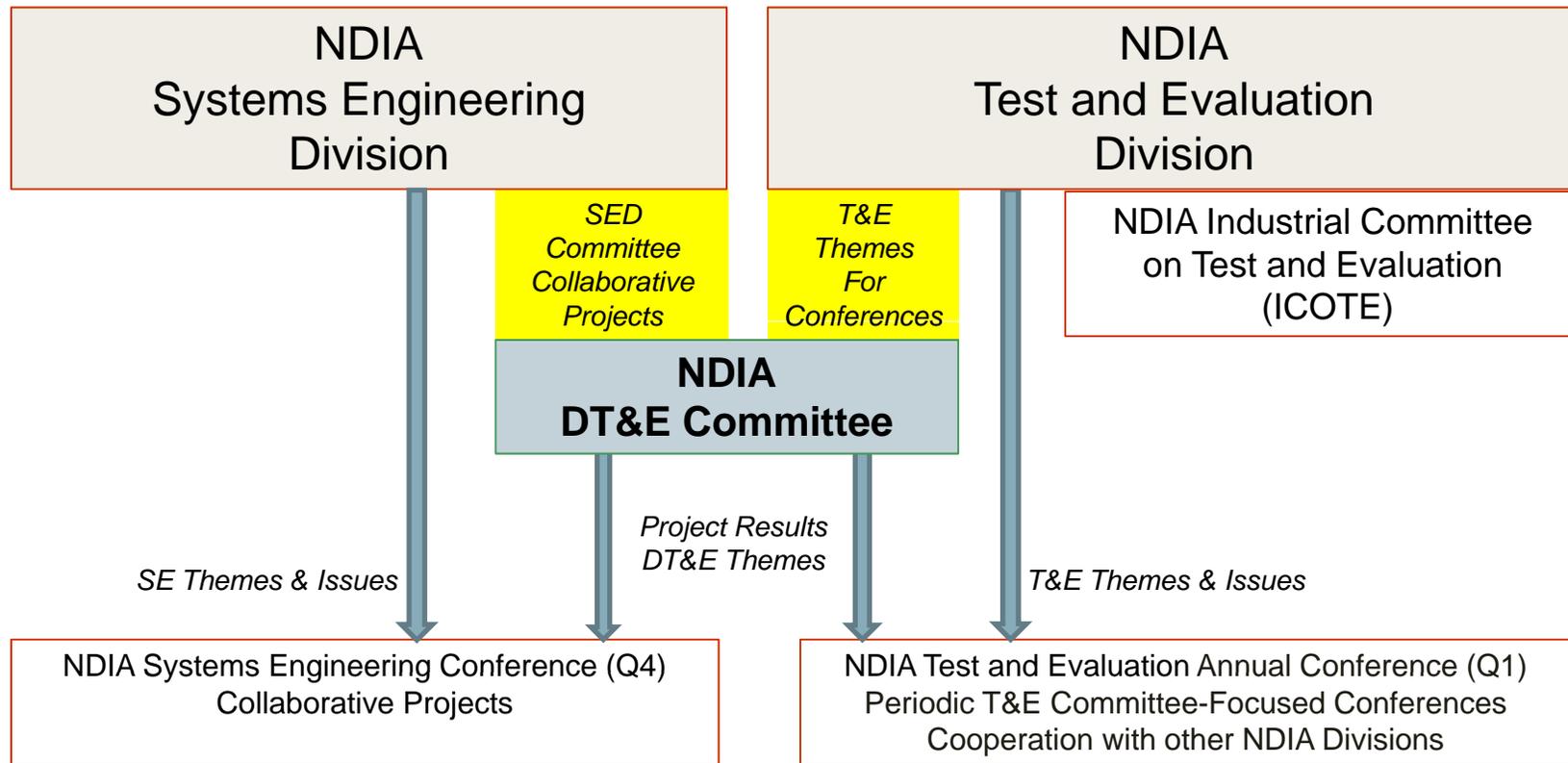


Developmental Test and Evaluation Committee Results and Activities

**Beth Wilson, Raytheon
Steve Scukanec, Northrop Grumman
Industry Co-Chairs**

October 2013

DT&E Committee Current Structure Since 2010



DT&E Committee Focus: T&E initiatives aligned with SE, DT&E

Summary of DT&E Committee Test and Evaluation Efforts



	Topic	Activity
DT&E Committee	DoD T&E Policy Study	2006 – 2008: Workshops and Study Report Improving T&E in the DoD Acquisition Process
	Integrated Testing	2008 – 2010: Integrated Test Study NDIA presentations and tutorial ITEA journal article
	RFP Language for T&E	2010 – 2011: Comments for Update to OSD Guide Incorporating T&E into DoD Acquisition Contracts
	Test Optimization	2012: Statistical Optimization Conference Thread 2013: Scientific Test and Analysis Techniques report Working publications for NDIA National Defense Magazine, ITEA Journal, and CrossTalk
	Cyber Testing	2013: Industry recommendations for cyber testing
	Chief Developmental Tester	2013: Industry interaction with new role

