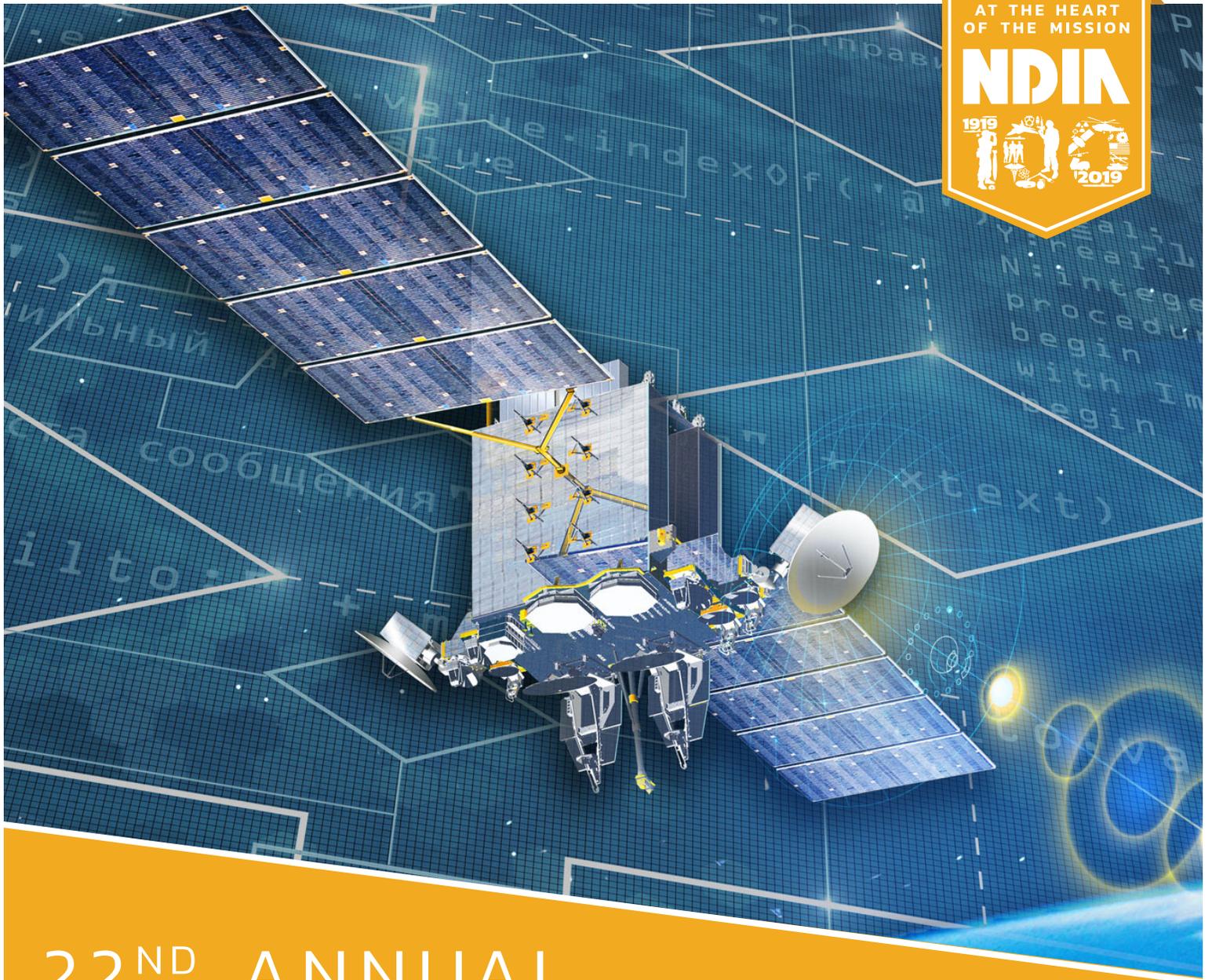AT THE HEART
OF THE MISSION

NDIA

1919 2019

22ND ANNUAL
SYSTEMS & MISSION
ENGINEERING CONFERENCE

October 21 – 24 | Tampa, FL | NDIA.org/SME

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WHO WE ARE

The National Defense Industrial Association is the trusted leader in defense and national security associations. As a 501(c)(3) corporate and individual membership association, NDIA engages thoughtful and innovative leaders to exchange ideas, information, and capabilities that lead to the development of the best policies, practices, products, and technologies to ensure the safety and security of our nation. NDIA's membership embodies the full spectrum of corporate, government, academic, and individual stakeholders who form a vigorous, responsive, and collaborative community in support of defense and national security. NDIA is proud to celebrate 100 years in support of our warfighters and national security. The technology used by today's modern warfighter was unimaginable 100 years ago. In 1919, BG Benedict Crowell's vision of a collaborative team working at the intersection of science, industry, government, and defense began what was to become the National Defense Industrial Association. For the past century, NDIA and its predecessor organizations have been at the heart of the mission by dedicating their time, expertise, and energy to ensuring our warfighters have the best training, equipment, and support. For more information, visit **NDIA.org**

LEADERSHIP

Bob Rassa
Conference Chair

Joe Elm
Division Chair

Geoff Draper
Vice Chair

Garry Roedler
Vice Chair

SYSTEMS ENGINEERING DIVISION

WHO WE ARE

NDIA's Systems Engineering Division advocates the widespread use of systems engineering in the Defense Department acquisition process to achieve affordable, supportable, and interoperable weapon systems that meet the needs of military users, support the open exchange of ideas and concepts between government and industry, and work for a new understanding of a streamlined systems engineering process.

WELCOME TO THE 22ND ANNUAL SYSTEMS & MISSION ENGINEERING CONFERENCE

On behalf of the National Defense Industrial Association's Systems Engineering Division, I would like to extend a very warm welcome to the 22nd Annual Systems & Mission Engineering Conference. It may be hard to believe that we in the defense industry have discussed systems engineering topics for over 20 years yet find new elements to explore. After all, as technology evolves, our military capability increases, the complexity of our systems develops, and the threats we have to address grow.

Last year, we added "Mission" to our name to recognize the new focus of engineering within the Pentagon circles since Mission Engineering and Integration are critical to our military and defense systems. As all that we do is oriented towards satisfying the specific mission, we are focused on the end goal rather than the means to achieve it—which we know to be effective systems engineering.

When we began twenty-two years ago, "Cybersecurity" was hardly mentioned in DoD circles. Neither was System-of-Systems, Mission Engineering, Engineered Resilient Systems, Model-Based Systems

Engineering, or System Security Engineering. Today, these topics constitute some of the most pressing issues that the defense industrial complex seeks to address, among many others.

This premier conference convenes the engineering arms of the Office of the Secretary of Defense, the Services, Federal Agencies, and the defense industrial complex to identify solutions to widespread issues. Executives, managers, and engineers from industry, government, and academia are here to achieve a mutual understanding of the issues we all face and must solve. This conference provides an outstanding opportunity to engage in such conversation, so please take maximum advantage of this opportunity.

We are pleased to have technical co-sponsorship by the Institute of Electrical & Electronics Engineers, Aerospace & Electronic Systems Society and Systems Council, as well as INCOSE, the International Council on Systems Engineering, for this conference.

If there is anything that the conference committee, the undersigned, or the outstanding NDIA staff can do to assist you, please let us know.

Bob Rassa
Director, Engineering Programs, Space & Airborne Systems, Raytheon Company | Conference Chair, Systems Engineering Division, NDIA

SCHEDULE AT A GLANCE

MONDAY, OCTOBER 21	TUESDAY, OCTOBER 22	WEDNESDAY, OCTOBER 23	THURSDAY, OCTOBER 24
Registration Galleria B 12:00 – 5:30 pm	**Registration** Galleria B 7:00 am – 6:30 pm	**Registration** Galleria B 7:00 am – 6:00 pm	**Registration** Galleria B 7:00 am – 5:00 pm
Concurrent Tutorials Esplanade I – III 1:00 – 5:30 pm	**Networking Breakfast** Bayshore Ballroom I & Palma Ceia Ballroom III & IV 7:00 – 8:00 am	**Networking Breakfast** Bayshore Ballroom I & Palma Ceia Ballroom III & IV 7:00 – 8:00 am	**Networking Breakfast** Bayshore Ballroom I & Palma Ceia Ballroom III & IV 7:00 – 8:00 am
Networking Break Galleria B 3:00 – 3:30 pm	**Keynote & General Session** Bayshore Ballroom II – VII 8:00 am – 5:00 pm	**Concurrent Technical Sessions** Various Hotel Room Locations 8:00 am – 5:00 pm	**Concurrent Technical Sessions** Various Hotel Room Locations 8:00 am – 5:00 pm
	Networking Lunch Bayshore Ballroom I & Palma Ceia Ballroom III & IV 12:15 – 1:15 pm	**Networking Lunch** Bayshore Ballroom I & Palma Ceia Ballroom III & IV 12:00 – 1:00 pm	**Networking Lunch (On Own)** 12:00 – 1:30 pm
	Networking Reception Galleria B 5:00 – 6:30 pm	**Networking Reception** Galleria B 5:00 – 6:00 pm	

EVENT INFORMATION

LOCATION	Hilton Tampa Downtown 211 N. Tampa Street Tampa, FL 33602
EVENT WEBSITE	NDIA.org/SME
ATTIRE	Civilian: Business Military: Uniform of the Day
SURVEY AND PARTICIPANT LIST	You will receive via email a survey and list of participants (name and organization) after the conference. Please complete the survey to help make our event even more successful in the future.

EVENT CONTACT

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Associate Director, Meetings
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mmangas@NDIA.org

Tatiana Jackson
Program Manager, Divisions
(703) 247-9479
tjackson@NDIA.org

SPEAKER GIFTS

In lieu of speaker gifts, a donation is being made to the Fisher House Foundation.

HARASSMENT STATEMENT

NDIA is committed to providing a professional environment free from physical, psychological and verbal harassment. NDIA will not tolerate harassment of any kind, including but not limited to harassment based on ethnicity, religion, disability, physical appearance, gender, or sexual orientation. This policy applies to all participants and attendees at NDIA conferences, meetings and events. Harassment includes offensive gestures and verbal comments, deliberate intimidation, stalking, following, inappropriate photography and recording, sustained disruption of talks or other events, inappropriate physical contact, and unwelcome attention. Participants requested to cease harassing behavior are expected to comply immediately, and failure will serve as grounds for revoking access to the NDIA event.

ANTITRUST STATEMENT

NDIA has a policy of strict compliance with federal and state antitrust laws. The antitrust laws prohibit competitors from engaging in actions that could result in an unreasonable restraint of trade. Consequently, NDIA members must avoid discussing certain topics when they are together at formal association membership, board, committee, and other meetings and in informal contacts with other industry members: prices, fees, rates, profit margins, or other terms or conditions of sale (including allowances, credit terms, and warranties); allocation of markets or customers or division of territories; or refusals to deal with or boycotts of suppliers, customers or other third parties, or topics that may lead participants not to deal with a particular supplier, customer or third party.

TRACK INFORMATION

Agile in Systems Engineering

John Norton
Raytheon Company

Eileen Wrubel
Software Engineering Institute

Agile usage is becoming more prevalent within the government space. Lessons learned and ideas for implementation can be shared with those who are experienced in using Agile concepts. This track brings together practitioners with experience applying agile methods in a variety of disciplines and domains, with the goal of collaboration to expand their effective use in systems engineering and on defense programs.

Architecture

Bob Scheurer
The Boeing Company

Ed Moshinsky
Lockheed Martin Corporation

Architecture is a key element in systems engineering. This track addresses architecture frameworks, strategies, and applications to improve system design, test, operations, and support.

CMMI

Geoff Draper
L3Harris Technologies

CMMI, or Capability Maturity Model Integration, will address topics in process improvement for systems and software engineering and the overall development process that have improved product development within the defense and commercial industry.

Developmental Test & Evaluation (DT&E)

Joe Manas
Raytheon Company

Developmental Test and Evaluation is a key aspect of successful systems engineering. This track addresses the entire continuum of test and evaluation from early planning to operational testing.

Digital Engineering/Model-Based Systems Engineering

Philomena Zimmerman
OUSD(R&E)

Digital Engineering is an emerging set of practices for Systems Engineering and other engineering disciplines which has, at its core, the use of models (data, algorithms and/or processes) as a technical means of communication. When used properly, models can provide a cohesion across engineering activities, and cohesion with acquisition activities. When coupled with computational capabilities, resultant data from simulations can be used in decision-making at all echelons, and an increased level of insight, and risk reduction in the end item can be achieved.

Engineered Resilient Systems (ERS)

Lois Hollan
Potomac Institute

Engineered Resilient Systems (ERS) is a Department of Defense priority initiative that seeks to transform engineering environments so that warfighting systems are more resilient and affordable across the acquisition lifecycle. The track will present new results across the ERS initiative including anchor technologies and computational representation.

Education & Training

Dr. Don Gelosh
Worcester Polytechnic Institute

The Education and Training track for 2019 is an excellent collection of six presentations from government, industry, and academia. The presentations describe a wide range of systems engineering (SE) workforce development activities covering the core of SE, agile approaches, an MBSE learning environment, modular online open education and the future of SE.

Enterprise Health Management

Chris Resig
The Boeing Company

The health of the system as a whole – the enterprise – is a critical function of systems engineering. This session will touch on some issues relating to the system health, including prognostics, diagnostics and reliability.

Environment, Safety, and Occupational Health

Sherman Forbes
U.S. Air Force

Lucy Rodriguez
Booz Allen Hamilton

Dave Schulte
SAIC

Engineering design considerations included under the DoD acronym ESOH, as defined in MIL-STD-882E, the DoD Standard Practice for System Safety. Mr. David Asiello, the Acquisition ESOH lead in the Office of the Assistant Secretary of Defense for Sustainment will make the ESOH Track's keynote presentation. He will provide an overview of the Office of the Secretary of Defense (OSD) reorganization that has separated Systems Engineering from Acquisition and Sustainment and has separated safety and health management from environmental management. Also, he will emphasize the importance of incorporating ESOH risks and requirements management into Acquisition and Sustainment as a way to promote readiness and summarize the new Defense Acquisition System (DAS) Adaptive Acquisition Framework and its challenges to Systems Engineering and ESOH policy. The remainder of the ESOH track presentations will address specific acquisition ESOH issues, to include integrating ESOH risks and requirements management into Digital Engineering and the new Middle Tier Acquisition framework, specific ESOH system design issues, hazardous materials management, and acquisition and sustainment programs' lessons learned.

Human Systems Integration (HSI)

Dr. Matthew Risser
Pacific Science & Engineering

Tom Hagale
The Boeing Company

The HSI track focuses on the human component in systems development to ensure systems are usable, useful, and support operational needs. The goal is to demonstrate value by aligning HSI processes with acquisition and systems engineering processes, in accordance with DoD HSI policy, standards, and guidance. Topics include HSI methods and best practices, standards and guidance, process innovation, metrics, applications, and approaches to program integration.

TRACK INFORMATION

Mission Engineering

Dr. Judith Dahmann
The MITRE Corporation

Mission Engineering (ME) is the deliberate planning, analyzing, organizing, and integrating of current and emerging operational and system capabilities to achieve desired warfighting mission effects. This track focuses on current directions in Defense ME and approaches to applying SoS and SE approach to ME.

Program Management

Vaughn Schlegel
Lockheed Martin Corporation

Program Managers and chief Systems Engineers should be the "joined-at-the-hip" leads on all programs that wish to be successful. This session will address some of the issues that our program managers face in the execution of programs.

Software Engineering

Ken Nidiffer
Software Engineering Institute

Software is often overlooked when talking systems engineering yet software is a key element of most designs today and must always be part of the systems engineer's portfolio of responsibility. This session will highlight a few significant software development issues.

