



# **Defense Modeling and Simulation Coordination Office and the Defense M&S Reference Architecture**

**April 19, 2016**

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Defense Modeling and Simulation Coordination Office (DMSCO)  
Office of the Deputy Assistant Secretary of Defense for Systems Engineering



# Purpose



## To provide an update on

- The strategy and emerging configuration for the Defense Modeling and Simulation Coordination Office (DMSCO) in FY 2016 and beyond, and
- Several success stories of DMSCO-sponsored M&S projects

## To provide an overview of the Defense Modeling and Simulation Reference Architecture (DMSRA)



# Modeling and Simulation in the DoD

## Strategic Vision:

*Empower DoD with modeling and simulation capabilities that effectively and efficiently support the full spectrum of the Department's activities and operations.*

- Policy
- Standards



# M&S

- Technology
- Collaboration

Fostering development of tools standards and services to enable interoperability and reuse



Technology-watch and advocacy for Component-led M&S Research and Development





# DoD Modeling & Simulation Community



*Defense M&S is a large and diverse community*

*– the Defense M&S Coordination Office (DMSCO) is the focal point for DoD M&S*

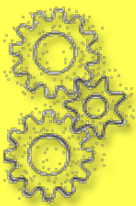
## Other Federal Organizations

Department of Homeland Security  
Department of Energy  
NASA

## Academia



## Industry



## International Partners



TTCP

Coalition Partners  
US Allies

## DoD Communities Enabled by M&S

Spotting trends/gaps across Components;  
foster sharing good ideas, practices,  
tools & data across Components

Training  
T&E

Planning

Intelligence

Experimentation

Analysis

Acquisition

Policy

Standards

Technology

Collaboration



# M&S CO

*Focal point for DoD M&S*



Army  
Navy  
Marines  
Air Force  
CCMDs  
MDA  
DTRA  
DLA  
DARPA  
Other Agencies

## DoD Components

Determine requirements, fund development



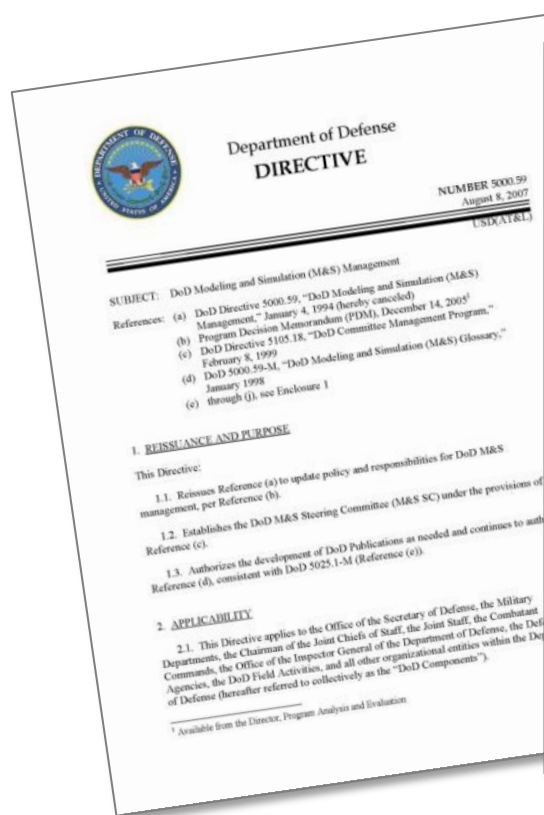




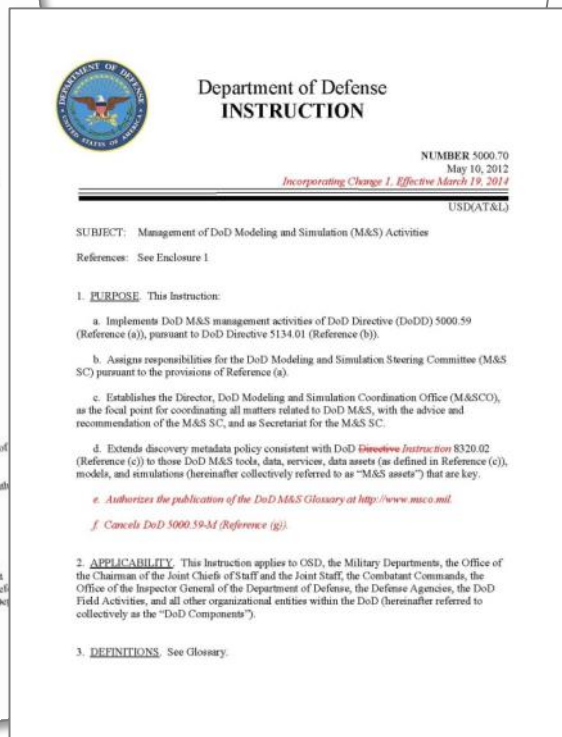
# Policy



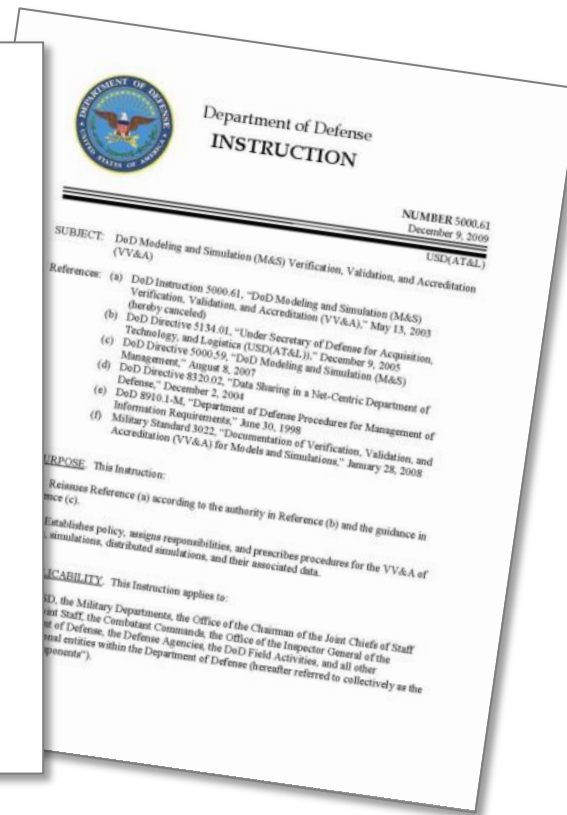
As the Department's lead for implementing the USD(AT&L)'s role as Principal Staff Assistant for M&S, DMSCO develops and updates Defense-wide policies and guidance to enable interoperability and reuse



