Study on Management Concepts for Broadly Needed M&S Tools

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NDIA Systems Engineering M&S Committee
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Presentation Outline

- Study Objectives, Background, and Major Technical Activities
- Summary of Activities Performed To Date
- List of M&S Tools with Responses to Survey
- Categories of Tool Management Approaches Identified
- Taxonomy for Judging Success of Approaches
- Preliminary List of Success Attributes
- Planned Next Steps
- How You Can Participate
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 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 initial 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
Management Concepts for Broadly Needed M&S Tools
Major Technical Activities

- Develop project plan
- Develop list of M&S tools used by multiple organizations not under the same chain of command or contract
- Document and categorize management approaches for the tools identified
- Assess degree of success each identified tool management approach has had in avoiding certain problems
- Identify/develop best practices for managing broadly needed M&S tools
- Recommend actions DoD should take to improve its management of broadly-needed M&S tools
- Develop list of desirable characteristics of candidate tools to be used in pilot applications
- Quarterly progress reviews, presentation at NDIA Systems Engineering Conference (Oct 09), final report (Dec 09)

- Done
- Done – but still growing
- Done – but open to update
- Taxonomy proposed
- Preliminary success attributes
List of M&S Tools with Responses to Initial Survey (29 responses on 25 tools)

<table>
<thead>
<tr>
<th>Advanced Joint Effectiveness Model (AJEM)</th>
<th>Joint Theater Level Simulation (JTLS)</th>
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<tbody>
<tr>
<td>Advanced Testing Capability (ATC)</td>
<td>Model for Intratheater Deployment by Air/Sea (MIDAS)</td>
</tr>
<tr>
<td>Battle Command Management Service (BCMS)</td>
<td>Naval Simulation System (NSS)</td>
</tr>
<tr>
<td>Comprehensive Mine and Sensor Simulator (EADSIM)</td>
<td>One Semi-Automated Forces (OneSAF)</td>
</tr>
<tr>
<td>Hazard Prediction and Assessment Capability (HPAC)</td>
<td>ProtoCore</td>
</tr>
<tr>
<td>Intelligence Modeling and Simulation for Evaluation</td>
<td>Role Player Workstation</td>
</tr>
<tr>
<td>Joint Analysis System (JAS)</td>
<td>RunTime Infrastructure (RTI) - MATREX</td>
</tr>
<tr>
<td>Joint Conflict and Tactical Simulation (JCATS)</td>
<td>RTI NG Pro</td>
</tr>
<tr>
<td>Joint Communication Simulation System (JCSS)</td>
<td>Simulation Display (SIMDIS)</td>
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<tr>
<td>Joint Integrated Mission Model (JIMM)</td>
<td>SPIRITS</td>
</tr>
<tr>
<td>Joint Semi-Automated Forces (JSAF) (JFCOM version)</td>
<td>Suppressor</td>
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<tr>
<td></td>
<td>Synthetic Theater Operations Research Model (STORM)</td>
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<td>Threat Modeling and Analysis Program (TMAP)</td>
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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 – 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

- **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 – 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 – 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
# Preliminary M&S Tool Management Success Attributes (1 of 3)

The M&S Tool Manager …

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

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</tr>
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<tr>
<td>6. Has implemented a process to acquire and assess (using a peer / user review process) externally developed capabilities for inclusion into the baseline tool.</td>
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<td>X</td>
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<tr>
<td>7. Publishes a coding standards and style guide with which all externally developed capabilities are required to comply.</td>
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<td>X</td>
<td></td>
<td>X</td>
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<tr>
<td>8. Has developed and implemented a quality assurance process that rigorously evaluates each new baseline tool implementation before final product release.</td>
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<td>X</td>
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<tr>
<td>9. Receives and expends the funds necessary to conduct thorough regression tests on all new baseline releases to ensure past functionality has not been compromised.</td>
<td></td>
<td></td>
<td>X</td>
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## Preliminary M&S Tool Management Success Attributes (3 of 3)

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<tr>
<td>10. Receives and expends the funds necessary to conduct verification and validation tests on all new enhancements of the baseline tool.</td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>11. Updates the User's Guide and / or Technical Reference Manual with each baseline enhancement release, including constraints and limitations.</td>
<td></td>
<td>X</td>
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<td>X</td>
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<tr>
<td>12. 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&amp;S community.</td>
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<td></td>
<td>X</td>
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<tr>
<td>13. Provides customer support within 24 hours of receiving a request for assistance (i.e., a competent and adequately staffed Help Desk).</td>
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<td></td>
<td></td>
<td>X</td>
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Planned Next Steps

- Continue soliciting inputs on M&S tool management approaches and best practices
- Refine preliminary success attributes
- Develop preliminary list of recommended DoD actions to improve M&S tool management
- Share preliminary success attributes and recommended DoD actions with M&S tool manager survey participants, and others
- Write technical paper for 2009 Fall Simulation Interoperability Workshop (abstract accepted)
- If abstract accepted, prepare presentation for NDIA Systems Engineering Conference
How You Can 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 or using M&S tools and have insights on best practices in M&S tool management, please complete the broad survey at
  
  http://outersurveyor.outer.jhuapl.edu/ss/wsb.dll/s/6ge

  - Survey is similar to manager survey, but not tool-specific
    - See next slide for survey questions
Questions on the Broad 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.