Systems Engineering Effectiveness

Tim White
Raytheon Company

Joe Elm
Chair, Systems Engineering Division, NDIA

Systems Engineering Effectiveness is obvious to some and quite esoteric to others. The goal though, improving the value obtained for each SE dollar spent, is shared by each who joins the discussion. Please attend the SE Effectiveness track to learn how your peers are implementing practical measures to better quantify the benefits of Systems Engineering and its value to Product Users and Developers alike. Early and effective Systems Engineering has been shown to return excellent value to all project stakeholders. This Track will highlight the latest DoD policy and guidance, define new approaches, and provide some practical experiences to assist the DoD and defense industry SE community in achieving a quantifiable and persistent improvement in program outcomes through appropriate application of systems engineering principles and best practices.

System of Systems (SoS)

Dr. Judith Dahmann
The MITRE Corporation

Jennie Horn
Raytheon Company

Rick Poel
The Boeing Company

The System of Systems track will feature papers highlighting development SoS engineering approaches, particular SoS SE application areas, and SoS tools and modeling, including SoS SE applied to defense missions in mission engineering. See directly related track in Mission Engineering, above.

System Security Engineering (SSE)

Holly Dunlap
Raytheon Company

Melinda Reed
OUSD(R&E)

Systems Security Engineering has become one of the most important aspects in the design of DoD systems. This track will focus on system security engineering and a holistic approach to program protection.
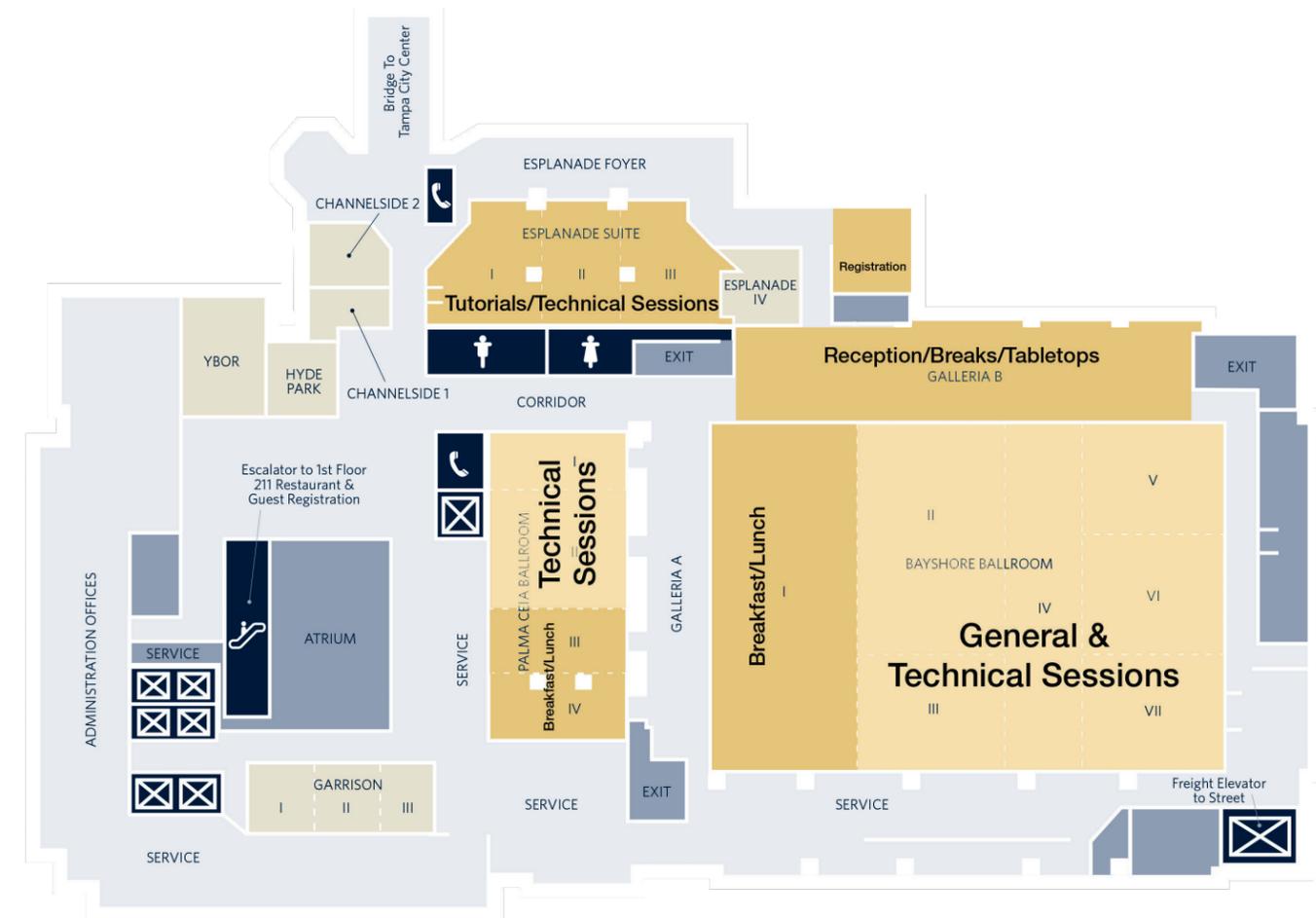
AGENDA

MONDAY, OCTOBER 21

12:00 – 5:30 pm

REGISTRATION
GALLERIA B

1:00 – 3:00 pm

CONCURRENT TUTORIALS
ESPLANADE I – III

Modeling and Simulation in the Systems Engineering Process
Dr. James Coolahan

Integrate SE with Earned Value Management and Program Management, Contractually and Practically
Paul Solomon

Model-Based Systems Engineering (MBSE): How to do 21st Century Systems Engineering Faster, Better, and Cheaper
Dr. Steven Dam

VENUE MAP

3:00 – 3:30 pm

NETWORKING BREAK
GALLERIA B

3:30 – 5:30 pm

CONCURRENT TUTORIALS CONTINUED
ESPLANADE I – III

Modeling and Simulation in the Systems Engineering Process
Dr. James Coolahan

Integrate SE with Earned Value Management and Program Management, Contractually and Practically
Paul Solomon

Model-Based Systems Engineering (MBSE): How to Do 21st-Century Systems Engineering Faster, Better, and Cheaper
Dr. Steven Dam

TUESDAY, OCTOBER 22

7:00 am – 6:30 pm

REGISTRATION
GALLERIA B

7:00 – 8:00 am

NETWORKING BREAKFAST
BAYSHORE BALLROOM I & PALMA CEIA BALLROOM III & IV

8:00 – 8:15 am

OPENING REMARKS
BAYSHORE BALLROOM II – VII

MG James "Jim" Boozer, USA (Ret)
Executive Vice President, NDIA

Joe Elm
Chair, Systems Engineering Division, NDIA

Bob Rassa
Director, Engineering Programs, Space & Airborne Systems,
Raytheon Company
Conference Chair, Systems Engineering Division, NDIA

8:15 – 9:15 am

KEYNOTE ADDRESS
BAYSHORE BALLROOM II – VII

James Faist
Director, Defense Research and Engineering for Advanced Capabilities,
Office of the Under Secretary of Defense for Research and Engineering

9:15 – 9:45 am

NETWORKING BREAK
GALLERIA B

9:45 – 11:00 am

EXECUTIVE PANEL: PROTOTYPING WITH A MISSION ENGINEERING FOCUS
BAYSHORE BALLROOM II – VII

Daniel Ermer
Director, Prototypes & Experiments (Acting)
Director, Joint Capability Technology Demostration (JCTD)
Moderator

Tony Schmidt
Senior Scientist and Technology Manager,
Navy Warfare Center

Robert Swahn
DTRA, R&D

Anthony Van Deusen
U.S. Army Futures Command,
Combat Capabilities Development Command

11:00 am – 12:15 pm

EXECUTIVE PANEL: GOVERNMENT INDUSTRY INTERACTION TO HELP ACHIEVE EFFECTIVE RESEARCH AND DEVELOPMENT ROADMAPS
BAYSHORE BALLROOM II – VII

Philomena Zimmerman
Director, Engineering Policy & Systems (Acting)
DDR&E(AC)/Deputy Director, Engineering Tools and Environments
Moderator

Col Jonathan Luminati, USAF
FNC3/OSD OUSD R&E

Christi Gau Pagnanelli
Director, BDS Systems Engineering and Engineering Multi-
Skilled Leadership, Boeing Defense, Space & Security

Guy Slominski
Center Manager, Air and Land Systems, Missile Systems,
Raytheon Company

12:15 – 1:15 pm

NETWORKING LUNCH
BAYSHORE BALLROOM I & PALMA CEIA BALLROOM III & IV

1:15 – 2:30 pm

INDUSTRY EXECUTIVE PANEL
BAYSHORE BALLROOM II – VII

Chauncey McIntosh
Vice President, F-35 Training Systems, Rotary and
Mission Systems, Lockheed Martin Corporation

Guy Slominski
Center Manager, Air and Land Systems, Missile Systems,
Raytheon Company

David Sharp
Principal Senior Technical Fellow
Chief Architect, AvionX, The Boeing Company

Bob Klein
Vice President of Engineering
Northrop Grumman

2:30 – 2:45 pm

PRESENTATION OF LT GEN THOMAS R. FERGUSON SYSTEMS ENGINEERING EXCELLENCE AWARDS
BAYSHORE BALLROOM II – VII

2:45 – 3:15 pm

NETWORKING BREAK
GALLERIA B

3:15 – 5:00 pm

DOD PROGRAM MANAGERS PANEL: PLATFORM PMS AND SYSTEM ENGINEERS CHALLENGES
BAYSHORE BALLROOM II – VII

Scott Menser
DDR&E(AC)/Mission Integration
Chief Engineer, Fixed Wing Aircraft and Weapons Lead
Moderator

CAPT Brian Durant, USN
Missile Defense Agency, AB/AG

Col Paul Rounsavall, USAF
B61-12 TKA

5:00 – 6:30 pm

NETWORKING RECEPTION
GALLERIA B

TECHNICAL SESSIONS

7:00 AM – 6:00 PM – REGISTRATION – GALLERIA B

7:00 – 8:00 AM – NETWORKING BREAKFAST – BAYSHORE BALLROOM I & PALMA CEIA BALLROOM III & IV

	Digital Engineering	Architecture & Modular Open Systems Approach	Model-Based Systems Engineering 2	CMMI
	Bayshore II	Bayshore III	Bayshore V	Bayshore VI
8:00 am	22286 New Digital Engineering Enabled Systems and Mission Engineering Performance Measures **Dr. Ed Kraft** University of Tennessee Space Institute	22319 Operationalizing the Architecture: Turning the Enterprise Architecture into an Active Mission Asset **Dr. John McDowall** BAE Systems	22408 Shipshape and Bristol Fashion: Model Documentation and Curation to Facilitate Reuse **Michael Vinarcik** SAIC	22292 CMMI Higher Maturity: The Implications of Getting it Wrong **Tara Lemieux** Daijo Consulting
8:30 am	22380 Implementing a Semantic Integration Strategy for an Interoperable Systems Engineering Ecosystem **Dr. Douglas Orellana** SAIC	22425 Re-Architecting the Systems Engineering Enterprise at Lockheed Martin Space to Meet the Challenges of DoD's Mission Needs **Calvin Craig** Lockheed Martin Space	22407 The Value of Pragmatism: The ROI of Efficient Modeling **Michael Vinarcik** SAIC	22480 How the CMMI Maturity Level 2 Practices Benefit the 367 TRSS **Parker Bauer** Air Force STSC
9:00 am	22404 Intellectual Property Challenges Within the Model-Based Enterprise **Seam Dykes** LMI	22421 The Role of Advanced Data Architectures in the MBSE Universe: Single Source of Truth Now and in the Future **Sonya Hand** Skayl, LLC	22517 Machine Learning in the Modeling and Simulation World **Joseph Keum** Riverside Research	22300 Streamline Your Business Performance with CMMI V2.0 **Ronald Lear** CMMI Institute **Kevin Schaff** CMMI Institute **Kileen Harrison** CMMI Institute **Parker Bauer** Air Force STSC
9:30 am	22159 INCOSE Model-Based Enterprise Capabilities Matrix **Al Hoheb** The Aerospace Corporation	22506 A Reference Architecture for Autonomy: Design, Development and Evaluation **Jeremy Gray** Air Force Institute of Technology	22540 The UFOS Framework: Enabling Ontology-Driven Simulation of Physics-Infused Descriptive Architecture Models **Gregory Haun** Relatech	22300 (cont.) **Brian Gallagher** BG Solutions and Services
	10:00 AM – NETWORKING BREAK – GALLERIA B			

	Engineered Resilient Systems	Education & Training	Human Systems Integration	System of Systems	Model-Based Systems Engineering
	Bayshore VII	Esplanade I	Esplanade II	Esplanade III	Palma Ceia Ballroom I & II
8:00 am	22455 Computational Engineering Ecosystem **Dr. Robert Wallace** U.S. Army Engineer Research and Development Center	22271 Exploring the Core of Systems Engineering **Dr. Fred Robinson** The MITRE Corporation	22326 System Architecture of a Human Biosensing and Monitoring Suite with Adaptive Task Allocation **Brandon Cuffie** Florida Institute of Technology	22520 Mission Engineering, Systems Engineering and System of Systems Engineering **Dr. Judith Dahmann** The MITRE Corporation	22448 Rapid Model Building with Patterns **Shane Connelly** Georgia Tech Research Institute
8:30 am	22398 EXPEDITE: Meeting the Engineering Challenges of Hypersonics Design **Dr. Justin Foster** U.S. Army Engineer Research and Development Center	22484 An Agile Approach to Training **Virginia Aguilar** Raytheon Missile Systems **Carla Sayan** Raytheon Missile Systems		22470 A Digital Toolchain for Architecture-Centric Decision Making **Christopher Garrett** Air Force Lifecycle Management Center	22502 The Use of MBSE and a Reference Architecture in a Rapid Prototyping Environment **Dr. David Jacques** Air Force Institute of Technology
9:00 am	22488 Machine Assisted Trade Space Analysis (MATSA) Raytheon and Engineered Resilient Systems **Abe Wu** Raytheon Company	22516 Creating an Enhanced MBSE Learning Environment Using Lego Mindstorms **Mike Shearin** Georgia Tech Research Institute	22456 Standard Practice for Human Systems Integration (SAE6906) and HSI-Related Projects **Steve Merriman** SCMerriman Consulting, LLC	22549 Challenges for System of Systems/Mission Engineering in a Space Acquisition Environment **Maj Benjamin Bennett, USAF** USAF Space and Missile Systems Center	22343 Exploration of Semantic Web Technologies as an Enabler of Model-Based Systems Engineering (MBSE) and Digital Engineering (DE) **Hyun June Ferrabolli** Department of Defense
9:30 am	22395 Current and Future ERS Projects **Dr. Owen Eslinger** U.S. Army Engineer Research and Development Center	22396 Future of Systems Engineering Continued **Dr. Steven Dam** SPEC Innovations	22482 Machine Learning as an Operator Decision Aid on the Tactical Edge **Edward Beck** ASRC Federal Mission Solutions	22461 Cybernetics, Complexity, and the Challenges to the Realization of System of Systems **Dr. Tod Schuck** Lockheed Martin RMS	22494 Using the Digital Thread for Change Analysis During Operation of an Asset Represented by its Digital Twin **Dr. Craig Miller** ANSYS
	10:00 AM – NETWORKING BREAK – GALLERIA B				

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	Digital Engineering	Architecture & Modular Open Systems Approach	Model-Based Systems Engineering 2	Systems Security Engineering
	Bayshore II	Bayshore III	Bayshore V	Bayshore VI
10:30 am	22362 — SysML-Based, Collaborative Research Project Management — Dr. Benjamin Kruse — Stevens Institute of Technology	22358 — The Problem with DoDAF Models — Mark Gibson — SAIC	22355 — Transitioning from Document-Centric to Model-Centric System Integration: Challenges and Opportunities for Legacy System Stakeholders — Mace Baesler, BAE Systems; Justin Gliptis, BAE Systems; Michael Hanlon, BAE Systems; Isaac Nuss, BAE Systems	22471 — Welcome and NDIA System Security Engineering Committee Highlights, Accomplishments, and Plans — Holly Dunlap — Raytheon Company
11:00 am	22375 — Modeling Languages: What Makes a Good Language and Why? — Dr. Ronald Giachetti — Naval Postgraduate School	22358 — DoD Data Rights: Policy Efforts — Philomena Zimmerman, OUSD(R&E); David McKeeby, Engility	(continued above)	22378 — Secure Cyber Resilient Engineering (SCRE) Standardization — Melinda Reed — OUSD(R&E)
11:30 am	22393 — The Ontology of Systems Engineering: Towards a Computational Digital Engineering Semantic Framework — Douglas Orellana — SAIC	22366 — Recent Activities and Updates to the DoD Approach and Strategy to Implementing Modularity and Openness in Weapon Systems — J. Kyle Hurst, U.S. Air Force; Dr. Kelly Alexander, Army ASA(ALT); Bruce Burnside, NAVSEA	22470 — A Digital Toolchain for Architecture-Centric Decision Making — Christopher Garrett — Air Force Lifecycle Management Center	22580 — Cyber Resiliency for AF Weapon Systems Architecture-Drive Assurance for Avionic Systems — Daniel Holtzman — U.S. Air Force

