Department of Defense Acquisition Modeling and Simulation Master Plan

April 17, 2006
Issued Under the Authority
of the
Systems Engineering Forum
Office of the Under Secretary of Defense (Acquisition, Technology and Logistics)
Defense Systems

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OFFICE OF THE UNDER SECRETARY OF DEFENSE
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APR 17 2006

ACQUISITION
TECHNOLOGY
AND LOGISTICS

Acquisition Modeling and Simulation Master Plan
FOREWORD

This plan for Department of Defense (DoD) acquisition modeling and simulation is needed to help remove obstacles to efficient use of modeling and simulation in the acquisition workforce. It is issued under the authority of the Systems Engineering Forum established by the Under Secretary of Defense memorandum dated February 20, 2004.

This plan is applicable to the Office of the Secretary of Defense (OSD), the Military Departments, the Chairman of the Joint Chiefs of Staff, the Combatant Commands, the Inspector General of the Department of Defense, the Defense Agencies, and the DoD Field Activities (hereafter referred to collectively as "the Components").

The purpose is to provide an action plan to improve M&S support to DoD acquisition for defining, developing, testing, producing, and sustaining capabilities. Twenty-seven actions are identified to achieve that intent. The actions are designed to:

- Foster widely-needed M&S capabilities beyond the reach of individual programs
- Better enable acquisition of effective joint capabilities and systems-of-systems
- Empower program and capability managers by removing systemic M&S obstacles, identifying new options for approaching tasks, and helping support widely-shared needs.
- Promote coordination and interface with M&S activities of the DoD Components.

These actions support implementation of policies in DoDD 5000.1 and DoDD 5134.01. Each action identifies organizational responsibilities, products, and completion goals to improve M&S support to DoD acquisition. OUSD(AT&L) will monitor implementation of this plan and recommend appropriate adjustments over time.

Send recommended changes to this business plan to the following address:

Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics
Defense Systems/Systems Engineering/Developmental Test & Evaluation
3090 Defense Pentagon (Room 2B278)
Washington, DC 20301-3090

The Components, other Federal Agencies, and the public may download this plan from the Systems Engineering web page at: http://www.acq.osd.mil/ds/se/index.html.

Mark D. Schaeffer
Acting Director
Defense Systems

Acquisition Modeling and Simulation Master Plan

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INTRODUCTION

Purpose

This is an action plan to improve modeling and simulation (M&S) support to the DoD acquisition process. This plan defines specific actions to improve: policy and guidance, the technical framework for M&S, M&S capabilities and use, and knowledge and training resources. These steps will foster better tools and processes to support systems engineering, acquisition decision making, development of joint capabilities, and realization of cost efficiencies.

DoD M&S Acquisition Vision

The DoD M&S acquisition vision is to optimally employ responsive, trustworthy, and cost-effective M&S capabilities to support defining, developing, testing, producing and sustaining America's capabilities that support the spectrum of DoD missions.

Scope

The scope of this plan is to improve the use of M&S in the DoD acquisition process across the system life-cycle. The system life cycle begins early in the process to include the Joint Capabilities Integration and Development System (JCIDS) as defined in the Joint Chiefs of Staff Instruction 3170.01E and extends through the acquisition process to system operation, sustainment, and disposal to ensure an integrated approach. Twenty-seven identified actions are designed to:

- Foster widely-needed M&S capabilities beyond the reach of individual acquisition programs;
- Better enable acquisition of effective joint capabilities and systems-of-systems; and
- Empower program and capability managers by removing systemic M&S obstacles, identifying new options for approaching tasks, and helping support widely-shared needs.

As the Department of Defense embraces the JCIDS process and its associated issues with capability management, changes to the acquisition process and the acquisition management structure are inevitable. Traditional acquisition management is focused on individual programs. Capabilities-Based Acquisition and execution of the JCIDS require new processes and authority structures to realize effective systems-of-systems. As a result, an enterprise level, authoritative capability management structure is needed. While such a management structure will necessarily include responsibility for systems engineering at the capability level and its M&S component, action to change acquisition management structure is beyond the scope of this plan.

Objectives

To organize efforts for achieving this vision, necessary actions to improve M&S are organized under five acquisition objectives. Figure 1 below illustrates the alignment of actions with objectives.

Objective 1: Provide necessary policy and guidance.

Objective 2: Enhance the technical framework for modeling and simulation.

Objective 3: Improve model and simulation capabilities.

Objective 4: Improve model and simulation use.

Objective 5: Shape the workforce.

Organization of the Plan

This plan identifies twenty-seven actions organized under five overarching acquisition objectives. Each action is constructed to resolve specific M&S-related issues identified in past studies and in current acquisition activities. The past studies are identified in the bibliography of this document. Each action includes a rationale to describe the issue to address, and a discussion of considerations to guide execution. Lead organizations and supporting organizations are identified for each action. Expected products are listed, along with a completion date goal for each action.

Roles and Organizational Responsibilities

The Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD(AT&L)) Defense Systems (DS) is responsible for oversight of this master plan and to monitor progress toward completion of the actions in this plan by requesting periodic updates from the organizations leading the actions. OUSD(AT&L)/DS shall report status to the Systems Engineering Forum and to the Modeling and Simulation Steering Committee, as appropriate, and recommend any appropriate modification or redirection.

Lead organizations are assigned actions based on organizational missions and functions, or expressed preference to lead an action. Lead organizations shall plan and execute their assigned actions, coordinating with supporting organizations to realize a unified, efficient approach. The lead organizations should identify key activities, output products, resources, and a schedule of milestones to satisfy the action. Lead organizations shall provide status reports upon request of OUSD(AT&L)/DS. OUSD(AT&L)/DS will coordinate master plan revisions and objective updates with the Modeling and Simulation Steering Committee.

Support organizations are identified to support accomplishment of the assigned action. The assigned supporting organizations are intended to identify a minimum set with which the lead organization should coordinate.

Resources

Lead organizations should leverage current activities and resources to complete their assigned actions. In any case where available resources are insufficient, the lead organization is responsible for identifying resources needed to accomplish the assigned action through the Planning, Programming, Budgeting, and Execution process.

Products

The products identified with each action represent the expected outcome.

Completion Goals

The completion goals listed under each action are the desired calendar year by which the product of each action should be completed. This goal should be considered by lead organizations in planning their execution of assigned actions. Inability to complete an action by its goal does not negate its importance and efforts to complete the action should continue.

Acquisition Modeling and Simulation Master Plan, April 17, 2006

Objective 1	Objective 2	Objective 3	Objective 4	Objective 5
Provide necessary policy & guidance	**Enhance technical framework for M&S**	**Improve M&S capabilities**	**Improve M&S use**	**Shape the workforce**
Actions	***Actions***	***Actions***	***Actions***	***Actions***
1-1 M&S management	2-1 Product development metamodel	3-1 Acquisition inputs to DoD M&S priorities	4-1 Define M&S strategy	5-1 Required M&S competencies
1-2 Model-based systems engineering & collaborative engineering environments	2-2 Commercial SE standards	3-2 Best practices for model/sim development	4-2 M&S best practices: planning & employment	5-2 Commercial M&S lessons
1-3 M&S in testing	2-3 Distributed simulation standards	3-3 Distrib. LVC environments	4-3 Foster reuse	5-3 Body of Knowledge for Acqn M&S
1-4 M&S planning documentation	2-4 DoDAF utility	3-3(a) Standards	4-3(a) Business model	5-4 M&S education & training
1-5 RFP & contract language	2-4(a) DoDAF 2.0 Acq'n Overlay	3-3(b) Compliance	4-3(b) Responsibilities	5-4(a) DAU, DAG & on-line CLMs
1-6 Security certification	2-4(b) Standards for interchange	3-3(c) Event services	4-3(c) Discovery	5-4(b) Conferences, workshops & assist visits
	2-5 Metadata template for reusable resources	3-4 Central funding of broadly-needed M&S	4-4 Info availability	5-5 MSIAC utility
		3-4(a) Prioritized needs	4-4(a) Scenarios	
		3-4(b) Pilot projects	4-4(b) Systems	
		3-4(c) Expansion as warranted	4-4(c) Threats	
			4-4(d) Environments	
			4-5 VV&A	
			4-5(a) Documentation	
			4-5(b) Risk-basis	
			4-5(c) Examination	
			4-6 COTS SE tools	
			4-7 M&S metrics	

Lead Responsibility for Actions

OUSD (AT&L):	1-1, 2-3, 2-5, 3-1, 3-2, 3-3(a), 3-4(a), 3-4(b), 3-4(c), 4-1, 4-3(a), 4-3(b) [co-lead], 4-3(c), 4-4(a), 4-5(a), 4-5(b), 4-7 [co-lead], 5-3, 5-5			
USD(AT&L)/DS:	1-2, 1-3 & 1-4 [co-lead], 1-5, 2-1, 2-2, 2-4.a, 4-2, 4-4(b), 4-5(c), 4-6, 5-1 [co-lead], 5-2, 5-4(b)			
ASD(NII):	1-6, 2-4(b), 4-3(b) [co-lead]			
DOT&E:	1-3 & 1-4 [co-lead]			
DIA:	4-4(c)	**DoD(CIO):** 2-2 [co-lead]	**DAU:** 5-1 [co-lead], 5-4(a)	**USD(I):** 4-3(b) [co-lead]
Components:	3-3(b), 3-3(c)	**Dept of the Navy:** 4-7 [co-lead]	**DoD Modeling & Simulation Executive Agents (MSEAs) Terrain:** 4-4(d)	

Figure 1: Acquisition M&S Objectives and Actions

OBJECTIVE 1

PROVIDE NECESSARY POLICY AND GUIDANCE

A1.1. ACTION 1-1. Provide effective, persistent DoD-wide M&S management to address cross-cutting issues, coordinate actions.