**DoDD 5000.59**  
**DoD M&S Management**



**DoDI 5000.70**  
**Management of DoD M&S Activities**



**DoDI 5000.61**  
**DoD M&S VV&A**



# Standardization



## DMSCO is Simulation Interoperability Standards Organization (SISO) sponsor

- DMSCO is a SISO sponsor through a cooperative agreement
- DMSCO funding goes to the maintenance of SISO operations and not towards conferences
- SISO provides DoD with a mechanism to achieve consensus standards



## DMSCO is DoD Lead Standardization Activity for Modeling and Simulation Standards and Methodologies (LSA MSSM)

- Direct MSSM standardization activities
- Implement Defense Standardization Program (DSP) policies
- Approve MSSM standardization projects and maintain M&S standards records in the Acquisition Streamlining and Standardization Information System (ASSIST)

## DMSCO Director is member of Joint Enterprise Standards Committee (JESC) for IT standards



- DMSCO is the DoD Co-Chair of the M&S Technical Working Group (TWG) to:
  - Maintain DoD Information Technology Standards Registry (DISR) Standards citations
  - Make recommendations to JESC regarding life cycle status (emerging, mandated, retired) of standards, and adoption of new standards
- Coordinate Actions with other JESC TWGs





# Technology



## DMSCO:

- Provides technical expertise and support of DoD M&S Strategic Vision, goals, and objectives
- Identifies and assesses technology from DoD Communities, Federal Agencies, FFRDCs, Industry, and Academia for application to Defense M&S



VMASC



IDA







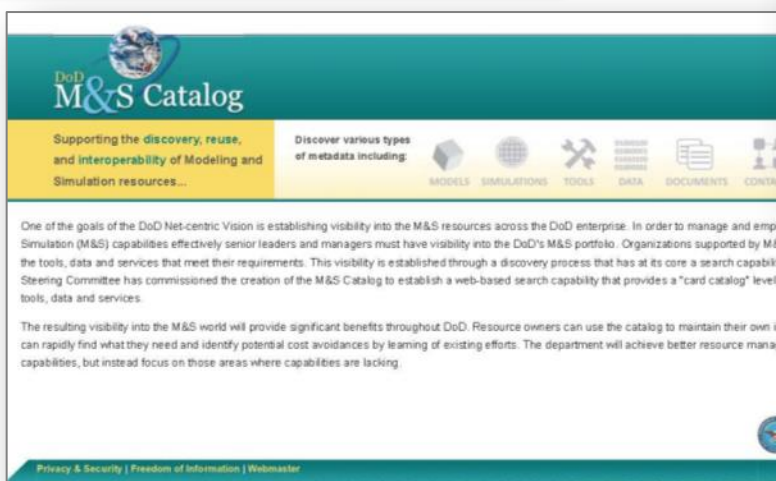
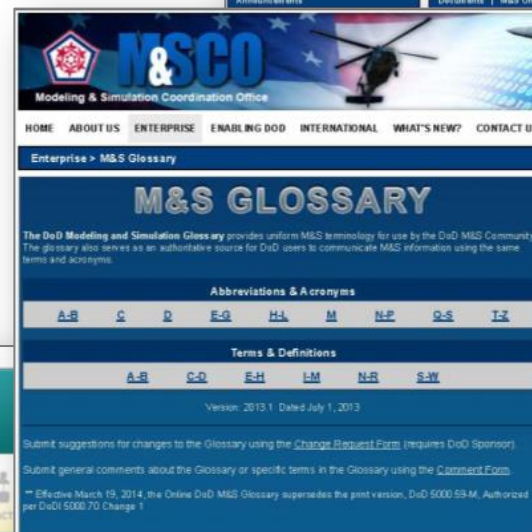
# Collaboration



## DMSCO:

- Leads DoD M&S technical forums, including **Cyber M&S**, data standardization, and architecture development; and International M&S technical panels
- Enables asset reuse through information sharing via Defense-wide **M&S repositories and catalogs**
- Maintains the **M&S Glossary** as a dynamic, online resource to improve Defense-wide common understanding and interoperability

