

Articles:

- *** HLA implementation, evolution continue ***
 - *** Significant progress achieved in RTI software development ***
 - *** MSOSA remains first place to look for M&S advice ***
 - *** DMSO joins OMG, seeks industry involvement in developing distributed simulation standards ***
 - *** ST Conference - Senior Technologists briefed on M&S ***
 - *** Modeling and Simulation Executive Agents (MSEAs) ***
 - * Air and Space Natural Environment (ASNE) *
 - * Ocean Executive Agent (OEA) *
 - * Terrain Modeling Project Office (TMPO) *
 - * MSEA for Intelligence completes initial version of Defense Intel Mission Area Model
 - * MSEA POC Information
 - *** M&S user communication requirements sought for near future, post-2000 period ***
 - *** DMSO Industry Days, May 22-23 ***
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*** HLA implementation, evolution continue ***

Progress continues in the implementation and evolution of the DoD High Level Architecture (HLA). While the HLA baseline and supporting documentation are evolving through the Architecture Management Group (AMG) process, development and release of supporting software, such as the HLA Runtime Infrastructure (RTI) and Object Model Development Tools, continue. In addition, as the DoD implements the HLA as its technical architecture for simulations, the HLA Transition Team is working to investigate related issues.

Version 1.1 of the HLA Baseline definition was approved unanimously by the AMG on Feb. 12. While most changes to the specifications were textual in nature for internal consistency and clarity, language-specific Application Program Interfaces (APIs) were added to the HLA Interface Specification, and a "notes" feature was added to the HLA Object Model Template. An evolution process involving six-month review cycles has been defined to facilitate future changes to the HLA. Issues have been identified and are under investigation for the August checkpoint. In addition, progress has been made in the definition of HLA supporting documentation. This includes the definition of an HLA Security Architecture, as well as a design document for HLA Data Distribution Management services.

Significant progress has been made in the development and release of HLA supporting software. This includes the release of RTI version F.0, development and plans for RTI 1.0 and 1.1, the award of design contracts for RTI 2.0, and plans for broad DoD release of the HLA Object Model Development Tools. For a more detailed discussion of these developments, see the related RTI article in this issue. To aid DoD simulation programs as they transition to the HLA, the DMSO has teamed with the Services and Joint Staff to support that transition. This team, composed of representatives from the Service and Joint Staff Modeling and Simulation Management Offices who have been tasked to identify and classify candidate simulations for HLA transition, resolve programmatic and policy decisions within their organizations, and develop a formal process for HLA transition. Currently, team members are working with the DMSO to

support broad availability of HLA information and to develop the process of reviewing simulations and planning for HLA framework in their organizations.

*** Significant progress achieved in RTI software development ***

In recent months, the DMSO has made significant progress in the development of High Level Architecture support software. This includes the release of Runtime Infrastructure version F.0 (RTI F.0), development and plans for RTI 1.0 and 1.1, the award of design contracts for RTI 2.0, and plans for broad DoD release of the HLA Object Model Development Tools. HLA support software is being developed by the DMSO in an effort to make HLA implementation and transition efficient, simple, and inexpensive by making infrastructure software and automated tools available to the modeling and simulation (M&S) community as government furnished equipment.

RTI F.0 was released to the DoD M&S community on Dec. 16, 1996. Subsequently, RTI F.0 has been ported to Silicon Graphics and IBM platforms. Efforts are currently underway to port RTI F.0 to Windows NT and HP platforms, as well as support for other languages and systems. This includes work to develop Ada bindings, Ada '95 and Java Application Program Interfaces (APIs), and a Common Object Request Broker Architecture (CORBA) Cap in which the RTI can be referenced as a CORBA object. The exact release dates for these products are available on the DMSO homepage (<http://www.dmsomil.wrkgtps/amg/#AMG17>); all RTI F.0-related products will be released between March 7 and May 15.