A1.1.1. RATIONALE: A number of M&S-related activities are ongoing across the Department of Defense and in defense systems acquisition. The Department has varying objectives, policies, and guidance around which it conducts M&S activities. Currently, there is insufficient coordination and constancy of purpose toward achieving DoD M&S objectives. Furthermore, central guidance and monitoring to align and coordinate individual activities, and preclude redundant investments, is lacking. Improved DoD M&S management and linkage to the user customer base are necessary, as is stability in position assignments to see activities through to completion.

A1.1.2. DISCUSSION: USD(AT&L) is responsible for strengthening M&S in the Department of Defense. The current management structure is inadequate to meet the needs of the Department to address DoD-wide M&S issues through well-known standardized structures and processes. There is a need to reinvigorate the M&S management function by appropriately revising the responsibilities, composition, and operating procedures. Senior Department level membership should be closely aligned to represent users of M&S as well as M&S developers. [Note: In response to a Program Decision Memorandum (PDM), activity led by OSD is in progress to revise the DoD M&S management structure. The PDM-directed revision of M&S management will be reviewed in the context of satisfying this action.]

A1.1.3. LEAD: OUSD(AT&L)

A1.1.4. SUPPORT: USD(AT&L)/DS, USD Personnel and Readiness (P&R), USD(C)/ Program Analysis and Evaluation (PA&E), Director of Operational Test and Evaluation (DOT&E), Chairman of the Joint Chiefs of Staff (CJCS), Assistant Secretary of Defense (ASD) Networks and Information Integration (NII), and DoD Chief Information Officer (CIO)

A1.1.5. PRODUCTS: Acquisition input to revise DoDD 5000.59, *DoD Modeling and Simulation (M&S) Management*; revised senior leadership management; and improved policies for M&S management.

A1.1.6. COMPLETION GOAL: 2006

A1.2. ACTION 1-2. Promote model-based systems engineering (MBSE) and M&S-enabled collaborative engineering environments (CEEs) at both the program and joint capability level.

A1.2.1. RATIONALE: MBSE and M&S-enabled CEEs are emerging M&S capabilities to better support capabilities-based assessment, defense acquisition, and to reduce time for achieving needed capabilities. Their use will improve efficiency and effectiveness for program-level systems engineering, and are essential to support capability-level systems engineering. MBSE is an emergent concept under the International Council on Systems Engineering (INCOSE) and the Object Management Group (OMG). MBSE calls for automated systems engineering tools, which are modeling environments, to analyze requirements, develop architectures, and specify constraints. The individual views are integrated into, and generated from, an underlying database. Simulation is used to verify the architecture and assess its merits (e.g., completeness, rough measures of performance). Reports and other documents may be generated automatically from the underlying database. There is a growing suite of commercial tools that provide such capabilities. M&S-enabled CEEs provide a means to share authoritative information across an acquisition enterprise and use interoperable modeling environments, models, simulations and distributed environments to communicate, design, assess, immerse warfighters, integrate, verify, and test. These MBSE and collaborative engineering environment capabilities assist in designing a system, and are particularly useful in conducting systems engineering at the capability level. The development of an integrated architecture at that level, specifying the interfaces, and the interactions among the systems that comprise a system of systems (SoS) within a net-centric environment, will provide effective guidelines for the coordinated development of those individual systems. Beyond that, it may also provide an objective frame of reference for testing individual systems and evaluating joint capabilities.

A1.2.2. DISCUSSION: DoD must maintain awareness of emerging tools and processes to enable MBSE, lessons learned in commercial and defense applications, and trends in the systems engineering community to exploit MBSE. An active outreach effort to maintain awareness of commercial and defense industry practices, academic, commercial, and defense research, applications, and trends followed by communication to the DoD acquisition community will improve the overall state of DoD awareness. Presentations and papers in industry and DoD discussion forums can promote concepts and share lessons learned. Consideration may be given to hosting industry exhibits and demonstrations of processes and tools capabilities. The concepts of MBSE and CEE should be endorsed in the *Defense Acquisition Guidebook* (DAG). Lessons learned from MBSE and CEE implementation should be captured and shared via the workforce shaping Actions 5-2, 5-3, and 5-4. The DAG may be further modified as experience dictates.

A1.2.3. LEAD: USD(AT&L)/DS

A1.2.4. SUPPORT: Components

A1.2.5. PRODUCTS: Revised guidance in the DAG.

A1.2.6. COMPLETION GOAL: 2007

A1.3. ACTION 1-3. Establish policy and guidance on appropriate use of M&S to plan tests, complement system live tests, and assess joint capabilities.

A1.3.1. RATIONALE: There is general agreement within the test community that M&S has a complementary role to play with respect to live testing. It may also provide an objective frame of reference for testing individual systems and evaluating joint capabilities. However, implementation has proven difficult due to the lack of definitive policy and guidelines regarding the appropriate role, extent, and fidelity of the models and simulations. Although public law has been clear regarding the testing of actual individual systems under realistic conditions, the DoD intent to orient its acquisition activities on functional capabilities does not identify the extent to which evaluation of those capabilities must be accomplished in live testing versus M&S.

A1.3.2. DISCUSSION: Explicit DoD policy is now needed to require improvement of system representations to meet acquisition decision needs and the appropriate use of M&S to plan tests, complement live tests, and evaluate the joint capabilities enabled by a system of systems within a net-centric environment. M&S is integral to the T&E process by complementing testing, and aiding in the assessing a system in scenarios, climatic and threat environments, and areas of the mission space and performance envelope where testing is not cost effective, or additional data is required. Modeling and simulation and test tools allow the analyst and tester to focus on that which is essential to evaluate, to monitor the activities as they occur, and to consolidate and analyze the results of their activities. Testing tools include live tests, stimulators, and laboratory facilities that have supported testing for many years. M&S includes resources that together describe the system characteristics and performance at all levels from engineering models to campaign level war games. They are used in a variety of ways from measuring compliance to design requirements through predicting system performance in an operational environment. M&S plays a significant role in testing a system that is part of a systems-of-systems, families-of-systems, or used in a joint environment.

A1.3.3. CO-LEADS: USD(AT&L)/DS and DOT&E

A1.3.4. SUPPORT: Components

A1.3.5. PRODUCTS: Revised policy and guidance in DoDI 5000.2 and DAG.

A1.3.6. COMPLETION GOAL: 2007

A1.4. ACTION 1-4. Establish policy to require documented M&S planning as part of the Systems Engineering Plan, T&E Strategy, and T&E Master Plan.

A1.4.1. RATIONALE: There is no DoD requirement for formal M&S planning to support acquisition other than T&E. Some Services require acquisition program managers to develop stand-alone M&S support plans. M&S is a key enabler of systems engineering and is best linked from the outset to systems engineering planning to attain effective and efficient M&S across the system life cycle. The acquisition of DoD systems is supported by a Systems Engineering Plan (SEP), a Test and Evaluation Strategy (TES), and a Test and Evaluation Master Plan (TEMP). Currently, only the TEMP requires documenting the use of M&S when all three documents should do so. Most DoD M&S takes a project, vice an enterprise, approach. There is

scarce activity across the Department to plan M&S use to support development of a joint capability. A program's M&S plans should be addressed in these systems engineering and test and evaluation documents.

A1.4.2. DISCUSSION: The M&S strategy may optionally be summarized in a separate section of these documents (or even in a stand-alone document such as a Simulation Support Plan), but the use of M&S to support specific systems engineering or test activities should be embedded in the discussion of those activities. Further, M&S planning must be explicitly addressed at the joint capability level – not just the individual program level. Such plans must address program responsibilities to support others with models and data.

A1.4.3. CO-LEADS: USD(AT&L)/DS and DOT&E;

A1.4.4. SUPPORT: Components

A1.4.5. PRODUCTS: Revised policy and guidance in DoDI 5000.2, DAG, and TEMP guidance

A1.4.6. COMPLETION GOAL: 2007

A1.5. ACTION 1-5. Establish M&S-related guidelines for solicitations, source selections, and contracting.

A1.5.1. RATIONALE: There are insufficient guidelines regarding contracting for M&S and the data it needs or produces. Acquisition programs often leave M&S planning, use, and ownership to prime contractors. Government organizations are often unaware of contractor attributes that are indicators of M&S capability maturity and are, therefore, useful criteria in evaluating proposals. Rarely is early consideration and contractual direction specifically intended to provide access to, or reuse of, models and data across the life-cycle.

A1.5.2. DISCUSSION: The recommended RFP language and contract provisions should address M&S strategy; representation requirements; M&S tool sources; ownership and maintenance; data sources and rights; VV&A; user support; access control; and metrics and documentation requirements, all across the system life-cycle. The source selection criteria guidance should address those contractor attributes that have a direct relationship to successful M&S use.

A1.5.3. LEAD: USD(AT&L)/DS

A1.5.4. SUPPORT: USD(AT&L)/ Defense Procurement and Acquisition Policy (DPAP), DOT&E and Components

A1.5.5. PRODUCTS: Sample language and suggested criteria in DAG. Updates to Federal Acquisition Regulations (FAR) as appropriate. Contract Data Requirements List (CDRL) or a family of CDRLs listing the M&S requirements for an RFP.

A1.5.6. COMPLETION GOAL: 2007

A1.6. ACTION 1-6. Ensure practical guidelines for information assurance certification and accreditation of M&S federated networks falling under multiple Designated Accreditation Authorities (DAA).

A1.6.1. RATIONALE: Representatives of activities establishing multiple-organization M&S networks report a common and persistent problem: timely security accreditation of the entire M&S federation. This issue arises within both industry and government whenever multiple accreditation authorities have jurisdiction over various parts of the endeavor.