12:00 PM – NETWORKING LUNCH – BAYSHORE BALLROOM I & PALMA CEIA BALLROOM III & IV

	Digital Engineering	Architecture & Modular Open Systems Approach	Program Management & Life Cycle support	Systems Security Engineering
	Bayshore II	Bayshore III	Bayshore V	Bayshore VI
1:00 pm	22447 — Digital Engineering Implementation Across the Department of Defense — Philomena Zimmerman — OUSD(R&E)	22354 — DoD Tri-Service MOSA Initiative for Standardization — Himanshu Patni — Defense Standardization Program Office	22551 — Agile Framework Overview — Andrea Nibert — Leidos, Inc.	22379 — Joint Federated Assurance Center (JFAC) Update 2019 — Thomas Hurt — OUSD(R&E)
1:30 pm	22452 — U.S. Navy and Marine Corps Digital Engineering Strategy — Michael Doctor — U.S. Navy	22365 — A Graph and Model-Based Analysis of the Openness of Functional Reference Architectures for Modular Open Systems — J. Charles Domerçant — Georgia Tech Research Institute	22563 — Managing Irreducible Schedule Risk — Rick Price — ClearPlan Consulting	22381 — Software Assurance Throughout the System Life Cycle — Thomas Hurt — OUSD(R&E)

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	Engineered Resilient Systems	Education & Training	Human Systems Integration	System of Systems	Model-Based Systems Engineering
	Bayshore VII	Esplanade I	Esplanade II	Esplanade III	Palma Ceia Ballroom I & II
10:30 am	22450 — Techniques in Large-Scale Data Analytics for Engineers Framework — Cody Slater — U.S. Army Engineer Research and Development Center	22525 — Modular Online Open SE Education (MOOSE) — Kyle Hastings — The MITRE Corporation		22498 — STITCHES: DARPA Technology Enabler for Rapid Composition of System of Systems — Dr. Judith Dahmann, The MITRE Corporation; Lt Col Jimmy Jones (Rev), USAF, DARPA PM	22474 — Approaches to Marking and Validating Sensitive MBSE Models — Veejay Gorospe — Johns Hopkins University Applied Physics Laboratory
11:00 am	22414 — High-Fidelity Rotorcraft Modeling to Support Future Vertical Lift — Dr. Andrew Wissink — U.S. Army Aviation Development Directorate	22309 — Designing Systems that are Chemical, Biological, Radiological, and Nuclear (CBRN) Survivable — Brendan Powers — Joint CBRN Defense Program Analysis and Integration Office	22544 — Informing Early Systems Engineering Through an Improved HSI Approach to User Needs Analysis — Dr. Matthew Risser — Pacific Science & Engineering	22498 (cont.) — Dr. Evan Fortunato, Apogee Research – STITCHES Technology; Michael Solari, Lockheed Martin – STITCHES Application Experience	22481 — A New Approach to Modeling, Viewing, and Managing Engineering Processes — Teresa McCarthy — Lockheed Martin Corporation
11:30 am			22345 — PTSD and a New Way to Fight It — Apurva Lanman — University of Central Florida		22505 — Hazardous Materials Model Library & Digital Engineering Resource — Mike LaPierre — Booz Allen Hamilton

12:00 PM – NETWORKING LUNCH – BAYSHORE BALLROOM I & PALMA CEIA BALLROOM III & IV

	Mission Engineering	Enterprise Health Management	Environment Safety & Occupational Health	Development Test & Evaluation	Model-Based Systems Engineering
	Bayshore VII	Esplanade I	Esplanade II	Esplanade III	Palma Ceia Ballroom I & II
1:00 pm	22333 — Mission-Focused Engineering — Dean Ridgely — OUSD(R&E)	22242 — Key Metrics for Performance Based Logistics Sustainment Program — Dr. Camille Lewis — Lockheed Martin Corporation	22364 — Environment, Safety, and Occupational Health (ESOH) – Design Considerations to Strengthen Readiness & Sustainability — David Asiello — ODASD(ENV)	22527 — Systems Engineers Should be the Test Engineers! — Paul Newell — Raytheon Company	22285 — Autonomous Sensor Tasking for Space Situational Awareness Using Deep Reinforcement Learning — Quintina Jones — Raytheon Missile Systems
1:30 pm	22445 — Extending the DoD Digital Engineering Strategy to Missions, System of Systems and Portfolios — Philomena Zimmerman — OUSD(R&E)	22262 — Unique Wake State Management and Extended Power Enablers for Effective Power Management within U.S. Military Ground Vehicle Electronics and Architecture Solutions — Lawrence Osentoski — GC Associates USA / Oakland University	22274 — Systems Engineering Lessons Applied in NNSA Weapons Programs — R. Glenn Bell — NNSA/DOE Defense Programs		22546 — Benchmarking the Business Benefits of MBSE — Tom McDermott — Stevens Institute of Technology

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	Digital Engineering	Architecture & Modular Open Systems Approach	Program Management & Life Cycle Support	Systems Security Engineering
2:00 pm	**22536** Outbrief from the Digital Engineering Information Exchange Working Group (DEIXWG) Digital Viewpoint Model (DVM) Sub-Team — Sean McGervey, Johns Hopkins University Applied Physics Laboratory	**22483** Modular Open Systems and Models — Virginia Aguilar, Raytheon Company	**22515** Effective Risk and Opportunity Escalation — Vaughn Schlegel, Lockheed Martin Corporation	**22529** Cyber Survivability Endorsement – New DoD Direction and Cyber Architecture — Cory Ocker, Raytheon Company

2:30 PM – NETWORKING BREAK – GALLERIA B

	Digital Engineering	Architecture & Modular Open Systems Approach	Program Management & Life Cycle Support	Systems Security Engineering
Room	Bayshore II	Bayshore III	Bayshore V	Bayshore VI
3:00 pm	**22382** Breaking the Dependency of MBSE Tools — Robin Mikola, Sodius-Willert; Chris Finlay, Raytheon Company	**22565** NDIA MOSA White Paper Overview and Recommendations — Steve Thelin, Raytheon Company	**22457** Leveraging DCMA EVMS Data Driven Metrics to Support Your Contract Lifecycle — David Scott, BDO Industry Specialty Services	**22250** Systems Engineering Challenges for Integrating Software Assurance into Systems — Dr. Kenneth Nidiffer, SEI
3:30 pm	**22312** Digital Transformation Using AI, IoT, and Blockchain — Niten Malik, Microsoft Corporation	**22485** Getting the MOSA Out of Composable Common Products: Raytheon's Approach to MOSA — Randy Ramsey, Raytheon Company	**22177** Systems Engineering Concepts and Their Relationship to First Time Quality — April King, Northrop Grumman Corporation	**22403** Enhanced Software Assurance Through DevSecOps — Bradley Lanford, SAIC; Thomas Hurt, OUSD(R&E)
4:00 pm	**22294** AI Based Engineering Assistant – Leveraging AI Technologies in the Digital Engineering Domain — Gavin Arthurs, IBM	**22468** Open System Architecture as Applied to Air-Launched Weapons — Leo Rose, Odyssey Consulting; Johnathan Shaver, Air Force Research Laboratory	**22304** Product Supportability Through Lifecycle Modeling and Simulation — Izydor Radzik, Systecon	**22310** Mission Driven Security: Baseline Assurance and Threat/Vulnerability — David Olmstead, Lockheed Martin Corporation
4:30 pm	**22247** Pushing the State of the Art: A Web-Enabled MBSE Analysis Integration Framework — Dr. Andy Ko, Phoenix Integration	**22550** How Open and Modular is Your System? — Mark Gibson, SAIC	**22316** A System of Systems Approach to Evaluate the Emergence of Technology on International Regulations for Preventing Collisions at Sea (COLREG) — LCDR Matthew Press, USCG, The George Washington University	**22581** Visibility & Control: Addressing Supply Chain Challenges to Trustworthy Software-Enabled Things — Robert Martin, The MITRE Corporation

5:00 PM – NETWORKING RECEPTION – GALLERIA B

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	Mission Engineering	Enterprise Health Management	Environment Safety & Occupational Health	System of Systems	Model-Based Systems Engineering
2:00 pm	**22558** Implementing Mission Engineering — Dr. Judith Dahmann, The MITRE Corporation	**22388** Reform – Improving Forecasting to Increase Speed to Delivery and Reliability — Lynn Kohl, NAVSUP Weapon Systems Support	**22370** DON System Safety in (Middle Tier) Accelerated Acquisition Process — Jennifer Glenn, ODASN(RDT&E)		

2:30 PM – NETWORKING BREAK – GALLERIA B

	Mission Engineering	Enterprise Health Management	Environment Safety & Occupational Health	System of Systems	Model-Based Systems Engineering
Room	Bayshore VII	Esplanade I	Esplanade II	Esplanade III	Palma Ceia Ballroom I & II
3:00 pm	**22423** The Effectiveness-Based Capability Model (EBCM), A Methodology for Mission Engineering — John Green, Naval Postgraduate School	**22437** The MBSE Digital Thread for Systems Failure Prediction — David Segal, PTC	**22501** Improvements to Current Standards as a Solution to the Militaries on Board Oxygen Generation System (OBOGS) Problems — J. Kyle Hurst, U.S. Air Force		**22478** Model-Centric Source Selection Workshop — Al Hoheb, The Aerospace Corporation; Nathaniel Norwood, NAVAIR
3:30 pm	**22426** Scenario, Visualization, and Simulation Approaches for Addressing Integration Challenges in Mission Engineering — Dr. Alejandro Hernandez, Naval Postgraduate School; Dr. Anthony Pollman, Naval Postgraduate School	**22435** In-Situ Monitoring/Lifetime Prognostication of Critical System Components Using Unintended Emission Analysis Techniques — Dr. Nick Martin, Defense Microelectronics Agency	**22510** Defining, Developing & Enhancing the Next Generation in Digital Engineering; A-10 Tactical Advantages, Lessons Learned and Future Plans — Hazen Sedgwick, U.S. Air Force	**22462** Information Maneuverability and the Transformation of the Warfighting Environment — Dr. Tod Schuck, Lockheed Martin RMS	
4:00 pm	**22376** Analysis of Interoperability to Support Mission Engineering — Dr. Ronald Giachetti, Naval Postgraduate School	**22508** Using Unstructured Logbook Narratives to Correct Work Unit Codes — Josh Kalin, PeopleTec	**22298** Digital Engineering for DoD ESOH — Dr. Dirk Zwemer, Intercax, LLC	**22541** How Can Six Sigma and Model-Based Systems Engineering (MBSE) Improve Communication Within System of Systems (SoS) — LaTasha Starr, Lockheed Martin Aeronautics	
4:30 pm		**22439** Enterprise Integrated Health Management Systems for Reliable Sustainment, Maintenance and Lifecycle Management — David Segal, PTC	**22336** Safe from the Start: Using MBSE for Safety Engineering — Daisy Bower, U.S. Army Futures Command CCDC Armaments Center	**22519** When to Do System to System Testing — Paul Newell, Raytheon Company	

5:00 PM – NETWORKING RECEPTION – GALLERIA B

7:00 AM – 5:00 PM – REGISTRATION – GALLERIA B

7:00 – 8:00 AM – NETWORKING BREAKFAST – BAYSHORE BALLROOM I & PALMA CEIA BALLROOM III & IV

	Digital Engineering	Architecture & Modular Open Systems Approach	Program Management & Life Cycle Support	Systems Security Engineering
	Bayshore II	Bayshore III	Bayshore V	Bayshore VI
8:00 am	22251 The Role of Analytics in the Digital Twin **Gavin Jones** SmartUQ	22497 Requirements Architecting: Object-Oriented To M&S-Driven **Sachin Mehta** L3Harris Technologies	22334 Independent Technical Risk Assessments: Informing Decisions **Scott Menser** OUSD(R&E)	22432 Integrating Security into Enterprise Architecture with UAF **Matthew Hause** PTC
8:30 am	22313 Implementing the Digital Thread Across the Lifecycle with Global Configurations (GCs) **Dr. Graham Bleakley** IBM UK	22492 Innovation Opportunities Within Product Breakdown Structures **Mike Franco** The Boeing Company	22453 Dynamic Innovation Portfolio Risk & Opportunity Management: Keeping Ahead of the Pace of Change **Thomas Brazil** Integrated Computer Solutions, Inc.	22377 A Loss-Driven Approach to Systems Analysis **Melinda Reed** OUSD(R&E) **Michael McEvilley** The MITRE Corporation
9:00 am	22397 Do We Always Want to Integrate Tools to Create the Digital Thread? **Dr. Steven Dam** SPEC Innovations	22454 Custodianship Model for Distributed Fusion Environments **I-Ju Nelson** BAE Systems	22487 Whole System Life Cycle Management with Blockchain and Digital Twins **Patrick Price** DESE Research	22306 Application of Explainable Machine Learning Systems for Improving Network Intrusion Detection **Ying Zhou** The George Washington University
9:30 am		22438 Implementing Modular Open Systems Approach (MOSA) Architectures with MBSE **Matthew Hause** PTC	22405 Digital Engineering Throughout the DoD Lifecycle **Sean Dykes** LMI	22371 Systemic Security and the Role of Design for Cyber Physical Systems: Methods for Dynamic Analysis and Implications for MBSE Practice **Dr. Valerie Sitterle** Georgia Tech Research Institute
	10:00 AM – NETWORKING BREAK – GALLERIA B			

	Mission Engineering	Systems Engineering Effectiveness	Environment Safety & Occupational Health	Agile	Model-Based Systems Engineering
	Bayshore VII	Esplanade I	Esplanade II	Esplanade III	Palma Ceia Ballroom I & II
8:00 am	22491 Set-Based Design Is a Sensible By-Product of Mission Engineering **Dr. Dennis Buede** Innovative Decisions, Inc.	22469 DoD Engineering Policy and Systems Initiatives **Philomena Zimmerman** OUSD(R&E)	22387 System-Theoretic Process Analysis (STPA) Guided Model-Based Safety Analysis (MBSA) **Jing Liu** Collins Aerospace **Wesley True** Collins Aerospace	22547 Industry Recommendations (NDIA, INCOSE, PSM) for Implementing Continuous Iterative Software Development in the Defense Industry **Joe Elm** NDIA SE Division **Robin Yeman** Lockheed Martin Corporation	22261 INCOSE Model-Based Enterprise Capabilities Matrix – For Organizational Assessments **Al Hoheb** The Aerospace Corporation **Joe Hale** NASA/MFSC
8:30 am		22272 Increasing SE Performance Through Quantifiable Measurement of Required Program Documentation **James Miller** U.S. Air Force	22433 Semi Automated Model-Based Safety and Security Analysis of Embedded Systems **Rand Whillock** Adventium Labs	22548 Industry Best Practices for Iterative Software Development, Agile, and DevOps **Robin Yeman** Lockheed Martin Corporation	
9:00 am	22568 Deploying the Source of Truth for Model-Based System Development – From Acquisition to Sustainment **David Ewing** Aras Corporation	22269 2018 Nuclear Posture Review – Implementation Using Systems Approach **Marc Boucher** National Nuclear Security Administration	22442 Adapting ESOH Risk and Requirements Management in a Rapid and Adaptive Acquisition Framework **Karen Gill** Booz Allen Hamilton	**Jason McDonald** L3Harris Technologies **Firas Glaiel** Raytheon Company **Suzette Johnson** Northrop Grumman Corporation	
9:30 am		22537 A Scalable MBSE Architectural Framework for A Rapid RDT&E Environment **Robert Iannuzzi** NSWC Dahlgren Division	22503 Hazardous Materials Model Library & Digital Engineering Resource **Lori Hales** Booz Allen Hamilton		
	10:00 AM – NETWORKING BREAK – GALLERIA B				