RTI 1.0 is currently under development by the MITRE Corporation in Reston, VA, and will support all of the services specified in the HLA Interface Specification version 1.1, except Data Distribution Management. The release date for RTI 1.0 is May 15. RTI 1.1, scheduled for release in late summer, is being developed jointly by the MITRE Corporation and MIT/Lincoln Labs in Boston, MA. RTI 1.1 will support all services specified in the HLA Interface Specification v1.1. The Data Distribution Management services will reflect experience gained in the STOW '97 experiments. Finally, design contracts for RTI 2.0 have been awarded to two teams: LADS in Burlington, MA, and SAIC in Arlington, VA. RTI 2.0 design proposals are due to the DMSO in June. The decision on development will follow review of the proposals.

Along with the development of RTI software, the DMSO is also sponsoring prototype development of additional automated HLA support tools. The most mature of these, the HLA Object Model Development Tools, has already been released to the Architecture Management Group (AMG) community for alpha testing. Plans are currently underway to more broadly distribute these tools as beta test software, with beta release tentatively set for late spring. These and other HLA tools are described in the paper, "HLA Tool Architecture" (SIW paper number), which outlines the DMSO strategy for encouraging the development of a broad set of interoperable tools by government and industry supported by open data interchange formats.

*** MSOSA remains first place to look for M&S advice ***

The Modeling and Simulation Operational Support Activity (MSOSA) continues to function as the first place to look for modeling and simulation (M&S) advice, assistance and information. On Dec. 9, 1996 the Executive Council for M&S (EXCIMS) revalidated the MSOSA mission "To assist Department of Defense activities in meeting their M&S needs by providing operational advice and

facilitating access to M&S information and assets" and approved its continued operation through at least 1997. The EXCIMS also directed the MSOSA to broaden its scope of operations from its previous focus on the training domain to supporting the entire M&S community. Since its activation in December 1995, the MSOSA has responded to over 900 requests for assistance and has developed a list of contacts that includes over 500 activities and over 1600 personnel. MSOSA continues to develop its homepage on the World Wide Web as a means of communicating and providing information resources to the M&S community. Recent developments include interactive tools such as a worldwide M&S events/exercise calendar that includes information on key M&S activities. Another new development is a news bulletin board that provides an opportunity for members of the M&S community to announce upcoming events. The MSOSA has begun to expand its information support function by adding staff that will specifically respond to queries regarding the DoD High Level Architecture. Later this spring the MSOSA will add additional staff to provide technical and management support for the Modeling and Simulation Resource Repository (MSRR) as it reaches Initial Operational Capability (IOC) on May 30. The MSOSA will function as the MSRR registrar and help desk. Discussions are ongoing to institute a classified MSOSA cell at the Defense Intelligence Agency (DIA). For the time being the Defense Modeling, Simulation and Tactical Technology Information Analysis Center (DMSTTIAC) will continue to provide scientific and technical analysis support to the M&S community as an independent activity. MSOSA services are available through the Help Desk at (703) 998-1623/1624, or toll free in CONUS at (800) 510-6399. Send e-mail requests and queries to msosahelps@msosa.mil.inter.net. MSOSA also operates a World Wide Web site at <http://msosa.mil.inter.net>. There you will find additional information support services, including a world-wide M&S exercise and events calendar. The DMSTTIAC can be reached through its web site at <http://dmsttiac.hq.iitri.com/>.