## Cyber M&S Technical Working Group







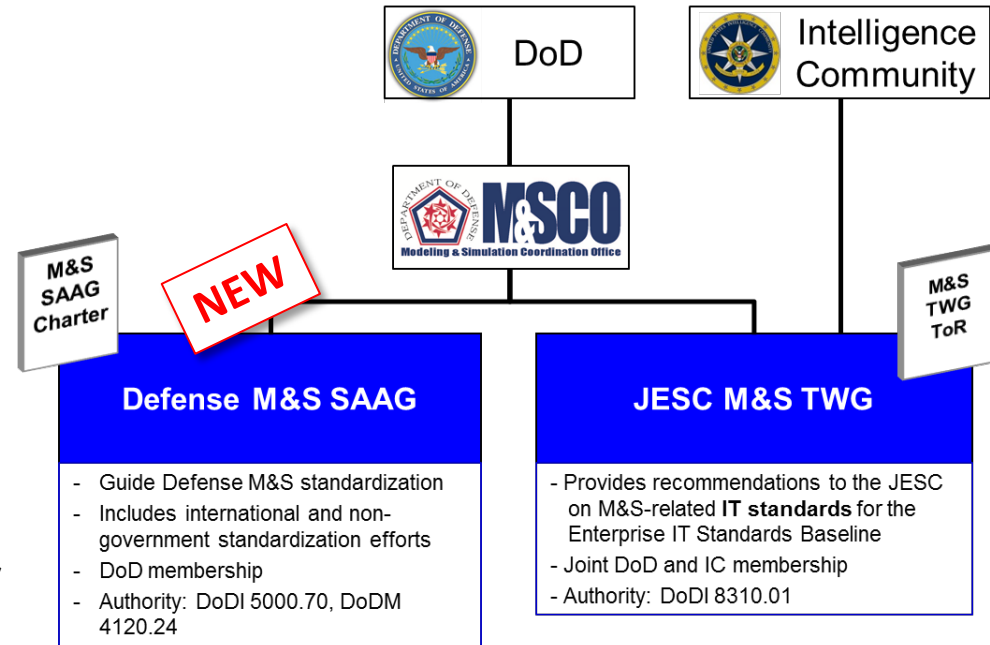
# RECENT ACTIVITIES



# Defense M&S Standardization Activities Advisory Group (M&S SAAG)



- **Chair: Mr. Leigh Yu**
- **Membership:**
  - M&S Steering Committee Organization representatives
  - Defense M&S standardization Subject Matter Experts (SMEs)
- **Purpose:**
  - Advise Director, DMSCO in his role as Lead Standardization Activity for M&S Standards and Methodologies
  - Maintain awareness of Defense M&S standardization needs and activities
  - Serve as coordinating body for Defense M&S Standardization activities



- **Activities:**
  - Maintain M&S standards and profiles databases (i.e., ASSIST, DISR)
  - Identify emerging standards and standardization gaps, work with SDOs and Preparing Activities for standards development





