Modeling and Simulation Capability Portfolio Review and Gap Analysis

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ABSTRACT

The Army Modeling & Simulation Office (AMSO) spearheaded the first ever Army Modeling and Simulation Capability Portfolio Review (M&S CPR) in 2015 to identify current M&S capabilities and gaps. This paper will describe the M&S CPR process and results, demonstrate how AMSO facilitates Army Enterprise M&S solutions for critical M&S needs; how the process enables communication and sharing between Army communities, Joint, and Industry partners; and provides long term prioritized planning for M&S needs to address Army strategic goals. The M&S CPR identified 394 M&S tools in active use and M&S enterprise gaps in the following areas: Chemical, Biological, Radiological, and Nuclear (CBRN); Cyber / Electronic Warfare (EW); Fires; Intelligence; Network; Resourcing; Sensors; Terrain; and Workforce. Each M&S gap area formed a working group to analyze and refine gaps, identify the communities impacted, and discover ways to close gaps to meet Army needs and mission requirements. In February 2016, the first annual Army M&S Gaps Forum brought together the working groups and stakeholders in Fort Belvoir, VA to discuss M&S gap resolutions. The resultant courses of action provided to the M&S Governance Forums included recommendations for policy updates, procedure changes, capability sharing, studies for new research and methodology development, and improvements to existing models and simulations. The processes and results documented in this paper will provide readers with: A method to assess capabilities distributed across multiple organizations, commands, and communities; Insights on Army M&S gaps, areas needing support from Joint Services, DOD, and Industry; The Army enterprise approach to M&S capability gaps and how to get involved.

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EXECUTIVE SUMMARY

The Army Modeling & Simulation Office (AMSO) spearheaded the first ever Army Modeling and Simulation Capability Portfolio Review (M&S CPR) in 2015 to identify current M&S capabilities and gaps. The CPR identified 92 common M&S gaps, grouped into nine categories or M&S gap areas: Cyber / Electronic Warfare (EW); Network Modeling; Fires; Chemical, Biological, Radiological, and Nuclear (CBRN); Intelligence Environment; Terrain; Sensors; Resourcing; and Workforce Training. Working groups were formed to analyze and refine the gaps, identify the Army Communities impacted (i.e. Acquisition, Analysis, Experimentation, Intelligence, Test and Evaluation, and Training), and gap closure recommendations. In February 2016, AMSO initiated the first annual Army M&S Gaps Forum to discuss common M&S enterprise gaps and methods to resolve gaps. The Forum resulted in the development of courses of action (COA) to address each gap and the Army M&S Governance Forums provided prioritization and endorsement. The COAs included policy updates; procedure changes; capability and knowledge sharing across communities; studies for new research and methodology development; and improvements to existing models and simulations. AMSO will host an annual M&S Gaps Forum to discuss strategies to mitigate M&S capability gaps and biennially conduct an Army-wide M&S capability assessment to affirm existing capabilities, monitor gap closure and identify new capability shortfalls. The Army communities have not joined in a process or forum like this in over a decade. The efforts and products of the M&S CPR and Forum will promote integration across different disciplines, reduce redundancies, and enable information sharing across Army M&S users, Joint Services, DOD, and Industry partners.

The processes and results documented in this paper will provide readers with the following information.

- A method to assess capabilities distributed across multiple organizations, commands, and communities.
- Insights on Army M&S gaps; areas needing support from Joint Services, DOD, and Industry.
- The Army enterprise approach to M&S capability gaps and how to get involved.

ARMY CAPABILITY PORTFOLIO REVIEW

The Secretary of the Army established the Capability Portfolio Review process in February 2010 under the direction of the Under Secretary of the Army and Vice Chief of Staff of the Army (VCSA) with Deputy Chief of Staff, G-3 (Operations and Plans) as lead. The Army CPR provides a comprehensive view that includes validating, modifying, or terminating Army programs using the following four objectives (Association of the United States Army, 2010):

1. Examine and modify investment/procurement portfolios.
2. Identify what requirements are influencing development and sustainment.
3. Validate requirements to current mission needs.
4. Confirm, modify or eliminate funding strategies based on validated requirements.

The CPR process focuses on strategy for each portfolio by prioritizing capabilities according to Defense strategies. CPRs provide a holistic review of operating force capabilities across Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF). The results affect input to Army planning, programming, budgeting, and execution (PBBE) development and provide a stronger defense of Army requirements. The CPR process remains an invaluable tool in arming Senior Leaders to make tough decisions.