*** DMSO joins OMG, seeks industry involvement
in developing distributed simulation standards ***

In an effort to increase industry awareness and involvement with the High Level Architecture (HLA), the Defense Modeling and Simulation Office (DMSO) has joined the Object Management Group (OMG) as a contributing member and led the formation of a Special Interest Group (SIG) on Distributed Simulation. At the January meeting of the OMG, a working group met on distributed simulation and demonstrated enough broad interest in the topic to justify creation of a SIG within the OMG. A highlight of the working group meeting was an address by DMSO Director CAPT James Hollenbach on the DMSO's mission and desire for industry involvement in distributed simulation standards. The OMG voted without dissent to charter the SIG, thereby giving it official standing within the OMG. As a new contributing member of the OMG DMSO will thus have a vote in all OMG forums. The SIG will work in several directions. It will try to understand the range of applications for distributed simulation. It will seek to influence existing and emerging standards to facilitate building distributed simulation infrastructure and toolkits. The SIG will also seek to encourage Common Object Request Broker Architecture (CORBA) vendors to supply implementations of the services most needed in our community. It will also seek the adoption of the Runtime Infrastructure (RTI) interface, or a broadly appropriate version of it, as an OMG standard. The SIG needs workers who can help others understand technology and applications and can represent the concerns of the simulation community to the rest of the OMG. OMG members are organizations, but OMG meetings are open to individuals. In order to track or contribute to the work of the OMG Distributed Simulation SIG, subscribe to the simsig mailing list at request@omg.org. OMG Meetings, which occur about every

eight weeks, are announced on the OMG web site at www.omg.org. As an organization, the DMSO will be represented by Dr. Frederick Kuhl. He will bring substantial issues that will affect the HLA community to the DMSO-sponsored Architecture Management Group (AMG) for consideration as they arise. The OMG is a not-for-profit consortium of major software vendors, software users, government, and academia, whose goal is to create standards for distributed object technology. OMG standards are meant to be commercially useful. They are derived as quickly as possible and are backed by implementations from member organizations. The OMG's keystone standard is the CORBA. It produces no software itself and has a small staff. The OMG was chartered in the U.S. in 1989 and now has representation from around the world.

*** ST Conference
Senior Technologists briefed on M&S ***

The annual Director Defense Research and Engineering (DDR&E)-sponsored DoD Senior Technologists Conference was held Feb. 11-12 at the ANA Hotel in Washington, DC. The theme of this year's conference was modeling and simulation (M&S). The audience was composed of senior technical leaders from the DoD and Service Laboratories. The DDR&E, Dr. Anita Jones, presented the keynote address which focused on the convergence of the training and acquisition communities with the scientific and engineering communities through M&S. Using the now familiar analogy of city planning, Dr. Jones discussed the importance of having a common technical framework to enable interoperability and reuse of models, simulations, data, and databases, particularly environmental representations. Dr. Jones tied the need for high performance computers to the increased capabilities of M&S. Increases in computing power will allow increased fidelity in all areas of M&S: e.g., exercises and simulations, physics and dynamics, materials, test and evaluation, and physical environments. Mr. George Singley, the Deputy DDR&E, gave an overview of the continued importance of the DoD research and development program. He also discussed the current and future Department budgets for basic and applied research in DoD. CAPT James Hollenbach, DMSO Director, presented an overview of DoD's M&S program. The DMSO's Chief Scientist, Dr. Judith Dahmann, discussed the DoD High Level Architecture (HLA) and support tools. Additional briefings on the DoD M&S Common Technical Framework (CTF) covered the Conceptual Models of the Mission Space (CMMS) concepts and tools; an application of the CMMS to the Joint Warfare System development; M&S Executive Agents for Environmental Representations plans and programs; the M&S Resource Repository (MSRR) and DoD M&S Information Resources. The DMSO sponsored five demonstrations of the CTF and supporting services as the last agenda item of the day. Demonstrations of the HLA, CMMS, MSRR, SEDRIS, and the M&S Operational Support Activity were open and available to the attendees during the evening. Both the presentations and the demonstrations were well received. Questions and in-depth discussions during the briefings and demonstrations clearly indicated the interest from the laboratory community in the interoperability and reuse of M&S components. The briefings mentioned above are available on the DMSO web site at www.dmsomil.com. The second day of the conference was dedicated to high performance computing (HPC). HPC information is available from Mr. Bill Jenkins, DDR&E (LM&TT), at (703) 693- 0456.

