Solving Einstein’s Dilemma with a Rapid Integration, Innovation, Process (RI2P)

DCGS ENTERPRISE BUILDING A BETTER MOUSETRAP

John Snevely
John.Snevely@osd.mil
703 695 4293
The Baby is Ugly

- Undeniably, the status quo Defense IT acquisition process does not adequately serve war fighters at the tactical edge.
- Simply trying harder with the same organizations and processes will not fix the problem.
- Hence, the Secretary of Defense has mandated fundamental change.
  - Early continuous user-involvement
  - Rapid prototyping
  - Incremental delivery
  - Modular Open System Approach (MOSA)
Evolution of Architectures

Stove Pipes → Open Middleware → Open Services

1970 / 1980
Stove-piped systems

1990 / 2000
Middleware glued to mission applications

Today
Service-oriented architecture (SOA)
Shared applications and services

Future
SOA Infrastructure
Infrastructure
A Single Enterprise

All services consolidated to DECC Columbus and other central sites. Tactical edge supported with unlimited reliable communications.

6212 NCES Vision

Enterprise of Enterprises

Each enterprise capable of independent operations in the face of disadvantaged, disconnected, or denied communications or destroyed infrastructure.

DCGS-Enterprise Vision
You need to test for both types of interoperability!

**System Interoperability**

- Can I talk to a specific system through the cloud?
  - Example: Will this PC work with that printer?

**Net-Centric Interoperability**

- Can I talk to anything in the cloud based on my interoperable interface?
  - Example: A network printer that can talk to any PC on the LAN.

**SLAs (point to point agreements)**

- **Point to Point Interoperability With Anticipated Users**
  - System-level Requirements

- **Potential Interoperability with Unanticipated Users**
  - Standards-based data/services

- **DCGS-Enterprise ICD**
New capabilities rain into Storefront

Develop

Integrate and deploy survivable solutions

Deployed across the echelons for bandwidth and survivability

Agility

Deploy World-Wide

Survivability

Integrate and deploy survivable solutions

Supports
MACE is a government sponsored neutral physical and virtual space where all agencies can collaborate in order to:

- identify common and complimentary problems,
- develop holistic non-proprietary solutions to those problems,
- invest in transformational technologies
- efficiently apply resources through economies of scale

Mission: To create data sharing partnerships across the federal government to deliver greater levels of situational awareness and enable more accurate and timely decision making across the DoD and Federal Agencies
"Multi-Agency Collaboration Environment”
The committee is aware that the office of the Assistant Secretary of Defense for Networks and Information Integration sponsored a program intended to break down interagency information stovepipes and promote greater information sharing among the Department of Defense and its partners. The Multi-Agency Collaboration Environment (MACE) is an innovative effort to address many of the information sharing problems identified by the 9/11 Commission which continue to plague the U.S. Government. MACE provides a unique proving ground for federated information sharing architectures and techniques...

...Equally important, the contracting paradigm for MACE is a radical departure for the Department, and offers a potential future standard that leverages Darwinian principles in support of information systems program management...

...The committee plans to closely monitor the progress of MACE, and encourages the Department to make greater use of this capability."
MACE Ongoing Business Model

- Business model creates direct relationships between the government customer and the government contracting agency
- Costs to use MACE facility are built into the project costs
Transformational Catalyst?

www.macefusion.com
- **Creating Partnerships across all of Government demonstrating the power of data sharing**
  - Putting people with capabilities together with people looking for solutions
- **Fostering an enterprise approach to data sharing**
  - Supporting organizations with their requirements to turn data into knowledge
  - Making data compliant and accessible to users from across a community of interest
  - Exposing capabilities to our mission partners promoting reuse and operational/financial efficiencies
Benefit of Performing Work @ MACE

• Designed to support Agile development
• Open environment for development
  • “Off Government site” flexibility
• All contract work is non-proprietary
• Partnerships
  • DoD and Federal Agency participation and oversight
    - PM-ISE, USDI, DHS, ATF, USAF, DOD
• Facility
  • Purpose built facility to foster collaboration
  • No lease required
    - 1 week to 3 months to 3 years
• Cost Efficiency
  • Potential cost sharing across efforts
  • Leverage other team’s lessons learned
  • Matrix FTE/Surge support
2009-2012 DIB Accomplishments

• DIB now operational at over 100 service/agency nodes world-wide
• DIB has lead to a 325% increase in the volume and number of data federations across DoD
• Estimated cost avoidance savings of $54 million dollars per DIB version
• Four times faster release cycle when compared to traditional acquisition methods
• DIB 4.0 delivers technology leap with DDF
  • Basis for DI2E “data layer”
  • Rapid integration of new data sources and formats
Government Oversight Option

- USDI Neil Tipton
- AT&L Robin Hicks
- OSD Agency?
- Federal Agency?

MACE Government Advisory Board

Chris Gunderson
On-Site MACE Government Oversight

Provide counsel, advice, direction and mediation

Provides on-site oversight of MACE activities and provides feedback to the Advisory Board
Providing the DCGS community with an environment that facilitates the establishment and validation of enterprise standards and capabilities with the DCGS architecture.
Solving Einstein’s Dilemma with a Rapid Integration, Innovation, Process (RI2P)

Multi-Agency Collaborative Environment…not your Father’s System Command

Chris Gunderson
Christopher.Gunderson@macefusion.com
703 464 6429
How Will MACE Avoid Einstein’s Rake?