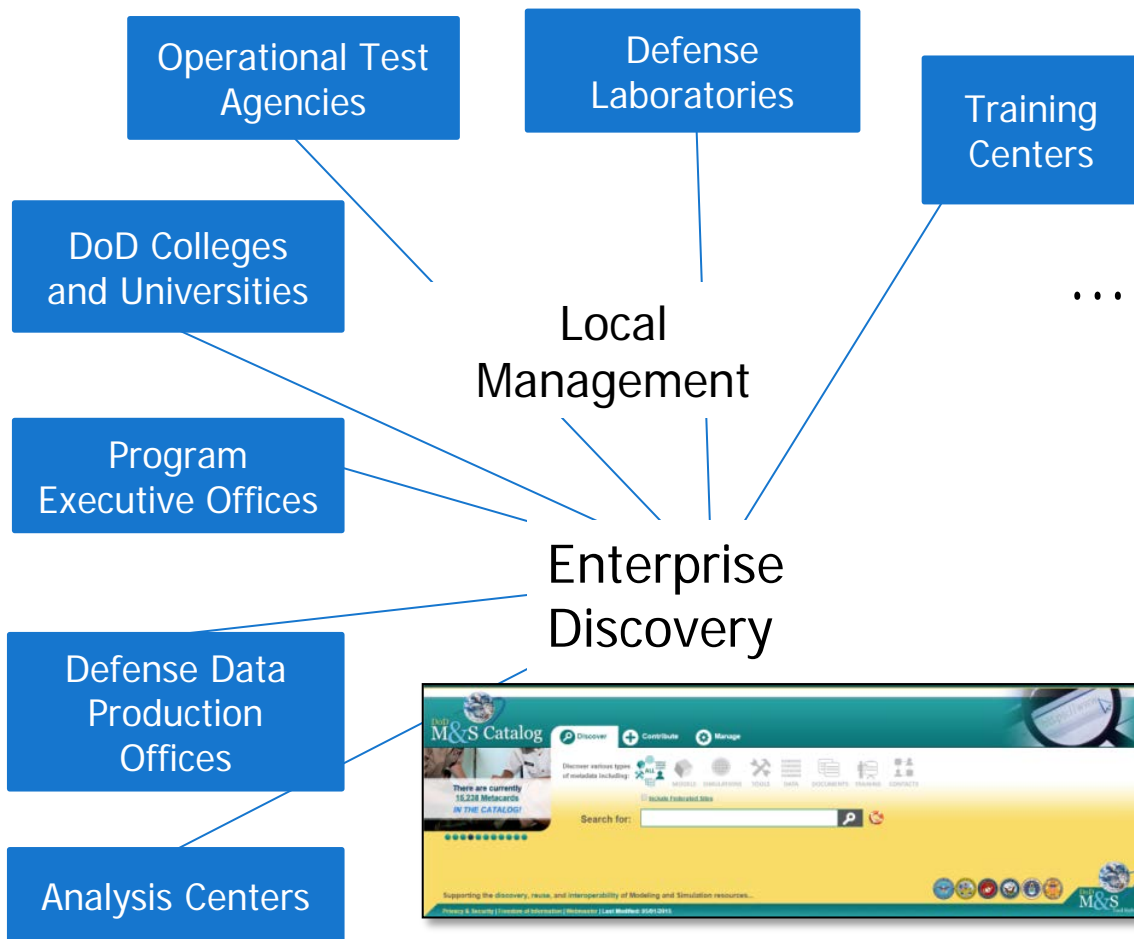
# Defense M&S Catalog

<http://MSCatalog.msco.mil>



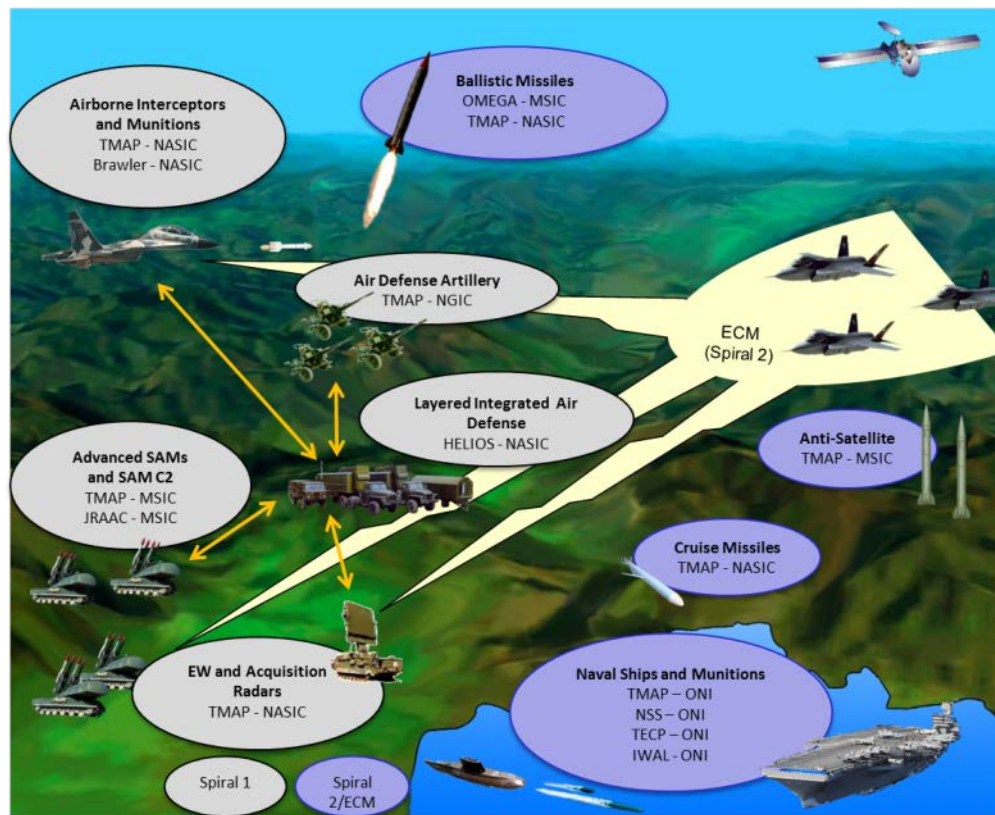
**Purpose:** The DoD Modeling & Simulation Catalog is a CAC-enabled, Web-based discovery service that provides visibility of the resources available across the DoD M&S Enterprise to help users of models and simulations search for tools, data, and services to meet their requirements.

- **Provides visibility**
- **Provides federated search for Enterprise-wide discovery**
- **Benefits/Value for searchers**
  - Significant cost avoidances
  - Avoid duplicate efforts
  - Visibility can lead to joint efforts
- **Benefits/Value for contributors**
  - Local control:
    - Each organization develops and controls its private collections of metacards using the Enterprise Metacard Builder Resource (EMBR)
    - Each organization decides which metacards are published in Catalog for wide visibility
  - Efficient metadata capture
    - Contribute metadata via System-to-System and user-friendly forms
- **Configuration Control Board**





# Integrated Threat Analysis Simulation Environment (ITASE)



## ITASE capabilities provides Services/CCMDs

- Authoritative, integrated threat simulation & kill chain analysis
- Enhanced threat analysis capability to support pivot to Pacific
- Uniform simulation standards to promote real world scenarios
- Credibility, consistency, cost savings to threat representations

## • Purpose

- Represent the variety, integration and scalability of complex threat “systems-of-systems” (SoS) in the Anti-Access/Area Denial (A2/AD) environment
- Support Red and Blue analysis through well-defined interface (standards)
- Leverage existing Intelligence Production Center’s investments in threat weapon system M&S

## • Impact

- Red and Blue analysis can be consistently executed
- High fidelity mission and engineering level analysis
- Improved Best Practices to rapidly update threat data (Threat Modeling & Analysis Program, TMAP) used by:
  - DIA (MSIC)
  - USAF (NASIC)
  - USN (ONI)
  - USA (NGIC)



**\*\*Transitioned to MSIC/NGIC/NASIC/ONI\*\***



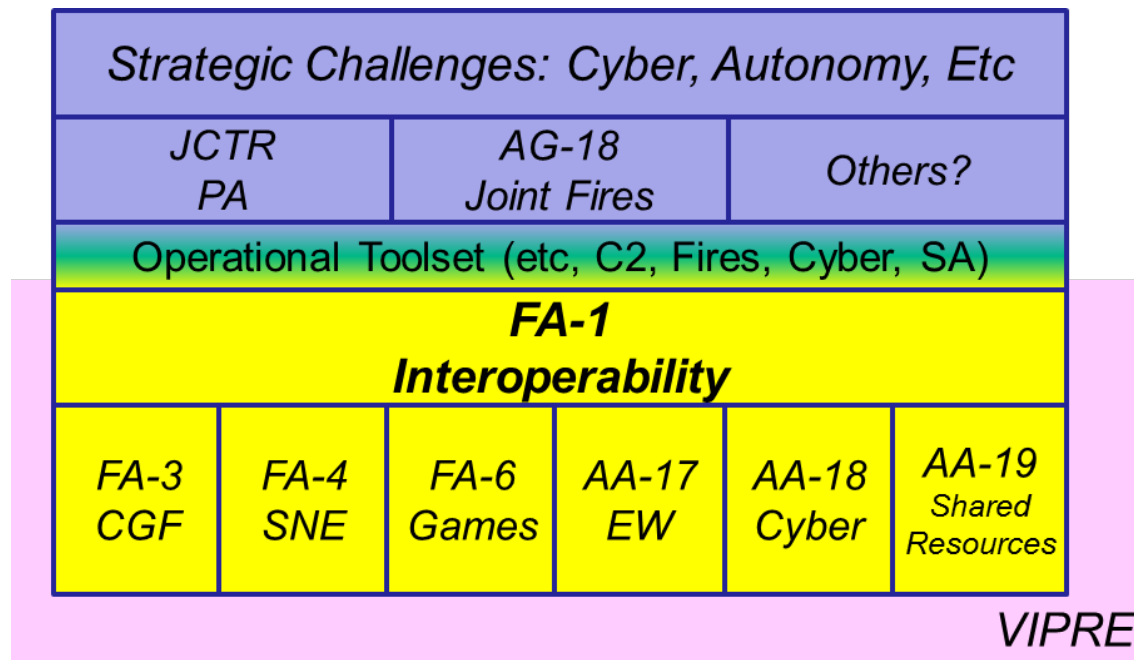


# The Technical Cooperation Program (TTCP) Technical Panel (TP)-2: Modelling & Simulation



## TP-2 Vision:

“To develop an underlying shared and accessible Modelling and Simulation capability by 2025. Integral to this capability is an affordable, on-demand, distributed simulation and experimentation system available to all TTCP nations.”