Army M&S Special Topic CPR

Modeling and simulation is not a formal Army portfolio in context of the standard materiel based CPR. The Army designated M&S as a Special Topic CPR for FY 2015. During the 25 September 2014 Army M&S General Office Steering Committee (GOSC), the Chair (Assistant Deputy Chief of Staff, G-8) requested the Director, Capabilities Integration, Prioritization and Analysis (DAMO-CIA) Deputy Chief of Staff, G-3/5/7, and the Deputy Director, AMSO to jointly lead and conduct a FY 2015 Special Topic CPR on Army M&S. The method was to apply, with modifications, the established Army Requirements Oversight Council (AROC) CPR framework to Army M&S tools. This enabled an assessment of M&S portfolio requirements, capabilities, priorities, and strategy. The modified process had to address the objectives of a traditional CPR and adhere to the Army Regulation (AR) 5-11 (Management of Army Modeling and Simulation, 30 May 2014) guidance. AR 5-11 requires enterprise processes and mechanisms enabling: coordination and integration of common M&S tools and data; further interoperability of models and simulations; and Army coordination with appropriate M&S stakeholders external to the Army (i.e. DOD, Joint Services, academia, private organizations). The desired end-state was to examine the requirements that drive M&S capability development, acquisition and sustainment. The goal achieved by the M&S CPR was to provide visibility of modeling and simulation capabilities and gaps. Figure 1 illustrates an overarching view of the Army M&S Enterprise CPR participating organizations who contributed to achieve this goal.

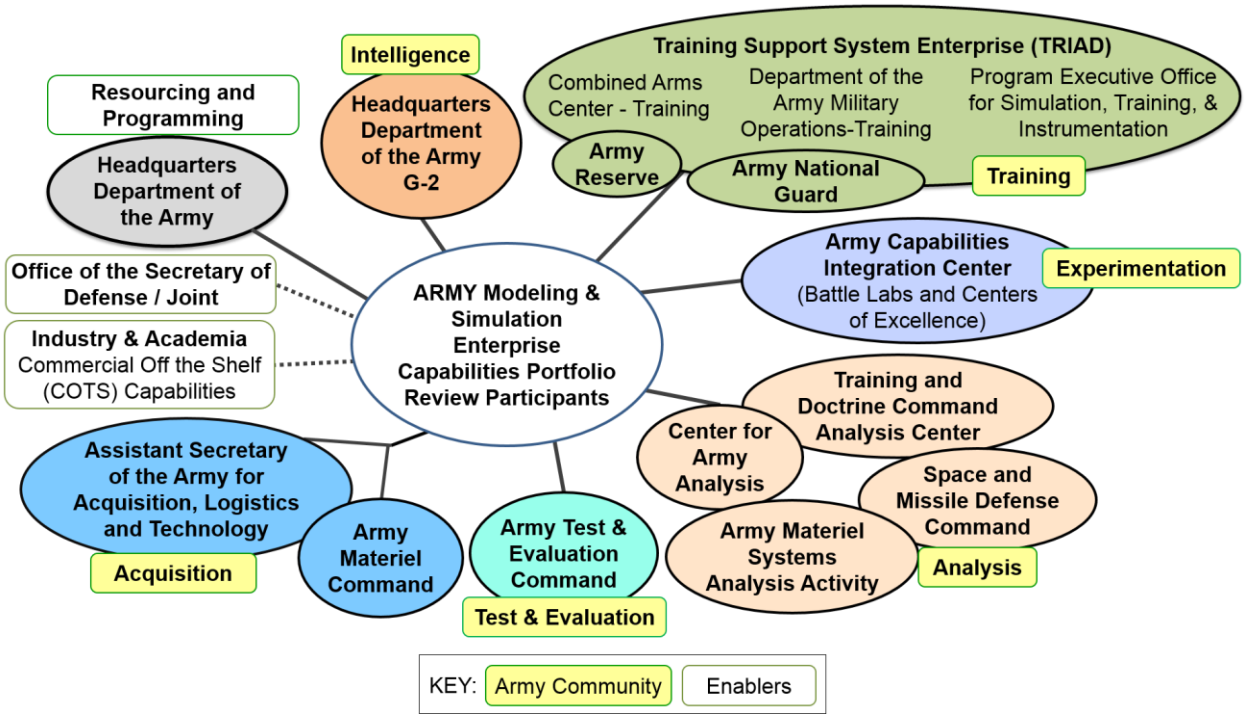

Figure 1. Army M&S Enterprise CPR Participants

M&S, as a portfolio, differs from typical materiel portfolios in a number of significant ways such as non-uniform methods of funding, varying requirement processes, no basis of issue plans, and it is not a formal portfolio. Some models and simulations are developed and maintained with funding from a variety of sources to meet requirements. Requirement processes vary from fully documented and approved (i.e. over 30 Programs of Record), to undocumented requirements funded by organizational resources. Some M&S capabilities even reside within other established portfolios. The scope of the M&S CPR was to consider the tools and capabilities of the six Army M&S-enabled communities: Acquisition, Analysis, Experimentation, Intelligence, Test and Evaluation, and Training. The M&S-enabled communities participated in the CPR efforts by submitting data and information on existing M&S tools, as well as known capability gaps and issues to AMSO. The Army M&S Vision is to provide flexible and adaptive modeling and simulation capabilities, enabling the United States Army to cost effectively organize, train, educate, equip, and employ current and future land forces as part of a joint force for the full range of operations (AR 5-11 Management of Army Modeling and Simulation, 30 May 2014). In preparation to conduct the M&S CPR, the M&S-

enabled communities defined their use of M&S in support of decision makers and Commanders. Figure 2 provides those definitions for each community.

