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Information for the Defense Modeling & Simulation Community
DMSO NEWS March 1996

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DoD plan stresses interoperability, reuse

In the DoD vision for modeling and simulation, M&S will provide readily available, operationally valid synthetic environments for use by DoD components in support of operations and acquisition.

To achieve this vision, the DoD Modeling and Simulation Master Plan calls for the establishment of a common technical framework for M&S to facilitate interoperability and promote reuse of simulation components. The Defense Modeling and Simulation Office (DMSO) is sponsoring the development of such a technical framework, comprising a High Level Architecture (HLA), conceptual models of the mission space (CMMS), and data standardization.

The DoD M&S Master Plan supports reuse in several ways.

First, the HLA provides a common architecture for reuse of simulations. The HLA is based on the premise that no single model or simulation can satisfy all uses and users in DoD at all levels of resolution. An individual simulation or set of simulations developed for one purpose can be applied to another application under the HLA concept of the federation: a composable set of interacting simulations. A common federation object model supporting runtime infrastructure (RTI) software can be used as a whole to achieve a

specific objective.

The intent of the HLA is to provide a structure which will support reuse of capabilities available in different simulations, ultimately reducing the cost and time required to create a synthetic environment for a new purpose.

A second area of reuse is the software which supports HLA federations. There is a class of software which supports the wide variety of different simulation applications, and so provides another opportunity for reuse across DoD. Providing this reusable software to developers is expected to reduce costs, save development time, and minimize technical risk for future simulation developments.

The best example of reusable HLA supporting software is the RTI. The backbone of the federation is the RTI which is, in effect, a distributed operating system for the federation. It is implemented in such a way that it is broadly applicable and reusable across a wide range of M&S applications in DoD. The RTI provides a set of basic services to all the simulations. It also provides interfaces to live players and exercise management components, collectively known as federates, which interoperate via the RTI. Because the HLA interface specification is standardized across all applications, there is also an opportunity for commonality in the software used by federates to address the RTI. By making RTI software widely available to simulation developers, the functions of the RTI software can be used by simulation developers who won't have to produce their own software.

Another opportunity for reusable software is in the interface between simulations and live systems. There is an initiative underway to prototype a set of reusable software modules to support interfaces with live players at C4I systems called the Modular Reconfigurable C4I Interface, or MRCI.

A third area of reuse is a set of resources for simulation and federation development. These include the CMMS (a first-level abstraction of the real world providing a common world view for simulation developers), common data standards, and common environmental process representations. These and other resources will be accessible through the Modeling and Simulation Resource Repository (MSRR).

These areas of reuse are illustrated functionally in Figure 1. The reusable components are depicted by the gray-shaded regions in the figure. The MSRR is depicted by the triangles above the architecture schematic. The number of these pieces that can be made broadly reusable will be determined based on the experience of the community in using HLA. One of the goals of the HLA development process is to make as many reusable as possible, but with open specifications which will allow for innovation and adaptation. The HLA does not impose the internal system architecture of a federate, but rather addresses the manner in which the federate operates with the RTI and with other federates.

The HLA baseline definition is being evaluated through a set of prototypes which implement a diverse set of applications using the initial HLA specification. The experience of these prototypes is being

used to evolve the specification to establish the HLA baseline by August 1996. The prototype process will also support an assessment of various reusable software components. Ultimately, a DoD simulation developer should be able to concentrate efforts on the system-specific components of a simulation, relying with confidence on the common infrastructure provided by the HLA. Director's Column by CAPT Jim Hollenbach, USN

I am pleased to report that we've come a long way in achieving the objectives of DoD's Modeling and Simulation Master Plan (MSMP). Many M&S programs are developing functional simulation prototypes using the High Level Architecture (HLA). The lessons learned from this prototyping activity are being used to refine the HLA, with the baseline definition being decided in August.

Two prototypes of common supporting software, the Runtime Infrastructure (RTI) and the Modular Reconfigurable C4I Interface (MRCI), are also under development. The second version of the RTI was released on schedule at the end of February. We expect the MRCI to provide a reusable, cost-effective way for HLA-compliant simulations to interface with real-world command and control systems.

The Conceptual Models of the Mission Space (CMMS) project has brought together the knowledge acquisition teams from a wide range of simulation development programs, including JSIMS, JWARS, WARSIM, and NASM. Prototypes of user-friendly database management tools to ingest and display the knowledge of the real world which their efforts will yield are also being built.

