Chief Developmental Tester & Industry Test Lead
Partnering for success

NDIA DT&E Committee Project Lead
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Agenda

• Origin of project (NDIA DT&E Committee)
• Project Overview
• Strategy to align Industry with new Chief Development Tester & Initiatives
• DASD(DT&E) Shift Left initiative
• Critical interactions and acquisition timeline
• Examples of excellence
• Recommendations
• Next Steps – Future Work
NDIA Systems Engineering Division

Focus on T&E initiatives aligned with SE & DT&E Ex. Cybersecurity Guidelines, Architecture for Test

SE Themes & Issues
NDIA Systems Engineering Conference (Q4) Collaborative Projects

NDIA DT&E Committee

SED Committee Collaborative Projects

NDIA Test and Evaluation Division

T&E Themes For Conferences

NDIA Industrial Committee on Test and Evaluation (ICOTE)

T&E Themes & Issues
NDIA Test and Evaluation Annual Conference (Q2) Periodic T&E Committee-Focused Conferences Cooperation with other NDIA Divisions

SE – T&E Collaborate on Projects together
Chief Developmental Tester Project

**Title 10, Section 139b**
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.

**Goal:** Propose a model for industry interaction throughout the phases of a development program with an emphasis on "Shift Left".

**CDT Project team**
- Joe Manas (Lead) – Raytheon
- Sandi Gianotas – Boeing (BTE)
- Tom Simms – DASD(DT&E)
- Joe Wascavage – NAVAIR
- Brendan Rhatigan – Lockheed Martin
- Steve Scukanec – Northrop Grumman
- Paul Alfieri – DAU
- Dr. Bram Lillard – OT&E
Opportunity for Improvement on Developmental Programs

The Cost

Notional

Number of Issues Realized

Nominal cost for fault removal (NIST data)

Issue actual discovered
Earliest opportunity for discovery

1x 5x 16x 40x 110x

Late discoveries are considerably more costly!

The Impact

DT&E Assessments recommending to proceed to IOT&E
(2012 DT&E Annual Report)

Proceed
Do Not Proceed

IOT&E

25%

50%

Only 41% (5 of 12) programs made it to & through a successful IOT&E

Late discoveries are considerably more costly!

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Strategy To Improve

• Comprehensive DT&E activities, earlier in the development process, better inform technical, acquisition, and programmatic decisions.

• Early and often interaction and coordination between Government (Chief Developmental Tester) and Industry (Industry Test Lead) is critical in the early identification of problems, validating fixes, and ensuring technology is mature well before committing to production.
  • Populate the Developmental Evaluation Framework (DEF)
  • Determine the Technical and Programmatic decisions to be informed by T&E Evaluations: How will the system be evaluated?
  • Tests/Modeling & Simulation (M&S): How will test and M&S events provide data for these evaluations?
  • What resources are required to execute tests, M&S and conduct evaluations?
  • Earlier start on Reliability Growth Planning
  • Earlier Cybersecurity Testing

• “...the real benefit of an effectively structured test program is in the cost avoidance it can provide by discovering problems as early as possible.”
  (Mr. Frank Kendall, USD(AT&L), March 2013, ITEA Journal)
DASD(DT&E) Initiatives

“Shift Left” (started in 2012)

• Find and Fix Problems **EARLY**!
• Three focus areas:
  - Earlier **Mission Context**
  - Earlier **Interoperability Testing**
  - Earlier **Cybersecurity Testing**
• Currently, the initiative is also focusing on:
  - System performance
  - Reliability

Developmental Evaluation Framework

• Provides the roadmap to obtain developmental data
• Knowledge gained from testing provides information for technical, programmatic, and acquisition decisions.
• Aids programs in determining how to structure a test program.
  - Shows correlation/mapping test events, resources, and decisions.

**Early DT&E activities inform technical, programmatic, and acquisition decisions**
Test and Evaluation Master Plan (TEMP) includes a Developmental Evaluation Framework (“T&E Roadmap”)

- Knowledge gained from testing provides information for technical, programmatic, and acquisition decisions.