	Digital Engineering	Architecture & Modular Open Systems Approach	Program Management & Life Cycle Support	Systems Security Engineering
	Bayshore II	Bayshore III	Bayshore V	Bayshore VI
10:30 am	22391 Digital Engineering Ecosystem for Innovative Nuclear Technologies **Christopher Ritter** Idaho National Laboratory	22557 Lowering the Barrier for Gov. MBSE Adoption Using a UPDM/UAF Acquisition Model Template to Communicate a Precise RPF **Laura Hart** Lockheed Martin Space	22521 Force Level Integration: Application of Set-Based Design to POM Trade **David Fullmer** Georgia Tech Research Institute	22344 Cybersecurity Verification and Validation, and Developmental/Operational Test & Evaluation **David Olmstead** Lockheed Martin Corporation
11:00 am	22429 Digital Engineering Toolchain: Requirements and Implementation **Dr. Aleksandra Markina-Khusid** The MITRE Corporation	22411 Continuing Madness: Methods Behind System Architecting Challenged **Robert Scheurer** The Boeing Company	22523 Fleet Management of USAF Legacy Aircraft in a Hybrid Digital/Paper-Based Sustainment Environment **Richard Billings** A-10 System Program Office	22347 Utilizing a Maximin Approach to Explore System Design Trade-Space to Optimize Mission Resiliency **Hassan Liaghati** The George Washington University
11:30 am	22534 The Role of Engineering Practitioners in the Ideal Digital Engineering Ecosystem of the Near Future **Dr. John Coleman, III** SAIC **Frank Salvatore** SAIC **Chris Schreiber** Lockheed Martin Corporation **Celia Tseng** Raytheon Company **Tamara Hambrick** Northrop Grumman Corporation	22583 What's Needed by Industry to Show OSD's Commitment to MOSA **Ed Moshinsky** NDIA SE Architecture Committee	22522 Application of Probabilistic Graph Models to Warfighting Capability and Capacity Assessments **Jason Baker** Georgia Tech Research Institute	22368 Answering the Cyber-Physical System Security Workforce Challenge **Tom McDermott** Stevens Institute of Technology

	12:00 PM – NETWORKING LUNCH (ON OWN)			
	Digital Engineering	Software	Program Management & Life Cycle Support	Systems Security Engineering
	Bayshore II	Bayshore III	Bayshore V	Bayshore VI
1:30 pm	22103 Blockchain for Defense: AFCEA Technology Perspectives **Nikhil Shenoy** Colvin Run Networks, LLC	22372 Software Experts Panel: DoD Software Engineering **Dr. Bernard Reger** OUSD(R&E) *Moderator* **Sean Brady** Defense Acquisition University **Leo Garciga** JIDO **Robin Yeman** Lockheed Martin Corporation	22530 Environment and Simulator Availability and Adequacy During Sustainment **Paul Newwell** Raytheon Company	22320 National Nuclear Security Administration's Approach to Systems Security Engineering **Matthew Lee** Honeywell FM&T

	Mission Engineering	Systems Engineering Effectiveness	Environment Safety & Occupational Health	Agile	Model-Based Systems Engineering
	Bayshore VII	Esplanade I	Esplanade II	Esplanade III	Palma Ceia Ballroom I & II
	22352 Mission Engineering – Competencies Panel **Dr. Dinesh Verma** Stevens Institute of Technology **Philomena Zimmerman** OUSD(R&E) **Dr. Gregg Vesonder** Stevens Institute of Technology **Dr. Judith Dahmann** The MITRE Corporation	22301 Systems Engineering Transformation Surrogate Pilot Experiments: Doing Everything in Models to Demonstrate the Art-of-the-Possible **Dr. Mark Blackburn** Stevens Institute of Technology	22441 Defense Acquisition Materials Declaration **Tim Sheehan** Raytheon Company	22559 A Path Toward Consensus Measures for Iterative Software Development **Cheryl Jones** U.S. Army, PSM	22542 The Growing Importance of Models for Defense Acquisition **Dr. John Colombi** Air Force Institute of Technology
		22475 Efficient Modeling & Simulation Using Sequential Design of Experiments Methods **Dr. Tom Donnelly** SAS Institute	22459 Naval Sea Systems Command's (NAVSEA) Approach for Managing the Risk of Hazardous Material Usage in New Acquisition **Jessica Klotz** NSWC Carderock Division	22499 Addressing Agile Threat Considerations in the Defense Capability Lifecycle **John Daly** Booz Allen Hamilton	22554 Lessons Learned and Recommended Best Practices from MBSE Pilot Programs **Ryan Noguchi** The Aerospace Corporation
		22507 9 Key Enablers for Knowledge-Based Defense Acquisition **Brian Kennedy** Targeted Convergence Corporation	22493 Air Force Coating System Specification Approach to Non-Chromium Coating Qualification for the Outer Moldline on Aircraft **Diane Buhrmaster** Air Force Research Laboratory	22324 Strategies for Streamlining Enterprise Architecture in the Age of Agile **John Mallinger** Raytheon Company	22560 Model-Based Acquisitions: How Do We Get There? **Dr. Peter Pan** Northrop Grumman Corporation

	12:00 PM – NETWORKING LUNCH (ON OWN)				
	Mission Engineering	Systems Engineering Effectiveness	Environment Safety & Occupational Health	Agile	Model-Based Systems Engineering
	Bayshore VII	Esplanade I	Esplanade II	Esplanade III	Palma Ceia Ballroom I & II
	22367 Addressing Mission Engineering from a Lead Systems Integration Perspective **Dr. Warren Vaneman** Naval Postgraduate School	22290 MBSE 2.0: The Future is Now! **Zane Scott** Vitech Corporation	22463 Systems Analysis of Cd-free Electroplating at Fleet Readiness Center Southeast **Michael Bruckner** Noblis	22513 DevOps Development – Dynamics of Engineering Concurrent Multi-Product Efforts **Brian Davenport** Raytheon Company	22460 Using the MBSE and Architecture Keys to Decrypt the Innovation Process and Corporate Memory **Bob Sherman** Procter & Gamble Company

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Time	Digital Engineering		Program Management & Life Cycle Support	Systems Security Engineering
2:00 pm	22479 A Framework to Guide AI/ML and Autonomy Research in Systems Engineering — **Tom McDermott**, Stevens Institute of Technology		22436 From Electrons to Physical Systems: Integrating MBSE and Product Lifecycle Management — **Matthew Hause**, PTC	22283 DoD Industrial Base Impacts of Recent System Security Engineering and Software Assurance Guidance via Use Case Assessment — **Cory Ocker**, Raytheon Company
2:30 pm	22446 A Technology Road-Map for Emerging Technologies to Support the Future End-to-End Digital Engineering Enterprise — **Dr. John Coleman, III**, SAIC		22531 Digital Engineering Transformation on Legacy Weapon Systems — **Lt John McCrea, USAF**, ICBM Systems Directorate	22509 Loss-Driven Systems Engineering — **Michael McEvilley**, The MITRE Corporation

3:00 PM – NETWORKING BREAK – GALLERIA B

Time	**Digital Engineering**	**Software**	**Program Management & Life Cycle Support**	**Systems Security Engineering**
	Bayshore II	Bayshore III	Bayshore V	Bayshore VI
3:30 pm	22555 MBSE^2 – Using MBSE to Architect and Operate the MBSE System — **Ryan Noguchi**, The Aerospace Corporation	22428 An MBSE Approach to Software Intensive Systems — **Matthew Hause**, PTC		22547 Industry Recommendations (NDIA, INCOSE, PSM) for Implementing Continuous Iterative Software Development in the Defense Industry — **Joe Elm**, NDIA SE Division; **Robin Yeman**, Lockheed Martin Corporation
4:00 pm	22449 Architecture Centric Virtual Integration Process (ACVIP): A Key Component of the DoD Digital Engineering Strategy — **Alex Boydston**, U.S. Army			
4:30 pm				

5:00 PM – CONFERENCE ADJOURNS

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Time	Mission Engineering	Systems Engineering Effectiveness	Environment Safety & Occupational Health	Model-Based Systems Engineering	Model-Based Systems Engineering
2:00 pm	22360 Curation of the Digital Mission Engineering Enterprise — **Brian Haan**, SAIC	22348 Feature-Based Product Line Engineering: A Transformative Approach for Aerospace and Defense — **Dr. Charles Krueger**, BigLever Software, Inc.	22511 Adaptive and Intelligent Electronic Warfare Support — **Carolyn Stwertka**, ODASD(ENV)	22496 Tailoring Systems Engineering for Adaptive Acquisition — **Dr. Peter Korfiatis**, The MITRE Corporation	22464 The Migration Crisis: Solving the Transition from DOORS to DNG to Unlock the Digital Thread — **Julie DeMeester**, Raytheon Company
2:30 pm	22532 A Rapid Prototyping Simulation Capability in Armor Active Protection Systems — **Cody Fernandez**, Georgia Tech Research Institute	22465 Cloud Decision Framework — **Sunny Anand**, The MITRE Corporation	22514 Assessing Supply Chain Risks of Critical Chemicals and Materials for National Defense — **Andrew Rak**, Noblis		22518 Model-Based Roadmapping: Time-Dependent Tradespace Analysis — **Daniel Browne**, Georgia Tech Research Institute

3:00 PM – NETWORKING BREAK – GALLERIA B

Time	**Mission Engineering**	**Systems Engineering Effectiveness**	**Environment Safety & Occupational Health**	**Model-Based Systems Engineering**	**Model-Based Systems Engineering**
	Bayshore VII	Esplanade I	Esplanade II	Esplanade III	Palma Ceia Ballroom I & II
3:30 pm	22486 Model-Based Mission Engineering – How We Implemented MBME for Cyber COE, Intel COE, PEO IEWs and PEO C3T — **Matthew Maher**, Processus Group	22399 Future of Systems Engineering Panel — **Dr. Steven Dam**, SPEC Innovations	22299 ESOH Risk Management in Middle Tier Acquisition — **Sherman Forbes**, SAF/AQRE	22314 The Role of Simulation in the Implementation of a Digital Twin — **Dr. Graham Bleakley**, IBM UK	22582 Integrating the Digital Thread from Requirement to System Modeling and to PLM Platform to Enable Enterprise MBSE Capabilities — **Gan Wang**, BAE Systems
4:00 pm	22322 An Information Model for Mission Engineering — **Zane Scott**, Vitech Corporation			22427 SysML Based Co-Simulation and Integration of Physical System Models Using a Standard Interface — **Dr. Behnam Afsharpoya**, Dassault Systemes	22361 Defining a Model-Based Systems Engineering Approach for Technical Reviews — **Dr. Warren Vaneman**, Naval Postgraduate School
4:30 pm					22413 The Risks of Classical Systems Engineering in a Model-Based Systems Engineering World — **Curtis Sisson**, The Boeing Company

5:00 PM – CONFERENCE ADJOURNS

TECHNICAL SESSION SUMMARIES

Blockchain for Defense: AFCEA Technology Perspectives

22103 | Shenoy, N.
Understanding Blockchain has never been more important as hype gives way to practical applications. Nikhil Shenoy, CEO of Colvin Run Networks and Leader of the AFCEA Technology Committee's Blockchain Vector, presents a real-world guide to Blockchain in defense.

INCOSE Model-Based Enterprise Capabilities Matrix

22159 | Hoheb, A. • Hale, J.
The Matrix document provides a reference for enterprise and program/project organizations to assess their current and desired implementation of modeling. It is based on the OSD Digital Engineering Strategy, the ISO/IEC/IEEE 15288 documents, and leading MBSE research.

Systems Engineering Concepts and Their Relationship to First Time Quality

22177 | King, A.
This presentation delves into the relationship between Systems Engineering processes and how they promote first time quality. Focus on how these concepts reduce rework throughout the development lifecycle. Attention on the main areas: "Total Quality Costs", "prevention", "detection" and "failure."

Key Metrics for Performance-Based Logistics Sustainment Program

22242 | Lewis, C.
A robust predictive Model is essential to compressing the supply chain, optimizing repairs, and managing outcomes. An Optimization Model with multi-indenture, multi-echelon scenarios is needed for spares provisioning so supplier profit can be maximized under the PBL contract.

Pushing the State of the Art: A Web-Enabled MBSE Analysis Integration Framework

22247 | Ko, A.
The vision and promise of MBSE is one where systems models and analyses are tightly integrated in an automated, collaborative, easily accessible framework. Phoenix Integration is meeting that vision by demonstrating feasibility of a web-based integrated Systems Engineering Modeling and analysis tool.

Systems Engineering Challenges for Integrating Software Assurance into Systems

22250 | Nidiffer, K.
Presentation focuses on current Government and Industry efforts to provide Program Managers and Developers Guidebooks for engineering-In software assurance into defense systems. Each attendee will receive a free copy of the Program Managers and Developers Guidebooks for Software Assurance.

The Role of Analytics in the Digital Twin

22251 | Jones, G.
Using uncertainty quantification (UQ) and other analytics techniques, this presentation will introduce attendees to the digital twin process workflow. A digital twin example utilizing systems simulation data combined with UQ and analytics tools will be included.

INCOSE Model-Based Enterprise Capabilities Matrix – For Organizational Assessments

22261 | Hoheb, A. • Hales, J.
The INCOSE Model-Based Enterprise Capabilities Matrix 2-hour workshop provides an overview of its use and content and how it helps implement the OSD Digital Engineering Strategy. Participants will apply the matrix against an acquisition scenario to define needed modeling capabilities.

Unique Wake State Management and Extended Power Enablers for Effective Power Management within U.S. Military Ground Vehicle Electronics and Architecture Solutions

22262 | Osentoski, L.
Integration of configurable wake states and extended power enablers during system start-up and shut down serves to mitigate the risk to system power degradation and overall system vulnerability by mapping a truly determinate state at all times.

2018 Nuclear Posture Review – Implementation Using Systems Approach

22269 | Boucher, M. • Venkatesh, S.
With the 2018 Nuclear Posture Review (NPR), the National Nuclear Security Administration (NNSA) committed to continue its responsibilities to maintain the nation's nuclear weapons and deterrent. This paper presents the systems approach and roadmaps to reach the end state for holistic systems integration.

Exploring the Core of Systems Engineering

22271 | Robinson, F.
A discussion of 4 proposed core cognitive characteristics of effective systems engineers: Perform "English to English" (E2E) translation, focus on "Behavior Defined Systems" (BDS), recognize the importance of the "Art of Good Enough" (AGE) and understand that in the end "We Are Generalists" (WAG).

Increasing SE Performance Through Quantifiable Measurement of Required Program Documentation

22272 | Miller, J.
This presentation describes a methodology to quantitatively measure the quality of a program's SE documents. Actual scoring criteria, metrics, and portfolio comparison will be shown to turn tangibly and specifically depict the problem areas and shortfalls in a program's documents.

Systems Engineering Lessons Applied in NNSA Weapons Programs

22274 | Bell, R. • Venkatesh, S.
This presentation describes the key factors for improvements within NNSA for streamlining design, production, and sustainment processes and integration in a 21st century systems engineering context.

DoD Industrial Base Impacts of Recent System Security Engineering and Software Assurance Guidance via Use Case Assessment

22283 | Ocker, C. • Sundstrom, C.
To analyze the effect of recent government guidance on System Security Engineering and Software Assurance will have on the acquisition process, a case study was performed leveraging an existing acquisition program to identify impacts, lessons learned, and value provided.

Autonomous Sensor Tasking for Space Situational Awareness Using Deep Reinforcement Learning

22285 | Jones, Q.
The implementation of deep reinforcement learning for tasking sensors that are responsible for monitoring the space objects, such as satellites, in various orbits.