## JSA TP-2 Sim Test Bed

Virtual Interoperability Prototyping & Research Environment (VIPRE)



# Modeling & Simulation Community of Interest (M&S COI)



- **Oversight:**

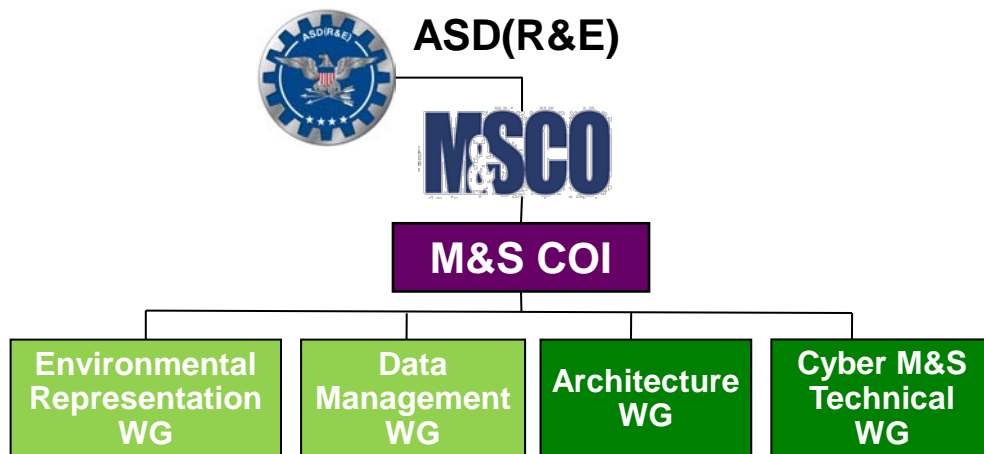
Director, DMSCO

- **Chair:**

Associate Director, DMSCO

- **Roles & Activities:**

- Promote policies and best practices for sharing M&S data, tools, and IT services
- Ensure appropriate collaboration with other DoD COIs and Working Groups (WGs)
- Host outreach and advocacy forums for DoD M&S solutions
- Advise and assist the Director, DMSCO regarding DoD M&S Enterprise assets (MSC-DMS, M&S Standards, M&S Core tools)
- Operates in accordance with DoD CIO guidance (DoD 8320 Issuances)



- **Impact:**

- Technical collaboration forum (not policy or governance) promoting M&S awareness for the OSD, Services, and Components
- M&S product/solution technical review and feedback
- Develop and use common practices for applications and exchanges of M&S assets



# Cyber M&S Technical Working Group

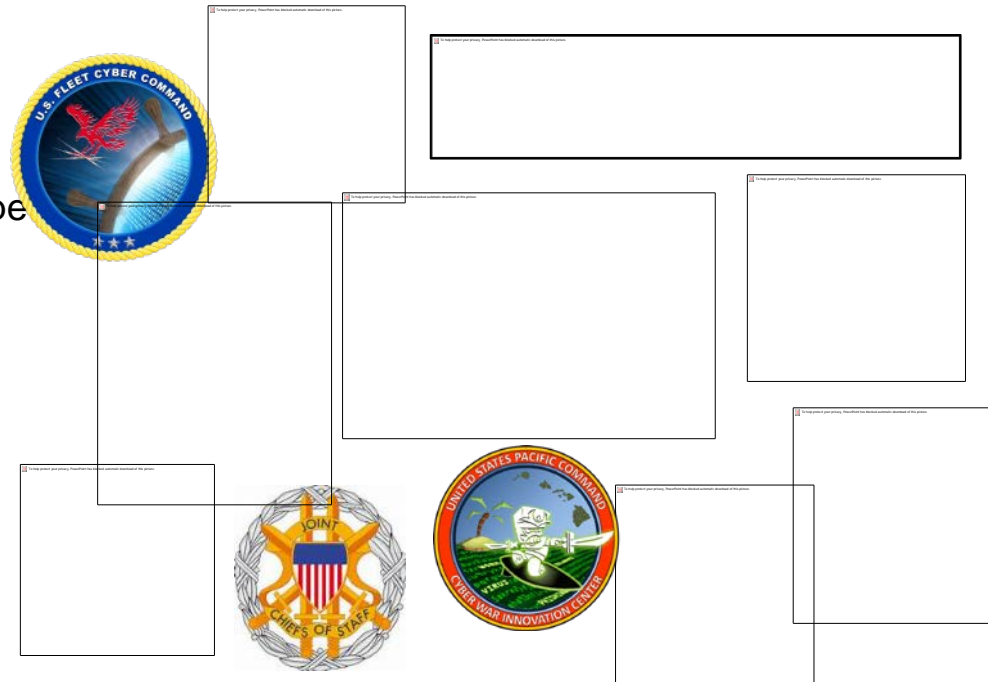


## Cyber Range Subgroup

- Focus cyber M&S on key solutions to integrate the right M&S into DoD Test & Training Cyber Ranges
- Identify appropriate mix of investigation and non-recurring engineering to deliver needed scale, scope and fidelity

## Cyber Threat Modeling Subgroup

- To identify methods for software and system engineers to better understand system threats and mitigations
- To review and recommend cyber threat modeling solutions that are effective at “building security in,” and at evaluating the security of software-intensive systems acquired and developed by the DoD.



## Accomplishments

**Cyber M&S Framework** - a “live” wiki on milSuite archiving cyber tools & capabilities

**Interoperability Technical Capability Team** (Lead: DMSCO/JHU APL)

- Cyber range interoperability gaps and priorities
- Transitioned to PACOM

**Mission Effectiveness Team** (Lead: HAF/A9)

- Transitioned to HAF/A9 Cyber Joint Munitions Effectiveness Model (JMEM) effort

## Other Cyber-related DMSCO Activities

- TTCP TP-2 AA-18: DMSCO-lead Cyber M&S effort
- TTCP TP-3: Cyber-Analytics
- NATO MSG-117 - Cyber M&S Working Group
- Cyber Operational Architecture for Training Systems (COATS)
- NATO MSG-124 - Data Farming, Cyber Application Syndicate