Completed

Current

Summary of DT&E Committee Systems Engineering Efforts



	SED Committee	Activity
SE Collaboration	Software	2009: SW T&E Summit Recommendations
	System of Systems	2010 – 2011: T&E for SoS Workshop and Initiatives 2012: Final Report on Best Practices Model
	Modeling and Simulation	2011: Effective Use of Modeling and Simulation for T&E 2012: Distributed Model-Based Testing
		Future: T&E Perspective for Modeling and Simulation products
	Performance Measurement	2012: Leading Indicators for T&E workshop
		2013: Requirements Verification leading indicators report
Architecture	Future: T&E Perspective for Architecture views	

Completed	Current
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DT&E Committee 2013

Statistical Test Optimization



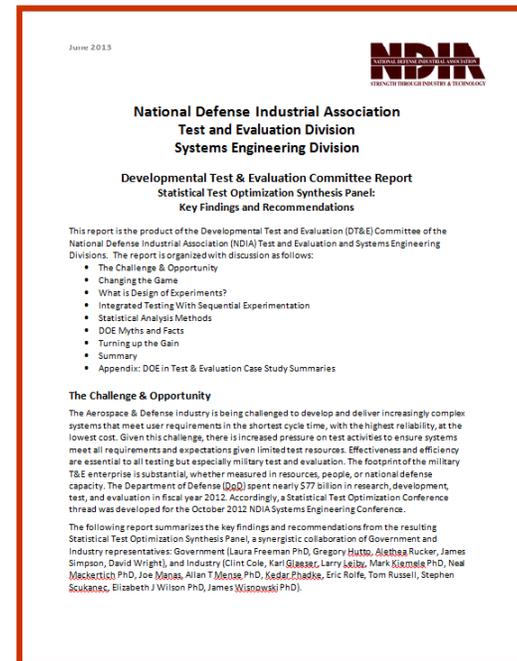
Activity	Plans for 2013	Status/Plans
Scientific Test and Analysis Techniques STAT for T&E	Examples of effective use of statistical approaches for test optimization (including DOE) for an implementation framework	White paper complete SE Conference track: 2012 and 2013 Working additional publications, MORS conference Nov 2013

2012 SE Conference summit/workshop thread

- Tutorials on Monday 10/22
- Presentations on Wednesday 10/24
- Synthesis Panel on Wednesday 10/24

Follow-on Results:

- DT&E Committee white paper (complete)
- National Defense Magazine
- ITEA Journal
- CrossTalk



DT&E Committee 2013 Leading Indicator Metrics



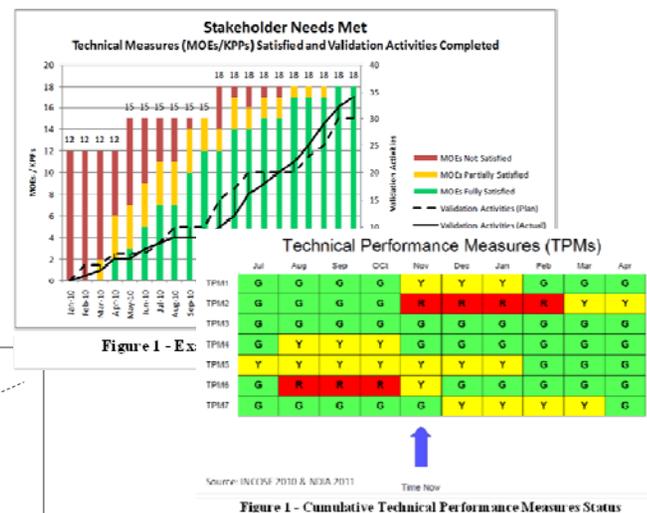
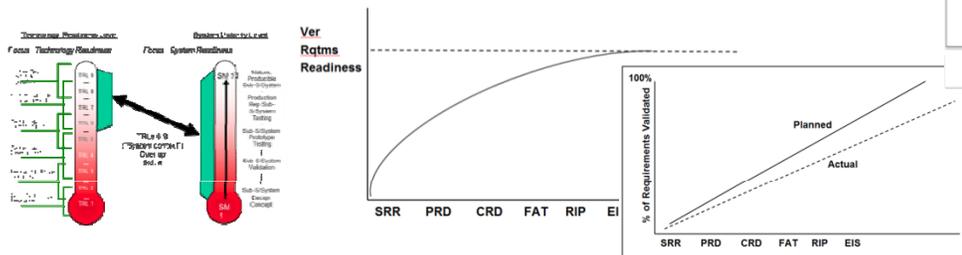
Activity	Plans for 2013	Status/Plans
Metrics (with Performance Measurement WG)	Provide more information on leading indicators for T&E	Draft report Presenting results at SE conference