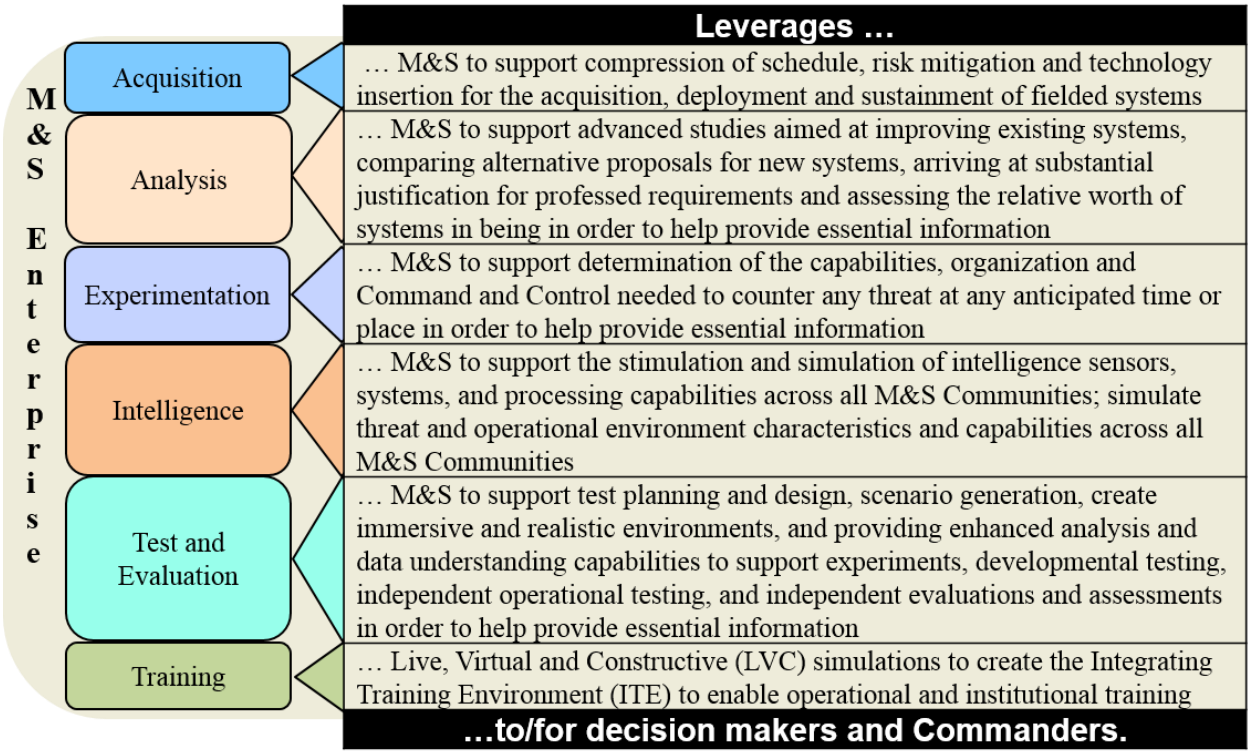

Figure 2. M&S Enterprise Community Descriptions

The guidance to conduct the M&S CPR required that each M&S-enabled community examined the requirements that drive capability development; acquisition and sustainment; and recommend development, approval, revalidation, modification, or termination of community capabilities within the portfolio. For each model or simulation evaluated, the responsible community had to consider how the capabilities met the intended roles, functions, and requirements. As part of the M&S CPR, each community also assessed the management and employment of capabilities.

M&S CPR Process

Given that the M&S CPR was a special topic, AMSO had to adapt the traditional Army CPR process to meet the significant differences between the M&S portfolio and other Army materiel focused portfolios, yet follow the established Development Cycle. The CPR Development Cycle consists of a Planning Phase, Preparation Phase, and Execution Phase, with assessments that occur throughout the cycle (U.S. Department of the Army, Capability Portfolio Review and Integration Division, July 2013). The following describes actions taken during each phase of the M&S CPR Process and Figure 3 provides a visual of the process.

Phase 1 - Planning

The planning phase focused on establishing the M&S CPR purpose and objectives, identifying portfolio issues, socializing the M&S CPR focus and timeline, and identifying calendar windows for key meetings. Key meetings included Community Action Officer Working Groups (CAOWGs), the Army M&S Councils of Colonels (CoCs), the M&S GOSCs, and a briefing to the VCSA. The Planning Phase of the M&S CPR ran from October 2014 to January 2015. AMSO and DAMO-CIA developed the approach and plan to execute the first ever Army M&S Special Topic CPR.