# Architecture Working Group (AWG)



## Purpose

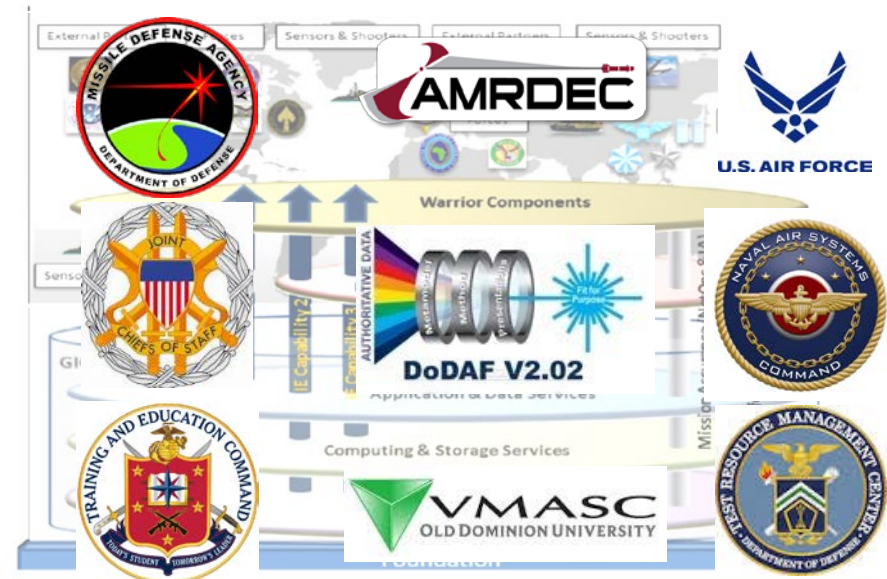
- Provide a forum for collaboration and information sharing about architecture issues effecting M&S development and use.
- Focus on issues related to structure and communications within and between persistent M&S architectures, and with the broader Service and DoD IT enterprise architectures.
- Objective is to identify areas of common interest, not to endorse a specific architecture

## Defense M&S Reference Architecture (DMSRA) Goals

- Establish a **long term strategic vision** (2030 and beyond) for DoD M&S interoperability
- Provide a **set of best practices for today** that are consistent with achieving that vision in the future
- Layout a **research and development roadmap** (including standards development) to achieve the vision

To support the DMSCO vision of “reducing simulation cost through reuse by influencing compatibility and interoperability of models and simulations

- **Planned release:** DMSRA v1, May 2016



## Other Architecture-related DMSCO Activities

- NATO MSG-136 Modelling and Simulation (M&S) as a Service (MSaaS) – Rapid deployment of interoperable and credible simulation environments
- NATO MSG-131 “Modelling and Simulation as a Service: New Concepts and Service Oriented Architecture”
- Technical Exchanges – Cloud Computing
- Toward M&S as a Service Study – VMASC
- Defense M&S Standardization activities





# For More Information...

- Visit the M&SCO Website at [www.msco.mil](http://www.msco.mil)
- Send your e-mail inquiries to [osd.ask.msco@mail.mil](mailto:osd.ask.msco@mail.mil)





# Summary



- **The Department:**
  - Is committed to improving and increasing M&S capabilities
  - Must maintain emphasis/focus on Defense-wide M&S interoperability and reuse through the DMSCO
- **The DMSCO maintains USD(AT&L)'s commitment to DoD M&S and executes chartered duties with specialized expertise sufficient to:**
  - Act as the focal point for Defense M&S
  - Address the enduring interoperability and reuse needs of the Department through **policy, standards, technology, and collaboration**
  - Identify and assess technology for application to Defense M&S



# **DoD M&S Reference Architecture (DMSRA) Overview**

**Mr. Brian Miller**



# DMSRA Introduction



**The contents of the DMSRA provide a blueprint to assist M&S activities in:**

- Leveraging DoD IT, enterprise services and technologies such as cloud computing and service oriented architectures (SOA)**
- Developing simulations that take advantage of emerging technologies and enterprise services**
- Adopting DoD M&S enterprise standards to facilitate sharing of model and simulation services**

**Leverage and build upon former funded M&S SC approved approaches to address enduring challenges in M&S interoperability and reuse**





# DMSRA Motivation



- **The Federal Government and DoD have IT strategies promoting the adoption of cloud computing.**
  - Initiatives are already under way such as the the Joint Information Environment (JIE) which will change how the department does IT business.
  - The M&S community must prepare for the coming changes.
- **Technologies such as cloud computing and SOA can provide significant opportunities**
  - To improve accessibility and agility
  - While reducing operating and maintenance costs
- **These technologies inherently promote reusability.**
  - By coordinating their implementation across the department we can
    - Reduce development time and cost
    - Increase simulation accuracy through component reuse



# DMSRA Goals



- Establish *a long term* strategic vision (*2030 and beyond*) for DoD M&S interoperability
- Provide a set of *best practices* for today that are consistent with achieving that vision in the future
- *Layout a research and development roadmap (including standards development) to achieve the vision*

**In order to support the DMSCO vision of “reducing simulation cost through reuse by influencing compatibility and interoperability of models and simulations”**



# Approach



- **Survey of existing/planned architectures**
  - Literature review
  - AWG briefings/discussions
  - Personal contacts
- **Develop working draft document**
- **Work with M&S COI Architecture Working Group to expand and refine draft**



# DMSRA on milSuite

## <https://www.milsuite.mil/book/groups/dmsra>

UNCLASSIFIED // FOUO

**milSuite** | milBook | milWiki | milWire | milTube | milSearch

**milBook** | Streams | Content | People | Places

Overview | Activity | Content | People | Reports | Calendar | Content Manager


Account | Support

@ 0 | [User Icon] | [Edit Icon] | [Search Icon]

Actions | About | Manage

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**GROUP OVERVIEW**



Collaboration and coordination site for development of the Defense Modeling and Simulation Reference Architecture (DMSRA)

**Owned by:**  
Katherine Morse, Brian Miller, Michael Heaphy

**Tags:**  
awg, dmsra

**Group Type:**  
Private

**Created:**  
Feb 8, 2016

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**CATEGORIES**

	1	0	0	0	0	0
DMSRA Introduction	1	0	0	0	0	0
DMSRA Patterns (Enterprise Capabilities, Services)	0	0	1	0	0	0
DMSRA Principles (Rules and Best Practices)	0	0	2	0	0	0
DMSRA Strategic Purpose	0	0	0	0	0	0
DMSRA Technical Positions (Standards)	1	0	1	0	0	0
OSD References/Input	1	0	3	0	0	0
USA References/Input	1	0	0	0	0	0
USAF References/Input	0	0	0	0	0	0
USMC References/Input	0	0	0	0	0	0
USN References/Input	0	0	0	0	0	0