A1.6.2. DISCUSSION: When assembling a distributed environment (i.e., federation), several DoD Components and/or contractors are often involved, each having a different DAA. Responsibility for security of the overall M&S network is complicated and ambiguous. The M&S activities may also include multiple levels of security which leads to further complexity in accrediting the M&S environment. Separate independent accreditations do not add up to a federation accreditation. Guidance should be published to identify a coordinated approach under a lead accreditation authority. Practical guidelines are also needed to walk the potential M&S manager through the M&S federated network information assurance certification issues and offer "how to" guidance that will reduce duplication and lower the time and expense to attain and maintain a federation M&S security accreditation.

A1.6.3. LEAD: Assistant Secretary of Defense (ASD) Networks and Information Integration (NII)

A1.6.4. SUPPORT ORGANIZATION: USD(AT&L)/DS, USD(I), and NSA

A1.6.5. PRODUCTS: Proven practical guidelines published in the DAG and DoD Information Assurance Certification and Accreditation Program (DIACAP) Knowledge Base.

A1.6.6. COMPLETION GOAL: 2007

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OBJECTIVE 2

ENHANCE THE TECHNICAL FRAMEWORK FOR M&S

A2.1. ACTION 2-1. Develop a product development information metamodel and associated metadata extensions to the DoD Discovery Metadata Specification.

A2.1.1. RATIONALE: Adequate metadata (data used to describe other data) is necessary to: discover the existence of, locate, gain access to, understand, assess, and properly use data. Such metadata would document the meaning, structure, lineage (i.e., source, means produced), and limitations (e.g., classification, valid context) of the data asset (i.e., information resource) being described. A standard for such metadata would support the Department's Net-Centric Data Strategy by fostering interoperability among compliant information systems, facilitating the automated and efficient discovery, access control, display, download, and transformation of data.

A2.1.2. DISCUSSION: The metamodel should describe all technical information needed to support the acquisition and upgrade of DoD systems. Per DoDD 8320.2, a community of interest (COI) should be formed to support accomplishment of this action. The DoD Discovery Metadata Specification (DDMS) provides a foundation for this task. Extensions to the DDMS shall be accomplished in coordination with related COIs (e.g., Acquisition, M&S). The Global Information Grid (GIG) Enterprise Services Metadata Working Group, which will be responsible for configuration management of the DDMS, will ensure consistency with the Department's Net-Centric Data Strategy Objectives.

A2.1.3. LEAD: USD(AT&L)/DS

A2.1.4. SUPPORT: ASD(NII) and Components

A2.1.5. PRODUCTS: Revised DDMS; revised guidance in DAG.

A2.1.6. COMPLETION GOAL: 2008

A2.2. ACTION 2-2. Support development of open commercial and non-proprietary standards for systems engineering, such as OMG's Systems Modeling Language (SysML) and ISO Standard 10303 AP-233.

A2.2.1. RATIONALE: Some standards needed to facilitate systems engineering across organizations (e.g., more than one contractor, program, or DoD Component) are not yet established. For instance, there is no standard modeling notation (like Unified Modeling Language (UML)) for capturing the full range of information critical to system engineering, such as system configuration, behavior, requirements traceability, test cases, and verification results. There is also no standard format for exchanging this information. Developing DoD-unique

standards for such information would limit the expertise involved in the development, the potential user base for the standard, COTS tool support, and opportunities for reuse.

A2.2.2. DISCUSSION: The Department should participate in and influence promising commercial standard development efforts. Two such efforts are the SysML and AP-233 projects which address the deficiencies noted above. The chairs of both standard development groups have invited DoD participation.

A2.2.3. CO-LEADS: USD(AT&L)/DS and DoD(CIO)

A2.2.4. SUPPORT: ASD(NII), DLA, and USD(AT&L)

A2.2.5. PRODUCTS: An identified set of standards suitable for use by the Department of Defense.

A2.2.6. COMPLETION GOAL: 2007

A2.3. ACTION 2-3. Establish a forum to clarify the characteristics and application of various distributed simulation methods (ALSP, DIS, HLA, SI3, TENA, etc.); examine opportunities for convergence.

A2.3.1. RATIONALE: Lack of agreement within the Department of Defense on a common distributed simulation method increases the complexity, time, and cost of composing distributed live-virtual-constructive environments. These environments link various combinations of simulations, lab hardware and software, and actual systems/forces on ranges to provide a more realistic context for experimentation, concept development, design, test, training, course of action analysis, and mission rehearsal. Staying abreast of the strengths, weaknesses, and related developments regarding the various distributed simulation methods is usually impractical for individual simulation, lab, and range managers. Making their representations compliant with all is usually inefficient - exceeding the time, money or expertise available. As a result, these representation assets are typically compliant with at most one distributed simulation method. This reduces the flexibility needed to rapidly compose such environments using the full range of representations.

A2.3.2. DISCUSSION: The Department needs a holistic, well-informed assessment of the issues and choices in this area to include the perspectives of all of the M&S functional areas. This assessment would educate potential adopters of these methods by documenting the advantages and limitations of the various distributed methods, various simulation standards, the underlying business models, and the efforts needed to achieve compliance. Documenting the pros and cons of the various distributed methods, understanding the underlying business models, and assessing the relative effort to achieve compliance would educate potential adopters of these methods. It would also provide the knowledge needed to decide whether or not to converge these methods. Such an analysis must be done in an open and objective manner. Building consensus on the best way forward, including associated DoD policy, is desirable.

A2.3.3. LEAD: OUSD(AT&L)

A2.3.4. SUPPORT: USD(AT&L)/ Test Resource Management Center (TRMC), USD(AT&L)/DS, DOT&E; and Components

A2.3.5. PRODUCTS: (1) A report or plan to include current usage; strengths and weaknesses of distributed simulation interfacing methods (e.g., TENA, DIS, HLA) for systems engineering and the acquisition process, (2) revised policy and guidance regarding distributed simulation methods, and (3) a way ahead regarding methods for distributed simulation.

A2.3.6. COMPLETION GOAL: 2007

A2.4. ACTION 2-4. Improve the utility of the DoD Architecture Framework (DoDAF) for acquisition. (Sub-actions follow with rationale and discussion)

A2.4.1. ACTION 2-4 (a). Develop the Acquisition Overlay (profile) for DoDAF v2.0 and subsequent versions.

A2.4.1.1. RATIONALE: Developing architectures, which define a system's desired behavior and physical arrangement is an essential systems engineering task. Explicit graphical depiction of an architecture that integrates both operational views (behaviors) and system views (design) will foster a better understanding of the proposed material solution and reduce the risk of divergence between desired behavior and system design. The DoDAF is intended to provide a common way to capture and communicate such architecture information across the disparate organizations involved in related system and SoS development. DoDAF 1.0 has several weaknesses, including: (1) a focus on views, vice data, frequently resulting in incoherence among views and marginal utility for the views that are produced; and (2) an unclear strategy regarding what views are required to support particular activities (e.g., JCIDS Functional Solution Analysis, portfolio management, systems engineering). The DoDAF 2.0 development project seeks to overcome such problems with one means being the definition of DoDAF overlays (profiles) for individual activities such as acquisition.

A2.4.1.2. DISCUSSION: The DoDAF 2.0 development project requires acquisition community involvement to succeed. The acquisition community should lead development of the Acquisition Overlay for DoDAF v2.0, which will define the types of information and level of detail that should be captured. Coordination with the JCIDS Overlay development effort should foster a smooth transition from the JCIDS into acquisition.

A2.4.1.3. LEAD: AT&L/DS (in cooperation with defense industry associations)

A2.4.1.4. SUPPORT: ASD(NII) and Components

A2.4.1.5. PRODUCTS: Acquisition Overlay for DoDAF v2.0

A2.4.1.6. COMPLETION GOAL: 2007

A2.4.2. ACTION 2-4 (b). Support the development of open commercial standards for the depiction and interchange of DoDAF-compliant architectures.

A2.4.2.1. RATIONALE: Additional weaknesses of DoDAF 1.0 are that it does not specify a standard language (modeling notation) for its various views and does not specify a standard data interchange format for DoDAF-compliant architectures. This impedes architecture coordination within and across programs.

A2.4.2.2. DISCUSSION: The OASD(NII), in cooperation with the UK's Ministry of Defense (MOD), in September 2005 issued an RFP for a commercial standard Unified Modeling Language (UML) Profile for DoDAF/MODAF (MOD Architecture Framework). Another commercial standard, ISO 10303 (STEP) AP-233, is being considered for the data interchange format standard. The DoD Open Systems Joint Task Force has conducted a pathfinder project to demonstrate the use of AP-233 to exchange architecture information among commercial off-the-shelf (COTS) systems engineering tools.

A2.4.2.3. LEAD: ASD(NII)

A2.4.2.4. SUPPORT: USD(AT&L)/DS

A2.4.2.5. PRODUCTS: Revised standards in DoDAF 2.0; revised guidance in DAG.

A2.4.2.6. COMPLETION GOAL: 2007

A2.5. ACTION 2-5. Establish a standard template of key characteristics (metadata) to describe reusable M&S resources.

A2.5.1. RATIONALE: Although many M&S resources (e.g., models, simulations, databases, utilities, networks, computing platforms, laboratories, ranges, technical services) are reusable for various acquisition-related purposes, relatively little reuse occurs. There are many obstacles to reuse, including difficulty discovering the existence of such assets. Although there are many M&S resource repositories and registries across the Department of Defense, there is no effective way to search them for a particular type of resource (e.g., simulations that represent a particular surface to air missile, performance data for the C-130). Standard templates of descriptive information (metadata) about such resources would aid in automated searches for such resources.

A2.5.2. DISCUSSION: Although logically related to Action 2-1, the nature of the metadata to be captured in this template is largely different from the types of information described in the metamodel. For instance, the reusable resource metadata template will focus on capability descriptions, not pedigree, and will have points of contact (POCs) for obtaining use of the resource, vice the POCs involved in producing information. As well, metadata template(s) will be complemented by a specific enumeration of the allowable entries in the various fields to facilitate searching by keywords. This action is under the purview of the M&S Community of Interest (COI) Metadata Focus Group.