Phase 2 – Preparation

The M&S CPR Preparation Phase ran from February 2015 to June 2015 and consisted of completing critical tasks including defining the portfolio, refining portfolio issues, verifying the Community Action Officers, and gathering community input. Required Community input included: Community description, list of M&S tools (name, description, development requirement proponent, users, resource owner, types of requirements documents available and status, and Program of Record Memorandum (POM) resources), Community issues, gaps and priorities. The CPR participants reviewed the M&S Threat Assessment with G-2, gathered initial inputs from the community, and held weekly M&S CAOWGs. The Army M&S Governance Forums (CoC and GOSC) received initial CPR In Progress reviews and AMSO hosted three Integration Meetings with all M&S-enabled Army Communities participating to review final outputs. Preparation Phase outputs included:

- Portfolio DOTMLPF Assessment
- Prioritized Gaps
- Proposed areas to accept more or less risk
- Recommended Portfolio 1-N Priorities
- Operations and Maintenance
- Projected Costs
- Requirements Revalidation
- Divestiture Priorities
- Portfolio Issues
- Portfolio Resourcing
- System Specific Programmatics (where applicable)

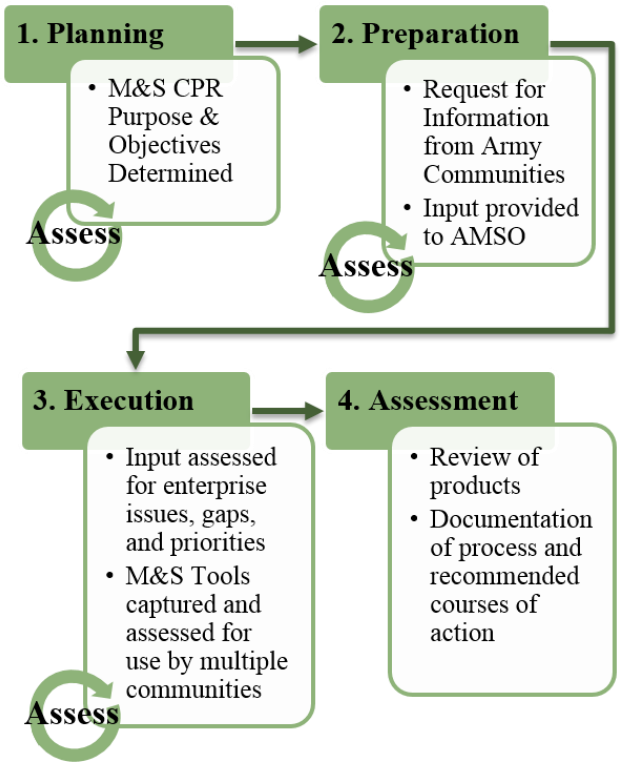

Figure 3. M&S CPR Process

Phase 3 - Execution

The M&S CPR conducted the Execution Phase from July 2015 to August 2015 providing an Army M&S enterprise review of information provided by each community during the Preparation Phase. AMSO, in coordination with the CAOWG, compiled information provided for M&S tools, issues, gaps and priorities. Analysis identify commonalities across communities, resulting in several areas recognized as deficient in M&S capabilities by multiple Army Communities. Analysis was also able to identify several M&S tools utilized by multiple communities indicating an increase in M&S reuse from past years. During the Execution Phase, AMSO and DAMO-CIA conducted status briefings to the M&S GOSC and governing bodies of the traditional CPR process (the CPR CoC and the CPR 3-Star GOSC). The phase concluded on August 4, 2015 with an M&S CPR Special Topic briefing to the VCSA. The VCSA brief covered the M&S CPR results and obtained gap prioritization guidance.

Phase 4 - Assessment

DAMO-CIA, in coordination with AMSO and the Community leads, conducted assessments throughout the process. AMSO was responsible for the M&S Enterprise and the Community Leads for their inter-community processes. The Assessment Phase included consolidation of community products, comments, recommended courses of action, and standard operating procedures.

M&S CPR SPECIAL TOPIC RESULTS

M&S Gaps

A significant outcome of the CPR was the identification of 92 common M&S gaps across the Enterprise, 85 of which were technical gaps (i.e. M&S tool shortfalls, representation and functionality gaps) and seven as non-technical

strategic gaps (i.e. policy, resources, governance). The gaps were grouped into nine categories or M&S gap areas: Cyber and Electronic Warfare (EW); Network Modeling; Fires; Chemical, Biological, Radiological, and Nuclear (CBRN); Intelligence Environment; Terrain; Sensors; Resourcing; and Workforce Training. In August of 2015 the VCSA was briefed on the M&S CPR findings and directed the prioritization of gaps, first by the Army Community, and then across communities. In the Fall of 2015, each community submitted their prioritization by gap area resulting in an Army Enterprise prioritized M&S CPR Gap list by functional category.

Prioritized Technical M&S Gaps Defined

1. **Network Modeling** - Army lacks an operational network simulation environment to support development, analysis, experimentation and testing of systems, and system of systems, for current and future network architectures.
2. **Cyber / EW** - Army needs doctrine for cyber - Need to develop M&S capabilities to replicate cyber and its impacts in various models and simulations, to include impacts on aggregation at higher levels.
3. **Sensors** - Need to update and develop M&S capabilities to show how new technologies and different environments affect the ability to detect, identify, and track various targets / systems.
4. **Intelligence Environment** - Need to update and develop M&S capabilities to represent Intel fusion, processing and distribution to provide accessible and authoritative data to the other communities in the area of terrain, social, environmental, cultural geography, and opposing force capabilities / capacities.
5. **Fires** - Need to develop M&S capabilities to show how new technologies (directed energy, precision munitions, ADA systems and counter defilade weapons) and non-traditional battlespace (urban terrain / subterranean structures) impact combat systems.
6. **Terrain** - Army is developing a future terrain representation concept that reduces cost and time and improves reuse and quality. There also continues to be a gap in M&S terrain knowledge and data sharing.
7. **CBRN** - Need to update and develop M&S capabilities to represent the environmental and operational effects of CBRN on the Army.