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**ACTIONS**

- Start a discussion
- Write a document
- Upload a file
- Write a blog post
- Create a poll
- Create a status update
- Invite people to join this group
- Group feeds
- Create an event
- Create an idea

**VIEW BLOGS**

- DoDAF/UPDM use in the DMSRA**  
3 weeks ago in DMSRA  
by Michael Heaphy
- Does DMSRA address just run-time or the full lifecycle?**  
3 weeks ago in DMSRA  
by Michael Heaphy
- Contributing to the DMSRA**  
1 month ago in DMSRA  
by Michael Heaphy

**PDF download of the draft DMSRA**

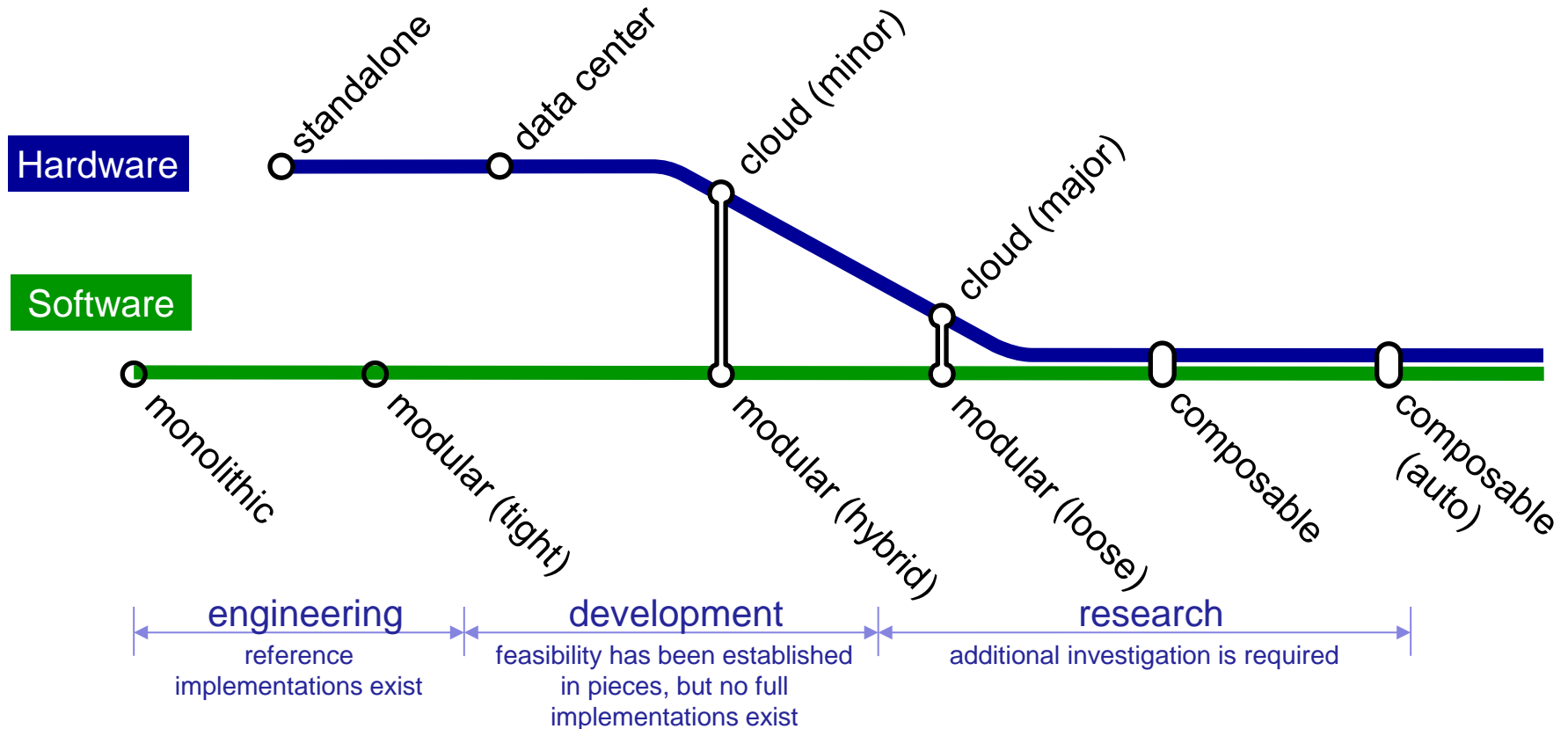
- Emphasize the dynamic and collaborative nature of the DMSRA
- Make the revision process more transparent
- Make it easier to contribute to the DMSRA
- Make contributions immediately available and easier to find





# DMSRA Vision

- Provide unified direction for Cloud and SOA adoption to support M&S-enabled enterprises.
- Continue to press on persistent, technical issues that enable cloud and SOA application including composition and VV&A.





# DMSRA Elements



- **Strategic Purpose**

- Goals and objectives of the DMSRA; specific purpose of and the problem(s) to be addressed by the DMSRA.

- **Principles**

- High-level foundational statements of rules, culture, and values that drive technical positions and patterns.

- **Technical Positions**

- Technical guidance and standards, based on specified principles that need to be followed and implemented as part of the solution.

- **Architectural Patterns**

- Generalized architecture representations (viewpoints, graphical/textual models, diagrams, etc.) that show relationships between elements and artifacts specified by the technical positions and encourage adherence to common standards, specifications and patterns.

- **Vocabulary**

- Acronyms, terms, and definitions used in the DMSRA and relevant to architectures and solutions that are guided and constrained by the DMSRA.



# OV-1 High Level Operational Concept Graphic



## Vision

A robust modeling and simulation (M&S) capability that supports a full spectrum of DoD activities and operations, delivered to the point of need, within current fiscal constraints, managing schedules and risk enabled by agile composition.