**Developmental Evaluation Framework:**

- Identifies key data that contributes to assessing progress on:
  - Key Performance Parameters
  - Critical Technical Parameters
  - Key System Attributes
  - Interoperability requirements
  - Cybersecurity requirements
  - Reliability growth
  - Maintainability attributes
  - Developmental test objectives
  - Others as needed

- Show the correlation/mapping between:
  - Test events
  - Key resources
  - Decisions supported

The TEMP is the Program Managers primary planning and management tool for all test and evaluation activities.
T&E in Acquisition Lifecycle

SHIFT LEFT: Includes earlier test and evaluation planning and activities to support Milestone C decision

MDD Material Solution Analysis

Technology Maturation & Risk Reduction

Requirements Decision

Developmental RFP Decision

Most important single decision in the life cycle... sets in motion all that follows.

Full Rate Production Decision Review

Materiel Solution Analysis

Requirements Decision

Developmental RFP Decision

Most important single decision in the life cycle... sets in motion all that follows.

Full Rate Production Decision Review

EXECUTIVE SUMMARY

Most important single decision in the life cycle… sets in motion all that follows.

The venue for frequent interaction with all key stakeholders

PROJECT FOCUS: Interactions between Industry and government

Chief Developmental Tester

Lead DT&E Organization

T&E WIPT

The venue for frequent interaction with all key stakeholders

Industry Test Lead(s)

Industry Test Lead

TMRR Contract

EMD Contract

Industry Test Leads can help with early test and evaluation planning and activities

SHIFT LEFT: Includes earlier test and evaluation planning and activities to support Milestone C decision

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Industry Test Lead

TMRR Contract

EMD Contract

Industry Test Leads can help with early test and evaluation planning and activities
CDT/ITL Descriptions

Chief Developmental Tester
Is a key leader in the program office, provides advice and recommendations based on test results to the program manager to inform technical, acquisition, and programmatic decisions. Chairs the T&E WIPT.

Highly qualified professional that possesses knowledge, skills, and ability to develop and execute a comprehensive and efficient test and evaluation program

Brings the technical education, test and evaluation experience, leadership, and cross-functional insight necessary to guide the technical management, program execution, and business management efforts associated with test and evaluation and defining test requirements.

Industry Test Lead
Industry counterpart to the Chief Developmental Tester and is a member of the Government T&E WIPT. Currently, has many names, (Test Architect, Test Manager, Chief Validation Engineer, etc).

Highly qualified professional that possesses knowledge, skills, and ability to plan and coordinates all Contractor T&E activities during development.

Brings the technical education, test and evaluation experience, leadership, and cross-functional insight necessary to guide the contractor test program

Operates at a level above the Contractor IPTs and provides guidance across all the Contractor IPTs (similar to that of a Chief Engineer). Works with and provides feedback based on test results to design engineers or product teams during development.

T&E is a Technical Discipline
Potential Industry Organization Models

Corporate T&E Executive
- Corporate Executives
  - Test VP
  - Program Executives
    - ITLs
    - Chief Eng Office
    - Individual PMs

ITLs at Program Level
- Corporate Executives
  - Program Executives
    - Individual PMs
    - ITLs
    - Chief Eng Office

ITL Part of CE Office
- Corporate Executives
  - Program Executives
    - Chief Eng Office
    - Individual PMs
    - ITLs
    - CEs

- Currently most organizations are set up with ITL as part of the CE office (if an ITL exists)
- “Shift Left” Initiative calls more for ITL to move out of the CE office and report direct to the program manager
- T&E has most independence in the Corporate Model
  - This model does not exist in most companies, transformational
Enclosure (4): A robust DT&E program includes a number of key activities to provide the data for decision making.