Prioritized Non-Technical Strategic M&S Gaps Defined

1. **Resourcing** - There is no Army portfolio or dedicated funding to support non-Program of Record Army M&S. This affects approximately 300 tools across the M&S Enterprise. Development and sustainment increasingly at-risk in the current budget environment.
2. **Workforce Training** - The M&S civilian workforce lacks critical skills to develop and employ M&S.

M&S Tool Assessment

The M&S CPR also identified 394 M&S tools in active use, including Joint Defense tools and Commercial-Off-the-Shelf (COTS) products. Figure 4 shows the distribution of capabilities across Army Communities, Joint Defense and COTS. From the tools identified, 175 tools are in use by multiple organizations across the Army enabling M&S re-use. This information is valuable to decision makers and M&S users both within the Army and with partners outside the Army. Therefore, AMSO is moving forward with a plan to leverage this information and the information collected annually via the AMSO Data Calls and future M&S CPRs, by making it available to the greater DOD Community via the DOD M&S Catalog. The DOD M&S Catalog is a capability hosted by the DOD Modeling and Simulation Office.

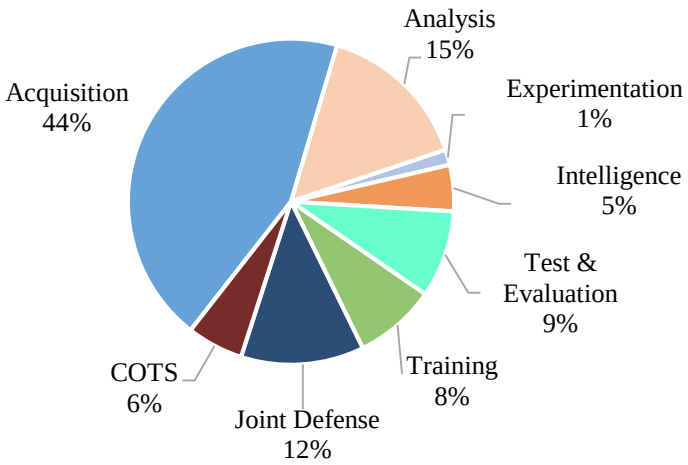

Figure 4. Army M&S Tools by Ownership

M&S Funding

Resourcing data collected from the M&S-enabled Communities' input to the M&S CPR demonstrated the diversity and complexity of the Army M&S Enterprise portfolio. M&S resources where found to exist almost exclusively within the Army Commands and Direct Reporting Organizations resulting in the M&S-enabled communities not having direct control or decision making over M&S resources. To assist the Communities in preparing the projected cost reports on M&S tools, AMSO made available the resource data collected during the M&S Portfolio Assessment data call for Army POM Fiscal years 2016-2020. The M&S data call for POM16-20 applied to all Army Commands and Program Executive Offices (PEOs). The authority for the data collection was the M&S Data Call Chapter in the Army Resource Formulation Guide (RFG). This data provided the Communities with details of where resources for the models and tools they employed in M&S existed. The collected M&S CPR resource data revealed that the reported tools existed within at least three Program Evaluation Groups (PEGs) and the resource distribution existed throughout at least four different Army resource appropriations.

ARMY M&S ENTERPRISE APPROACH TO GAPS

The VCSA directed AMSO to establish an Army M&S enterprise approach to address the gaps in a manner that will prevent redundancy and promote cross-communication. The process must have a mechanism for the Army's M&S governance to endorse development and/or acquisition of any new M&S capabilities and tools. To meet the VCSA directive, AMSO developed the Enterprise Approach to the M&S Gaps process shown in Figure 5. AMSO's enterprise approach is a cyclic annual process that capitalizes on current policy, governance and the CPR results in order to focus resources for enterprise-level M&S gap resolution. The process begins with the biennial CPR findings and the annual M&S Gaps Forum.