New Digital Engineering Enabled Systems and Mission Engineering Performance Measures

22286 | Kraft, E.
New Digital Engineering enabled Systems and Mission Engineering metrics focused on performance measures and quantified margins and uncertainties at critical decision points are introduced enabling better decisions to optimize system development and mission execution.

MBSE 2.0: The Future is Now!

22290 | Scott, Z.
Systems Engineering itself must evolve to keep pace with complexity and rapid change. No longer can design engineering take place in a disconnected and serial manner. Engineering must become connected and concurrent. Models must enable and embody that sense of connection. That evolution is MBSE 2.0.

CMMI Higher Maturity: The Implications of Getting it Wrong

22292 | Lemieux, T.
In this presentation, we will explore the natural evolution of an internal metrics capability, invoking real world case studies to delineate factors inhibiting our performance while offering practical guidance to navigate those not-so-common missteps and challenges.

AI-Based Engineering Assistant – Leveraging AI Technologies in the Digital Engineering Domain

22294 | Arthurs, G.
Discussion of AI technologies and application to the digital engineering lifecycle, including RFP evaluation, requirements engineering, MBSE, testing.

Digital Engineering for DoD ESOH

22298 | Zwemer, D.
Digital Engineering (DE) offers enhanced opportunities to incorporate ESOH considerations into system development and to expedite reviews over the product lifecycle. We will demonstrate a DE infrastructure for identifying, accessing, sharing, querying and documenting ESOH-critical information.

ESOH Risk Management in Middle Tier Acquisition

22299 | Forbes, S.
This presentation will discuss how procedures and techniques used for management of Environment, Safety, and Occupational Health (ESOH) as a design consideration will have to adapt to address ESOH considerations in the Middle Tier (Rapid Prototyping and Rapid Fielding programs) Acquisition programs.

Streamline Your Business Performance with CMMI V2.0

22300 | Lear, R. • Bauer, P. • Gallagher, B. • Harrison, K. • Schaaff, K.
Early results of CMMI V2.0 are in and showing great promise for improved performance for systems, software and hardware engineering! Key points covered in this panel include:

- Brief History of CMMI V2.0
- V2.0 Overview
- Promising Early V2.0 Results
- Performance Improvement vs. Process Compliance

Systems Engineering Transformation Surrogate Pilot Experiments: Doing Everything in Models to Demonstrate the Art-of-the-Possible

22301 | Blackburn, M. • Bone, M. • Kruse, B.
NAVAIR characterized the Systems Engineering Transformation (SET) Framework for a Digital Engineering (DE)-enabled acquisition. This presentation discusses the Surrogate Pilot use cases, models and lessons learned in assessing the SET Framework for collaboration between government and industry.

Product Supportability Through Lifecycle Modeling and Simulation

22304 | Woulfe, J.
This paper outlines the fundamentals of successful Product Life Cycle Management, a method to monitor systems towards fulfilling the operational needs at the lowest possible Total Ownership Cost (TOC).

Application of Explainable Machine Learning Systems for Improving Network Intrusion Detection

22306 | Zhou, Y. • Mazzuchi, T. • Sarkani, S.
The objective of my research is to apply new approaches for constructing machine learning systems with both high performance and interpretability for improving network intrusion detection.

Designing Systems that are Chemical, Biological, Radiological, and Nuclear (CBRN) Survivable

22309 | Powers, B. • Custer, L.
Education of CBRN survivability is key component to ensure employment of CBRN survivable systems which will directly affect the ability of the force to win battles in a contaminated environment. CBRN survivability, when addressed early in development, significantly reduces program cost and schedule impacts.

Mission Driven Security: Baseline Assurance and Threat/Vulnerability

22310 | Olmstead, D.
A call for the application of both Mission Driven Security types: Baseline Assurance and Threat/Vulnerability methods.

Digital Transformation Using AI, IoT, and Blockchain

22312 | Malik, N.
Cloud strategy is intended to foster a culture of innovation - where risk taking and "not being afraid to fail" fuels "continual innovation" and where "creative thinking and piloting new ideas rapidly and cost effectively" is at the heart of every mission.

Implementing the Digital Thread Across the Lifecycle with Global Configurations (GCs)

22313 | Bleakley, G.

The digital thread is the set of relationships that exist between lifecycle artefacts(requirements, models, tests). GCs are a way to version manage these links and artefacts. This presentation will demonstrate the use and value of GCs based upon a worked example from the European Crystal project.

The Role of Simulation in the Implementation of a Digital Twin

22314 | Bleakley, G.

The DoD and INCOSE are driving MBSE into the mainstream for complex systems development. An aspect of MBSE is the ability to develop virtual behavioral representations or a Digital Twin(DT) of a product. This presentation will describe how a DT can be developed and the benefits and uses of a DT.

A System of Systems Approach to Evaluate the Emergence of Technology on International Regulations for Preventing Collisions at Sea (COLREG)

22316 | Press, M. • Mazzuchi, T. • Sarkani, S.

Thirty-seven years ago, the International Maritime Organization adopted nine amendments to the 1972 Convention on the International Regulations for Preventing Collisions at Sea (COLREG). Since 1981, the world has experienced a rapid growth in technology; however, international rules remain unchanged.

Operationalizing the Architecture: Turning the Enterprise Architecture Into an Active Mission Asset

22319 | McDowall, J.

Enterprise architecture has not delivered on its promises of improved interoperability and increased component reuse. In many quarters enterprise architecture is regarded as a failure. A new, mission-focused approach to enterprise architecture is possible.

National Nuclear Security Administration's Approach to Systems Security Engineering (Nuclear Enterprise Assurance)

22320 | Lee, M. • Leifheit, C.

The purpose of this presentation is to introduce and overview the NNSA's and approach to Systems Security Engineering called Nuclear Enterprise Assurance(NEA). It will detail the NNSA NEA policy, Organization structure, major accomplishments, challenges that require partnership, and present a path forward.

An Information Model for Mission Engineering

22322 | Scott, Z.

This presentation will address the challenges of mission engineering by describing an information meta-model that will facilitate operational analysis for SoS.

Strategies for Streamlining Enterprise Architecture in the Age of Agile

22324 | Mallinger, J. • Davenport, B. • Spence, D.

Traditional enterprise architecture practice can seem like an anachronism in the age of agile. By tailoring architecture practice and leveraging transition architecture strategies we can leverage the best of EA while reducing up-front design.

System Architecture of a Human Biosensing and Monitoring Suite with Adaptive Task Allocation

22326 | Cuffie, B. • Stephane, L.

This human biosensing and monitoring suite will specify and implement a proof of concept of non invasive sensor system for crew monitoring in space missions, by integrating cost-cutting off-the-shelf equipment using the human systems integration (HSI) approach.

Mission-Focused Engineering

22333 | Ridgely, D.

This presentation discusses the Department of Defense focus on linking engineering investment to necessary future mission capabilities: not just "building it right" but "building the right thing."

Safe from the Start: Using MBSE for Safety Engineering

22336 | Bower, D. • Kovalovsky, K.

Key deliverables for safety boards and certifications can be produced directly from the system architecture. This presentation gives examples of how to use MBSE to develop top-level mishap analysis, functional hazard analysis, software hazard analysis, and software level-of-rigor analysis.

Exploration of Semantic Web Technologies as an Enabler of Model-Based Systems Engineering (MBSE) and Digital Engineering (DE)

22343 | Ferrabolli, H.

This research is to provide information on the DoD's investigation of semantic web technologies as a means to integrate tools and models. This research sought to validate and identify the practical benefits and challenges behind implementing these technologies on a Government network.

Cybersecurity Verification and Validation, and Developmental/Operational Test & Evaluation

22344 | Olmstead, D.

An overview of Systems Engineering Verification and Validation and Department of Defense (DoD) Developmental and Operational Test and Evaluation to include IEEE Std 1012™-2016 and the "Blue Book/Team and Red Team/Book".

PTSD and a New Way to Fight It

22345 | Lanman, A. • Kennedy, R. • Lee, G.

The results of a survey conducted on the effects of diet, sleep and environmental substances on people suffering from PTSD and other anxieties shows that people consume healthy food, interact less with harmful substances and sleep well, but continue to suffer with anxiety.

Feature-Based Product Line Engineering: A Transformative Approach for Aerospace and Defense

22348 | Krueger, C. • Clements, P.

This talk will introduce Feature-based Product Line Engineering, a well-defined automation-centered approach to system development and acquisition that is being used in at least half of the world's top 10 defense contractors and achieving documented cost avoidance of 10s to 100s of millions of dollars.

Mission Engineering – Competencies

22352 | Verma, D. • Dahmann, J. • Vesonder, G. • Zimmerman, P.

Mission Engineering – What Skills and Capabilities are necessary within the organization to execute the strategic intent?

DoD Tri-Service MOSA Initiative for Standardization

22354 | Patni, H. • Barley, N.

This presentation discusses Department of Defense (DoD) standards designed to enable effective implementation of modular open systems approaches across DoD programs.

Transitioning from Document-Centric to Model-Centric System Integration: Challenges and Opportunities for Legacy System Stakeholders

22355 | Baesler, M. • Gliptis, J. • Hanlon, M. • Nuss, I.

Model-Centric Systems Engineering/Integration has profound benefits when implemented early in the system lifecycle. However, this doesn't mean it can't provide value when applied to legacy systems with document-centric data sets. We plan to illustrate this discussion using real-world examples.

The Problem with DoDAF Models

22358 | Gibson, M.

This presentation discusses how the Department of Defense is working with industry and the Services to balance the requirement for modular open systems approaches with the need to protect intellectual property.

Curation of the Digital Mission Engineering Enterprise

22360 | Haan, B. • Orellana, D.

The role of model curator emerges on the path towards the digital transformation. This presentation will demonstrate how model curation is applied to accelerate mission engineering.

Defining a Model-Based Systems Engineering Approach for Technical Reviews

22361 | Vaneman, W. • Carlson, R.

This presentation discusses how Model-Based Systems Engineering development activities, performed during the system acquisition lifecycle, will evolve technical reviews to provide greater insight with faster comprehension for the system and program details.

SysML-Based, Collaborative Research Project Management

22362 | Kruse, B. • Blackburn, M. • Bone, M. • Hagedorn, T.

This presentation discusses lessons learned from using SysML models with OpenMBEE for managing a research project, including continuous updates and collaboration, model-based report generation, and semantic reasoning through a developed SysML profile that matches an underlying ontology.

Environment, Safety, and Occupational Health (ESOH) – Design Considerations to Strengthen Readiness & Sustainability

22364 | Asiello, D.

ODASD(ENV) will highlight policy for managing Environment, Safety, and Occupational Health (ESOH) risks and strengthening readiness and include efforts to streamline the traditional acquisition process, develop a culture of rapid and meaningful innovation, and fortify industry partnerships.

A Graph and Model-Based Analysis of the Openness of Functional Reference Architectures for Modular Open Systems

22365 | Domerçant, J. C. • Brimhall, E. • Cooksey, D. • Dunning, R.

This presentation will discuss the development of openness metrics applicable to a variety of functional reference architectures (FRAs) and the implementation of those metrics to allow comparative analysis. Thorough analysis of FRA openness can transform FRAs from templates to true analytical tools.

Recent Activities and Updates to the DoD Approach and Strategy to Implementing Modularity and Openness in Weapon Systems

22366 | Hurst, J. K. • Alexander, K. • Kaib, J. • Ofori, M.

Implementing Modular Open System Approaches (MOSA) has been the preferred method of managing Acquisition Programs for decades, but stovepiped solutions and proprietary systems are still the norm. This presentation highlights recent activities to better enable MOSA across the Joint Force.

Addressing Mission Engineering from a Lead Systems Integration Perspective

22367 | Vaneman, W. • Carlson, R.

Lead Systems Integration is a mission engineering, and acquisition, strategy that employs a series of methods, practices, and principles to increase the span of both management and engineering acquisition authority and control to acquire a System of Systems.

Answering the Cyber-Physical System Security Workforce Challenge

22368 | McDermott, T.

Engineering resilient cyber physical systems is a systems engineering challenge. The National Initiative for Cybersecurity Education needs to embrace engineered systems and the breadth of engineering disciplines in its specialty areas. Systems engineering can provide leadership to that development.

DON System Safety in (Middle Tier) Accelerated Acquisition Process

22370 | Glenn, J.

The presentation provides and overview and discussion of the DON's System Safety in (Middle Tier) Accelerated Acquisition Process (SSAAP).

Systemic Security and the Role of Design for Cyber Physical Systems: Methods for Dynamic Analysis and Implications for MBSE Practice

22371 | Sitterle, V. • Clifford, M. • McDermott, T. • Welz, Z.

This session describes initial efforts toward developing a capability to enable co-development of system models and threat attacker models to inform requirements and design of cyber-physical systems (CPS). The discussion will include lessons learned and implications for future development.

Software Experts Panel: DoD Software Engineering

22372 | Reger, B. • Boleng, J. • Brady, S. • Garciga, L. • Yeman, R.

This panel will discuss multiple initiatives to enable rapid software releases to the warfighter, including refactoring acquisition statutes and regulations, establishing DevSecOps (development, security, and operations) environments, and improving workforce competency and training.

A System of Systems Approach to U.S. Army Talent Management

22373 | Do, M. • Saling, K.

Applying a systems approach by modeling Army Talent Management as a system of systems enabling Human Resource personnel the ability to predict and fill Army assignments.

Modeling Languages: What Makes a Good Language and Why?

22375 | Giachetti, R.

The digital engineering strategy means engineers and others will interact with system data via modeling languages. This presentation discusses research of how the characteristics of a modeling language affect human understanding and task performance.

Analysis of Interoperability to Support Mission Engineering

22376 | Giachetti, R.

This presentation describes an architecture-centric method for analyzing the interoperability between mission-oriented system of systems. The method results in a set of interoperability requirements.

A Loss-Driven Approach to Systems Analysis

22377 | Reed, M. • McEvilley, M.

This presentation explains an approach to systems analysis that enables engineers to address losses resulting from adversary action in cyberspace despite the absence of quality and timely threat intelligence information.

Secure Cyber Resilient Engineering (SCRE) Standardization

22378 | Reed, M. • McEvilley, M.

This presentation provides an overview of the recently created DoD Secure Cyber Resilient Engineering (SCRE) Standardization Area, the role that SCRE standardization serves for weapon systems engineering, and the ongoing efforts for the SCRE Standardization Area.

Joint Federated Assurance Center (JFAC) Update 2019

22379 | Hurt, T.

This presentation describes the Full Operational Capability of the Joint Federated Assurance Center (JFAC), including recently developed guidance and training materials, the latest software assurance license acquisition, and an update on the JFAC Portal and the Assurance Knowledge Base.

Implementing a Semantic Integration Strategy for an Interoperable Systems Engineering Ecosystem

22380 | Orellana, D. • Nierman, R. • Vredenburgh, D.

The need to share data among SE tools to support SE processes has become critical for increasing quality and reducing inconsistencies. Unfortunately, today, we require many tool-to-tool integrations, bogging down what is shared. Semantic technologies, can present new opportunities for data sharing.

Software Assurance Throughout the System Life Cycle

22381 | Hurt, T.

This brief highlights a systems engineering approach to applying software assurance countermeasures based on an understanding of common vulnerabilities that plague defense software systems and the activities/tools that can be employed to protect the software mission.

Breaking the Dependency of MBSE Tools

22382 | Mikola, R. • Finlay, C.

Extract the full value of your Rhapsody SysML designs in MagicDraw. Publish your Rhapsody SysML designs, including diagram layout, to MagicDraw for review, delivery, or migration all with ease.

System-Theoretic Process Analysis (STPA) Guided Model-Based Safety Analysis

22387 | Liu, J. • Bliek, D. • True, W.

Application of new and novel methods in the performing system safety assessment of a relevant avionic system. The effort focuses on the application of the System-Theoretic Process Analysis coupled with Model-Based Safety Analysis on the Engine Instrument and Crew Alerting System of existing avionics system.

Reform – Improving Forecasting to Increase Speed to Delivery and Reliability

22388 | Kohl, L.