2012 SE Conference workshop

- Follow-on workshop with System Performance Measurement WG
- Focused on Requirements Verification not addressed in first report

Potential Measures Identified:

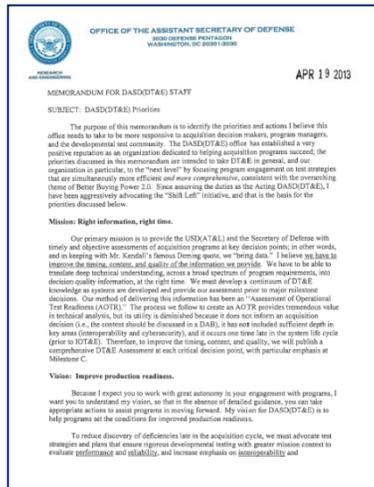
- System Maturity Level
- Verification Requirement Maturity
- Technical Measures and Stakeholder Need



DT&E Committee 2013 Cyber Testing



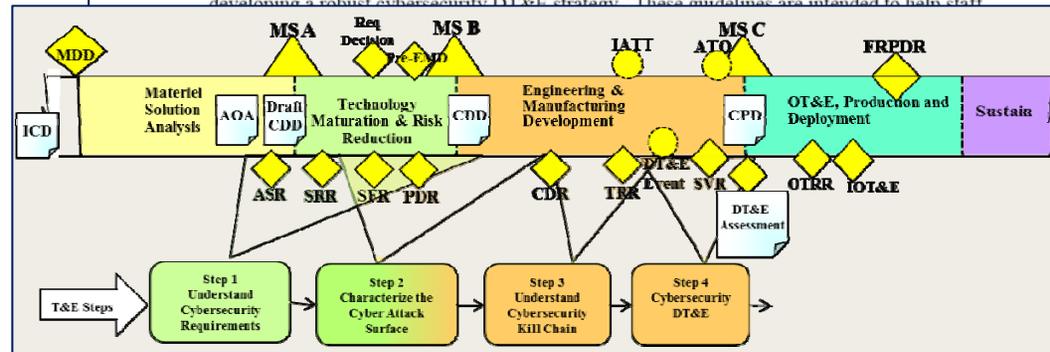
Activity	Plans for 2013	Status/Plans
Cyber Testing	Review what industry does for cyber testing, expand focus to include interoperability	Recommendations for Cyber Testing guidelines



Office of the DASD (DT&E)
Guidelines for Cybersecurity DT&E, version 1.0, 19 April 2013

Guidelines for Cybersecurity DT&E v1.0

1. Purpose. These guidelines provide the means for DASD(DT&E) staff specialists to engage and assist acquisition program Chief Developmental Testers and Lead DT&E Organizations in developing a robust cybersecurity DT&E strategy. These guidelines are intended to help staff



New Project: Participants Welcome!

DT&E Committee 2013 Chief Developmental Tester



Activity	Plans for 2013	Status/Plans
Chief Developmental Tester	Review service policies for new role and industry implementations	Propose model for industry interaction White paper T&E/SE conference presentations

December 1, 2011

Ordered to be printed as passed

In the Senate

Resolved, That the titles (H.R. 1540) entitled "Department of Defense, for the fiscal year 2011, and the activities of the Department of Defense, for the fiscal year 2011, and the personnel strengths for the fiscal year 2011, do pass with the amendments proposed." do pass with the amendments proposed.

AMENDMENTS

Strike out all

1 SECTION 1. SHORT TITLE.

2 This Act may be cited as the

3 Chief Developmental Tester Act for Fiscal Year 2011.

3 SEC. 806. MANAGEMENT OF DEVELOPMENTAL TEST AND EVALUATION PROGRAMS.

4 EVALUATION FOR MAJOR DEFENSE ACQUISITION PROGRAMS.

5 TION PROGRAMS.

6 (a) CHIEF DEVELOPMENTAL TESTER.—

7 of the John Warner National Defense Authorization Act for

8 Fiscal Year 2007 (Public Law 109-364; 120 Stat. 2330),

9 as amended by section 805(c) of the National Defense Au-

10 thorization Act for Fiscal Year 2010 (Public Law 110-181;

11 125 Stat. 2403), is further amended—

12 (1) by redesignating paragraph (6) as para-

13 graph (7); and

14 (2) by inserting after paragraph (5) the fol-

15 lowing new paragraph (6):

16 “(6) Chief developmental tester.”.

17 (b) RESPONSIBILITIES OF CHIEF DEVELOPMENTAL

18 TESTER AND LEAD DEVELOPMENTAL TEST AND EVALUA-

19 TION ORGANIZATION.—Section 139b of title 10, United

20 States Code, is amended—

The Secretary of Defense shall require that each major defense acquisition program be supported by—

“(A) a **chief developmental tester**; and

“(B) a governmental test agency, serving as **lead developmental test and evaluation organization** for the program.