Other actions underway to maximize interoperability and reuse among simulations include data standardization and establishment of a support infrastructure to serve simulation users and builders. The three DoD M&S Executive Agents for representations of the environment (the Defense Mapping Agency for terrain, the Navy for oceans, and the Air Force for air and space) are actively engaged and already yielding benefits to our various simulation developers and users.

A series of workshops have been held on the interface of C4I systems with simulation, the interoperation of simulations at different levels of granularity, and the representation of command and control decision making. These have shared valuable lessons learned, helped clarify the state of practice in these areas, and pointed the way to appropriate future developments.

These, and many other initiatives (e.g. M&S Resource Repository and Verification, Validation and Accreditation) are impressive in itself, but the combined effect is that we are well on the way to achieving our shared vision of an advanced, interoperable, reusable and cost-effective modeling and simulation capability.

The entire M&S community can stand tall, for we are doing great work that will continue to serve us well for decades to come.

Schedule of Events

March

11-15 Distributed Interactive Simulation (DIS) Workshop, Orlando, FL
21 Executive Council for Modeling and Simulation (EXCIMS) Meeting,
Pentagon

April

23 Modular Reconfigurable C4I Interface (MRCI) System Requirements
Review, Alexandria, VA
24-25 Architecture Management Group (AMG) 11 Meeting, IDA, Alexandria, VA
29 Tech Area Review and Assessment (TARA), TBD

May

1 Individual Combatant Behavioral Research Workshop, TBD
22-23 Industry Days, Alexandria, VA

June

4 Unit Behavioral Research Workshop, TBD
4-6 AFCEA Conference,
TBD
5 MRCI Preliminary Design Review, Alexandria, VA
12 AMG-12, IDA, Alexandria, VA
18 Military Operations RESEARCH Society (MORS) Conference,
Ft. Leavenworth, KS

July

8-9 National Research Council Entertainment Workshop, TBD
16 MRCI Critical Designs Review, Alexandria, VA
17 AMG-13, IDA, Alexandria, VA
23-25 Computer Generated Forces Behavioral Research Workshop,
Orlando, FL

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CMMS "DRC, S3I to implement one-year project"

Dynamics Research Corporation (DRC) & System Simulation Solutions, Inc. (S3I) were recently selected by DMSO to execute the one-year rapid prototyping project for implementing the Conceptual Models of the Mission Space (CMMS) program.

The prototype project is actually the second phase of three for the CMMS program. The first phase, which consisted primarily of experimental work, concluded in January with the delivery of several pieces of working software and a number of studies. Science Applications International Corporation (SAIC), DRC and S3I conducted small, independent research efforts during that phase.

In addition to the tangible deliverables, three experiments generated ideas about creating a useful common conceptual model, according to Lt Col Mark Jefferson, Chief of Technology Applications at DMSO. While the prototype phase is more product focused, DMSO hopes to preserve the level of enthusiasm evidenced during the first six months of effort. DMSO expects the CMMS Prototype team to proceed iteratively through two rapid prototyping cycles during the one-year project. Each cycle includes surveys and demonstrations with prospective users, requirements analysis (or re-analysis), design, and the construction of a prototype.

The rapid prototype being developed to explore user requirements in a CMMS implementation is not the only area where DMSO Technology Applications Division hopes to foster community-wide coordination and fiscal savings. DMSO is also coordinating M&S community efforts to establish unified guidance and standards for knowledge acquisition terminology and data sources. Two of the specific initiatives aimed at that larger problem include developing a common list of authori

These initiatives will be addressed in the draft CMMS Technical Framework due in March.

HLA reaches two RTI prototyping milestones

Two significant milestones in the prototyping of the DoD High Level Architecture (HLA) have been reached recently.

First, on October 31, 1995, version 0.1 of the HLA runtime infrastructure (RTI) software was released to the HLA proto-federations. The RTI software, which can be thought of as the HLA's distributed operating system, is being developed jointly by teams from MIT Lincoln Labs, headed by Dr. Duncan Miller, and the MITRE Corporation, headed by Dr. Richard Weatherly. As part of the software release, DMSO has sponsored classes to familiarize the HLA proto-federations with both the RTI and Orbix, the distributed computing environment in which the current RTI software runs. Since the software release, HLA proto-federation team members have worked to

integrate their simulations with the software.

The HLA is being evaluated through a set of proto-federation tests and the baseline definition will be released on August 31, 1996. As part of this, the second significant milestone was reached at the Ninth Architectural Management Group meeting on January 25, 1996, when the Air Combat Environment Test and Evaluation Facility (ACETEF) group from the Engineering Proto-federation demonstrated for the first time two simulations interoperating through the RTI.