Being successful in sustainment depends on the ability to forecast accurately. NAVSUP WSS, through "reform," is working to better understand and anticipate customer demands. The goal is to provide greater agility and customer service to the warfighter by leveraging advanced analytics.

Digital Engineering Ecosystem for Innovative Nuclear Technologies

22391 | Ritter, C. • Borders, T. • Kerman, M.

The construction, aerospace, and automotive industries have achieved cost and schedule savings by utilizing virtual design. This program proposes a similar approach for the nuclear industry to leverage integrated digital engineering for cost and schedule savings.

The Ontology of Systems Engineering: Towards a Computational Digital Engineering Semantic Framework

22393 | Orellana, D. • Huelar, M.

Enterprise digital engineering improves data sharing, a critical element of interoperability of digital artifacts. Interoperability requires ontologizing ISO/IEC/IEEE Systems Engineering Process to eliminate syntax and semantic differences. Retrospective of Process inconsistencies and gaps found.

Current and Future ERS Projects

22395 | Eslinger, O.

ERS combines high-performance computing with weapon systems modeling to enable detailed analysis and prediction of system performance. The result is better-informed decisions prior to major acquisition milestones, saving both time and money. This presentation details current and future ERS efforts.

Future of Systems Engineering Continued

22396 | Dam, S.

This paper follows up on the question, "What is the future of systems engineering?" that was presented at the 2018 NDIA SE Conference. This paper discusses includes the on-going activities and ideas developed by the INCOSE Future of Systems Engineering (FuSE) initiative.

Do We Always Want to Integrate Tools to Create the Digital Thread?

22397 | Dam, S.

For Digital Engineering to become a reality, many people envision that this requires systems and design engineering tools be fully integrated. This paper will discuss when and where integration makes sense and "air gap" is needed to better understand the limitations of the digital thread models.

EXPEDITE: Meeting the Engineering Challenges of Hypersonics Design

22398 | Foster, J. • Davies, C.

Engineered Resilient Systems efforts are striving to impact the process by which hypersonic vehicles are modeled and simulated, thereby improving the quality and efficiency of hypersonic vehicle design.

Enhanced Software Assurance Through DevSecOps

22403 | Lanford, B. • Hurt, T.

This brief provides a look into how software assurance can be incorporated into every phase of the software development life cycle, highlighting how Agile/Development and Operations (DevOps) practices can reduce software vulnerabilities and improve confidence that code operates only as intended.

Intellectual Property Challenges Within the Model-Based Enterprise

22404 | Dykes, S. • Jilson, B. • Kassel, B.

While Model-Based Enterprise (MBE) can alleviate a number of System Engineering (SE) pain points, the data sharing required by a functioning MBE can be challenged by industry's need to protect Intellectual Property. This presentation presents this challenge and seeks to identify systemic solutions.

Digital Engineering Throughout the DoD Lifecycle

22405 | Dykes, S. • Jilson, B. • Kassel, B.

This talk outlines the benefits Digital Engineering brings to unique DoD challenges by comparing specific use cases, identifying best and worst practices, and encouraging discussion of future challenges and how the DoD can act to make new developments easier to incorporate across the enterprise.

The Value of Pragmatism: The ROI of Efficient Modeling

22407 | Vinarcik, M. • Jugovic, H.

A demonstration of the use of modeling best practices and comparing model size and cost between well-formed and sloppy models.

Shipshape and Bristol Fashion: Model Documentation and Curation to Facilitate Reuse

22408 | Vinarcik, M.

Minimize your model's non-awesomeness to make it useful, tidy, and easy to reuse.

Continuing Madness: Methods Behind System Architecting Challenged

22411 | Scheurer, R.

System architecting has been performed for multiple decades now, yet positive outcomes are still elusive. This presentation will re-examine the architecting methods, tools, training, and other elements of an enabling environment that are used (or not used) today to see what may have really changed.

The Risks of Classical Systems Engineering in a Model-Based Systems Engineering World

22413 | Sisson, C. • Gabel, A. • Georgiades, N.

Transitioning to a MBSE approach is challenging. During this transition, there is an inclination to maintain Classical Systems Engineering (CSE) processes & deliverables. We must mitigate the risks in a dual CSE/MBSE environment and implement an transition plan to avoids many of those risks.

High-Fidelity Rotorcraft Modeling to Support Future Vertical Lift

22414 | Wissink, A. • Strawn, R.

This presentation will discuss application of high-fidelity modeling tools developed under the DoD HPCMP CREATE program to rotary-wing vehicles in the JMR TD program, used to inform decisions in Future Vertical Lift. Planned application of these tools for the FARA program will also be presented.

The Role of Advanced Data Architectures in the MBSE Universe: Single Source of Truth Now and in the Future

22421 | Hand, S. • Allport, C. • Hunt, G. • Lombardi, D.

Advanced architectural approaches are being proven out in systems integrations today but hold even greater promise in enterprise-wide application. This session explores how advanced architectures are defined via the IDML, how they benefit MBSE today, and the broader operational implications.

The Effectiveness-Based Capability Model (EBCM), A Methodology for Mission Engineering

22423 | Green, J.

This paper presents a concept for a military mission engineering methodology and its associated effectiveness-based capability model (EBCM) as an approach to translating mission capability objectives into a mission architecture.

Re-Architecting the Systems Engineering Enterprise at Lockheed Martin Space to Meet the Challenges of DoD's Mission Needs

22425 | Craig, C. • Moshinsky, E.

This presentation outlines the approach Lockheed Martin Space is taking to meet the challenges facing DoD in spacecraft & missile solutions. We are re-architecting the SE Enterprise to meet these challenges. We call our comprehensive approach to reinvigorating Systems Engineering the "SE Re-boot."

Scenario, Visualization, and Simulation Approaches for Addressing Integration Challenges in Mission Engineering

22426 | Hernandez, A. • Pollman, A.

The introduction of mission engineering in the DoD lexicon adds a new dimension to integration. This research investigates the utility of scenario analysis and visualization methods, combined with simulation, to evaluate and improve the level of integration that a technology reaches.

SysML Based Co-Simulation and Integration of Physical System Models Using a Standard Interface

22427 | Afsharpoya, B. • Pavalkis, S.

A co-simulation methodology based on SysML models to integrate and execute multiple physical models is introduced. The co-simulation utilizes integration of Functional mock-up units (FMU) from several simulation tools and executes them through SysML based parametric and behavior diagrams.

An MBSE Approach to Software Intensive Systems

22428 | Hause, M.

Systems and software engineers need to collaborate to develop successful systems. And integrated SysML/UML model can help achieve this within a well-defined process and strategy. This presentation will demonstrate such an integrated approach and how to achieve a successful handover.

Digital Engineering Toolchain: Requirements and Implementation

22429 | Markina-Khusid, A. • Jacobs, R. • Quinn, G. • Vodov, J.

This presentation documents MITRE's Digital Engineering (DE) Toolchain, an effort to build a digital engineering environment that connects people, processes, tools and data across an end-to-end digital enterprise. Examples of successful integration among several disciplinary tools are demonstrated.

Semi Automated Model-Based Safety and Security Analysis of Embedded Systems Using System Theoretic Process Analysis (STPA)

22433 | Whillock, R. • Whillock, S.

Model-based STPA analysis of embedded systems can uncover system level safety and security hazards and their causes, which other analysis methods fail to find. This can reduce complex system integration costs by addressing these issues earlier in the design process when they are easier to address.

In-Situ Monitoring/Lifetime Prognostication of Critical System Components Using Unintended Emission Analysis Techniques

22435 | Martin, N. • Flowers, D.

This presentation describes a technique employing unintended emission-based technologies, originally developed to detect counterfeit parts, to predict in situ the reliability of electronic devices in safety-critical applications.

From Electrons to Physical Systems: Integrating MBSE and Product Lifecycle Management

22436 | Hause, M.

Integration between SysML models and Product Lifecycle Management (PLM) tools will enable the digital world to connect more closely to the physical world. It will also provide a means of impact analysis and traceability and enable further upfront analysis of systems.

The MBSE Digital Thread for Systems Failure Prediction

22437 | Segal, D. • Hause, M.

Linking the digital threads of predictive failure prediction and MBSE provides an engineering ecosystem that engineers can use to identify system problems before they occur and a means of analyzing the impact of those failures throughout the development lifecycle.

Implementing Modular Open Systems Approach (MOSA) Architectures with MBSE

22438 | Hause, M.

MOSA architectures require well-defined, replaceable, reusable, modular components. Defining and implementing these architectures requires a modeling language that supports these goals. The UAF combined with SysML provides the means to do this.

Defense Acquisition Materials Declaration

22441 | Sheehan, T.

This presentation will discuss work by the aerospace and defense industry in developing a materials declaration process to be used in acquisition programs. It will cover the development of declarable substances lists, declaration data elements and data exchange through the acquisition supply chain.

Adapting ESOH Risk and Requirements Management in a Rapid and Adaptive Acquisition Framework

22442 | Gill, K.

This presentation looks at how traditional procedures and techniques for ESOH risk, compliance, and requirements management must be adapted to support Rapid and Model-based systems, mission, and sustainment engineering activities.

Extending the DoD Digital Engineering Strategy to Missions, System of Systems and Portfolios

22445 | Zimmerman, P. • Dahmann, J. • Gilbert, T.

This presentation proposes ways the Department of Defense Digital Engineering Strategy could be extended to engineering support beyond individual systems to address missions, system of systems, and portfolios.

A Technology Road-Map for Emerging Technologies to Support the Future End-to-End Digital Engineering Enterprise.

22446 | Coleman, J. • Castro, D. • Haan, B.

A predictive analysis of emerging technologies to create the end-to-end digital engineering enterprises. The technology road-map provides signposts so researchers and innovators can better invest their resources to achieve a future state that enables human ingenuity in the engineering value-chain.

Digital Engineering Implementation Across the Department of Defense

22447 | Zimmerman, P. • Gilbert, T.

In 2018, the Department of Defense released a Digital Engineering Strategy. This presentation provides an overview of efforts to implement the strategy's five goals, and it discusses the impact, challenges, and next steps to advance the state of practice.

Rapid Model Building with Patterns

22448 | Connelly, S. • Cole, B.

The presentation will introduce an open-sourced tool for quickly updating SysML models from spreadsheets. It will also discuss its use and the experience of using it so far to support projects.

Architecture Centric Virtual Integration Process (ACVIP): A Key Component of the DoD Digital Engineering Strategy

22449 | Boydston, A. • Feiler, P. • Lewis, B. • Vestal, S.

Architecture Centric Virtual Integration Process is an analytical, incremental development practice for software reliant real time systems that enables discovery of integration issues early, with a potential 25% reduction in aviation system development cost.

Techniques in Large-Scale Data Analytics for Engineers

22450 | Slater, C.

As technological advances in weapon systems continue to cause exponential growth in data size, the need for capabilities that enable fast and efficient analysis of large datasets has also grown. Engineered Resilient Systems is enabling large-scale data analytics for multiple DoD problem domains.

U.S. Navy and Marine Corps Digital Engineering Strategy

22452 | Doctor, M.

The Department of the Navy (DoN) must change in order to improve how it delivers timely and effective capability to our warfighters. In support of that imperative, we choose to implement a Digital Engineering Strategy.

Dynamic Innovation Portfolio Risk & Opportunity Management: Keeping Ahead of the Pace of Change

22453 | Brazil, T.

This presentation will discuss an agile innovation portfolio management process that integrates dynamic risk and opportunity management. It is based on best practices of the US-based and ISO/ANSI-sponsored International Association of Innovation Professionals (IAOIP).

Custodianship Model for Distributed Fusion Environments

22454 | Nelson, I. • Duchon, E. • Li, S. • Zwillinger, D.

In a centralized Distributed Common Ground System (DCGS), sensor data fusion is concentrated and isolated by manual operation of fusion engines, limiting intelligence gathering and delaying target identification. BAE Systems created the Custodianship Model as a distributed fusion system architecture solution.

Computational Engineering Ecosystem

22455 | Wallace, R.

High-performance computing (HPC) is critical to DoD mission success. However, with that advantage also comes challenges that are preventing wide-spread usage and adoption of tools. ERS is developing a computational engineering ecosystem that will eliminate obstacles to HPC tool use.

Standard Practice for Human Systems Integration (SAE6906) and HSI-related projects

22456 | Merriman, S.

This presentation briefly introduces the SAE International G-45 HSI committee, describes the recently released HSI Best Practice Standard (SAE6906) and describes other HSI-related standard development efforts currently underway in the committee.

Leveraging DCMA EVMS Data Driven Metrics to Support Your Contract Lifecycle

22457 | Scott, D. • Coral, J.

The DCMA's new business processes use a data driven approach for assessing EVMS compliance throughout the life of a contract. We will review how data driven metrics may be used to support your organization's internal processes whether you are considering proposing on a contract or subject to surveillance.

Naval Sea Systems Command's (NAVSEA) Approach for Managing the Risk of Hazardous Material Usage in New Acquisition

22459 | Klotz, J.

The use of Hazardous Materials (HM) over the lifecycle of an asset poses a hazard that must be addressed through proper management strategies. NAVSEA has implemented a standard process to properly assess and minimize HM in delivered systems.

Using the MBSE and Architecture Keys to Decrypt the Innovation Process and Corporate Memory

22460 | Sherman, B.

This talk will highlight some key elements of MBSE strategy and Enterprise Architecture that must be addressed to solve the juggernaut of minimizing work process complexity while, at the same time, delivering strategic improvements in cross-discipline systems analysis and knowledge management.

Cybernetics, Complexity, and the Challenges to the Realization of System of Systems

22461 | Schuck, T.

The linking of smart systems together, including the Internet-of-things concepts, require a complete set of systems-of-systems control concepts. Emergent properties, hostile agents, and evolutionary and adaptive development can have destabilizing repercussions.

Information Maneuverability and the Transformation of the Warfighting Environment

22462 | Schuck, T.

The Boyd OODA loop needs to be transformed for information age problems. This paper provides the foundations for the application of OODA for information maneuverability for multiple warfare areas.

Systems Analysis of Cd-free Electroplating at Fleet Readiness Center Southeast

22463 | Rak, A. • Bruckner, M. • Henderson, A.

Presentation discusses ODASD(ENV)'s work with the Navy's Fleet Readiness Center Southeast to apply the DoD Sustainability Analysis methodology to calculate the cost and materials savings of electroplating alternatives, providing steel components with conventional and galvanic corrosion resistance.

The Migration Crisis: Solving the Transition from DOORS to DNG to Unlock the Digital Thread

22464 | DeMeester, J.

Many Raytheon programs use DOORS "classic" and want to take advantage of DOORS Next Generation benefits, including the ability to achieve the DoD's Digital Engineering strategy. This presentation provides lessons learned in migrating from DOORS to DNG.

Cloud Decision Framework

22465 | Anand, S.

Showcases the application of systems thinking, leveraging cloud technologies, to solve a government sponsor's significant cost and system performance issues. The framework can also be applied to a broader set of government problems in non-cloud domains.

Open System Architecture as Applied to Air-Launched Weapons

22468 | Rose, L. • Neal, C. • Shaver, J.

Paper discusses the reasons for applying Open Architecture to future weapons as well as the testing methodogies and procedures to characterize the performance of the message traffic.

DoD Engineering Policy and Systems Initiatives

22469 | Zimmerman, P.

This presentation provides an overview of the Department of Defense Engineering Policy and Systems initiatives to address challenges in integrating and adapting new technologies for mission success.

A Digital Toolchain for Architecture-Centric Decision Making

22470 | Garrett, C. • Cotter, M.

Using Open Standards & Architectures, Digital Engineering, Model-Based Systems Engineering, and mature Application Programming Interfaces to conduct Acquisitions with Speed & Discipline.

Welcome and NDIA System Security Engineering Committee Highlights, Accomplishments, and Plans

22471 | Dunlap, H.

Open discussion on technologies, methods, threats, etc that have impacted SSE in the last year, trends, sign posts of things to come, challenges, and opportunities. This discussion will provide an opportunity to collect input for 2020 Committee planning.

Approaches to Marking and Validating Sensitive MBSE Models

22474 | Gorospe, V.