Coordinating DT&E activities
Insight into Contractor activities
Oversee T&E activities
Inform government PM about contractor DT&E results

New Project: Participants Welcome!

Summary



- **DT&E Committee Alignment**
 - Test and Evaluation Division
 - Systems Engineering Division

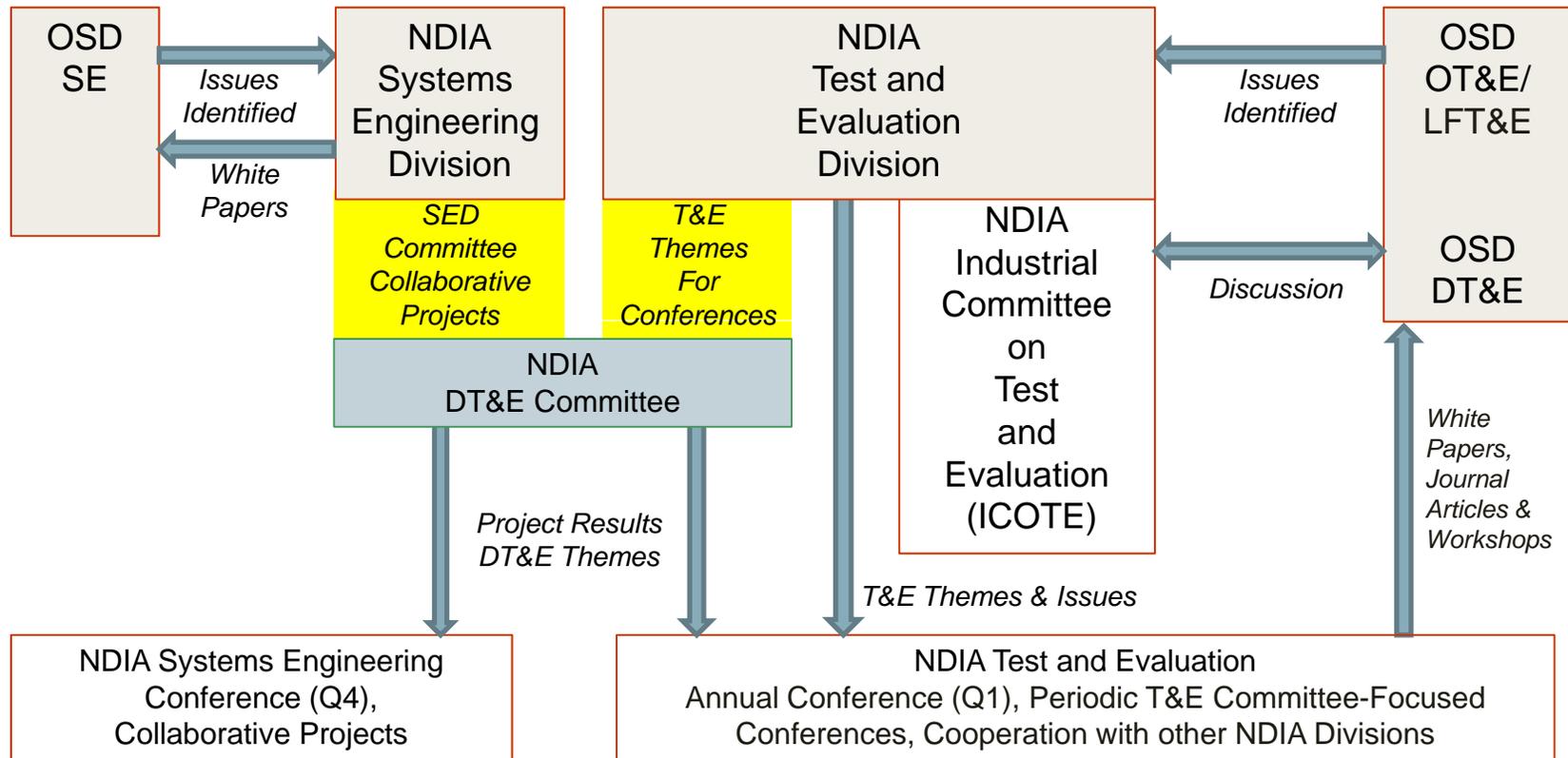
- **DT&E Presence at SE Conference**
 - Tutorials
 - DT&E Track
 - Statistical Test Optimization Track
 - Joint DT&E and SoS Track
 - Net-Centric Operations/Interoperability Track

- **Current Projects – Participation Welcome!**
 - New: Cyber Testing Guidelines
 - New: Chief Developmental Tester
 - Future: T&E as a stakeholder for modeling efforts

