Report on a Study on Management Concepts for Broadly-Needed Modeling and Simulation Tools in the U.S. Department of Defense

NDIA Systems Engineering Conference
San Diego, CA
October 26-29, 2009

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Presentation Outline

- **Study Background**

- **Study Objectives and Approach**

- **Surveys of M&S Tool Managers and Users**

- **Categories of Tool Management Approaches**

- **Taxonomy for Assessing Success of Management Approaches**

- **Preliminary Assessment of Success Attributes for M&S Tool Management**

- **Future Work**

Management Concepts for Broadly Needed M&S Tools Study Background (1 of 2)

- **Certain M&S tools are common to multiple programs and organizations**
- **Many government-managed models and simulations are already used broadly**
- **However, such broadly-used M&S tools typically suffer from several problems, including**
  - **A lack of adequate model manager funding, and**
  - **A stakeholder requirements management council to:**
    - **allow the incorporation of tool enhancements developed by users into the standard version ("street version"),**
    - **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**
    - **build in new capabilities to meet foreseeable needs, such that the capabilities can be delivered by the time users need them**

Management Concepts for Broadly Needed M&S Tools Study Background (2 of 2)

- **Study is sponsored by the Director, Office of the Director of Systems and Software Engineering (D, SSE) in the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD(AT&L))**
  - **On behalf of the Acquisition M&S Working Group (AMSWG)**
- **Study is an <u>initial</u> step in addressing Acquisition M&S Master Plan (AMSMP) Action 3-4 ("Centrally fund and manage the development of high-priority, broadly-needed M&S tools")**
  - **Before embarking on such an initiative, it is prudent to objectively study DoD's current experience in the management of broadly-needed tools**
    - **Attempt to identify innovative approaches that could be leveraged to improve the cost-effectiveness of DoD M&S tools more broadly**

APL

Management Concepts for Broadly Needed M&S Tools Study Objectives

- **Identify best practices for managing broadly-needed M&S tools**

- **Based on these findings, recommend actions the U.S. DoD should take to improve its management of such M&S tools**

Management Concepts for Broadly Needed M&S Tools Study Approach

- **Develop list of M&S tools used by multiple organizations not under the same chain of command or contract**
  - Done – but still growing

- **Survey M&S tool managers and users on management approaches**
  - Done – but still accepting inputs

- **Document and categorize management approaches for the tools identified**
  - Done – but open to update

- **Assess degree of success each tool management approach has had in avoiding certain problems**
  - Done, based on survey responses

- **Develop a taxonomy for assessing success of M&S tool management approaches**
  - Taxonomy developed

- **Identify/develop best practices for managing broadly needed M&S tools**
  - Success attributes developed

- **Recommend actions DoD should take to improve its management of broadly-needed M&S tools**
  - In progress

- **Develop list of desirable characteristics of candidate tools to be used in pilot applications**

List of M&S Tools with Responses to Tool Manager Survey (31 responses on 27 tools)

- Advanced Joint Effectiveness Model (AJEM)
- Advanced Testing Capability (ATC)
- Battle Command Management Service (BCMS)
- Comprehensive Mine and Sensor Simulator
- Extended Air Defense Simulation (EADSIM)
- Hazard Prediction and Assessment Capability (HPAC)
- Intelligence Modeling and Simulation for Evaluation
- Joint Analysis System (JAS)
- Joint Conflict and Tactical Simulation (JCATS)
- Joint Communication Simulation System (JCSS)
- Joint Integrated Mission Model (JIMM)
- Joint Semi-Automated Forces (JSAF) (JFCOM version)
- Joint Theater Level Simulation (JTLS)

- Langley Standard Real-Time Simulation in C++ (LaSRS++)
- Model for Intratheater Deployment by Air/Sea (MIDAS)
- Naval Simulation System (NSS)
- One Semi-Automated Forces (OneSAF)
- OpenEaagles Simulation Framework
- ProtoCore
- Role Player Workstation
- RunTime Infrastructure (RTI) - MATREX
- RTI NG Pro
- Simulation Display (SIMDIS)
- SPIRITS
- Suppressor
- Synthetic Theater Operations Research Model (STORM)
- Threat Modeling and Analysis Program (TMAP)

Questions on the M&S Tool User Survey

Responder Information
    1) Name   2) Rank/Title   3) Organization   4) Email Address   5) Phone Number

Requirements Management
    6) How should user requirements be prioritized when funding and/or schedule are insufficient to meet all requirements?

Configuration Management
    7) Is it critical to maintain a single source baseline, or are there circumstances under which multiple forks should be permissible? What criteria should be used to make this decision?
    8) Identify good tool distribution mechanisms/methods (for source, executable, or both).
    9) How frequent should releases be? Please describe the criteria upon which the frequency may depend, e.g. tool maturity, criticality of bug fixes.

Code Development
    10) Should externally developed code (by users or others) be integrated into the code baseline?
    11) How should conflicts between modifications submitted by different users/co-developers be mediated?

Test Management
    12) Should V&V be a formal part of the integration process?
    13) What processes/products are critical prior to product release, e.g., regression testing, reference data?

Lessons Learned
    14) Please describe any other management best practices that are critical to successful model management.