*** Modeling and Simulation Executive Agents (MSEAs) ***

The three DoD environmental Modeling and Simulation Executive Agents (MSEAs) have established the following five major program elements to organize their efforts, promote cooperation and ensure complete coverage of the natural environment: requirements and capabilities analysis, standards, just-in-time production, dynamic representation and access to resources.

Each of the environmental MSEAs have highlighted their work in the five program element areas in the following articles.

* Air and Space Natural Environment (ASNE) *

A key project in the requirements and capabilities area continues to be the baseline requirements assessment. It accurately captures the ASNE needs of major Joint simulation programs such as the Joint Warfare System (JWARS) and Joint Simulation System (JSIMS). This effort continues as a technical requirements analysis in which the atmospheric and space parameters most critical to modeling and simulation (M&S) will be determined.

In the standards area the Synthetic Environment Data Representation and Interchange Specification (SEDRIS) supports the unambiguous and complete exchange of environmental source data and value-added databases. The SEDRIS data representation model is being reviewed to ensure it adequately handles ASNE data. Verification and validation (V&V) guidelines will cover both the verification and validation and accreditation (VV&A) of models and the verification and validation and certification (VV&C) of data. In developing these guidelines, existing DoD instructions and Service instructions are being carefully reviewed. Recommended guidelines for the ASNE domain will be available by the end of FY97.

A Joint Meteorology and Oceanographic (METOC) Data Administration Committee is developing a data dictionary for the DoD METOC community as part of the DoD Data Dictionary System. The Joint METOC Conceptual Data Model (JMCDM) will be heavily leveraged in developing an M&S taxonomy for the ASNE and will be mapped to other related taxonomies, enumeration lists, or data models.

The major undertaking in just-in-time production is in the area of high resolution gridded climatology. This project will provide the capability to generate on demand estimates of hourly three dimensional (3-D) climate statistics at high spatial resolution (10 km). This data will be exceptionally useful in the many regions of the world where weather information is sparse. Simulations that have mission rehearsal and mission planning, as well as engineering, applications will greatly benefit from this technology. Demonstrations of initial capability for theater-sized regions will take place in Korea and the Middle East.

Dynamic representation work continues with the Air Force Phillips Laboratory (PL), Geophysics Directorate (GP), on a project called Space Environmental Effects on Systems. This effort models the effects of the space environment on space-based systems to diagnose and predict system degradation. Application tools and links to the space environment models in the GEOSpace software platform will be developed for evaluating system and detector degradation as modeled with the PL Satellite Simulation Toolkit for determination of ionospheric effects on communication links. This project is scheduled for completion in FY98.

There are two goals for the access to resources program:

- provide customers with source locations to obtain the data and algorithms,

and

- provide customers with tools to effectively and efficiently search for, analyze, visualize, and acquire data.

Availability of ASNE data in FY97 through the Master Environmental Library (MEL) will provide M&S developers with proof-of-concept data sets for M&S prototype development. Significant progress is being made in the development of a tool catalog that will become part of the environmental extension to the MSRR. The catalog is a database containing metadata about models and algorithms for use in specifying air and space conditions and effects.

* Ocean Executive Agent (OEA) *

OEA is now in its second year of existence. The first year efforts have shown significant improvement in assessing M&S community oceanographic data needs. The OEA is a primary player in the JSIMS Maritime group. A requirements and capabilities database will soon be releasable to DoD M&S users via a web-based application that will incorporate efforts of the standards area. Phase I of this project is a taxonomy/enumeration/data dictionary mapping effort. Both the requirements analysis and standards programs are working to develop Conceptual Models of the Mission Space (CMMS) for the ocean domain. A V&V help application will also be made available on the web. This will provide the M&S community with the guidelines necessary to ensure that their ocean data/model can be certified or accredited by the appropriate authority.