A2.5.3. LEAD: OUSD(AT&L)

A2.5.4. SUPPORT: USD(AT&L)/DS, USD(AT&L)/TRMC, ASD(NII), DOT&E; and Components

A2.5.5. PRODUCTS: Published standard template and usage guidance in DAG.

A2.5.6. COMPLETION GOAL: 2007

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OBJECTIVE 3

IMPROVE MODEL AND SIMULATION CAPABILITIES

A3.1. ACTION 3-1. Establish a process to ensure acquisition needs are reflected in DoD M&S priorities.

A3.1.1. RATIONALE: The Department of Defense, under the leadership of the Director of Defense Research and Engineering, has a defined process for coordinating the investment of the DoD Components in S&T. Likewise, the Department of Defense has a process for deciding its investments in M&S. Acquisition, including T&E, has particular interests, such as cost, reliability, and manufacturing representation challenges, which are not common to the broader community of M&S users. The acquisition community lacks, but needs, a coherent voice in those processes to ensure its needs receive appropriate consideration.

A3.1.2. DISCUSSION: A means to request, receive, and consider the acquisition community's recommendations must be established. There must be a related internal acquisition community process to solicit, integrate, and prioritize the needs that are identified. To provide feedback to submitters and foster continued involvement in this process, some means of tracking the outcome of individual organization and acquisition community inputs must be provided with those results made available broadly. Additionally, the acquisition community should identify gaps in M&S capabilities and address these needs in the DoD M&S Investment Plan.

A3.1.3. LEAD: OUSD(AT&L)

A3.1.4. SUPPORT: USD(AT&L)/DS, DOT&E, DoD(CIO), and Components

A3.1.5. PRODUCTS: A method to capture and prioritize acquisition needs.

A3.2.6. COMPLETION GOAL: 2007

A3.2 ACTION 3-2. Define and foster sound practices for efficient development and evolution of credible M&S tools, incorporating user-defined requirements in a systems engineering approach with appropriate verification and validation.

A3.2.1. RATIONALE: Although the importance and use of M&S tools (models, simulations, and utilities) is expanding across the Department of Defense, relatively few persons have a good grasp of the process and principles that should be followed when developing such tools. In conjunction with IEEE standardization of the HLA, the Department of Defense has identified a recommended practice for federation development and execution, but no equivalent best practice exists for the development of individual M&S tools. Whether conducting such a development or overseeing a contractor's efforts to do so, DoD acquisition professionals need to understand best practices for developing M&S tools.

A3.2.2. DISCUSSION: The systems engineering process provides a suitable framework for developing a model or simulation. However, this must be augmented by M&S particular considerations, such as conceptual modeling; agile programming techniques, authoritative data availability and transformation; coherency with other models and simulations, simulation time management; verification; and validation. The needed information exists but is scattered and hard to identify. Once assembled, a thorough review will be necessary to ensure correctness and build acceptance.

A3.2.3. LEAD: OUSD(AT&L)

A3.2.4. SUPPORT: USD(AT&L)/DS, DOT&E, DoD(CIO), and Components

A3.25. PRODUCTS: Best practices publication, available via the Modeling & Simulation Information Analysis Center (MSIAC), Defense Technical Information Center (DTIC), etc.; DAG guidance to use.

A3.2.6. COMPLETION GOAL: 2008

A3.3. ACTION 3-3. Enable readily-available distributed live-virtual-constructive environments, leveraging related initiatives. (Sub-actions follow with rationale and discussion)

A3.3.1. ACTION 3-3 (a). Establish DoD-wide standards for distributed environments.

A3.3.1.1. RATIONALE: Appreciation of the need for distributed environments (also known as virtual ranges in the T&E community) that are responsive to user identified needs is increasingly widespread across the Department of Defense. Such environments are useful to support systems engineering, testing, training, experimentation, course of action analysis, and mission rehearsal. It is desirable that these environments be readily composable from the complete inventory of simulations, ranges, laboratories, networks, and utilities controlled by the Department of Defense. Because, as discussed under Action 2-3, the owners of these assets would have difficulty complying with multiple competing standards, defense community-wide standards are needed whenever practical. These standards may include simulation technical architecture, object models, time management, semantic interoperability, data interchange formats, and encryption standards.

A3.3.1.2. DISCUSSION: The number of stakeholders in such a readily-available distributed environment capability is great. Initiatives in this area include: the Joint Service Battlespace Environment (JSBE), Test and Training Enabling Architecture (TENA), Joint Mission Environment Test Capability (JMETC), Joint National Training Capability (JNTC), and the Network-Centric Operations Industry Consortium (NCOIC). DoD-wide standards for distributed environments must be responsive to the acquisition community user's identified needs. DoD actions in this area also affect U.S. interactions with allied nations. No single community can decide this. Therefore, a body with broad representation must lead this action. This action should be coordinated with Action 2-3.

A3.3.1.3. LEAD: OUSD(AT&L)

A3.3.1.4. SUPPORT: USD(AT&L)/TRMC, USD(AT&L)/DS; DOT&E; DoD(CIO), and Components

A3.3.1.5. PRODUCTS: Published standard; DoDI (# TBD) policy to use

A3.3.1.6. COMPLETION GOAL: 2008

A3.3.2. ACTION 3-3 (b). Make candidate simulations, labs, and ranges compliant with these standards.

A3.3.2.1. RATIONALE: Individual DoD Components own and manage most of the assets that are candidates for participation in distributed environments. The Components set the requirements to fund, develop, operate, evolve, and configuration manage these assets. They are thus the logical parties to be responsible for bringing these assets into compliance with the distributed environment standards established under the preceding action. Funding for this will be dependent on individual program interests, but should be greatly encouraged by either central funding or the prospect of earning revenue for their use by others per the business model discussed in Action 4-3(a).

A3.3.2.2. DISCUSSION: The success of this action is almost totally dependent on (a) developing consensus regarding optimal DoD-wide standards for distributed environments and (b) a viable business model for funding the transition and employment of these assets. The economic viability of commercial businesses conducted over a service-oriented architecture (SOA) provides encouragement that such a concept may work within the Department of Defense. Under this concept, the owners of these assets would be compensated to operate them as part of a distributed environment, or make them available to others for this purpose. The extent of compliance is left to the Components to decide based on requirements, capability, and business case analysis.

A3.3.2.3. LEAD: Components

A3.3.2.4. SUPPORT: USD(AT&L)/DS, DOT&E, and USD(AT&L)/TRMC

A3.3.2.6. PRODUCTS: Bring into compliance a larger collection of simulations, labs, and ranges ready to be employed in distributed events.

A3.6.3.2.6. COMPLETION GOAL: 2010

A3.3.3. ACTION 3-3 (c). Ensure the availability of services to help plan and conduct distributed events.

A3.3.3.1. RATIONALE: To plan, develop, integrate, and execute a distributed environment event requires technical services by experts. Most potential users of a distributed environment, such as program managers, will need to have an organization they can turn to for such assistance (on a customer-funded basis).

A3.3.3.2. DISCUSSION: Because the number of such events that are in planning or execution at any one time are large and contention for these services may be considerable, business logic may dictate that several Components establish their own service organizations that provide services, possibly for a fee. An interservice working group with rotating leadership could be established to define types of services needed, alternatives to meet those needs, priorities, and resource leveraging opportunities. A business case and initial set of potential customers for a fee-based technical service to plan and conduct distributed events is needed. Alternatively, this may be an area where commercial services may be viable. Discretion in this matter is left with the Components.

A3.3.3.3. LEAD: Components

A3.3.3.4. SUPPORT: USD(AT&L), USD(AT&L)/TRMC, USD(AT&L)/DS, and Defense Information Systems Agency (DISA)

A3.3.3.5. PRODUCTS: Technical services to help users (e.g., Program Managers (PMs), Capability Managers (CMs), and Operational Test Agencies) plan and conduct distributed events.

A3.3.3.6. COMPLETION GOAL: 2009

A3.4. ACTION 3-4. Centrally fund and manage the development of high-priority, broadly-needed M&S tools. (Sub-actions follow with rationale and discussion)

A3.4.1. ACTION 3-4 (a). Identify and prioritize broadly-needed M&S tools.

A3.4.1.1. RATIONALE: Certain M&S needs are common to multiple programs and organizations. Lacking visibility into those needs, common needs may go unrecognized. Where they are identified, there is often a reluctance to rely on others to meet that need. Some government-managed models and simulations, such as Brawler and Radar-Directed Gun System Simulation (RADGUNS), are already used broadly. Such broadly used M&S tools typically suffer from several problems, including a lack of adequate model manager funding to: (a) allow the incorporation into the standard version ("street version") of tool enhancements developed by users, (b) improve the model's accuracy by examining discrepancies between the model and actual test results (the "fix" step of the "model-test-fix-model" process, and (c) build in new capabilities to meet foreseeable needs, such that the capabilities can be delivered within the time period when users need them. Central funding and management (through a council of stakeholders) of such broadly needed model and simulation capabilities will alleviate these problems.

A3.4.1.2. DISCUSSION: A necessary first step to exploring this approach is to identify and prioritize candidate M&S tools. Tools from all M&S domains should be considered. Industry perspectives should be considered. Completion of this task requires lines of communication across the acquisition community to announce this process and elicit inputs. A broadly-representative group of acquisition community representatives should lead prioritization of the inputs received to identify those models and simulations that are most appropriately funded and managed centrally.

A3.4.1.3. LEAD: OUSD(AT&L)

A3.4.1.4. SUPPORT: USD(AT&L)/DS, DOT&E, DoD(CIO), and Components

A3.4.1.5. PRODUCTS: Prioritized list of common M&S needs.

A3.4.1.6. COMPLETION GOAL: 2007

A3.4.2. ACTION 3-4 (b). Conduct one or more pilot projects to develop new M&S tools or update existing ones to meet these needs.