This program is short slide presentation starting with an overview of information security and the challenges applying the marking and identification component of information security to SysML models. Then the program goes into several in-tool examples of approach that we took to address these challenges.

Efficient Modeling & Simulation Using Sequential Design of Experiments Methods

22475 | Donnelly, T.

By sequentially running High Performance Computer (HPC) simulations in Design of Experiments (DOE) blocks, one can efficiently increase the accuracy of fast surrogate models. When sufficiently accurate surrogates have been obtained, HPC resources can - ASAP - be made available to other M&S projects.

Model-Centric Source Selection Workshop

22478 | Hoheb, A. • Norwood, N.

This workshop presents the concept of evaluating systems models in source selection. Participants contribute into to (1) an outline for a gov't model-centric standard (2) define pre-award steps, and (3) establishing model evaluation source selection criteria.

A Framework to Guide AI/ML and Autonomy Research in Systems Engineering

22479 | McDermott, T. • Verma, D.

The SERC created a framework that classifies research in AI and Autonomy across multiple dimensions of systems engineering. This presentation covers that framework to include likely areas of research, potential outcomes of that research, and impacts to the SE discipline.

How the CMMI Maturity Level 2 Practices Benefit the 367 TRSS

22480 | Bauer, P. • McPherson, R.

How does an organization with high inherent turnover (mostly Air Force enlisted personnel), a poor delivery record, and poor quality improve their performance? The 367 TRSS turned it around on the second attempt after five years following best practices of the CMMI.

A New Approach to Modeling, Viewing, and Managing Engineering Processes

22481 | McCarthy, T. • Meier, E. • Yokell, M.

This presentation describes a new approach to modeling, viewing, and managing engineering processes, resulting in improved consistency and technical integrity, as well as a reduction in cost to sustain them.

Using Machine Learning as an Operator Decision Aid on the Tactical Edge

22482 | Beck, E. • Berenato, M. • Peacock, M. • Wainwright, K.

"Big Data" refers to datasets whose scale and diversity require the use of new technologies to obtain insights that will aid users in making critical decisions. The volume, variety, and velocity of the data require a new type of analytics decision aid to manage the large amounts of data in a timely manner.

Modular Open Systems and Models

22483 | Aguilar, V.

Want Modular Systems? Focus on Modular Models

An Agile Approach to Training

22484 | Aguilar, V. • Sayan, C.

Experience using an agile approach to maintain training courses.

Getting the MOSA Out of Composable Common Products: Raytheon's Approach to MOSA

22485 | Ramsey, R. • Ball, G. • Ross, G.

In response to MOSA requirements, Raytheon Missile Systems (RMS) is pursuing a Composable Systems Initiative that allows RMS to rapidly develop affordable systems through the use of modular product families connected through consensus-based standards and linked through a digital ecosystem.

Model-Based Mission Engineering – How We Implemented MBME for Cyber COE, Intel COE, PEO IEWs and PEO C3T

22486 | Maher, M. • Orlando, R.

We will describe our process for execution Mission Engineering for multiple Organizations. We will discuss how we implement the mission "areas" into our modeling process to ensure that the role of the actors and systems are always linked to mission concepts.

Whole System Life Cycle Management with Digital Twins and Distributed Ledgers

22487 | Price, P. • Diggins, P. • Marinello, L. • Martin, J.

Developing and fielding a defense system is a complicated and often contentious process. Distributed ledgers may be the key to streamlining and improving outcomes, by introducing accountability and traceability through the use of digital twins.

Machine Assisted Trade Space Analysis (MATSA) Raytheon and Engineered Resilient Systems

22488 | Wu, A. • Ball, G. • Ramsey, R.

Machine Assisted Trade Space Analysis (MATSA) leverages ontologies and a knowledge graph to enable machine reasoning and machine learning to intelligently reduce computational demands of self-orchestrated multidimensional simulations to optimize conceptual system designs.

Human Systems Integration (HSI) as a Routine and Common Aspect of Acquisition and Systems Engineering

22490 | Pietryga, M.

HSI is the systems engineering process that provides integrated analysis and design for the human component of any engineered system. This presentation shares the approach to HSI program integration in support of acquisition and systems engineering on a major Air Force acquisition.

Set-Based Design Is a Sensible By-Product of Mission Engineering

22491 | Buede, D.

This paper describes Set-Based Design (SBD) and justifies SBD as reasonable approach to systems acquisition within the Department of Defense (DoD). In addition, the paper articulates how Mission Engineering is needed for SBD to be adopted successfully.

Innovation Opportunities Within Product Breakdown Structures

22492 | Franco, M.

Innovation opportunities still exist even within standard architecture frameworks, such as MIL-STD-881D. These opportunities typically lie one tier below the tiers of the standard and enable the overall cost-effectiveness of the standard architecture.

Air Force Coating System Specification Approach to Non-Chromium Coating Qualification for the Outer Moldline on Aircraft

22493 | Buhrmaster, D. • Spicer, M.

The Department of Defense (DoD) has changed the way it handles non-chromium coating material development, qualification, and acquisition. This paper briefly discusses the USAF approach and recent adoption of these non-chromium materials to eliminate future hazards to the DoD workforce.

Using the Digital Thread for Change Analysis During Operation of an Asset Represented by its Digital Twin

22494 | Miller, C. • Bruns, T. • Hause, M. • Lambert, L.

Change management at the asset level using the digital thread is demonstrated using an IoT platform, a simulation based digital twin and a lifecycle manager. The digital thread is shown to provide real-time awareness and alignment between requirements, design, physical asset and operational condition.

Tailoring Systems Engineering for Adaptive Acquisition

22496 | Korfiatis, P. • Dahmann, J. • Soeder, B.

Despite a variety of acquisition paths that promote agile development of military capabilities, current guidance provides a generic framework for systems engineering tailoring. This presentation will provide an approach to tailoring systems and SoS engineering for current DoD acquisition pathways.

Requirements Architecting: Object-Oriented to M&S-Driven

22497 | Mehta, S.

Utilizing object-oriented and M&S principles is a key enabler in requirements architecting. These concepts allow for viewing the problem-solution space in its entirety by "threading" validated architectures and requirements together - ensuring our warfighter centric platforms are reliable & resilient.

STITCHES: DARPA Technology Enabler for Rapid Composition of System of Systems

22498 | Dahmann, J. • Fortunato, E. • Jones, J. • Solari, M.

Panel presents an innovative technical enabler for system of systems through global interoperability without global consensus, a DARPA solution via the STITCHES toolchain.

Addressing Agile Threat Considerations in the Defense Capability Lifecycle

22499 | Daly, J. • Hynes, D.

Defense capabilities are typically described and designed as systems and in response to the existing threat from adversaries. As the system lifecycle progresses, these threat assumptions can become invalid. This presentation will detail these threat challenges and emerging concepts to meet them.

Improvements to Current Standards as a Solution to the Militaries On Board Oxygen Generation System (OBOGS) Problems

22501 | Hurst, J. K.

On Board Oxygen Generation Systems (OBOGS) failures have resulted in Physiological Events on multiple platforms. The wide reaching nature of these events suggests one potential solution: improving the Military Standard the systems adhere to, MIL-STD-3050 Aircraft Crew Breathing Systems Using OBOGS.

The Use of MBSE and a Reference Architecture in a Rapid Prototyping Environment

22502 | Jacques, D. • Cox, A.

The Air Force Institute of Technology has developed a Reference Architecture (RA) for Small UAS, with the intent of improving SE education and facilitating rapid prototyping cycles. The presentation will include details of the RA and observations associated with its use over the past year.

Hazardous Materials Model Library & Digital Engineering Resource

22503 | Hales, L. • LaPierre, M.

This presentation will discuss an acquisition Environment, Safety, and Occupational Health (ESOH) pilot project to develop a Hazardous Materials (HAZMAT) SysML Model Library that can be used in Digital Engineering/ Model-Based Systems Engineering (MBSE) environments.

Hazardous Materials Model Library & Digital Engineering Resource

22505 | LaPierre, M. • Hales, L.

This presentation will discuss an acquisition Environment, Safety, and Occupational Health (ESOH) pilot project to develop a Hazardous Materials (HAZMAT) SysML Model Library that can be used in Digital Engineering/ Model-Based Systems Engineering (MBSE) environments.

A Reference Architecture for Autonomy: Design, Development and Evaluation

22506 | Gray, J. • Jacques, D. • Leishman, R. • Peterson, B.

The Air Force Institute of Technology is developing a Reference Architecture for Autonomy to facilitate research and development of autonomous and cooperative systems. The Reference Architecture is being developed in a MBSE tool, and will support prototyping, test and evaluation of new concepts.

9 Key Enablers for Knowledge-Based Defense Acquisition

22507 | Kennedy, B.

An order of magnitude improvement in the Defense Acquisition Process is possible by accelerating the learning in the front end of the development process to establish knowledge that "Success is Assured" using these 9 Key Enablers, including Set-Based Analysis and Decision-Making.

Using Unstructured Logbook Narratives to Correct Work Unit Codes

22508 | Kalin, J. • Nover, D.

Aircraft fault narratives entered by maintainers offer valuable operator history of inspections, maintenance, and fleet readiness. Appling recent advances in machine learning, we explore utility and limitations with translating text narratives into accurate Work Unit Codes using these techniques.

Loss-Driven Systems Engineering as the Complement to Capability-Driven Systems Engineering

22509 | McEvilley, M. • Brtis, J.

Loss-driven systems engineering places emphasis on the potential for loss as a driver of need that is addressed in the planning, execution, and outcomes of systems engineering activities. This presentation will overview the concept of loss-driven SE.

Defining, Developing & Enhancing the Next Generation in Digital Engineering; A-10 Tactical Advantages, Lessons Learned and Future Plans

22510 | Sedgwick, H.

The A-10 program's transition to digital maintenance source data, integrated with digital engineering to effectively manage the fleet and enhance quality and engineering response times.

DevOps Development – Dynamics of Engineering Concurrent Multi-Product Efforts

22513 | Davenport, B. • Mallinger, J. • Spence, D.

Highlighting some of the dynamics and complexities of engineering concurrent unique, shared, and/or dependent products through a large scale DevOps development.

Assessing Supply Chain Risks of Critical Chemicals and Materials for National Defense

22514 | Rak, A. • Bruckner, M.

The DoD Chemical and Material Risk Management Program established a process to identify, evaluate, and mitigate risks associated with emerging contaminants that may adversely impact DoD's mission. This process is a useful as a screening mechanism for identifying risk to the defense industrial base.

Effective Risk and Opportunity Escalation

22515 | Schlegel, V. • Porter, R.

A new transfer/escalation process path was developed within the Lockheed Martin to more effectively manage Risks and Opportunities at the appropriate level.

Creating an Enhanced MBSE Learning Environment Using Lego Mindstorms

22516 | Shearin, M.

This presentation will demonstrate that a library of simple machines, sensor systems, status indicators built with Lego Mindstorms and SysML behavioral elements can be used to aid students in learning MBSE by providing a hands-on way of implementing SE abstractions and getting tangible V&V feedback.

Machine Learning in the Modeling and Simulation World

22517 | Keum, J.

What machine learning tools can be used in M&S.

Model-Based Roadmapping: Time-Dependent Tradespace Analysis

22518 | Browne, D. • Balestrini-Robinson, S.

This presentation discusses a model-based systems engineering approach developed at GTRI to support the Department of Defense in building and maintaining road maps/flight plans. The approach includes tooling and visualizations for tradespace analysis and decision support.

When to Do System to System Testing

22519 | Newell, P.

System of Systems testing is usually accomplished as the last portion of a test program and inevitable has issues when it occurs. This leads to costly discrepancies and rushing to update interface specifications. Is there a less costly way of testing interfaces earlier in the integration and test cycle?

Mission Engineering, Systems Engineering and System of Systems Engineering

22520 | Dahmann, J. • Doskey, S. • Tolk, A.

This presentation addresses the definition, overlap, and individual contributions of systems engineering for systems, system of systems, enterprises and now missions as a foundation to help for leveraging and adapting current systems engineering approaches and to identify areas for future research.

Force Level Integration: Application of Set-Based Design to POM Trades

22521 | Fullmer, D. • Browne, D. • Patterson, F.

This presentation provides an overview of the Force Level Integration analysis toolset GTRI has developed in support of the Navy's annual POM analysis. The approach to applying Set-Based Design to POM trades with an exemplar data set will be used to demonstrate the process and visualizations.

Application of Probabilistic Graph Models to Warfighting Capability and Capacity Assessments

22522 | Baker, J. • Browne, D. • Fullmer, D.

This presentation discusses an approach to utilizing Bayesian Networks for modeling warfighting capability and capacity assessments. Examples as applied to the Department of the Navy will be utilized to demonstrate the approach.

Fleet Management of USAF Legacy Aircraft in a Hybrid Digital/Paper-Based Sustainment Environment

22523 | Billings, R.

The presentation outlines the transition of a legacy aircraft from 2D paper based definition to digital definition. It includes lessons learned and future efforts to be able to perform active fleet management of the weapons system utilizing this hybrid mix of 2D and 3D data.

Modular Online Open SE Education (MOOSE)

22525 | Hastings, K. • Dahmann, J. • Markina-Khusid, A.

MITRE's MOOSE initiative seeks to create a platform for Systems Engineering training material available to the public.

Strategic Analytics: Operations Research for Mission Engineering

22526 | Parlier, G.

Strategic Analytics, the alignment of methods and models with the "ends-ways-means" strategy paradigm, is introduced. Foundational building blocks are presented and three recent applications of Strategic Analytics to Defense enterprise system challenges are described.

Systems Engineers Should be the Test Engineers!

22527 | Newell, P.

This abstract will provide the argument that (and downside of) System Engineers are the best Test Engineers. From requirement definition to requirement sell-off, System Engineers have the complete knowledge of the requirement baseline and have an expectation on how the system should work.

Cyber Survivability Endorsement – New DoD Direction and Cyber Architecture

22529 | Halbert, J.

The Joint Staff and Department of Defense (DoD) developed the Cyber Survivability Endorsement Implementation Guide (CSEIG) to include survivability during weapon system acquisition. Incorporation of CSEIG attributes and cybersecurity sub-elements into cybersecurity architectures is discussed.

Environment and Simulator Availability and Adequacy During Sustainment

22530 | Newell, P.

Sustainment environments and Simulator availability and adequacy during sustainment is paramount to ensure lower sustainment costs and high confidence in maintenance deployments. Risk is incurred if either of these items are missing or not sufficient.

A Rapid Prototyping Simulation Capability in Armor Active Protection Systems

22532 | Fernandez, C. • Cooksey, K. D.

Our simulation is used as a tool to verify MAF conformance and support hardware-in-the-loop (HWIL) testing of APS. It provides real-time visualization of sensor performance and can be fully extended to accommodate any combination of platforms, sensors, and threats.

The Role of Engineering Practitioners in the Ideal Digital Engineering Ecosystem of the Near Future

22534 | Coleman, J. • Hambrick, T. • Salvatore, F. • Schreiber, C. • Tseng, C.

A the future of Digital engineering will change to state of the systems engineering practice in the future. Its not new technologies but it will include new ways of working. It will focus on how engineers and machines will co-exists to produce innovations faster, cheaper, with more utility and reliability.

Outbrief from the Digital Engineering Information Exchange Working Group (DEIXWG) Digital Viewpoint Model (DVM) Sub-Team

22536 | McGervey, S. • Hambrick, T.

This presentation will provide an overview and current progress of the DEIXWG-DVM Sub-Team's efforts during FY2019 to define a conceptual model of information exchange between acquirers and suppliers in a digital engineering ecosystem as specified by OSD's Digital Engineering initiative.

A Scalable MBSE Architectural Framework for a Rapid RDT&E Environment

22537 | Iannuzzi, R. • O'Brien, M. • Sellers, J.

A discussion on a scalable architectural framework for MBSE in a rapid RDT&E environment. A look at how this architectural framework supports model-based design reviews.

The UFOS Framework: Enabling Ontology-Driven Simulation of Physics-Infused Descriptive Architecture Models

22540 | Haun, G.