Categories of Tool Management Approaches (1 of 2)

- **Government Coordinated (GC)**
  - **A single government office coordinates development of one version of the tool for all users. Government mechanisms, like MIPRs, are used to contribute funds. Developers (contractors or DoD employees) are paid and/or directed through a single coordinator.**
- **Developer Coordinated (DC)**
  - **A single development contractor coordinates one version of the tool for all users. Commercial mechanisms, like license fees or development contracts, are used to contribute funds from users.**
- **Independent Development (ID)**
  - **One or more developers (contractors or DoD employees) produce their own versions from a common tool baseline. Each user is free to select a version and/or developer.**

Categories of Tool Management Approaches (2 of 2)

- **Government Open Source Hybrid (GOSH)**
  - **A government office authorizes certain developers (contractors or DoD employees) to participate in a shared source effort. Each user chooses a developer and all changes are constantly available to all participants.**
- **Open Source (OS)**
  - **One or more developers (contractors or DoD employees) participate in a shared source baseline. Each user chooses a version to use. No contractual relationship necessarily exists between users and developers.**
- **Independent "Co-opetition" (IC)**
  - **One or more developers (contractors or DoD employees) produce independent changes to a shared baseline. Each user chooses a developer, and the user determines if and when their changes are made available for inclusion in future baselines.**

Taxonomy for Judging Success of Approaches – Meeting Foreseeable Needs

- **High – manager solicits inputs to future needs; manager prioritizes requirements and integration activities to meet projected user community needs**

- **Medium – priorities are set by a configuration control board; users may provide additional funding to meet their specific requirements**

- **Low – projected user community needs are not considered in the requirements and integration process**

Taxonomy for Judging Success of Approaches – Integrating User-Developed Enhancements

- **High** – manager has structured, documented process for evaluating user enhancements and integrating them into the standard version; process includes regression testing and mediation of differences between submitted changes

- **Medium** – enhancements from a recognized set of sources are accepted and/or the framework allows for users to individually integrate their own plug-ins or libraries

- **Low** – integration of user-developed enhancements is on an ad hoc basis or not at all

Taxonomy for Judging Success of Approaches – Model Accuracy (Verification and Validation)

- **High** – validation or testing of the fully integrated tool is required as part of the structured management process

- **Medium** – manager accepts validation data where available, but does not require it

- **Low** – management process does not include V&V

Taxonomy for Judging Success of Approaches – Customer Support

- **High** – manager provides broad and responsive customer support including live support (help desk) and extensive documentation that supports understanding and use of the model; manager actively communicates with user community

- **Medium** – manager provides documentation beyond just technical/user's manual and live support

- **Low** – manager provides technical/user's manual; live support is on an ad hoc basis

M&S Tool Management Success Attributes (1 of 3)

M&S Tool Management Success Attributes: "The M&S Tool Manager …"	Meeting Foreseeable Needs	Integrating User-Developed Enhancements	Model Accuracy (V&V)	Customer Support
1. Successfully solicits recommendations from users for new capabilities.	X			
2. Has a process for managing the tool baseline(s) that prevents irreconcilable divergence.	X	X		
3. Has implemented into the baseline tool enhancements agreed upon by a peer / user review process.	X	X		
4. Provides / publishes justification for not including any suggested tool enhancements that were not included in the new baseline tool.	X	X		X
5. Actively communicates with, and engages, users / external developers on a consistent basis concerning tool efficacy and applicability.	X			X

M&S Tool Management Success Attributes (2 of 3)

M&S Tool Management Success Attributes: "The M&S Tool Manager …"	Meeting Foreseeable Needs	Integrating User-Developed Enhancements	Model Accuracy (V&V)	Customer Support
6. Has implemented a process to acquire and assess (using a peer / user review process) externally developed capabilities for inclusion into the baseline tool.		X		
7. Publishes a coding standards and style guide with which all externally developed capabilities are required to comply.		X		X
8. Has developed and implemented a quality assurance process that rigorously evaluates each new baseline tool implementation before final product release.			X	
9. Receives and expends the funds necessary to conduct verification and validation tests on all new enhancements, and thorough regression tests on all new baseline releases to ensure past functionality has not been compromised.			X	

M&S Tool Management Success Attributes (3 of 3)

M&S Tool Management Success Attributes: "The M&S Tool Manager …"	Meeting Foreseeable Needs	Integrating User-Developed Enhancements	Model Accuracy (V&V)	Customer Support
10. Updates the User's Guide and / or Technical Reference Manual with each baseline enhancement release, including constraints and limitations.			X	X
11. Receives consistent and adequate funding to conduct tool baseline maintenance, exclusive of baseline enhancements, to ensure the tool remains compatible with current software and hardware products used within the M&S community.				X
12. Provides timely customer support upon receiving a request for assistance (i.e., a competent and adequately staffed Help Desk).				X

Future Work

- **Develop preliminary set of recommended actions DoD should take to improve its management of broadly-needed M&S tools**

- **Share M&S tool management success attributes and preliminary set of recommended actions with tool managers participating in the survey, and other selected members of the DoD M&S community**

- **Update recommendations based on comments**

- **Develop list of desirable characteristics of candidate tools to be used in pilot applications**

- **Produce final report (now targeted for February 2010)**

How You Can Still Participate

- **If you are a government or industry manager of a broadly used M&S tool, please complete the survey at**

  http://outersurveyor.outer.jhuapl.edu/ss/wsb.dll/s/6gd

  - **Survey should take 10-15 minutes to complete**

- **If you have prior experience in managing <u>or using</u> M&S tools and have insights on best practices in M&S tool management, please complete the M&S tool user survey at**

  http://outersurveyor.outer.jhuapl.edu/ss/wsb.dll/s/6ge

  - **Survey is similar to manager survey, but not tool-specific**