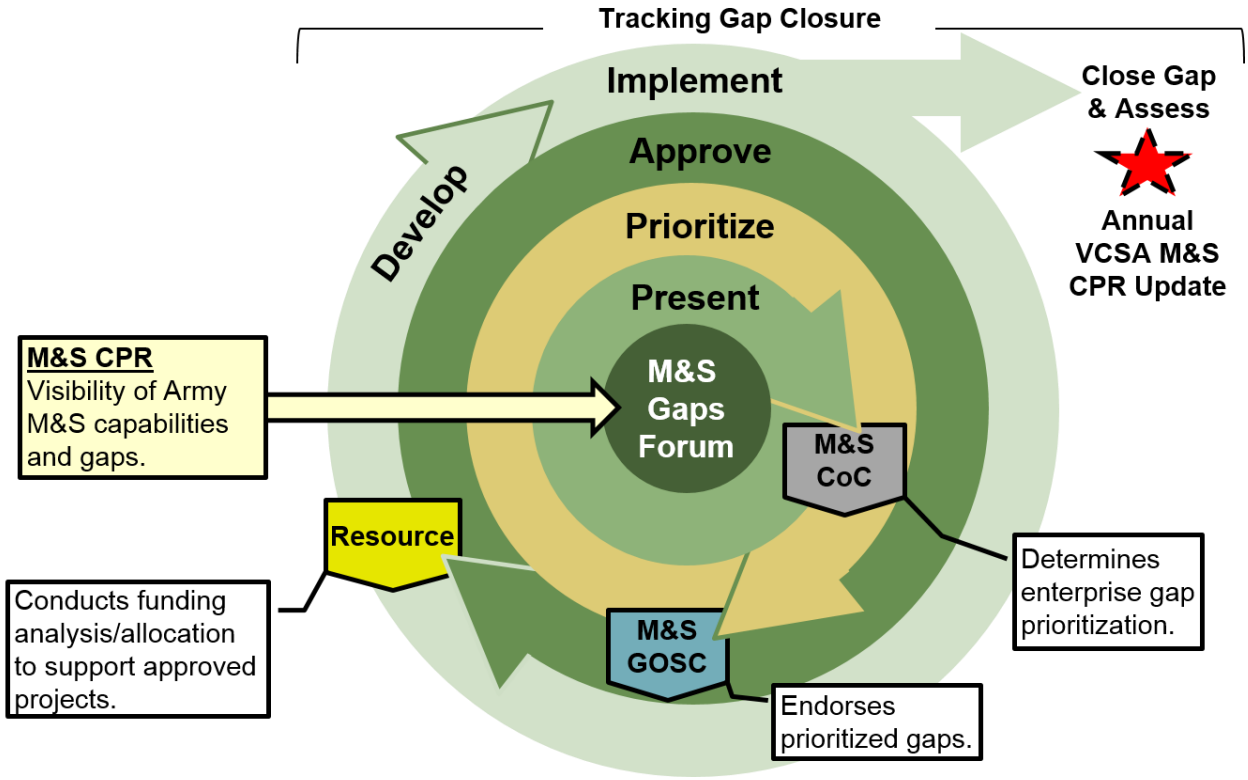

Figure 5. Enterprise Approach to M&S Gaps

ARMY M&S GAPS FORUM

The establishment of the annual Army M&S Gaps Forum allowed the Army Communities to collaboratively focus on near-term investments and cross-community solutions to M&S gaps. AMSO completed its inaugural Forum on 23 - 25 February 2016 in Ft. Belvoir, VA. The timing of the forum in February allows communities to work together as they build their budget plans for the next fiscal year, thus enabling a crowd-sourced resource model to solve common problems. During the forum, working groups conducted rigorous analysis of each gap and received informational briefings on what events and work have occurred. Small and large groups of experts gathered to discuss known and needed efforts to resolve the identified gaps. AMSO Deputy Director Colonel Joseph Nolan (2016) noted, "The Army M&S Forum is integral to the enterprise approach of capitalizing on current policy, governance, and the CPR results."

ARMY M&S GAPS FORUM RESULTS

Work completed during and after the Forum resulted in refined M&S Gaps with scope, impact, and recommended closure methods. Each gap area submitted their top five refined M&S gaps with recommended COAs to AMSO for enterprise M&S consolidation. The courses of action to solve identified M&S gaps include policy updates, procedure changes, capability sharing, studies for new research and methodology development, and improvements to existing models and simulations. AMSO is conducting additional analysis to identify quick action items to address with year-end funding and recommendations for Army studies. The following sections provide details on each gap working group and their top priority gaps.

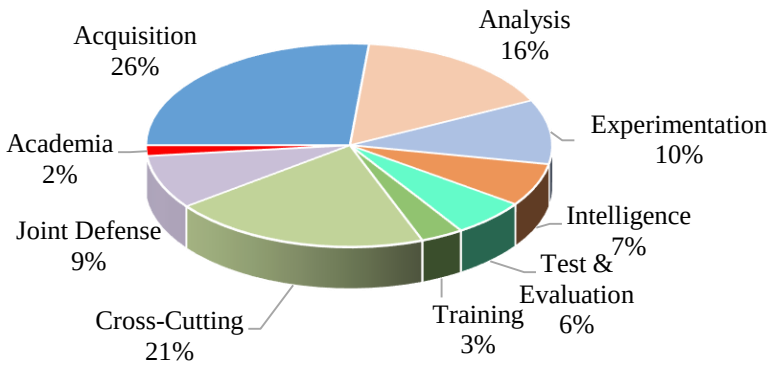

Figure 6. Army M&S Gaps Forum Attendees

Technical M&S Gaps Refined

Network

The Network gap working group leveraged the existing Network Analysis Group (NAG) with additional M&S stakeholders gathered during the Army M&S Gaps Forum. The group submitted five top priority M&S gaps:

1. Lack of a standardized network M&S framework to enable collective utilization of common high fidelity M&S network.
2. No common set of operationally relevant, authoritative scenarios for Army network modeling.
3. Lack of up-to-date tactical network traffic models which accurately represent applications, components and data flows.
4. Insufficient network model development and refresh to keep pace with rapidly evolving Army technologies to provide accurate and relevant network M&S.
5. Lack of resources and relevant data to initiate network model Verification and Validation (V&V).