NDIA DT&E Committee Summary of Accomplishments

2006 – 2012

DT&E Committee Current Structure Since 2010



DT&E Committee Focus: T&E initiatives aligned with SE, DT&E

DoD T&E Policy Study



August 2006: DT&E Committee Kickoff

Policy Study:
“Improving T&E in the DoD Acquisition Process”
Industry T&E policy recommendations

Workshops:
August 2007
January 2008

Focus Areas:

1. Earlier contractor and tester involvement
2. Integrated DT/OT and DT operational relevance
3. Suitability

April 2008: Report Summarized Results:
10 Findings
15 Recommendations

2006-2008

National Defense Industrial Association
Systems Engineering Division
Developmental Test & Evaluation Committee

Study Task Report
DT&E Support to Acquisition

April 2008

- 1. Purpose**
This report is a product of the Developmental Test and Evaluation (DT&E) Committee of the National Defense Industrial Association (NDIA) Systems Engineering Division, and responds to a U.S. Department of Defense (DoD) request for advice on improving T&E in the DoD acquisition process. This report specifically addresses T&E policy recommendations for incorporating T&E expertise early in the acquisition cycle, integrating developmental and operational testing, and improving suitability of weapon systems during development.
- 2. Background**
 - 2.1. Establishment of SE Division DT&E Committee**
The Developmental Test and Evaluation (DT&E) Committee provides a forum where Government, industry, and academia can share lessons learned, promote best practices, address issues, and advocate the role of DT&E in the Systems Engineering process. The primary purpose of the DT&E Committee is determining successful strategies for incorporating robust and efficient DT&E methodologies and activities into a program's structure, reflect them in the Systems Engineering Plan (SEP), and Test and Evaluation Master Plan (TEMP) and then executing according to the plans.
Developmental Test and Evaluation (DT&E) is a critical factor in maturing a system's design and measuring its technical progress, especially in today's environment of escalating system complexity incorporating network centric concepts. DT&E is a crucial part of the systems engineering process. DT&E assists program managers in system design and development by identifying and mitigating risks, generating data for cost/schedule/performance tradeoffs, demonstrating manufacturing processes, and validating models and simulations. DT&E also verifies that technical specifications have been met by identifying a system's capabilities and limitations, and evaluates a system's readiness for Operational Test and Evaluation (OT&E). DT&E is key to achieving operational effectiveness and operational suitability, and controlling a system's life cycle cost. These factors reinforce the need for a joint industry/Government/academia forum focusing on DT&E.
 - 2.2. Request to DT&E Committee**
During the initial meetings of the DT&E committee, Mr. Chris DiPetto, Deputy Director for DT&E, Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics, expressed an interest in obtaining a defense industry perspective on revitalizing

1

Integrated Testing (CT/DT/OT) Implementation Framework



NDIA Test and Evaluation Conference
Paper #7847



Walking the Line with Title 10: Implementation Strategies for Integrated Testing



2009 ITEA Journal

Integrating Test and Evaluation (September issue)

NDIA Systems Engineering Conference
Paper #8848



Integrated Testing: We Can Do It

ITEA Journal 2009, 30, 375-380
Copyright © 2009 by the International Test and Evaluation Association

Integrated Testing: A Necessity, Not Just an Option

Beth Wilson, Ph.D.
Raytheon Company, Sudbury, Massachusetts

Department of Defense policy states that developmental and operational test activities need to be integrated whenever possible to improve overall test and evaluation efficiency with increased emphasis on operational relevance. The National Defense Industrial Association Systems Engineering Division Developmental Test and Evaluation Committee has been evaluating existing integrated testing policies, methods, and practices to identify an implementation framework with best practices for sharing data, involving developmental test and operational test stakeholders in integrated test planning, and collaboratively executing an integrated test program. Barriers to integrated testing were identified looking at the cultural constraints placed on planning, people, and data. While the definitions and mandates are recent, the practice of integrated testing is not new. The framework described focuses on existing policy and captures

NDIA T&E Confer

NDIA Test and Evaluation Conference
Paper #9565



Erasing the Line with Title 10: Best Practices in Integrated Testing

NDIA Systems Engineering Conference
Paper #8818



Integrated Testing: Tutorial

Beth Wilson
Industry Co-Chair NDIA System Engineering Division, DT&E Committee
Principal Engineering Fellow, Raytheon Company

Darlene Mosser-Kerner
Government Chair NDIA System Engineering Division, DT&E Committee
OUSD(AT&L)/Developmental Test and Evaluation

Tom Wissink
Industry Co-Chair NDIA System Engineering Division, DT&E Committee
Director of Integration, Test & Evaluation, Lockheed Martin Corporate Engineering & Technology

Beth Wilson
Industry Co-Chair NDIA System Engineering Division, DT&E Committee
Principal Engineering Fellow, Raytheon Company