- Target and measure potential improvements?
- Incentivize collaboration across various similar efforts?
- Harness the efforts of the COTS ecosystem?
- Federate across build-time acquisition activities and runtime tactical and garrison environments?
- Overcome the tyranny of Moore’s Law despite Defense acquisition inertia?
IT Transition

• The to-be objective: Deliver better capability to the field, sustainably, and securely, *while the technology is still cutting edge.*

• As-is best practice, i.e., Einstein’s rake:
  • Transition S&T to POR, which eventually delivers to the field.
  • POR employs COTS-based development, but locks in a perishable “stack” during long, expensive, serial DT&C process. Delivers out-of-date technology.
  • Alternatively, rapid tech insertion processes deliver prototypes, or COTS, to the field quickly, but generally without enterprise interoperability or sustainability.
In the best case, mature S&T discoveries transition to POR. However, fielding of capability is delayed because of the long POR time spent on engineering and procuring proprietary system infrastructure. Then IT is locked down for long test and cert process. Stovepipe IT system is already out-of-date by IOC and falls farther behind during lifecycle.

Good PMs and prime contractors build with COTS components, especially COTS hardware.

S&T

Low TRL

High TRL

COTS-based Development

Tech Transition e.g. LTE

IncludeSIA & IoP C&A

Moore’s Law

Log COTS Compute Power

Customer’s requirements

Time = ~10 yr

Status Quo

Gap Analysis

Materiel Solution Analysis

Material Development Decision

Pre-Systems Acquisition

Technology Development

Post POR Assessment

Post CDR Assessment

Systems Acquisition

Engineering & Manufacturing Development

FRP Decision Review

Sustainment

Production & Deployment

Operations & Support

Includes IA & IoP C&A

Customer’s requirements
Status Quo

Good rapid prototyping and COTS insertion processes succeed at delivering stovepipe capability quickly. Often they use waivers to avoid certification requirements. Lifecycle sustainment is almost always an issue.

Rapid Tech Insert

Moore’s Law
Good government and commercial CIO's, and non-state terrorists, continuously improve business capability via shrink-wrapped plug & play tech refresh within "certified" enterprise infrastructure. In DoD this approach occurs occasionally post-FOC, but almost never pre-FOC.

*Per various logos: e.g.: ITIL, Scrum, Lean 6 Sigma, CMMI, eFile, etc
Status Quo

Log COTS Compute Power

Tech Transition e.g. LTE

COTS-based Development

Rapid Tech Insert

Capability Gap

COTS Tech Refresh

Moore’s Law

Time = ~10 yr

Customer’s requirements
Status Quo

Log COTS Compute Power

Time = ~10 yr

Customer’s requirements

OSD IT Reform Mandates:
• Early and continuous involvement of the user
• Multiple, rapidly executed releases of capability
• Early, successive prototyping to support evolutionary approach
• Modular Open Systems Approach

Objective
Capability Baseline

Adversaries’ Capability Baseline

Process Gap
• Operators busy and not connected
• Serial C&A prevents early releases
• Tech insert lacks O&M tail
• Specified open interfaces are absent

Moore’s Law

Technology Development
Engineering & Manufacturing Development
Production & Deployment
Operations & Support
Necessary IT Transition Process

- Small increments of capability delivered, sustainably, to both operational customers, and systems in development, simultaneously
  - Developed capability “plugs in” directly and sustainably to enterprise
    - Enterprise open interfaces must actually exist and be fully specified
    - Agile certification performed in parallel to agile development so cutting edge capability may legally plug in to live networks
      - Approved IA and IoP controls must exist in the real-time IT infrastructure, and be inheritable by applications
      - Components must be Certified-off-the-Shelf, i.e. readily reusable per “approved products” catalogs and convenient procurement vehicles
Value-based Acquisition Framework (VAF)

- System of systems (SoS) constructed via open standard reference architecture
- Enterprise interoperability model is platform-independent
  - Runtime interoperability means SoS information exchange performance is testably correlated to targeted enterprise mission outcomes (i.e. Delivered Information Value (DIV))
  - Build time interoperability means subsystems are constructed with readily procured, open standard, lifecycle supported, pre-certified components
- Objective is Max DIV per rapid delivery cycle per cost
To Be Process

Continuous Operations & Support of Existing Enterprise C4ISR Capability

OSD IT Reform Mandates:
- Early and continuous involvement of the user
- Multiple, rapidly executed releases of capability
- Early, successive prototyping to support evolutionary approach
- Modular Open Systems Approach

Process Improvements
- Operators connected transparently
- C&A in parallel
- Deliver advanced, but sustained, capability components
- Build to specified open interfaces

Moore’s Law

Time = ~3 yr

Capability Baseline
**To Be Process**

- **Gap Analysis**
  - To Be Process
  - Log COTS Compute Power
  - Time = ~3 yr

- **S&T**
  - Delivered directly to POR Portfolio
  - Delivered capability to operational customers and to POR capability portfolios simultaneously, as OTS modules.
  - OTS means that modules configure pre-certified out of the box, come with lifecycle support, are easily procured, e.g., via approved product list and standing contract vehicle or GOTS repository.