Cyber / EW

The Cyber / EW gap working group leveraged several existing working groups, past analysis, and the M&S CPR findings during the Forum. It was determined the gap area should be expanded from Cyber / EW to cyber electromagnetic activities (CEMA) in order to cover all aspects identified in the gaps.

The resulting top five Cyber / EW gaps are:

1. Strategic and operational Cyber Mission Forces (CMF) lack an adequate ability to simulate a tactical environment as a part of training events.
2. Inability to realistically replicate the electromagnetic (congested) environment in Warfighter exercises.
3. Lack of a common and unified traffic modeling capability, generating operationally relevant traffic, to support integration of CEMA into analytical efforts.

4. Insufficient capability to simulate/emulate CEMA effects/actions and their operational impact at Corps and below, and to stimulate mission command information systems (MCIS) with CEMA actions/effects to enable situational understanding.
5. Lack sufficient capability to simulate/emulate CEMA effects and actions and the Strategic, Operational and Tactical Levels of war.

Intelligence Environment and Sensors

The Intelligence Environment and the Sensors working groups completed a stakeholder and gap analysis and determined there would be great benefit to combining efforts. The group's methodology and gaps are discussed in the paper titled "Azimuth Check: How Intelligence M&S Executes Gap Analysis" (Thomas, Hieb, 2016). The combined Intel & Sensors working group submitted the following top five gaps:

1. Insufficient modeling of the representation of "patterns of life" to demonstrate ongoing activity levels and the ability to interrupt these patterns as a function of information operations or physical events leading to different activity patterns (second and third order effects/events). Inconsistent Signals / Communications network Modeling and associated signatures, signature effects and data associated with patterns of life behaviors. Insufficient signal emission and propagation effects with terrain, operational environment and interactions amongst other federates accounting for the signal environment.
2. Insufficient knowledge, data, algorithms to model dynamic tasking and re-tasking of platform/sensor packages.
3. Insufficient modeling of the representation of the political, economic and social conditions within the area of operations / area of interest, and their effects on combatants and noncombatants.
4. The Army lacks an authoritative database of blue Intelligence, Surveillance and Reconnaissance (ISR) aerial and terrestrial layer platform and sensors characteristic and performance data.
5. The Army lacks an authoritative, simulation-ready, "other-than-blue" order of battle (OOB) database.

Fires

Spearheaded by the U.S. Army Test and Evaluation Command (ATEC) Operational Test Command (OTC), the Fires working group identified four top priority gaps:

1. Insufficient algorithms to represent recent and emerging capabilities and systems (i.e. rules of engagement in counterinsurgency (COIN), building destruction and resulting rubble, cumulative damage from multiple hits, and collateral damage effects).
2. Insufficient representation of lethal and non-lethal fires, integration with Joint Interagency Intergovernmental Multinational (JIIM) capabilities (including coalition partners), and lack of the ability to use Directed Energy Weapons models to provide consistent associated behaviors across communities.
3. There is a lack of Army policies and processes to address sharing of knowledge, methods, data, technical standards, and capabilities.
4. Non-realistic live and synthetic environments supporting tactical engagement simulation.

Terrain

To address the terrain gaps, AMSO and the Army Geospatial Command (AGC) formed the Army Modeling & Simulation Terrain Working Group (AMSTWG). This working group used the M&S CPR gaps and incorporated past terrain data call gaps in the analysis. The following are the top five prioritized gaps submitted by the AMSTWG:

1. Lack Geospatial Information Services (GIS) data to characterize operationally relevant scenario locations.
2. Need for improved GIS data that more accurately and rapidly supports the Army mission areas.
3. Lack of a centrally funded, single source for Army global geospatial M&S data (including infrastructure and subterranean).
4. Smaller data producers do not have a process to contribute their data into the GIS enterprise.
5. Insufficient GIS data reuse as a result of M&S data producers often working disconnected from the Army Geospatial Enterprise (AGE) and the M&S Enterprise.

CBRN

The CBRN working group was able to move out on identified gaps and are already working to close identified gaps. Addressed gaps include having capabilities added to One Semi-Automated Force (OneSAF) to include effects on personnel, threat representation, personnel protection, medical countermeasures, threat detection, and immediate decontamination procedures. Additionally, modeled CBRN federated effects are underway by the Maneuver Support Center of Excellence to include CBRN dispersion and environmental effects, sensing of federated CBRN hazards,

marking of hazards, and effects on platforms and life forms. The CBRN gaps working group is continuing to analyze additional gaps including smoke modeling and effects on infantry and aviation operations.