This presentation will describe the development and utility of an orchestration and simulation framework, UFOS, founded on an executable architecture methodology, leveraging behavior-rich ontologies, allowing for the orchestration, execution, and examination of formalized process interactions.

How Can Six Sigma and Model-Based Systems Engineering (MBSE) Improve Communication Within System of Systems (SoS)

22541 | Starr, LaT. • C de Baca, J.

Communication across a System of Systems (SoS) and corresponding interfaces, is a difficult and complex task. Implementation of a robust communication structure is necessary to support SoS development, production, and sustainment. This presentation explores Six Sigma and MBSE usage across SoS relationships.

The Growing Importance of Models for Defense Acquisition

22542 | Colombi, J. • Ford, T.

With the widespread adoption of SySML and the maturation of SE tools, the acquisition workforce must embrace the potential and efficiencies that MBSE will bring to the Defense Acquisition System. This presentation captures insights in modeling for the acquisition community.

Informing Early Systems Engineering Through an Improved HSI Approach to User Needs Analysis

22544 | Risser, M. • Kiken, A.

This presentation highlights a tailored HSI approach to define user needs early in the system development process to better inform systems engineering. The outcomes have demonstrated direct impacts to architecture and system requirements.

Benchmarking the Business Benefits of MBSE

22546 | McDermott, T. • Draper, G. • Roedler, G.

There is limited data published on measurable benefits of MBSE. Can companies quantify the tangible benefit and program performance improvement? This session will provide attendees an opportunity to provide input toward a joint MBSE benchmarking study being conducted by INCOSE and NDIA.

Industry Recommendations (NDIA, INCOSE, PSM) for Implementing Continuous Iterative Software Development in the Defense Industry

22547 | Yeman, R. • Draper, G. • Elm, J.

NDIA, INCOSE, and PSM collaborated on industry recommendations to implement findings of the Defense Science Board for continuous iterative development in the defense industry. An executive summary of those recommendations and path forward will be provided.

Industry Best Practices for Iterative Software Development, Agile, and DevOps

22548 | Draper, G. • Johnson, S. • Yeman, R.

The defense software industry is moving rapidly toward continuous iterative development and DevOps in defense acquisition. This panel of distinguished experts will discuss industry best practices and recommendations based on experience within their companies.

Challenges for System of Systems/Mission Engineering in a Space Acquisition Environment

22549 | Bennett, B. • Horejsi, J. • Levi, A.

The paradigm of how space systems are acquired has changed. In response the USAF Space and Missile Systems Center has begun applying System of Systems/Mission Engineering in a Space Acquisition Environment. Discussion on progress so far, challenges, and potential ways forward are discussed.

How Open and Modular Is Your System?

22550 | Gibson, M. • Vinarcik, M.

Presents NDIA Architecture community work for measuring MOSA on Major DoD Systems. More rigor is established using a value structure based on the Analytical Hierarchy Process to calculate a scoring that is defendable to management. New MBSE tools are introduced to aid in assessment.

Agile Framework Overview

22551 | Nibert, A. • Duffy, J.

The purpose of this overview is to provide those unfamiliar with the Agile Development Framework an overview of Agile's essential characteristics, artifacts and roles and why Agile is the right approach to meet current-day security threats faced by the warfighter.

Lessons Learned and Recommended Best Practices from MBSE Pilot Programs

22554 | Noguchi, R.

This presentation describes some of the key lessons and recommended best practices that have emerged from several MBSE pilot projects over the past few years, focused primarily on the value of applying system architecting principles and methods to the planning and execution of pilot implementations of MBSE.

UMBSE2 – Using MBSE to Architect and Operate the MBSE System

22555 | Noguchi, R.

This presentation describes a methodology that was developed and is being applied to use MBSE principles and methods to architect the MBSE System that integrates models, datasets, tools, and infrastructure with appropriate methods, processes, and standards to enable the implementation of MBSE.

Implementing Mission Engineering

22558 | Dahmann, J.

DoD has expanded focus beyond systems to address the application of SE approaches to 'missions'. This presentation provides an implementation perspective on mission engineering (ME) based on an evolving 'ME playbook' which highlights key mission engineering drivers, activities and products.

A Path Toward Consensus Measures for Iterative Software Development

22559 | Jones, C. • Draper, G.

Traditional software development measures are incompatible with iterative development, agile, and DevOps trends. NDIA, INCOSE, & PSM are collaborating to develop a consensus-based measurement framework. This presentation summarizes current recommendations, feedback from the community, and path forward.

Model-Based Acquisitions: How Do We Get There?

22560 | Pan, P.

The Aerospace Industry Association (AIA) Model-Based Engineering (MBE) team is working to create an execution and standards roadmap for implementing the DoD Digital Engineering strategy. The end goal is that these roadmaps can provide guidance to navigate and further mature key gaps in the DE ecosystem.

Managing Irreducible Schedule Risk

22563 | Price, R.

This presentation provides risk management practitioners and program management with a proven approach to managing irreducible schedule risk.

NDIA MOSA White Paper Overview and Recommendations

22565 | Thelin, S.

Summary of recommendations from the NDIA SE Architecture committee MOSA White Paper.

Deploying the Source of Truth for Model-Based System Development – From Acquisition to Sustainment

22568 | Ewing, D.

An integrated knowledge and data management platform is needed to capture the source of truth. We will illustrate the platform approach to system development that integrates requirements management, systems engineering, simulation and maintenance.

Cyber Resiliency for AF Weapon Systems Architecture-Drive Assurance for Avionic Systems

22580 | Holtzman, D.

Cyber Resiliency for AF weapon systems continues to be a high profile initiative. The Cyber Resiliency Office for Weapon Systems (CROWS) has been working to improve the cyber resiliency across the AF, in collaboration with Industry, FFRDC/UARC.

Visibility & Control: Addressing Supply Chain Challenges to Trustworthy Software-Enabled Things

22581 | Martin, R.

Software is playing a pivotal role in most enterprises, whether they realize it or not, and with the proliferation of Industrial Internet of Things (IoT) and other cyber/physical systems across our society and critical infrastructure and our collective love affair with automation.

Integrating the Digital Thread from Requirement to System Modeling and to PLM Platform to Enable Enterprise MBSE Capabilities

22582 | Wang. G.

As industries embraces Digital Engineering (DE) and organizations invest in technologies and methodologies to advance the state of practices, digital thread is considered to be a critical link in the model-based systems engineering (MBSE) capability. Digital thread is realized with architectural traceability through the system life cycle connecting digital artifacts generated from design, development, operation and sustainment of a system. This presentation addresses a technique to connect these artifacts along the digital thread, from the requirement space to SysML models and to the Product Lifecycle Management (PLM) space. This presentation will reflect on the journey to date, as well as some early successes, hurdles, and challenges, on tracing Requirements to Functional to Logical to Physical architecture and design documentation across artifacts generated by DOORS, No Magic's Cameo Systems Modeler, and Dassault Systemes' 3DExperience Platform. This expands the digital thread to address the critical questions such as how design artifacts interact and are integrated into the overall technical baseline of the system in a development project.

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BIOGRAPHY

JAMES FAIST

Director
Defense Research and Engineering for Advanced Capabilities,
Office of the Under Secretary of Defense for Research and Engineering

James "Jim" Faist is the Director of Defense Research and Engineering for Advanced Capabilities, reporting directly to the Under Secretary of Defense Research and Engineering within the Office of the Secretary of Defense. Jim directs an organization whose mission is to recognize, explore, and accelerate the development and integration of new technology to maintain U.S. technological superiority. He is responsible for establishing a Department of Defense joint mission engineering capability, the oversight of developmental testing and test facilities, as well as the demonstration and validation of technology prototype and rapid fielding activities. Jim serves as the mission area advisor for warfighter portfolios in hypersonics, space, autonomy, and networked command, control, and communication architectures. He also provides independent technical risk assessments of major acquisition programs.

Jim has had an extensive career in industry and government with respect to national defense, including progressive responsibilities and experience in military operations, advanced technologies, system development, engineering leadership, and program management. He is a recognized expert in advanced sensors, weapons, and electronic warfare for space, air, and ground capabilities.

Faist was a chief engineer for the Northrop Grumman and Harris Corporations. He held senior executive positions at Schafer Corporation, Trident Systems Incorporated, and System Planning Corporation. Prior to his industry work, he served in the United States Air Force as a Weapons Systems Officer and an Electronic Warfare Officer in the F-4D/E Phantom II fighter aircraft.

Jim earned a BS in Electrical Engineering from Virginia Military Institute in Lexington, Virginia, and an MS in Electrical Engineering from Cornell University in Ithaca, New York, with emphasis on microwave and power systems. During his career, he received numerous performance awards and honors from the U.S. Air Force, academia, and industry.

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IBM Engineering

IBM CORPORATION

As products become more sophisticated, with increasing integration of software and ubiquitous IoT connectivity, the effort to engineer them increases exponentially, with a greater number of requirements, more dependency on modeling, greater testing, and increasing collaboration between teams. The IBM Engineering division offers an end-to-end systems development solution that empowers engineers and their teams to more easily manage requirements, workflow, test management and systems modeling. IBM's Engineering Lifecycle Management (ELM) is the foundation for enabling engineering teams to embrace and leverage AI, analytics, and digital twin/digital thread in their development processes.

Raytheon

RAYTHEON COMPANY

Raytheon is a technology and innovation leader specializing in defense, civil government and cybersecurity markets throughout the world. With a history of innovation spanning nearly a century, Raytheon provides state-of-the-art electronics, mission systems integration and other capabilities in the areas of sensing; effects; and command, control, communications and intelligence systems, as well as cybersecurity and a broad range of mission support services. Featured areas are MISSILE DEFENSE, COMMAND AND CONTROL, SENSORS AND IMAGING, CYBER, ELECTRONIC WARFARE, PRECISION WEAPONS, TRAINING, and MISSION SUPPORT

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CMMI Institute

CMMI INSTITUTE

CMMI® Institute offers solutions that elevate business performance and provide insights for baselining and optimizing key organizational capabilities such as product development, service excellence, enterprise data management, and cybersecurity.

For over 25 years, thousands of high-performing organizations in a variety of industries, including aerospace, finance, healthcare, information technology, software, defense, transportation, and telecommunications, have achieved sustainable business success through adopting the CMMI and proved they are capable business partners and suppliers.

DASSAULT SYSTEMES

DS GOVERNMENT SOLUTIONS CORP

Dassault Systèmes, the 3DEXPERIENCE Company, provides businesses and people with virtual universes to imagine sustainable innovations.

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The 3DEXPERIENCE platform leverages the Company's world-leading 3D software applications to transform how complex mechatronic, embedded software systems are scoped, designed, produced, and supported, enabling the warfighter to accomplish their mission.

A modular, open systems approach is core to the 3DEXPERIENCE platform. Our offers leverage multi-discipline and cross-functional solution capabilities enabling an authoritative source of truth, utilizing a digital thread for traceability and model-based enterprise capabilities.

TABLETOP HOURS

MONDAY, OCTOBER 21	TUESDAY, OCTOBER 22	WEDNESDAY, OCTOBER 23	THURSDAY, OCTOBER 24
1:00 – 5:30 pm	7:00 am – 6:30 pm	7:00 am – 6:00 pm	7:00 – 10:30 am

TABLETOP BY COMPANY

Amazon Web Services	15	The MITRE Corporation	11
BigLever Software	5	Modus Operandi	6
CMMI Institute	10	SAIC	7
FAMU-FSU College of Engineering	3	Sodius-Willert	4
IBM Corporation	8	SPEC Innovations	12
Jama Software	14	SYSTECON	13
Method Park Software AG	1	Unison Global	2
MilSource	9		

TABLETOP MAP

TABLETOP DESCRIPTIONS
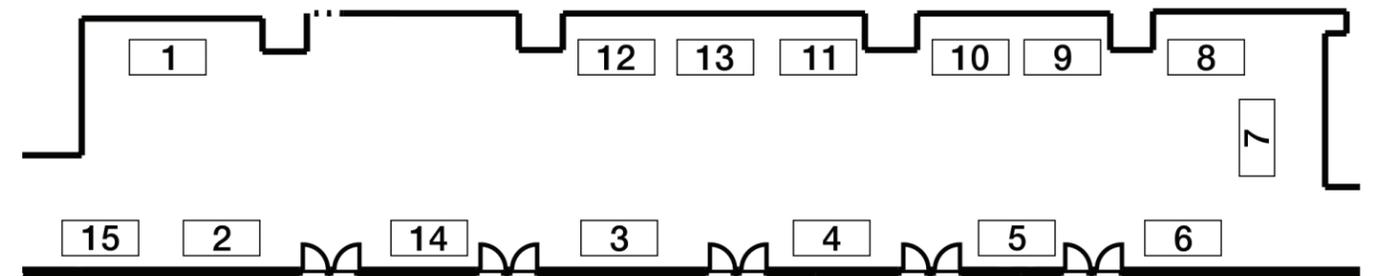
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Amazon Web Services (AWS) Worldwide Public Sector helps government, education, and nonprofit customers deploy cloud services to reduce costs, drive efficiencies, and increase innovation across the globe. With AWS, you only pay for what you use, with no up-front physical infrastructure expenses or long-term commitments. Public Sector organizations of all sizes use AWS to build applications, host websites, harness big data, store information, conduct research, improve online access for citizens, and more. AWS has dedicated teams focused on helping our customers pave the way for innovation and, ultimately, make the world a better place through technology.

BIGLEVER SOFTWARE #5

BigLever Software™ is the long-standing leader in the Product Line Engineering (PLE) field. BigLever's holistic onePLE™ solution delivers the leading-edge technology, proven methodology, business strategy, and organizational change expertise needed to efficiently transition to and operate a game-changing PLE practice. The company's state-of-the-art PLE methods and tools provide one unified, automated approach for feature-based variant management. This approach extends across the full lifecycle including engineering and operations disciplines; software, electrical, and mechanical domains; and tool ecosystem. Some of the world's largest forward-thinking organizations across a spectrum of industries are leveraging BigLever's PLE solution to engineer their competitive advantage through order-of-magnitude improvements in productivity, time-to-market, portfolio scalability, and product quality.

CMMI INSTITUTE #10

See company description on page 38.
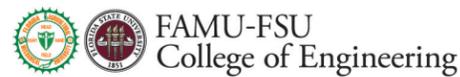
FAMU – FSU COLLEGE OF ENGINEERING #3

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IBM Engineering

IBM CORPORATION #8

See company description on page 38.

JAMA SOFTWARE #14

Jama Software provides the leading platform for requirements, risk and test management. With Jama Connect and industry-focused services, teams building complex products, systems and software improve cycle times, increase quality, reduce rework and minimize effort proving compliance. Representing the forefront of modern development, Jama's growing customer base of more than 600 organizations includes Panasonic, BAE Systems, Lyft, Deloitte, General Dynamics, Alight and Caterpillar.

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Method Park specializes in complex product engineering for the automotive, medical, and aerospace industries. Method Park's portfolio includes consulting and engineering services, a comprehensive training program and the process management tool "Stages". Method Park was founded in 2001. On a worldwide basis, the company has supported and coached its customers on process optimization, compliance to industry-specific standards and legal regulations, as well as the management of projects, products and quality assurance. Method Park offers a practice-based training program on all current topics of Software & Systems Engineering. With "Stages", Method Park offers a model-based process management tool, which supports its users on the definition, communication, and application of complex processes, particularly in the engineering environment – globally, beyond organizational borders and always in compliance with various industry-specific standards.

MILSOURCE #9

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We work across the government, through our FFRDCs and public-private partnerships, to tackle problems that challenge our nation's safety, stability and well-being. Our unique vantage point allows us to provide innovative, practical solutions in the defense and intelligence, aviation, civil systems, homeland security, judiciary, healthcare, and cybersecurity spheres.

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SAIC #7

See company description on page 37.

SODIUS–WILLERT #4

SodiusWillert connects the thread of engineering for complex products in regulated industries. Our mission is in enabling enterprise-scale linked data to accelerate your ideas to the market. Our products connect engineering repositories to empower your engineering teams with visibility and leveraging your assets for reuse. Together this is the Power of Connected Data.

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