The rapid-generation-of-littoral-environments project combines existing numerical models with state-of-the-art assimilation/fusion methods in a test bed for evaluation to description of capabilities, which can rapidly generate consistent littoral representations for any coastal region. A Joint distributed surf zone environmental system will develop a standard methodology for understanding and managing the effects of interconnecting simulations using oceanographic surf zone models of differing resolutions while interfacing with associated terrain and atmospheric effects.

MEL is sponsored by all three MSEAs with an OEA management lead. The near-term emphasis is on developing a very robust architectural implementation with tools for data manipulation, visualization, distributed computing, and product generation. An expanding customer base includes Joint operational users who require access to distributed sources of geospatial data and continued coordination and collaboration with other national and international library systems.

* Terrain Modeling Project Office (TMPO) *

The TMPO has realigned its project efforts to follow the MSEA Joint strategy. The main effort in requirements and capabilities analysis is to accurately determine and document the terrain environmental requirements of the DoD and Joint M&S communities. Technical capabilities of the terrain data provider and developer community are being assessed with regard to M&S user requirements. Requirements for which no capability solution is found are categorized as capability shortfalls. R&D initiatives will then be established to address these shortfalls.

Within standards, the interchange specification effort is the largest and most visible project. The synthetic environment consists of an integrated representation of terrain, ocean, and atmosphere data among M&S applications. SEDRIS goals are to develop an interchange mechanism with application across

the M&S community that facilitates broad reuse of synthetic environments and supports interoperability of heterogeneous simulation systems. Just-in-time production has focused on integrated Triangulated Irregular Network (TIN) process development and automated feature extraction. The objective is to define an efficient representation and rapid construction process. In FY97, further research will be conducted to advance integrated multi-resolution TIN generation capability. Cartographic feature manipulation and semi-automated feature extraction tool development will continue to improve production timeline and database quality.

Dynamic representation is being addressed by the Dynamic Agents/Mobile Objects (DYNAMO) project. DYNAMO is an object-oriented, dynamic-terrain repository tool. In FY97 DYNAMO will be enhanced to include production data sets and demonstrate capabilities in simulation exercises. This effort will focus on high fidelity physics modeling of the Military Operations in Urban Terrain training facility at Fort Benning, Ga. It will develop template terrain objects and enhanced visualization, including non-visual analytical data. A web-accessible demonstration capability will be made available.

The lead effort under access to resources is the MEL. In FY96 three terrain regional sites were established. They provide access to samples of multiple terrain data resources. In FY97 National Imagery and Mapping Agency (NIMA)-restricted data will be made more readily available via the use of classified networks to provide access. Work will also be started in FY97 and continue in FY98 to connect the MEL to the NIMA US Imagery and Geospatial System..

* MSEA for Intelligence completes initial version of Defense Intel Mission Area Model *

The Defense Intelligence Agency (DIA), the DoD Modeling and Simulation Executive Agent (MSEA) for Intelligence, recently completed the initial version of the Defense Intelligence Mission Area Model (DIMAM), a Conceptual Model of the Mission Space (CMMS) of the end-to-end US intelligence process.

The purpose of the DIMAM is to provide an authoritative representation for modeling and simulation (M&S) developers who require representation of the US intelligence process for use in training and analysis simulations. The first iteration of the DIMAM covers the entire US intelligence cycle, decomposing each phase of the intelligence cycle into essential entities, actions, tasks, and interactions, and mapping processes to be accomplished in each phase. This first version of the DIMAM is doctrine based, drawn from approved joint publications and reviewed and coordinated through a working group of Military Intelligence Board representatives. The DIMAM project is three phased:

- The first phase develops a prototype conceptual model of a portion of the military intelligence mission area allowing the DIA to develop a better understanding of the technical difficulties of modeling the US intelligence process.