The TEMP is the Program Managers primary planning and management tool for all test and evaluation activities.
DT&E Program

Government Testing
(Lead DT&E Organization)

- Provides technical expertise on T&E issues
- Conducts DT&E activities as directed by the Chief Developmental Tester
- Supports certification and accreditation activities, when feasible
- Assists the Chief Developmental Tester:
  - Provide oversight of contractors
  - Reach technically informed, objective judgments about contractor and government T&E planning and results

Contractor Testing
(Industry Test Lead)

- Provides technical expertise on T&E issues
- Plans out the strategy and implementation of the integrated test campaign
  - M&S to HWIL to ground test to field test
- Manages enterprise resources to achieve results
- Works with DT&E organization on collaborations
- Conducts DT&E activities, as stated in the contract
- Supports government testing, when directed
- Assist the Chief Developmental Tester:
  - Participate in T&E working groups
  - Use Evaluation Framework to guide integrated test planning
  - Contribute to test strategy that yields cost effective test event plans
INDUSTRY EXAMPLES
Industry Test Lead Results:
- Achieves Integrated Testing
- Promotes Operationally Relevant Testing
- Enables Statistical Test Optimization
- Implements “Shift Left”
- Improves Affordability
- Focuses on Reliability

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<th>Engineering, Manufacturing, and Development (EMD)</th>
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<th>Operationally Relevant Testing</th>
<th>STAT Methods Used</th>
<th>Driving Affordability</th>
<th>Early T&amp;E “Shift Left”</th>
<th>Transition to Milestone C</th>
<th>Reliability Growth</th>
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- Describe an instance on a program where the contractor test lead (equivalent to the new Chief Developmental Tester) and the government test lead worked together:
- Name of the contractor role:
- Why the contractor role emerged:
- What were the benefits of having this role:
- Who were the advocates for the role:
- Who were the opponents of the role:
- Recommended interaction with Chief Developmental Tester:

Industry Survey Template
Industry Examples: Test Strategy Excellence Themes

**Shift Left Implementation**
- Earlier mission context in – using M&S and L/V/C concepts
- More effective interoperability and cyber testing
- Mission info captured with minimum number of scenarios
- Promotes operationally relevant testing
- Cost-effective test program execution with coordinated test activity
- Risk based definition of test events
- More emphasis on suitability/logistics early in test
- Test planning focus on evaluation and informing decisions
- Proactive work-arounds to potential problems

**Developmental Evaluation Framework**
- DT scenarios defined to evaluate system in mission context
- Define the data defined to be collected and evaluated during the contractor, government DT&E, and Integrated Testing
  - Maximize data obtained and shared
- Optimize test program and the number of test events required – use statistics to validate
- Focus on capabilities, performance, cybersecurity, interoperability, and reliability to avoid “verification by exhaustion”
  - Identify potential sources of data to support reliability growth curves
  - Identify effective techniques for cyber testing
Industry Examples: Why Industry Lead Role Emerged

• **Program schedule and budget challenges**
  • Make sure test program had no overlapping/duplicate efforts
  • Acquisition challenges resulted in significant test events being deferred to later stages of the programs and later contracts

• **System complexity**
  • Ensure verification events lead to customer acceptance
  • Mitigate stove-piped verification planned within each sub-system test program

• **Limited test asset availability**
  • Testing needed to be coordinated with minimal damage to system assets
  • Test facility also used for development – development priorities not aligned with test team capability needs
RECOMMENDATIONS
Recommendations for mechanization

**Industry:**
- Understand the benefits of an effectively structure T&E program.
- Include test and evaluation in the corporate management structure.
  - Realize the value of having an Industry Test Lead and their contributions to the company's overall mission and goals.
- Establish an organizational culture that provides a career path for Test and Evaluation professionals
- Define Roles & Responsibilities between
  - Industry Test Lead / Chief Engineer / Test IPT Lead
  - Continued collaboration w/ DASD(DT&E) regarding process and infrastructure to support effective test strategies.

**Government:**
- Identify Industry Test Lead in RFP (Key Personnel Clause)
- Structure RFP to include specific interactions between Chief Developmental Tester and Industry Test Lead
Next Steps – Future Work

• Revisit and revise 2008 NDIA DT&E committee conducted study titled “DT&E Support to Acquisition.”
  
  • Since the study was conducted in 2008, there has been updates to policy and new legislation (e.g. WSARA, Integrated Testing definition, updates to DOD Instruction 5000.02, etc.) which implemented some of the findings.

  • Review findings and identify new/remaining gaps and/or areas for improvement.
  • Recommending that case studies be conducted for best practices (pilots)
    • CDT – ITL Developmental Evaluation Framework Implementation