A3.4.2.1. RATIONALE: The potential funding demands for central management of broadly-needed M&S tools may be beyond what the DoD budget can reasonably support. As well, this management concept warrants careful examination before adopting it on a large scale. Hence one or more pilot projects are warranted to explore this concept. Additionally, similar or relatable efforts in Allied nations should be investigated to determine alternative means to develop and implement these capabilities/tools as well as realize cost savings and interoperability early in the developmental process.

A3.4.2.2. DISCUSSION: From the prioritized list of broadly-needed M&S tools identified under the previous action, one or two should be selected and user councils established. With expert advice from the model manager's office regarding the degree of difficulty of the changes under consideration, specific requirements to be incorporated in the M&S tool will be agreed to by each council. The changes to the M&S tool may be accomplished within the Department of Defense (typically by the model manager) or contracted out. As a pathfinder project, careful monitoring of the project is warranted and appropriate metrics must be captured. A small (<$5M) POM issue paper may be required to obtain the required funding.

A3.4.2.3. LEAD: OUSD(AT&L)

A3.4.2.4. SUPPORT: USD(AT&L)/DS and Components

A3.4.2.5. PRODUCTS: Proof of concept for managing the development/evolution of M&S tools to meet broadly-shared needs.

A3.4.2.6. COMPLETION GOAL: 2008

A3.4.3. ACTION 3-4 (c). Expand the scope of central M&S tool management as warranted by pilot project results and the list of common M&S needs.

A3.4.3.1. RATIONALE: With the prioritized list of M&S tools to be centrally managed already in hand, once the results of the pilot projects are in, an appropriate DoD body can decide whether to pursue the establishment of other similar projects.

A3.4.3.1. DISCUSSION: The optimal relationship of individual M&S tool management efforts, perhaps under a broader, more senior executive council, is not yet clear. That will also be informed by the pilot project. The size of the associated POM issue will be a function of the desired expansion of this M&S tool management approach.

A3.4.3.1. LEAD: OUSD(AT&L)

A3.4.3.1. SUPPORT: USD(AT&L)/DS, DOT&E, and Components

A3.4.3.1. PRODUCTS: Capability to provide broadly-needed M&S tools in a more responsive and cost-effective way.

A3.4.3.1. COMPLETION GOAL: 2011

OBJECTIVE 4

IMPROVE MODEL AND SIMULATION USE

A4.1. ACTION 4-1. Provide potential acquisition M&S users the knowledge needed to formulate an effective M&S strategy via ready access to M&S expertise and information about M&S capabilities and gaps, reusable resources, lessons-learned, etc.

A4.1.1. RATIONALE: Most acquisition programs, particularly in their early stages before formal designation as a program, lack staff members with M&S expertise. Even those with M&S experience are usually only partially aware of information needed to formulate an effective M&S strategy. Making these program staffs more knowledgeable regarding M&S strengths and weaknesses, applicable standards, potentially available reusable resources, lessons from other M&S efforts, and options to obtain technical assistance would better equip them to formulate an M&S strategy.

A4.1.2. DISCUSSION: Various means should be considered to accomplish this action. Options include delivering documents, consultations with the MSIAC, consultations with similar programs, participation in conferences and workshops targeted toward M&S applications in acquisition, assist visits from Component or OSD personnel, directions to registries of reusable resources, interactions with other members of the M&S community, and the other education and training options discussed under Objective 5, "Shape the work force."

A4.1.3. LEAD: USD(AT&L)/DS

A4.1.4. SUPPORT: USD(AT&L), ASD(NII)

A4.1.5. PRODUCTS: Revised guidance in DAG, improved MSIAC consultant services, and assist visits (e.g., by OUSD(AT&L)/DS).

A4.1.6. COMPLETION GOAL: 2008

A4.2 ACTION 4-2. Define and disseminate best practices for disciplined M&S planning & employment.

A4.2.1. RATIONALE: Once an M&S strategy is decided, detailed M&S planning needs to be accomplished. Acquisition staffs and contractors often lack the expertise to do this well. Knowledge of the best practices can inform that decision process, improve the cost-effectiveness of a program's M&S activities, and benefit others that may reuse that program's M&S artifacts.

A4.2.2. DISCUSSION: The identification of best practices requires mining the literature for articles on the use of M&S to support acquisition activities and consulting with expert M&S practitioners with in-depth experience in the acquisition arena. Best practices should address the

rigorous analysis of M&S requirements; M&S project plan templates to support implementation of M&S; considerations to maximize cost-effective reuse across the life cycle; identification of alternative solutions to meet program requirements and selection of the best course; management of data and software; verification, validation, and accreditation (VV&A); and model initialization, execution, and post-run analysis. Cautions against inappropriate use should likewise be included.

A4.2.3. LEAD: USD(AT&L)/DS

A4.2.4. SUPPORT: USD(AT&L), ASD(NII), and Components

A4.2.5. PRODUCT: Revised best practices guidance in DAG and MSIAC.

A4.2.6. COMPLETION GOAL: 2007

A4.3. ACTION 4-3. Facilitate the sharing of reusable resources (Sub-actions follow with rationale and discussion).

A4.3.1. ACTION 4-3 (a). Establish a DoD-wide business model for compensating providers of reusable M&S resources (e.g., information, tools, services).

A4.3.1.1. RATIONALE: Although highly desirable whenever it can meet a requirement more cost-effectively, the reuse of M&S resources continues to be sparse. Past studies have shown less than ten percent of DoD's models and simulations are used on more than one program. Negative incentives include the extra cost required to make a resource reusable (e.g., exception handling, training materials), the workload on a resource owner's staff associated with assisting other users ("hand holding"), and the vulnerability of a resource owner to criticism from the organization reusing its asset. There is currently no commonly accepted way for resource providers to be compensated for their help. A business model that either mandates cooperative sharing or financially rewards resource providers is needed to overcome the negative incentives that currently discourage reuse.

A4.3.1.2. DISCUSSION: Mandates for any M&S policy will not be effective absent a forceful and persistent commitment by the DoD leadership. Positive incentives offer the most promise for a viable alternative. The commercial world uses economic incentives to establish a robust marketplace for M&S software, data, and services. If the Department of Defense can define, and put into practice, a business model that financially rewards programs that provide reusable resources (e.g. models, simulations, data sets), reuse can be expected to increase significantly. Guidelines are needed for (a) the amount of compensation, relative to the cumulative and incremental cost of providing the resource, and (b) the process to complete the agreement and transfer the funds.

A4.3.1.3. LEAD: OUSD(AT&L)

A4.3.1.4. SUPPORT: USD(AT&L)/DS, USD(P&R), USD(C)/PA&E, DoD(CIO), and Components.

A4.3.1.5. PRODUCT: Documented business model and revised policy and/or guidance in DoD 5000 series and DAG.

A4.3.1.6. COMPLETION GOAL: 2007

A4.3.2. ACTION 4-3 (b). Establish DoD policy and guidance regarding responsibilities to share, protect, and properly use M&S information, tools, and data.

A4.3.2.1. RATIONALE: Within both government and industry, concern about the inappropriate or damaging misuse of a database, model or simulation often discourages the owners of such resources from sharing them with another organization, even when a legitimate need to know exists. Industry sharing with government is often impeded by concerns about the protection of proprietary information and competitive advantage. Government sharing of reusable resources with industry is hampered by concerns about the contractual liabilities associated with government-furnished equipment or information (GFE/GFI). Policy and/or guidance to make clear the responsibilities of both parties when sharing occurs will go a long way toward alleviating such fears and fostering more reuse.

A4.3.2.2. DISCUSSION: Something akin to "rules of engagement" are required. Discussions with resource providers and consumers will be required to gain consensus on these guidelines. These guidelines will likely include a responsibility for resource providers to reasonably consider all requests (per the above business model), to inform the requestor how to use the resource, to provide all existing, pertinent documentation, and to warn the requestor regarding all known deficiencies. Resource requestors will likely be required to justify their need for the resource. Justification may include the way in which the resource will be used. The requestor may need to agree to: consult with the provider should any deficiency be detected or any adverse inference regarding the provider's system be drawn; not publicly criticize the resource provider; and, not sell, transfer or otherwise share the resource with third parties without prior agreement. Industry may be required to hold the government harmless for any resource deficiencies that the government has known and so informed industry.

A4.3.2.3. CO-LEADS: ASD(NII), OUSD(AT&L), and USD (I)

A4.3.2.4. SUPPORT: USD(AT&L)/DS & DPAP, USD(P&R), USD(C)/PA&E, and Components

A4.3.2.5. PRODUCT: Revised policy and/or guidance in various issuances, e.g., DoD 5000 series, DAG, contracting guidance.

A4.3.2.6. COMPLETION GOAL: 2008

A4.3.3. ACTION 4-3 (c). Enhance the means (e.g., directory service, registries, bulletin boards) to discover the existence of reusable resources required for M&S and contact information.

A4.3.3.1. RATIONALE: It is quite difficult to discover the existence of resources which may be suitable candidates for reuse in another organization or program. The Department of Defense and its contractors need an effective and responsive means to search for such resources.

A4.3.3.2. DISCUSSION: A reorientation and integration of the various DoD Modeling and Simulation Resource Repositories would be helpful. They should serve as a seamless set of registries containing descriptions of the resources and providing points of contact for requesting additional information (and then perhaps arranging for their use). All reusable M&S resources should be described using the metadata template called for under objective 2 "Enhance the Technical Framework for Modeling and Simulation" and registered in this system. The completed Actions 4-3(a), 4-3(b), and 4-4 are intended to provide sufficient incentives to register such resources.

A4.3.3.3. LEAD: OUSD(AT&L)

A4.3.3.4. SUPPORT: USD(AT&L)/DS, USD(P&R), USD(C)/PA&E, and Components

A4.3.3.5. PRODUCT: A better way to discover reusable resources. Re-orientation and integration of various DoD M&S resource repositories.