The RTI software is the most important component of the HLA. It contains services which, for example, start and stop HLA simulation exercises and synchronize time and transfer information between federates (participating simulations). The RTI also performs functions such as optimizing data flow between federates to reduce traffic on the communications network.

Although release 0.1 of the software does not contain the full set of services planned for the RTI, it contains enough functionality to allow simulation developers to implement some of its basic services. Subsequent releases of the RTI are scheduled to contain more functionality, and the full set of services are due in release 0.4 on July 15, 1996. The RTI is currently being implemented through Orbix, a commercially available software package for creating distributed computing environments.

In order to familiarize the HLA proto-federations with the RTI software, DMSO has sponsored RTI familiarization workshops. These workshops, which have targeted the proto-federation's software engineers, have considered subjects such as the installation, configuration and operation of the RTI, as well as the RTI development and release schedule. DMSO has also sponsored training courses in the Orbix computing environment to help the proto-federations in integrating their simulations with the RTI.

MSRR under construction. "10 unclassified nodes expected on Internet by October."

The Modeling and Simulation Resource Repository (MSRR) is a distributed system of servers, hosting information resources of interest to the modeling and simulation (M&S) developer and user.

When fully established, it will contain actual models and simulations; the conceptual model of the mission space and simulation object models; data and data models, data standards, instance databases; and use and verification, validation and accreditation (VV&A) histories.

In order to ensure the widest dissemination of unrestricted information, while ensuring that the most accurate, and useful, information is available to those who need it, the MSRR will consist of both unclassified and classified. The MSRR philosophy is to distribute information and products from hosts controlled by those who actually produce and maintain the products to ensure the most up-to-date versions are available.

MSRR information will be organized and indexed by domains, providing

enhanced user access and search capabilities. Information and products must be qualified prior to being registered in the MSRR, and must maintain a certain level of quality to remain registered. This will ensure customers of the credibility of products registered in the MSRR system.

The MSRR is in the process of initial prototype implementation. There will be as many as 10 unclassified nodes in operation on the Internet by October, 1996, including DMSO, Army, Navy, Air Force, Marine Corps, Joint Simulation System Joint Program Office (JSIMS JPO), Joint Database Element (JDBE) project, Master Environmental Library (MEL), Modeling and Simulation Operational Support Activity (MSOSA), and Distributed Interactive Simulation (DIS) Support Group site at Institute for Simulation Technology (IST).

For more information contact Gary Misch at 703-824-3425, or gmisch@msis.dmsi.mil.

MRCI will bridge C4I, RTI.

The ability to interoperate command, control, communications, computers, and intelligence (C4I) systems with simulation offers many potential advantages to DoD. Two of the primary advantages are the ability (1) to take M&S to war, and (2) to train as you intend to fight.

The interface between C4I and simulation will facilitate mission rehearsal; provide additional information to operational planners on weapons effects, sensor capabilities, etc.; provide additional insights/analysis regarding operational plans, potential dangers, conflicts, losses, and effectiveness; enhance distributed, collaborative planning among C4I systems; make it easier to use simulations for training users; and provide live C4I representations in simulation exercises. The result for the operational community: "More effective planning, rehearsal, and operations equals more combat power!"

DMSO has initiated the prototype development of the Modular Reconfigurable C4I Interface (MRCI) to facilitate use of the DoD HLA to support interfaces between C4I systems and simulations. The MRCI will conceptually reside between the live C4I system and the HLA runtime infrastructure (RTI) and be divided into three components: a section containing generic modules that transforms C4I information into information useable by simulations and vice versa; an interface between the generic modules and the RTI; and a C4I system-specific interface between the C4I system and the generic modules.

The MRCI initiative will produce two prototype applications using Air Force and Army C4I systems, one in the last quarter of FY96 and another in the first quarter of FY97. These are comprised of the Air Force Contingency Theater Automated Planning System (CTAPS) linked to the Air Warfare Simulation--Re-engineered (AWSIM/R) and Air Semi-automated Forces (SAF), and the Army's Maneuver Control System/Phoenix (MCS/P) and Advanced Field Artillery Tactical Data Systems (AFATDS) systems linked to Corps Battle Simulation (CBS) and Ground SAF.

Terrain, Oceans, Air & Space Environments
"MSEAs designated"

In order to achieve maximum value from modeling and simulation (M&S), authoritative representations of the natural environment are required. The DoD M&S Master Plan (MSMP) establishes representation of the natural environment as one of its six major objectives, and has subdivided it into action areas for terrain, oceans, atmosphere, and space. To provide focus, coordination, centers of excellence, and broad support to the M&S community in these areas, the Under Secretary of Defense for Acquisition and Technology (USD(A&T)) is designating M&S Executive Agents (MSEAs).