- **COTS Adoption & Tech Transition**
  - 3-6 Months
  - Persistent Test Environment
    - Distributed Federation of Labs and Certification Authorities
  - IA & IoP C&A
    - Complete by MS C

- **Materiel Solution Analysis**
  - Material Development Decision
  - Pre-Systems Acquisition

- **Technology Development**
  - Post POR Assessment
  - Post CDR Assessment
  - Systems Acquisition

- **Engineering & Manufacturing Development**
  - FRP Decision Review
  - Sustainment
How Will MACE Avoid Einstein’s Rake?

• Target and measure potential improvements?
• Incentivize collaboration across various similar efforts?
• Harness the efforts of the COTS ecosystem?
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JCIDS IT Box Acquisition Strategy

Business Case Analysis

Enterprise Value-Based Metrics

Light Weight Governance

Level Funding for Common Computing Environment

Continuously Delivered, Off-the-Shelf, Easily Procured, Certified, Sustained, Capability Modules

Value Proposition
Delivered Information Value (DIV) = \( f(\text{Customer-in-the-loop} \Rightarrow \text{Operational priorities} \Rightarrow \text{Critical mission threads} \Rightarrow \text{Measurable targeted effects}) \Rightarrow \text{Semantic interoperability model} \)

Max DIV per-time per-cost

Enterprise Value-Based Metrics

Value-based Acquisition Framework (VAF)

Policy, QoS, workflow

OTS apps/services

Mash ups

Sensors/devices

Open standard apps development framework

Open standard geospatial framework

Open standard message oriented middleware

Open standard real-time data-centric

Open standard network separation architecture

Open standard communication transport

Information Assurance

Platform independent enterprise interoperability model
MACE Integration Innovation Engine

- Customer-in-the-loop
- Government Sponsorship
- COTS Market

Delivered Value

Pre-certified off-the-shelf modular capability ... integrated as necessary... via convenient procurement vehicle

Light Weight Governance
Government-Industry “dot org” Umbrella
Exquisite Technical Expertise
Defense, DHS, Other Projects
Collaborative Ecosystem of Operators, Providers, Sponsors, and Certifiers
Marketing and Outreach
Automated Workflow, Documentation & Configuration Management
Expert Agile Fiscal & Contracting Processes
Persistent, Online, Agile, Open, Modular, D,T, &C Environment

Low Barrier to Entry
Industry Outreach: AFCEAA3I “Plug Fests”

- Rigorous demonstrations of plug-and-and-play open standard Off-the-Shelf (OTS) IT value added
  - Improves both capability delivered, and acquisition efficiency
    - Delivers actionable intelligence into critical decision cycles in time to assure effective outcomes.
    - Addresses well-documented inability to field IT on pace with Moore’s Law.
  - Implements IT Box
    - Provides transparency and incentivizes COTS focus on government requirements and process.
What’s a Plug Fest?

- Industrial best practice
  - Demonstrate that offerings “plug in” to a Common Computing Environment (CCE)
  - Proves value added to customer-defined use cases.
  - Requires well-defined open standards
- AFCEA/ISIL A3I Plug Fest
  - Implements JCIDS “IT Box” (JROCM 008-08)
  - Tactical edge ISR use cases provided by uniformed Marines.
  - COTS vendors compose run time MCISR-E CCE reference implementation
    - Complies with Defense Intelligence Information Enterprise (DI2E) and OSD AT&L UAV Control System (UCS) open standards
    - Includes pre-certified Information Assurance (IA) components.
  - “Mash up challenge” demonstrates speed-to-capability via open standard CCE
  - Objective is that Plug Fest demos will achieve JITC certification and “Pre-approved Product” status.
- 1st A3I Plug Fest in continuing series at AFCEA “TechNet Land Forces” Tucson 27-29 Mar
Plug Fest “Plug” = Value-based Acquisition Framework (VAF)

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C4ISR Industry Interoperability Engagement: Plug Fest

Government/Industry “dot org” Umbrella, e.g. AFCEA

Vendor COTS Offerings

USMC use Case Models, Simulations, & Metrics

Tested COTS Components

IT Box

Asymmetric Capability

Open Standard Test Framework

Open Standard Reference Model

For PISR Common Computing Environment

Embedded FE Test Harness

Analysis Options

Displaced Shape Scale

Platform independent enterprise interoperability model

Matrix

Gauss

Open standard real-time data-centric middleware

Open standard network separation architecture

Open standard communication transport

Value-based Acquisition Framework (VAF)
AFCEA Plug Fest, Tucson, Mar 27-29

USMC Use Case Models, Simulations, & Metrics

“Mash Up Challenge”

ETCorp
IBM
ATT

OSTF
Teledyne
BAE
Raytheon
ATT
IBM
ESRI

Tested OTS components

JITC Certified