- The second phase will develop conceptual models of those portions of the intelligence mission area designated by the DIA-Chaired DIMAM Working Group to the level of completeness and detail necessary to support the Joint Simulation System (JSIMS), Joint Warfare System (JWARS), Joint Modeling and Simulation System (J-MASS) and other joint M&S efforts. Most of the entire military intelligence mission area will be modeled in this phase.

- The third phase will establish a sustainment program to maintain the DIMAM for the intelligence and M&S communities.

* For additional information contact MSEAs at... *

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*** M&S user communication requirements sought for near future, post-2000 period ***

The DMSO is working with the Defense Advanced Research Projects Agency (DARPA)/Defense Information Systems Agency (DISA) Joint Program Office (JPO) to establish modeling and simulation (M&S) user communications requirements, both for the near future and the post-2000 period.

A survey was sent recently to M&S planners and operators to assist in codifying how the M&S community uses distributed simulations: locations, simulations used, frequency and duration of use, need for security, C4I connections, protocol support, requirements for external communications help. This information will be used to construct major usage categories from which communications requirements can be derived.

User requirements have not been gathered prior to this time. Why is this being done now? First, major changes are being planned for the Defense Simulation Internet (DSI), the network service used by many M&S groups. DISA is planning to assume operational control of the DSI in FY98 and intends to make major upgrades to the network. These upgrades will include replacing existing site routers with recent technology that supports multicast and the RSVP bandwidth reservation protocols. Sites will be interconnected through the NIPRNET 45mbps Asynchronous Transfer Method (ATM) backbone. Perhaps more importantly, DSI operations will be transferred from the JPO to DISA as a fee-for-service network. Present DSI subscribers are considering whether their requirements and budgets will match the services and fees being described by DISA. Second, DISA is launching a variety of services under the rubric of the Defense Integrated Services Network (DISN). These include commercial-grade, high-rate data transfer under the Defense Research and Engineering Intersite Services Contract (DISC) and voice, video teleconference and data services offered under the DISN-CONUS contract. Portions of the M&S community may find that these services will satisfy their performance and cost criteria.

Third, the adoption of the DoD High-Level Architecture for M&S will affect the network usage patterns and service levels required by M&S users, and will mean that the M&S Resource Repository's nodes will be part of the network. For example, the need to obtain objects with which to build, test and execute a Federation will require a flexible, on-demand data transfer service which interconnects both Federates and the objects they require at the appropriate security level. Another example is the compressed time planned for the cycle to obtain, build and use environmental data to support M&S in its mission-rehearsal roles. A further example is the Runtime Infrastructure (RTI) and its as-yet unknown influences on the characteristics of data presented to a network. Last, development and implementation of Joint simulations such as the Joint Simulation System (JSIMS), Joint Warfare System (JWARS) and their components, as well as the Joint Modeling and Simulation System (JMASS) are at

the stage where the concepts for their routine use are still being defined.

All of these influences require that processes be established to continually gather, review and validate user communications requirements and adjust the services to be offered as necessary. The recent survey was an first step in establishing an ongoing requirements cycle. DMSO and the JPO are organizing an M&S Communications Working Group to review the user-provided data and to derive communications needs from use cases. Initial results are to be reported this month to the EXCIMS.

Points of contact for the Working Group are Lt. Col. Harry Thompson, USA, Chief, DMSO Operations Division (thompson@msis.dmsomil; 703-998-0660) and Mr. Eric Elsam (elsam@msosa.mil.inter.net; 703-998-1637).

*** DMSO Industry Days, May 22-23 ***

The 6th Annual Defense Modeling and Simulation Office's (DMSO) Industry Days will be held May 22 - 23 at the Radisson Plaza Hotel in Alexandria, Va. Formally known as the "State of Modeling and Simulation Briefing to Government and Industry," the briefings are co-sponsored by DMSO and the National Training Systems Association. Industry Days will feature briefings from key members of the DoD M&S community on policy, emerging trends, and developments in major programs. For registration information, contact Ms. Barbara McDaniel, NTSA, at (703) 247-2569.