Darlene Mosser-Kerner
Government Chair NDIA System Engineering Division, DT&E Committee
Developmental Test & Evaluation
OUSD(AT&L)/Systems & Software Engineering

2008-2010

T&E Conference Mar 2010

NDIA SE Conference Oct 2009

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Software Test and Evaluation Software Summit



NDIA
PROMOTING NATIONAL SECURITY SINCE 1919

Announcing:
SOFTWARE TEST SUMMIT/WORKSHOP

Presented by the DT&E Committee & Software Expert Panel of the NDIA Systems Engineering Division

CONFIRMED SPEAKERS

- ▶ Mc Hung Nguyen, Loggear
- ▶ Mc Rex Black, RBCS
- ▶ Mc Adam Kolawa, Parasoft
- ▶ Dr. Cem Kaner, Florida Institute of Technology
- ▶ Military Service Software Test Representative Panel

Sept. 15: Plenary Session
Sept. 16: Workshops & Panel Discussion
Sept. 17: 1/2 day Plenary Session

SEPTEMBER 15-17, 2009
WWW.NDIA.ORG/MEETINGS/09T

NDIA
NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

**Software Test & Evaluation
Summit/Workshop Results
Issues & Recommendations White Paper**

Joint Authorship of the NDIA System Engineering Division's Software Industry Experts Panel and the Developmental Test & Evaluation Committee

Submitted: December 14, 2009

2009

RFP Language	How Much Testing is Enough?	Lifecycle and End-to-End Software T&E	Changing Paradigms
Training & Competency Model			
Policy, Guidance, and Standards			
Tools, Automation, Methodologies, Process			

RFP Language

Industry #	Master #	Reviewer	Line #	Comment and Rationale	Recommended Input	A/R/P
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Industry Comments for Update:
***Incorporating Test and Evaluation
 Into Department of Defense
 Acquisition Contracts***

DEPARTMENT OF DEFENSE – UNITED STATES OF AMERICA

Incorporating Test and Evaluation into Department of Defense Acquisition Contracts



CLEARED
 For Open Publication
 OCT 24, 2011
 Office of Security Review
 Department of Defense
 12-S-0150

October 2011

Office of the Deputy Assistant Secretary of Defense
 for Developmental Test and Evaluation

Supersedes May 2009 Version



**Software Test & Evaluation
 Summit/Workshop Results
 Issues & Recommendations White Paper**

Joint Authorship of the NDIA System Engineering
 Division's Software Industry Experts Panel and the
 Developmental Test & Evaluation Committee



Submitted: December 14, 2009

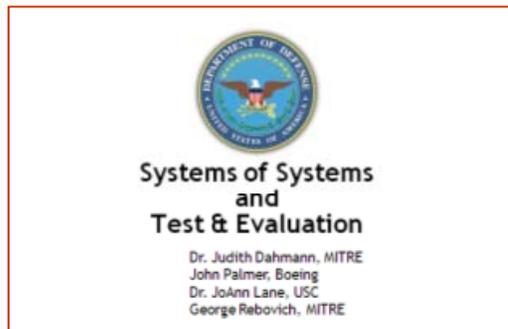
**Recommendations
 from SW Summit**

2010-2011

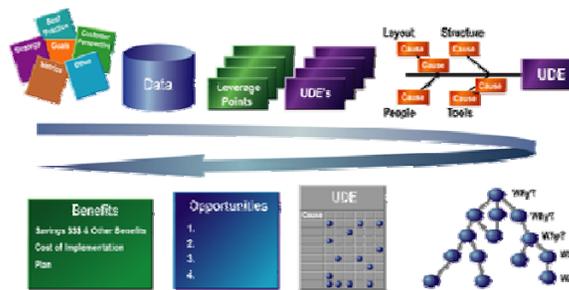
Test and Evaluation for Systems of Systems



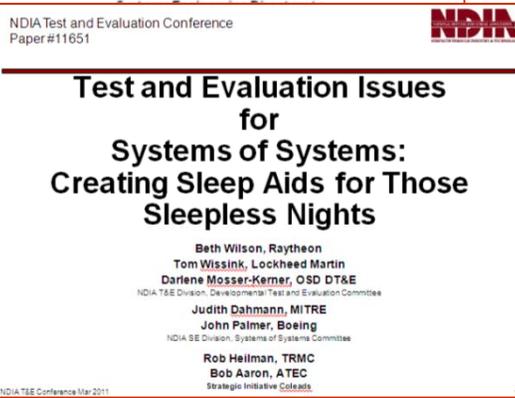
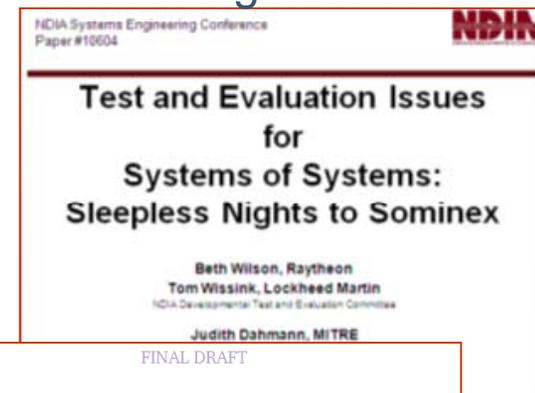
2009: "Sleepless Nights" List of Issues