A4.3.3.6. COMPLETION GOAL: 2007

A4.4. ACTION 4-4. Define the types of information DoD organizations shall make available to others (to include industry) with a clearance and valid need to know and the processes to obtain them (per reuse business model). (The process to obtain information should include an efficient mechanism for industry to request government data with specific "need to know" outside a specific contract environment. Sub-actions follow with rationale and discussion).

A4.4.1. ACTION 4-4 (a). Provide authoritative scenario data.

A4.4.1.1. RATIONALE: Capability managers (CMs) and program managers (PMs) need approved reference contexts in which their capabilities/systems will be expected to meet their requirements and fulfill their purpose.

A4.4.1.2. DISCUSSION: The reference contexts must be derived from the approved Defense Planning Guidance and associated scenarios. The reference contexts for scenario generation must be derived from approved Defense Planning Guidance (DPG) and associated scenarios and derived sub-scenarios or scenario excursions. Contingent on a clearance and need to know, these scenarios should be readily available electronically to inform the acquisition and testing process.

A4.4.1.3. LEAD: OUSD(AT&L)

A4.4.1.4. SUPPORT: CJCS(J8), USD(C)/PA&E, Defense Intelligence Agency (DIA), and Components

A4.4.1.5. PRODUCT: Approved scenarios and process to obtain.

A4.4.1.6. COMPLETION GOAL: 2007

A4.4.2. ACTION 4-4 (b). Provide authoritative system-related data.

A4.4.2.1. RATIONALE: The materiel aspect of joint capabilities is often provided by a system of systems operating within a net-centric environment. The interfaces and interactions of individual systems should be captured in an integrated architecture. Building such an architecture, or even the less efficient approach of negotiating system interfaces bilaterally, requires that PMs share some information about their systems.

A4.4.2.2. DISCUSSION: The obligation to share information about their systems is incumbent on all PMs whose systems are to interoperate with others. Explicitly defining the types of information that must be shared will decrease the number of inappropriately broad requests for information, improve inter-program planning, and decrease the number and severity of interoperability problems discovered late in the development, integration, and test process.

A4.4.2.3. LEAD: USD(AT&L)/DS

A4.4.2.4. SUPPORT: DOT&E and Components

A4.4.2.5. PRODUCT: Process to obtain authoritative system data documented in the DAG and appropriate OASD(NII) policy documents.

A4.42.6. COMPLETION GOAL: 2008

A4.4.3. ACTION 4-4 (c). Provide authoritative threat data.

A4.4.3.1. RATIONALE: Threat information is needed by the PMs and CMs to develop effective systems and system of systems within a net-centric environment.

A4.4.3.2. DISCUSSION: Historic, current, and forecast threat information is needed. The Defense Intelligence Agency (DIA) holds two separate DoD Modeling and Simulation Executive Agent (MSEA) designations for representations of (1) U.S. National and Joint Intelligence Processes and (2) Foreign Forces.

A4.4.3.3. LEAD: DIA

A4.4.3.4. SUPPORT: USD(AT&L); USD(AT&L)/DS, DOT&E, and Components

A4.4.3.5. PRODUCT: Process to obtain authoritative threat data.

A4.4.3.6. COMPLETION GOAL: 2007

A4.4.4. ACTION 4-4 (d). Provide authoritative natural environment data.

A4.4.4.1. RATIONALE: Information about the natural environment in their expected operating area is needed by the PMs and CMs to develop effective systems and systems-of-systems.

A4.4.4.2. DISCUSSION: The National-Geospatial Intelligence Agency (NGA) is the DoD MSEA for Terrain, the Air Force is the MSEA for Aerospace, and the Navy is the MSEA for Oceans. Given the wide variety of natural environment conditions, the approval of certain in-hand environmental data sets as reference environments would provide a more practical frame of reference for acquisition activities. Also a means of resolving the incompatibilities between environmental data sets is needed. Representation and format incompatibilities inhibit the creation, composition, and construction of synthetic environments spanning more than one of the air, space, land, and sea domains.

A4.4.4.3. LEAD: DoD Natural Environment MSEAs

A4.4.4.4. SUPPORT: USD(AT&L), USD(AT&L)/DS, and Components

A4.4.4.5. PRODUCT: Process to obtain authoritative natural environment data.

A4.4.4.6. COMPLETION GOAL: 2007

A4.5. ACTION 4-5. Foster cost-effective Verification, Validation, and Accreditation (VV&A). (Sub-actions follow with rationale and discussion)

A4.5.1. ACTION 4-5 (a). Require DoD-wide standardized documentation of VV&A.

A4.5.1.1 RATIONALE: The credibility, or trustworthiness, of M&S is essential to its acceptance to support acquisition decisions. Understanding this characteristic of a model or simulation is important when considering its potential reuse across the system life-cycle or by another organization. Assessing the credibility and appropriate use of a model or simulation is known as VV&A. The inability to clearly understand what VV&A has been accomplished has degraded the usefulness of much M&S. Programs have used a variety of formats to document whatever VV&A may have occurred. Documentation is difficult to find and to understand, and contacting anyone with knowledge about prior VV&A activities is often difficult.

A4.5.1.2. DISCUSSION: A DoD policy is needed to require DoD-wide standardized documentation of M&S verification, validation, and accreditation. Being able to describe this in a common way, with standard terms, will help users to comprehend what has been accomplished

in this area. This will facilitate reuse and be a step toward improving the Department's overall understanding of M&S strengths and weaknesses. The standard documentation template should include a number of sections that may be optional, or may be done to a greater of lesser degree of detail, depending on the nature of the M&S and its usage context. Also, provisions for program-unique tailoring within the overall program framework may be needed.

A4.5.1.3. LEAD: OUSD(AT&L)

A4.5.1.4. SUPPORT: USD(AT&L)/DS, DOT&E, and Components

A4.5.1.5. PRODUCTS: Updated DoDI 5000.61; revised policy and guidance in DoDI 5000.2 and DAG

A4.5.1.6. COMPLETION GOAL: 2007

A4.5.2. ACTION 4-5 (b). Develop risk-based methodology and associated guidelines for VV&A expenditures.

A4.5.2.1. RATIONALE: The importance of VV&A is directly related to the criticality of the decision being informed by M&S. Since the cost of verifying and validating (V&V) legacy simulations is high, the cost of V&V should be weighed against the risk of making a decision based on unreliable M&S results. For instance, there is potential loss of life if a new aircraft is released for first flight based on less than trustworthy structural strength or flight dynamics model results, but there is less risk regarding a model that predicts fuel required to fly a certain flight profile. As well, not all the software components within a model or simulation represent equal risk regarding the outcome. Sensitivity analysis and an understanding the pedigree of each component would allow an informed judgment as to where V&V should be focused for the greatest reduction in the risk of a misleading result.

A4.5.2.2. DISCUSSION: Assessing the decision criticality and M&S weighting should be the first step in assessing the importance of a VV&A investment. A risk-based methodology to assess expected performance, safety considerations, and costs of operation for DoD M&S is essential to identifying the appropriate level of VV&A. A range of cost considerations drive the degree to which V&V can and should be undertaken, particularly for legacy systems. A framework to define the level of fidelity desired, the scope of V&V needed, and the cost profile to support the necessary V&V should be developed to include a sensitivity analysis relevant to the criticality of the M&S role to support a component of interest, individual system, or SoS.

A4.5.2.3. LEAD: OUSD(AT&L)

A4.5.2.4. SUPPORT: USD(AT&L)/DS and Components

A4.5.2.5. PRODUCTS: Updated VV&A Best Practices documents/web site; guidance in DAG.

A4.5.2.6. COMPLETION GOAL: 2007

A4.5.3. ACTION 4-5 (c). Examine the relevant VV&A when M&S informs major acquisition decisions. Unambiguously state the purpose, key assumptions, and significant limitations of each model or simulation when results are presented.

A4.5.3.1. RATIONALE: Decisions regarding major events, milestones, and the future course of an acquisition program are often informed by M&S-based analyses. The trustworthiness of the M&S is therefore often a major influence on such decisions. Responsible program and oversight officials both bear a responsibility to evaluate this M&S trustworthiness. This action makes those responsibilities explicit.

A4.5.3.2. DISCUSSION: These responsibilities exist both within the acquiring Component, and also the applicable OSD oversight office. Education will be required to equip oversight officials to examine a program's VV&A activities. This education should be left to the Component performing oversight. Action 4-5 (a) will facilitate the examination of VV&A. Recommended practices for VV&A have been published by the Defense Modeling and Simulation Office (DMSO), Navy Modeling and Simulation Office, and the Joint Accreditation Support Activity (JASA) and will be strengthened by the accomplishment of Action 4-5 (b).

A4.5.3.3. LEAD: USD(AT&L)/DS

A4.5.34. SUPPORT: Components

A4.5.3.5. PRODUCTS: Guidance and training for oversight personnel; updates to Defense Acquisition Guidebook Chapters 4 & 9.

A4.5.3.6. COMPLETION GOAL: 2006

A4.6. ACTION 4-6. Assess the use of COTS systems engineering tools (modeling environments) for collaborative architecture development.

A4.6.1. RATIONALE: As discussed regarding Action 1-2, MBSE can improve the efficiency and effectiveness of systems engineering at all levels. One of the MBSE tasks is architecture development and verification. Commercial off-the-shelf (COTS) systems engineering tools exist that define and verify architectures, but are generally not interoperable, due in part to the standards deficiencies that prompted the Action 2-2. Assessment of the capability of these tools to support collaborative architecture development is warranted to assess the state of the practice, inform the acquisition community, and influence the tool vendors' future products.