Terrain

In April 1995, USD(A&T) appointed the Director, Defense Mapping Agency (DMA) as the DoD MSEA for Authoritative Representation of the Terrain Natural Environment. DMA established the Terrain Modeling Project Office (TMPO) to execute its MSEA responsibilities. TMPO has prepared and is implementing a Terrain Execution Plan to address the common problems encountered by program managers and users as outlined in the DoD M&S Master Plan.

TMPO is actively involved with M&S community programs in a structured effort to capture user and system developer requirements. Critical to this effort is understanding what terrain data and algorithms are required and what transformations are being used. TMPO is promoting use of and sponsoring changes to international, national, commercial, and military standards, to bring producers and M&S users closer together. Additionally it is assisting in defining interchange specifications to enhance interoperability and improve reuse of data sets and models.

As deficiencies in technology areas are uncovered, research and development activities are coordinated with the overall goal of improving M&S terrain generation, exploitation, and reuse capabilities. Commercial off-the-shelf (COTS) solutions for data generation, processing, and simulation database construction are being exploited. R&D efforts emphasize common benefits for the mission planning, crisis/mission rehearsal, training, and acquisition communities.

TMPO can be reached through the Internet at www.tmpo.dma.gov:8001, or at 703-275 - 8397, DSN 235.

Oceans

The Oceanographer of the Navy has been confirmed by the Executive Council for M&S (EXCIMS) as the DoD MSEA for Authoritative Representation of the Oceans Natural Environment. This MSEA will ensure that oceano-.cl.MSEAs designated;.cl.Schedule of Events;graphic data bases, models, data standards and ocean environmental

representations are made available for use by the M&S community.

The Oceans EA (OEA) will execute a comprehensive oceanographic M&S program which captures the oceanographic requirements of the M&S community, define procedures for M&S community access to ocean data and oceanographic models, and support major M&S exercises. Additionally the OEA will ensure DoD M&S interests are represented throughout the international, national, industrial, and DoD oceanographic communities.

The OEA office is well on its way to being established at the Naval Research Laboratory (NRL) in Washington, DC. Three members of the team, all from the Stennis Space Center (SSC) in Mississippi, have moved to Washington for that purpose. They are the Program Manager, Dr. George Heburn; the Requirements Manager, Mr. Edward Khedouri; and the Verification, Validation and Accreditation (VV&A) and Standards Manager, Ms. Eleanor Schroeder.

Until permanent offices are established at the NRL, the OEA can be reached at 703-824-3434.

Air and Space

The Air Force has been confirmed by the EXCIMS as the DoD MSEA for Authoritative Representation of the Air and Space Natural Environment. The formal Executive Agent (EA) function will reside at Air Force Combat Climatology Center (AFCCC; formerly USAF Environmental Technical Applications Center) in a multi-Service M&S Division consisting of three branches: Requirements Analysis, Technology Integration, and Standardization.

An execution plan is being developed to outline MSEA responsibilities and list various initiatives designed to address the issues and actions outlined in the DoD MSMP. Current MSEA activities involve organizational standup and the beginning of a DoD-wide requirements analysis.

The organizational standup is proceeding on three fronts: a temporary staff has begun work, a Joint Memorandum of Agreement is being negotiated with the Services for EA organizational participation, and startup funding has begun.

Requirements analysis activities have been on a fast track, starting with a series of meetings between all three environmental area MSEAs and the Joint Warfare Simulation (JWARS) and Joint Simulation System (JSIMS) program offices. For the JWARS program, the EAs are playing a significant role in the JWARS mission space analysis. In JSIMS, the EAs are working with the Joint Training Federation prototype (JTFp) development to test High Level Architecture (HLA) procedures and design. There is much work to do in a very short time. The Air and Space MSEA is working together with DMSO and the other EAs to ensure seamless representation in critical boundary areas and present a coordinated approach to supporting M&S community needs.

Call the Air and Space MSEA at 618-256-3402.

SEDRIS

Currently, there is no uniform and effective mechanism for interchanging synthetic environments which include integrated terrain, ocean, and atmosphere data among M&S applications. A mechanism is required which facilitates standard representation of, and access to, existing synthetic environment data, increases the utility of legacy databases, supports interoperability of heterogeneous simulation systems and can be easily expanded to capture future modeling investments.