Full Spectrum of DoD Activities

Delivered to the Point of Need

Within Current Fiscal Constraints

Agile Composition

## Business Goals & Objectives

Reduce Operational Complexity

Foster Discoverability & Secure Accessibility

Leverage DoD IT Infrastructure

Increase Consistency of Outputs & Outcomes

Reduce Lifecycle Costs

Provide High-Level Guidance & Best Practices

Leverage Gov't, Industry, & Academia Technology

Leverage Other DoD Systems & Investments

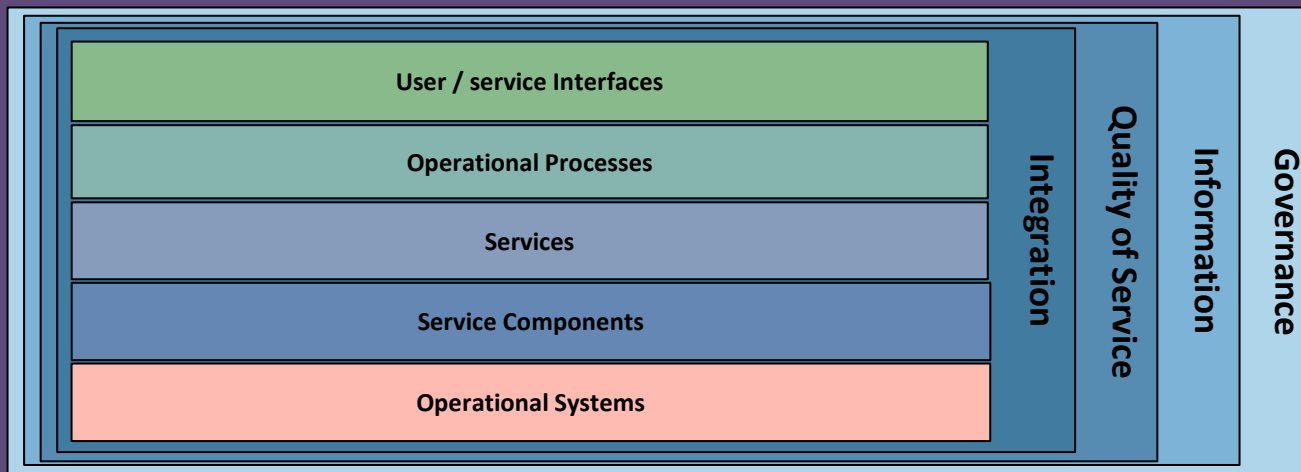
Foster Common Formats

Foster Multi- & Inter-Domain Support

Foster Accurate, Validated, Interoperable M&S Services

Provide More Realistic Simulation Environments

## Reference Architecture





# Alignment with Other Architecture Stakeholders' Efforts



DoD IEA

DoD CIO

The **DoD Information Enterprise Architecture (DoD IEA)** is the architecture and standards, and the organizing framework for describing the DoD desired Information Enterprise and for guiding the development of the DoD information technology capabilities

Other RAs

CIO or other

DMSRA

Defense M&S

The **DMSRA** is one of many reference architectures aligned to the DoD IEA. Others include: Joint C2 RA, Active Directory Optimization (ADORA), etc.

\* Alignment of architectures below is notional, for illustration purposes only

EAs

Service specific

Training

Domain specific

RAs

Joint/Collab  
domain RAs

Solution  
Arch.

System specific

**Component  
or Domain  
architectures**  
(enterprise,  
reference, or  
solution)

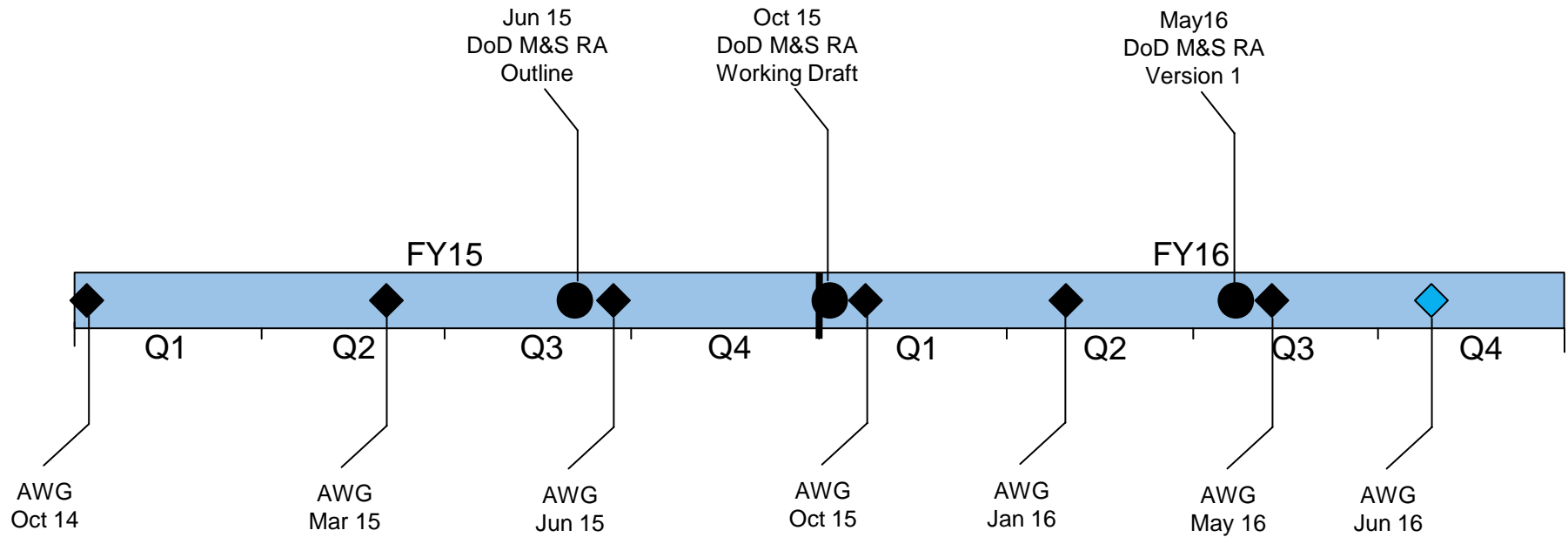
The DMSRA provides a framework to guide and align DoD Component or domain-specific M&S Architectures:

- Where doing so provides greater value to DoD
- Where inter-component interoperability is required
- When a common capability (service) is desired





# DMSRA Schedule





# Questions?