A4.6.2. DISCUSSION**:** The assessments should identify and non-intrusively leverage the efforts of DoD PMs and CMs to use COTS tools to develop and verify architectures. Three classes of assessments would be useful: (a) Use of a single type of tool by single organization; (b) use of a single type of tool by a multi-organization enterprise; and (3) use of heterogeneous types of tools by a multi-organization enterprise. These assessments would focus on the tool

capabilities and the process they were used to support (and not otherwise examine program issues). Results would be incorporated in the M&S Body of Knowledge and shared with the acquisition community via Action 5-4.

A4.6.3. LEAD: USD(AT&L)/DS

A4.6.4. SUPPORT: ASD(NII) and Components

A4.6.5. PRODUCT: Use results to enhance the M&S body of knowledge, DAG, Defense Acquisition University (DAU) courses, etc).

A4.6.6. COMPLETION GOAL: 2007

A4.7. ACTION 4-7. Define and capture meaningful metrics for M&S utility in acquisition.

A4.7.1. RATIONALE: Managers appreciate quantitative measures because they provide an objective means to evaluate matters, assess progress, and decide a course of action. This is particularly true regarding investment in M&S. Acquisition officials have repeatedly expressed frustration about the absence or inadequacy of M&S metrics.

A4.7.2. DISCUSSION: M&S metrics are difficult to obtain for several reasons. Most M&S costs are not broken out separately, but instead are embedded within the cost of other activities and program elements (PEs). Further, there is a proper reluctance to burden the program manager by adding requirements for additional information reporting. There is no consensus regarding the definition of appropriate metrics (i.e., what should be measured and in what context). Acquisition managers are reluctant to share such information for fear their budgets will be attacked. This action should consider all these factors. It should also consider other lines of argument, such as analyses that can only, as a practical matter, be done using M&S, and insights from M&S activities in commercial industry.

A4.7.3. CO-LEADS: OUSD(AT&L) and the Department of the Navy

A4.7.4. SUPPORT: USD(AT&L)/DS and Components

A4.75. PRODUCT: Defined process and metric definitions in DAG; metrics from individual projects in MSIAC.

A4.7.6. COMPLETION GOAL: 2007

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OBJECTIVE 5

SHAPE THE WORKFORCE

A5.1. ACTION 5-1. Define required M&S competencies for the acquisition workforce.

A5.1.1. RATIONALE: M&S strategy, planning, and implementation to support acquisition frequently lack a long term perspective, are inefficient, and can result in missing the desired outcome. M&S users often are not adequately trained and defer M&S planning and oversight to others. M&S developers often lack sufficient understanding of modeling best practices, abstraction techniques, context dependencies, and so forth. As well, persons who are expert users of a particular model or simulation, rather than having a broader M&S expertise, often perceive that their value to their organization will be decreased if their M&S tool is replaced, thus creating a cultural obstacle to reuse and modernization, negatively impacting M&S cost effectiveness. Better education and training can mitigate these problems. An important first step towards improving the acquisition workforce's M&S knowledge and skills is to understand what competencies the workforce should have.

A5.1.2. DISCUSSION: Existing organizational structure and processes support the USD(AT&L) in his responsibility to prescribe education, training, and experience standards for acquisition positions in the 12 acquisition career fields. Specifically, Functional Advisors supported by Functional Integrated Process Teams (FIPT) develop education, training, and experience requirements; career field requirements; and certification levels. This action proposes to leverage existing structure and processes, by identifying the FIPT(s) to define required M&S competencies for the workforce, the qualification requirements, and associated management process and structure.

A5.1.3. CO-LEADS: USD(AT&L)/DS and DAU

A5.1.4. SUPPORT: USD(P&R), USD(AT&L), USD(C)/PA&E, and Components

A5.1.5. PRODUCT: Identified lead FIPT; workforce qualification requirements; management process & structure.

A5.1.6. COMPLETION GOAL: 2008

A5.2. ACTION 5-2. Harvest lessons from commercial sector activities in the use of M&S to support product development.

A5.2.1. RATIONALE: Many advances in M&S strategies, tools, and processes originate in the commercial sector. The gaming industry, artificial intelligence community and cognitive and social science communities are potential sources of valuable M&S lessons. There is insufficient awareness and understanding of commercial M&S capabilities, activities, and state-of-the-art. It

would be beneficial to actively pursue M&S technology advantages from the commercial sector for defense acquisition, whenever practical.

A5.2.2. DISCUSSION: Industry forums routinely provide for exchanges of this type information. DoD participation in these forums will lead to early knowledge of technology advances and lessons learned from commercial application. This information can be provided to the defense acquisition community by a variety of means.

A5.2.3. LEAD: USD(AT&L)/DS

A5.2.4. SUPPORT: USD(AT&L) and Components

A5.2.5. PRODUCTS: Annual update in DAG of best practices and lessons from industry that should be considered by PMs in planning for M&S; improved M&S Body of Knowledge.

A5.2.6. COMPLETION GOAL: Recurring; initial in 2007.

A5.3. ACTION 5-3. Assemble and evolve the M&S body of knowledge relevant to acquisition.

A5.3.1. RATIONALE: The body of knowledge for M&S support to acquisition is deficient and not very well managed. There is no authoritative, up-to-date, consistent M&S knowledge base for defense acquisition. Bits and pieces of knowledge are found in many places, provided by many different sources. Knowledge gaps, inconsistencies, and errors are typical.

A5.3.2. DISCUSSION: An authoritative body of M&S knowledge for acquisition is needed. It needs to be established and maintained for convenient and ready use by defense acquisition programs. Consideration should be given to providing information of value via the Modeling and Simulation Resource Repository (MSRR) and a MSIAC web page. The body of knowledge must be sufficiently robust to support planning and M&S use across the acquisition life-cycle.

A5.3.3. LEAD: OUSD(AT&L)

A5.3.4. SUPPORT: USD(AT&L)/DS and Components

A5.3.5. PRODUCT: Information of value to M&S users (e.g., Program Managers, Capability Managers, Operational Test Agencies)

A5.3.6. COMPLETION GOAL: Recurring; initial in 2006

A5.4. ACTION 5-4. Educate and train the workforce to achieve required M&S competencies. (Sub-actions follow with rationale and discussion)

A5.4.1 ACTION 5-4 (a). Provide M&S knowledge via an expanded set of DAU courses, the DAG, and on-line Continuous Learning Modules.

A5.4.1.1. RATIONALE: Not enough M&S expertise exists in the DoD acquisition workforce. Acquisition community managers and staffs are mostly uninformed about M&S capabilities and limitations. There are insufficient M&S education and training options relating to acquisition, and there is no clear career path for M&S professionals. Few opportunities exist for the acquisition workforce to be enlightened on the new and emerging M&S capabilities. Because little real progress has been made under previous M&S initiatives, M&S content in DAU certification courses has remained relatively static over time and has been limited to essential M&S coverage relevant to a particular Defense Acquisition Workforce Improvement Act (DAWIA) career track.

A5.4.1.2. DISCUSSION: Working through existing Functional Advisors and Functional Integrated Process Teams (FIPT), education and training courses need to be expanded to include M&S body of knowledge consistent with defined requirements. In addition to DAU courses, tuition assistance for graduate degrees in M&S, other resources – such as professional military education resources – will be leveraged to deliver the M&S knowledge. Where appropriate, the defense acquisition guidebook will be updated to highlight parts of M&S knowledge and complement the courses.

A5.4.1.3. LEAD: DAU

A5.4.1.4. SUPPORT: USD(AT&L), USD(AT&L)/DS, and Components,

A5.4.1.5. PRODUCT: Expanded set of DAU courses, Professional Military Education (PME), DAG, and on line Continuous Learning Modules (CLMs).

A5.4.1.6. COMPLETION GOAL: 2009

A5.4.2. ACTION 5-4 (b). Provide M&S knowledge via conferences, workshops, and assist visits.

A5.4.2.1. RATIONALE: Elements of the M&S body of knowledge may change often, as does technology. Acquisition M&S processes evolve and drive the need to socialize such processes across a broad front to promote wide acceptance. To promote better understanding, interactions with industry and government audiences will encourage rich discussion and facilitate common, credible approaches. Program-specific discussions, particularly in the formative stages of the program, can also be highly beneficial.

A5.4.2.2. DISCUSSION: Active "outreach" to a variety of government and industry sponsored events is appropriate to successful delivery of the M&S body of knowledge. The outreach should include conferences, workshops, and similar forums. Also, assistance visits to acquisition programs will focus on specific application of the knowledge to support program planning and implementation.

A5.4.2.3. LEAD: USD(AT&L)/DS

A5.4.2.4. SUPPORT: USD(AT&L), DAU, and Components

A5.4.2.5. PRODUCT: Annual outreach program

A5.4.2.6. COMPLETION GOAL: Recurring; initial in 2006

A5.5. ACTION 5-5. Improve the knowledge and expertise available through the M&S Information Analysis Center (MSIAC) to make it of greater utility to the acquisition community.

A5.5.1. RATIONALE: M&S developers and users often lack an understanding of modeling best practices, abstraction techniques, context dependencies, and so forth. The MSIAC was established under the DMSO and DTIC to support M&S developers and users, and to provide them with an understanding of best practices, abstraction techniques, and context dependencies. The MSIAC has not reached its full potential in supporting the acquisition community and has occasionally demonstrated insufficient familiarity with acquisition M&S practices and issues.

A5.5.2. DISCUSSION: MSIAC needs to be competent, responsive, and focused on providing M&S expert advice to M&S developers/users. Questions such as; the types of MSIAC services to be delivered and the means for doing so should also be considered when developing a revised concept of operations for the MSIAC. MSIAC customer support operations will benefit from improved knowledge (currency and completeness) and better qualified staff. In addition, MSIAC responsiveness and business model should be examined to align with user expectations.