Non-Technical Strategic M&S Gaps Refined

AMSO is the lead on the non-technical strategic gaps of Resourcing and Workforce Training. To address the Resourcing gaps, AMSO is moving forward with the Enterprise Approach to Gaps as shown in Figure 5. This process will place M&S gaps before the M&S Governance Forums for prioritization and consideration for future funding. This methodology will help address how M&S funding is dispersed and will lead to community funding of efforts. AMSO is also developing additional M&S courseware using online distance learning to provide M&S users with training opportunities. Additionally, the M&S-enabled Army Communities, through AMSO and the M&S CPR efforts, will expand communication efforts to reach M&S users outside of the Army Functional Area (FA) 57 and civilian Career Path (CP) 36. This would enable users who are not in a typical M&S position (FA57 or CP36) to have access to M&S training in support of their duties.

LESSONS LEARNED

The following lessons learned captured and documented in this paper will demonstrate how the M&S CPR process, the Army M&S Gaps Forum, and the Enterprise Approach to M&S Gaps has been enlightening to the Army and M&S stakeholders. The first lesson captured was that the traditional CPR process does not fit how the Army manages, develops and applies M&S. Several modifications were required to shape the process for a non-portfolio set of capabilities. The distribution of M&S across Army communities inhibits communications and reuse. The CPR and Forum enabled the building of communication networks and resulted in experts sharing knowledge, tools, and capabilities.

The Forum also showed value by facilitating discussions of how each Community uses M&S and its' application outside the Army. Initial gaps identified by the M&S CPR process where refined and sometimes expanded to show how the same gap may be applied to several Communities, but differing in details such as fidelity. This provided the catalyst to begin documentation of Army Enterprise M&S gaps, which is important for Army M&S since it is not a traditional portfolio and there is no standard method of requirements validation and funding. By capturing M&S Enterprise gaps affecting multiple Communities, the Army has been able to verify, validate, and prioritize cross-community M&S gaps in need of future funding and capability development.

Gap closure efforts are also leading to additional lessons learned. Similar to how the traditional CPR process did not fit the needs of the Army M&S portfolio, the Joint Capabilities Integration and Development System (JCIDS) process, used for the acquisition of Army programs, does not fit the development and continual updating of M&S Tool needs. The design of the JCIDS process is linear and sequential resulting in the development and deployment of a system, followed by a sustainment process. M&S is more cyclical with the initial development followed by regular reoccurring updates of software and capabilities as requirements and needs continue to evolve. Industry has demonstrated this cyclical process with tools such as Microsoft Word, which continues to provide updates with additional capabilities based on user requirements. The lengthy capability delivery of the JCIDS process provides difficulties for M&S to keep pace with the need for high fidelity representations of the current operational environment.

AMSO and the gap working groups will continue to capture lessons as the M&S CPR and gap closure processes proceed. This is the first documentation of Army Enterprise M&S gaps and the process used to assess M&S capabilities. Future Forums and capability assessments will continue to refine and hone the process, enabling a better understanding of Army Enterprise M&S requirements and changing needs.

PATH FORWARD

Following the Enterprise Approach to M&S Gaps shown in Figure 5, annually the M&S Governance Forums starting with the M&S CoC receive the top prioritized gaps from each area. The M&S CoC, as an iterative process, will review submitted gaps with proposed courses of action and determine enterprise gap prioritization based on the cross-community needs and Army mission. The M&S GOSC endorses the prioritized enterprise gaps with courses of action. Finally, AMSO will use the endorsed list to seek funding opportunities for prioritized efforts and facilitate policy and procedure course of action updates. The M&S CPR and associated products will be an enduring process allowing

Army communities to track gap closures and capture new M&S gaps as mission and needs change. The AMSO anticipates the next M&S CPR to occur in fiscal year 2018 and the next M&S Gaps Forum will occur annually in February.

BENEFITS AND REUSE

The processes and results documented in this paper will provide readers with the following information.

- A method to assess capabilities distributed across multiple organizations, commands, and communities.
- Insights on Army M&S gaps; areas needing support from Joint Services, DOD, and Industry.
- The Army enterprise approach to M&S capability gaps and how to get involved.

The M&S Special Topic CPR was able to leverage the Army CPR process to review a capability that does not have a defined portfolio. Other organizations and departments can leverage this methodology to complete a deep-dive review of capabilities that may not be well structured. The M&S Special Topic CPR facilitated a discussion on modeling, simulation, and stimulation usage throughout the Army, and identified where there are insufficient capabilities.

It is notable to mention that several M&S gaps have identified that the primary issue is a lack of knowledge. This includes the need for studies to determine what to model, and identify second and third order effects. It also includes the need to reach out to the DOD Community at large and Industry Partners to determine what knowledge they can share based on their experiences, data, and M&S. Through the knowledge gathering and sharing, the Army M&S-enabled community will continue to coalesce and further engage Joint Services, DOD, and Industry. This will enable further identification of existing tools, data, and processes; supporting reuse and reduction in costs.

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