The Synthetic Environment Data Representation and Interchange Specification (SEDRIS) is a proposed format-independent data representation model for interchanging synthetic environment databases, including any combination of, but not limited to: terrain, ocean, atmosphere, three-dimensional (3D) icons/models, features, topology, sound, textures, symbols, and special effects. All three environmental-area MSEAs are participating in the SEDRIS development effort.

A current DMSO and U.S. Army Simulation, Training and Instrumentation Command (STRICOM) Broad Area Announcement desires to develop the read and write application program interfaces for the SEDRIS data representation model and to also develop the standard format and database architecture for interchanging synthetic environment data. Selection of responses to this initiative is ongoing with various prototyping events planned in the coming months.

For more information on SEDRIS, contact the development team through the TMPO Project Manager, Mr. Jerry Lenczowski at 703-275-8397, or via e-mail at lenczowj@dma.gov.

MSOSA "Use of DoD M&S resources promoted"

One of DMSO's newest programs is the Modeling and Simulation Operational Support Activity (MSOSA).

In January of 1995 the Director of Defense Research and Engineering (DDR&E) commissioned a task force to study what could be done to improve the coordination of modeling and simulation (M&S) activities and promote the fuller utilization of M&S resources within DoD. The task force recommended, and the Executive Council for Modeling and Simulation (EXCIMS) approved, the establishment of a contractor-staffed prototype MSOSA. While DMSO sponsors the activity, the Joint Warfighting Center is providing management for the initial prototype implementation.

The MSOSA began operations on December 4, 1995, with a customer service center that is open from 8 a.m. to 6 p.m. Eastern Standard Time, Monday through Friday. The MSOSA is staffed with M&S subject-matter experts who can advise customers in areas such as models, algorithms, C4I systems, databases, security, and the use of M&S in joint and combined operations and training. They are prepared to assist customers in identifying their M&S requirements and locating existing assets that are available to meet those requirements. The

MSOSA can also provide assistance in coordinating M&S events and access to M&S resources.

The prototype MSOSA is initially focusing its support on the training and military operations community, but, within the limits of available resources, MSOSA will also support customers from the analysis and acquisition support communities. The MSOSA's services will be free of charge to Department of Defense customers throughout the one-year prototype period.

Customers in the United States can call MSOSA at 1-800-510-6399. From England the toll free number is 05008 92487. MSOSA will soon also have toll free numbers for customers in Korea and Germany. The telephone number in the Washington, DC area is (703) 998-1623 and the FAX number is 703-998-1648. Customers can also reach MSOSA on the Internet at msosahelps@msis.dmsi.mil. For more information on the prototype MSOSA check out their home page at <http://www.dmsi.mil/MSOSA/>.

Although the prototype MSOSA has only been in operation a short time, it has already assisted a number of M&S users. Through the first week of February the MSOSA had processed 135 requests for assistance. It has over 400 M&S users registered in its data base. If you need assistance or you just want to make sure that you are registered in the data base, contact the MSOSA today at the above numbers.

New councils empower M&S consumers

At the June 1995 meeting of the Executive Council for Models and Simulations (EXCIMS), Dr. Anita Jones, Director, Defense Research and Engineering, proposed that the EXCIMS be augmented with councils representing the three functional areas - training, analysis, and acquisition. The intent of forming these councils was to empower the consumers of modeling and simulation (M&S) products, with each council focused to meet the needs of its community.

A generic charter was developed by DMSO to ensure consistency across the councils and with the EXCIMS' own charter. The charters define the missions, functions, membership, and support structure for each functional area.

The key mission of each council is to provide expert advice and strategic plans to the EXCIMS on M&S issues related to their respective functional area. Each council serves as a senior-level body for functional area M&S matters and assists in identifying and integrating requirements. A primary task for each of the three councils is the development of functional area plans which will serve as annexes to the DoD M&S Master Plan and further describe their goals and tasks.

Each of the three councils has met and begun the development of their functional area plans. Where possible, existing senior steering groups serve as the core for council membership. Council chairs are members of the EXCIMS and Council members must either be members of the EXCIMS or must have direct responsibility for M&S in their functional area for their DoD Component.

The councils are supported by functional working groups (FWGs) which mirror the membership of the councils. The FWGs provide a forum at the working level for coordination and cooperation for each functional area across the DoD Components. They also respond to the Modeling and Simulation Working Group (MSWG), which is the primary support group of the EXCIMS. FWG chairs are responsible for keeping the MSWG informed of issues intended for EXCIMS review through the councils and of broad issues that have potential impact outside of the functional area and across the larger M&S community.