A5.5.3. LEAD: OUSD(AT&L)

A5.5.4. SUPPORT: USD(AT&L)/DS, USD(P&R), USD(C)/PA&E, and Components

A5.5.5. PRODUCT: Plan of action with coordinated MSIAC CONOPS and staffing requirement; list of knowledge shortfalls that MSIAC will take on; success criteria and process to bring MSIAC up to criteria.

A5.5.6. COMPLETION GOAL: 2008

EXECUTION MANAGEMENT

OUSD(AT&L)/DS is responsible for oversight of this master plan and will request periodic progress reports from lead organizations. Action leads will identify metrics and milestones and quantify measures of progress. OUSD(AT&L)/DS will develop recommendations regarding progress on actions and report to the SE Forum. The monitoring and recommendation process includes:

- Requests for progress report presentations from lead organizations;
- Monitoring, on a non-intrusive basis, the impact of actions on defense acquisition activity;
- Periodic reports to SE Forum and to the M&S Steering Committee, as appropriate, recommending any appropriate modification or redirection; and
- Updating this plan every two to four years, based on progress completing actions, modifications needed, or new actions identified.

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APPENDICES

APPENDIX 1: REFERENCES

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APPENDIX 2: DEFINITIONS

Acquisition - The conceptualization, initiation, design, development, test, contracting, production, deployment, logistic support, modification, and disposal of weapons and other systems, supplies, or services to satisfy Department of Defense (DoD) needs intended for use in or in support of military missions. (Glossary of Defense Acquisition Acronyms and Terms)

Architecture - The structure of components, their interrelationships, and the principle guidelines governing their design and evolution over time. (CJCSI 3170.01E)

Capability - The ability to achieve a desired effect under specified standards and conditions through combinations of ways and means to perform a set of tasks. It is defined by an operational user and expressed in broad operational terms in the format of a Joint Capabilities Document or an Initial Capabilities Document (ICD) or a joint Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF) change recommendation. In the case of materiel proposals, the definition will progressively evolve to DOTMLPF performance attributes identified in the Capability Development Document (CDD) and the Capability Production Document (CPD). (CJCSI 3170.01E)

Collaborative Engineering Environment - An enduring collection of interoperable tools and data bases, authoritative information resources, and authoritative representations of product behavior and performance, and a representation of the processes and activities relevant to a system, system of systems(SoS), or family of systems (FoS).

DISRonline - The DISRonline consists of a collection of web-based applications supporting the continuing evolution of the Department of Defense (DoD) Information Technology (IT) Standards Registry (DISR) and the automation of all its processes. It supports all aspects of the DISR from standards development to daily usage and compliance guidance using a web-based front-end. It provides general information for the DoD IT Standards Committee (ITSC), IT Standards Working Groups (TWGs), and other DISR Communities of Interest (COIs), as well as access to all versions of the archived Joint Technical Architecture (JTA) documents.

DoD Components - Referred to as "the DoD Components," are identified as the Office of the Secretary of Defense, the Military Departments, the Chairman of the Joint Chiefs of Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities in the Department of Defense. (DoD5025.1-M)

Integrated Architecture - An architecture consisting of multiple views or perspectives (operational view, systems view, technical standards view) that facilitates integration, promotes interoperability, and permits identification and prioritization of capability shortfalls and redundancies.

Metadata - Information describing the characteristics of data; data or information about data; descriptive information about an organization's data, data activities, systems, and holdings. (DoDD 8320.2)

Metamodel - A model of a model. Metamodels are abstractions of other models, relating more generic concepts. (DoD 5000.59-M)

Model - A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process. (DoD 5000.59-M)

Net-Centric Environment - A framework for full human and technical connectivity and interoperability that allows all DoD users and mission partners to share the information they need, when they need it, in a form they can understand and act on with confidence, and protects information form those who should not have it. (Net-Centric Environment Joint Functional Concept, Version 1.0, April 7, 2005)

Operational Test Agencies - The Army Test and Evaluation Command, the Navy Operational Test and Evaluation Force, the Air Force Operational Test and Evaluation Center, the Marine Corps Operational Test and Evaluation Activity, and the Joint Interoperability Test Command. (DODD 5141.2, May 25, 2000)

Simulation - A method for implementing a model over time. (DoD 5000.59-M)

System - 1. The organization of hardware, software, material, facilities, personnel, data, and services needed to perform a designated function with specified results, such as the gathering of specified data, its processing, and delivery to users. 2. A combination of two or more interrelated pieces of equipment (or sets) arranged in a functional package to perform an operational function or to satisfy a requirement. (*Glossary of Defense Acquisition Acronyms and Terms*)

Systems Engineering (SE) - The overarching process that a program team applies to transition from a stated capability to an operationally effective and suitable system. SE encompasses the application of SE processes across the acquisition life cycle (adapted to each and every phase) and is intended to be the integrating mechanism for balanced solutions addressing capability needs, design considerations and constraints, as well as limitations imposed by technology, budget, and schedule. The SE processes are applied early in concept definition, and then continuously throughout the total life cycle. (*Defense Acquisition Guidebook*)

Systems Engineering Plan (SEP) - The SEP is the blueprint for the conduct, management, and control of the technical aspects of an acquisition program from conception to disposal, i.e., how the systems engineering process is applied and tailored to meet each acquisition phase objectives. The process of planning, developing, and coordinating systems engineering and technical management forces thoughtful consideration, debate, and decisions to produce a sound systems engineering strategy for a program commensurate with the program's technical issues, life cycle phase, and overall objectives. (SEP Preparation Guide, Version 1.02)

Test and Evaluation (T&E) - Process by which a system or components are exercised and results analyzed to provide performance-related information. The information has many uses including risk identification and risk mitigation and empirical data to validate models and simulation. T&E enables an assessment of the attainment of technical performance, specifications, and system maturity to determine whether systems are operationally effective, suitable and survivable for intended use, and/or lethal. There are three distinct types of T&E defined in stature or regulation: Developmental Test and Evaluation (DT&E), Operational Test and Evaluation (OT&E), and Live Fire Test and Evaluation (LFT&E). (Glossary of Defense Acquisition Acronyms and Terms)

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APPENDIX 3: ACRONYMS

ALSP - Aggregate Level Simulation Protocol
AP - Application Protocol
ASD - Assistant Secretary of Defense
AT&L - Acquisition, Technology, and Logistics
CEE - Collaborative Engineering Environment
CDD - Capability Development Document
CDRL - Contract Data Requirements List
CIO - Chief Information Officer
CLM - Continuous Learning Module
CM - Capability Manager
COI - Community of Interest
CPD - Capability Production Document
CTEIP - Central Test and Evaluation Investment Program
DAA - Designated Accreditation Authorities
DAG - Defense Acquisition Guidebook
DAU - Defense Acquisition University
DAWIA - Defense Acquisition Workforce Improvement Act
DDMS - DoD Discovery Metadata Specification
DDRE - Director, Defense Research and Engineering
DIA - Defense Intelligence Agency
DIACAP - DoD Information Assurance Certification and Accreditation Program
DIS - Distributed Interactive Simulation
DISA - Defense Information Systems Agency
DISR - DoD Information Technology Standards Registry
DLA - Defense Logistics Agency
DMSO - Defense Modeling and Simulation Office
DoD - Department of Defense
DODD - Department of Defense Directive
DoDAF - Department of Defense Architecture Framework
DODI - Department of Defense Instruction
DOT&E - Director of Operational Test and Evaluation
DOTMLPF - Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities
DPAP - Defense Procurement and Acquisition Policy
DPG - Defense Planning Guidance
DS - Defense Systems
DTIC - Defense Technical Information Center
DT&E - Developmental Test and Evaluation
EXCIMS - Executive Council for Modeling and Simulation
FCS - Future Combat Systems
FoS - Family of Systems
HLA - High Level Architecture
ISO - International Organization for Standardization

IA - Information Assurance
IT - Information Technology
ITSC - Information Technology Standards Committee
JASA - Joint Accreditation Support Activity
JCIDS - Joint Capabilities Integration and Development System
JMETC - Joint Mission Environment Test Capability
JSBE - Joint Service Battlespace Environment
JTA - Joint Technical Architecture
MBSE - Model-Based Systems Engineering
MDA - Milestone Decision Authority
MOD - Ministry of Defense
MODAF - Ministry of Defense Architecture Framework
M&S - Modeling and Simulation
MSEA - Modeling and Simulation Executive Agent
MSIAC - Modeling and Simulation Information Analysis Center
MSRR - Modeling and Simulation Resource Repository
MSWG - Modeling and Simulation Working Group
NCOIC - Network-Centric Operations Industry Consortium
NDIA - National Defense Industrial Association
NGA - National-Geospatial Intelligence Agency
NII - Networks and Information Integration
NSA - National Security Agency
OASD - Office of the Assistant Secretary of Defense
OCJCS - Office of the Chairman of the Joint Chiefs of Staff
ODOT&E - Office of the Director of Operational Test and Evaluation
OUSD - Office of the Under Secretary of Defense
PA&E - Program Analysis and Evaluation
PDM - Program Decision Memorandum
PM - Program Manager
PME - Professional Military Education
P&R - Personnel and Readiness
POCs - Points of Contact
POM - Program Objective Memorandum
RAGUNS - Radar-Directed Gun System Simulation
RFP - Request for Proposals
ROI - Return on Investment
SEP - Systems Engineering Plan
SI3 - Simulation Integration/Interoperation Infrastructure
SIAP - Single Integrated Air Picture
SOA - Service-Oriented Architecture
SoS - System of Systems
STEP - Simulation, Test, and Evaluation Process
STEP - STandard of the Exchange of Product model data
SysML - Systems Modeling Language
T&E - Test and Evaluation

TEMP - Test and Evaluation Master Plan
TENA - Test and Training Enabling Architecture
TES - Test and Evaluation Strategy
TRMC - Department of Defense Test Resource Management Center
UML - Unified Modeling Language
VV&A - Verification, Validation, and Accreditation
XML - Extensible Markup Language

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