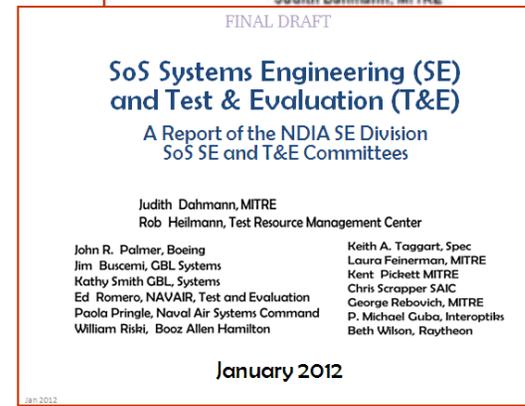
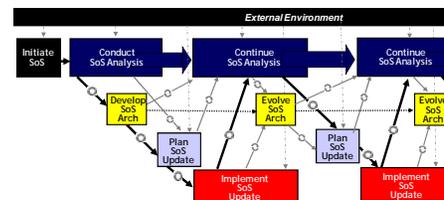
2010: Workshop



2010: "Sominex" Resulting Initiatives



2011: Best Practices Wave Model

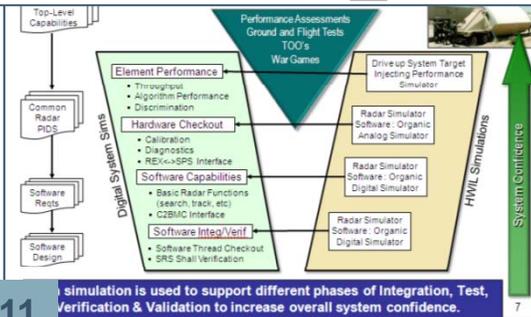
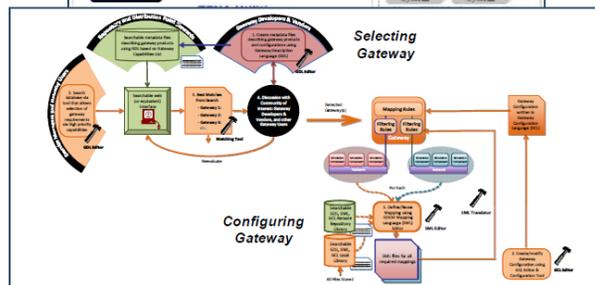
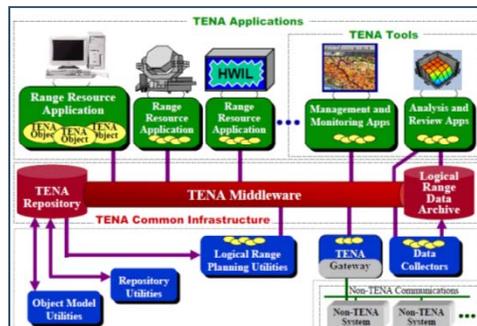


2012: Final Report

2009-2012

NDIA SE Conference
October 2013

Effective Use of Modeling and Simulation for Test and Evaluation



2011 simulation is used to support different phases of Integration, Test, Verification & Validation to increase overall system confidence.

Joint Meeting in August 2011

- Distributed Testing, the Joint Mission Environment Test Capability (JMETC) and the Test and Training Enabling Architecture (TENA)
- DoD M&S Community of Interest Data Management Working Group
- LVC Architecture Roadmap Implementation (LVCAR-I) Gateways Effort Applicability to T&E
- OSD T&E Working Group
- Raytheon Presentation on M&S for T&E
- Potential Topics for November AMSWG Meeting



Modeling & Simulation Collaboration Distributed Testing



Benefits:

- Find integration issues earlier
- Test to learn in 'safe' environment
- Protect proprietary information
- Facilitate DT to OT transition
- Increase performance testing range in operating environments
- Support end to end studies throughout the program

Barriers:

- Security
- Lack of persistent network
- Early consideration of technical issues
- Perceived value
- Disconnect between the communities (M&S and T&E)

Recommendations:

- Harmonize the standards for M&S and Test for the life cycle perspective (HLA, TENA, Metadata)
- Create a framework for reusing and repurposing M&S through the product model
- Establish M&S as part of statistical test design
 - Determine what tests are conducted to acquire data for model validation.
 - Fewer test events with better models.
- Recommend the use of M&S to do I&T
- Recommend establishment of JMETC as a persistent node for industry to engage in MBDI&T

Raytheon

MBDIT Workshop Results

- **Current State**
 - Pockets of 'best practice' utilize model based distributed integration and test
 - End to End Distributed Development Systems (various services)
 - Stimulation Frameworks (various programs)
 - JMETC (various demonstrations)
 - Use of MBDI&T is typically the exception not the rule!
- **Captured Discussion Results**
Inputs for NDIA DT&E/M&S meeting following week



11

**Joint Meeting
August 2012**

**Joint Track
SE Conference October 2012**

2012

Metrics Collaboration Leading Indicators for T&E



Workshop October 22, 2012

System Development Performance Measurement

NDIA National Defense Industrial Association
Systems Engineering Division

PSM Practical Software and Systems Measurement

**Working Group Report
System Development Performance Measurement
October 2011**

Introduction

An issue often cited in studies and reports¹ is the ineffective use of measures and predictive leading indicators to proactively plan and manage the successful acquisition and execution of defense programs. This is reflected as one of the top NDA systems engineering issues needing to be addressed:

Technical decision makers do not have the right information & insight at the right time to support informed & proactive decision making or may not act on all the technical information available to ensure effective & efficient program planning, management & execution.

In September 2010, the NDIA Systems Engineering Division and Practical Software and Systems Measurement (PSM) sponsored a working group to consider these issues and provide recommendations on a set of information needs, leading indicators, and measures for use by both acquirers and suppliers to obtain better insight into program status and risks to aid ongoing communication and to provide input to decision-making at key program milestones and decision points. This task builds upon prior measurement initiatives and consensus guidance (e.g., PSM, the International Council on Systems Engineering (INCOSE), academia), while integrating experience and practices from adopters as a next logical step in maturing common approaches for systems engineering measurement. The task team used the measurement approach described in the PSM guidance (see PSM in Appendix B) as a foundation to identify and define a small set of leading indicators that are very useful on most programs during the Technology Development (TD) and the Engineering and Manufacturing Development (EMD) phases. Though this product is targeted primarily at the NDIA aerospace and defense markets, the results may be broadly applicable into other domains.

Working group objectives include:

- Identify a set of leading indicators that provide insight into technical performance at major decision points for managing programs quantitatively across their life cycle, with emphasis on Technology Development (TD) and Engineering Manufacturing and Development (EMD) phases.
- Build upon objective measures in common practice in industry, government, and accepted standards. Do not define new measures unless currently available measures are inadequate to address the information needs.
- Select objective measures based on essential attributes (e.g., relevance, completeness, timeliness, simplicity, cost effectiveness, repeatability, and accuracy).
- Measures should be necessary and readily available, with minimal additional effort needed for data collection and analysis.

¹Refer to Appendix B for a summary of key studies and reports related to obtaining greater objective insight into

NDIA Deep Dive
REQUIREMENTS VALIDATED

Question:

- Is the requirement necessary to satisfy a stakeholder's need?
- Are changes in stakeholder's needs reflected in changed requirements?
- Are requirements feasible for cost, schedule, and technical maturity?

- Insight provided
 - TRL
 - Cost of risk
 - Schedule risk

Base measures

- Should be complete (100%) at SRR for known system requirements

NDIA Deep Dive
VERIFICATION RQT MATURITY

Question:

- Are the verification requirements:
 - Correct
 - Complete
 - Executable
- Insight provided
 - Viability of verification activity execution
- Base measures
 - Verification methods defined
 - Success criteria defined and approved
 - Verification environment available (resource commitment)

NDIA Deep Dive
OPERATIONAL COVERAGE

Question:

- Will the set of requirements, as a whole, satisfy the stakeholder's operational needs?
- Have the validated operational needs been adequately implemented and traced at all levels of our technical solution?

- Insight provided
- Base measures

	CONOPS	SRR	70%	80%	100%	PM			
Sys Threat									
Sys Desc									
Verification									
Validation									

Table 1. Information Needs

Highest Priority Information Needs (drivers for measures considered by breakout teams)	Other Information Needs (not considered by breakout teams)
<ul style="list-style-type: none"> Requirements Interfaces Architecture 	<ul style="list-style-type: none"> Testability Requirements Verification and Validation Defects and Errors System Assurance Process Compliance Work Product Progress Facilities and Equipment Change Backlog Review Action Item Closure
<ul style="list-style-type: none"> Risk Management Manufacturability 	

Follow-on workshop with System Performance Measurement WG
Focused on other information needs not addressed in first report

2012 www.ndia.org/Divisions/Divisions/SystemsEngineering/Documents/Studies/NDIA%20System%20Development%20Performance%20Measurement%20Report.pdf