

***** DoD High Level Architecture Baseline Approved *****

On September 10, 1996, Dr. Paul Kaminski, the Under Secretary of Defense for Acquisition and Technology, signed a memorandum designating the new High Level Architecture (HLA) as the technical architecture for all simulations in the Department of Defense. This represents a major step in the implementation of the DoD-wide Common Technical Framework (CTF). A copy of Dr. Kaminski's letter can be found on pages 7 and 8 of this newsletter.

For the past 18 months, the DoD's 16-member Architecture Management Group (AMG), under the guidance of the Defense Modeling and Simulation Office (DMSO), has been developing and testing the Baseline Definition of the HLA for simulation. The HLA is the cornerstone of the CTF, prescribed in the Modeling and Simulation (M&S) Master Plan (DoD 5000.59-P, dated October 1995). After unanimous AMG approval on August 21, 1996, the HLA Baseline Definition was presented to the DoD Executive Council for Modeling and Simulation (EXCIMS), which unanimously endorsed it on September 5, 1996, forwarding it to Dr. Kaminski for approval.

The HLA baseline is defined by versions 1.0 of the HLA Rules, the HLA Interface Specification, and the HLA Object Model Template. The key features of the HLA were refined through an extensive prototyping process involving hundreds of participants from across the DoD M&S community. Industry provided roughly half of the participants, with the remainder coming from government, federally funded research and development centers, and academia. Prototype Runtime Infrastructure (RTI) software was used to build and operate prototype federations using the HLA. This led to a high degree of confidence in the feasibility and utility of the various components of the HLA specification. Plans are in place to continue development of this supporting software and to make it widely available to the DoD M&S community in the first half of FY97 (see related article on RTI on page 3). In addition to the RTI, a number of other software support tools are envisioned, to include automated tools for developing required HLA object models and for testing compliance with the HLA.

Many of the features of the HLA and related projects will be discussed over the course of the 15th Workshop on Standards for the Interoperability of Distributed Interactive Simulations (DIS) in Orlando, September 16-20. The three defining documents of the HLA, along with a wealth of supporting documentation and briefings, are available for viewing and downloading through the DMSO Home Page on the World Wide Web (<http://www.dmsomil/>). This information, in the form of an HLA Technical Library, will continue to grow and be updated as the Baseline Definition evolves.

***** MSRR - On line starting September 30th *****

The Modeling and Simulation Resource Repository (MSRR) will go on line in a limited, unclassified prototype implementation on September 30. The unclassified MSRR will include a master site and the following individual sites:

- * DMSO
- * Army
- * Navy
- * Air Force

- * Marine Corps
- * Joint Simulation System (JSIMS) Joint Program Office
- * Distributed Interactive Simulation (DIS) Service Center
- * Army Electronic Proving Group (the Joint DatabasetElement Project site)
- * Modeling and Simulation Operational Support Activity (MSOSA)
- * Master Environmental Library (MEL) Master Site

A classified implementation, expected to be on line by February 1, 1997, will include these sites:

- * Naval Research and Development (Master Site)
- * Commander in Chief, US Atlantic Command (CINCUSACOM)
- * Commander in Chief, Pacific Command (CINCPACOM)

Access to the unclassified system will be via the Internet, while access to the classified system will be via Department of Defense's Secure IP Router Network (SIPRNET). For convenience, users of the classified system will have access to the registry on the unclassified system. A key purpose of the MSRR is to provide a central registry, or "virtual card catalog," of modeling and simulation (M&S) resources, including complete quality profiles and links to actual resources such as instance databases and tools of use to the M&S community. In some cases the MSRR will provide tools for visualization and data administration.

Resource owners are encouraged to host their M&S resources on their local systems and register them in the MSRR where potential users can readily locate them. Local hosting by resource owners helps ensure that the most current version of a resource is always available.

For more information contact Mr. Gary Misch, DMSO Support, 703-824-3425 or gmisch@msis.dmsomil.

***** RTI Development - Subsequent to HLA Baseline Definition *****

When the Architecture Management Group (AMG) approved the Department of Defense's (DoD) High Level Architecture (HLA) on August 21, 1996, the 0.x series of the HLA Runtime Infrastructure (RTI), which was used to support HLA prototyping, was retired.

The DMSO is in the process of procuring commercially-developed RTI software, which will be provided as government-furnished equipment (GFE) to DoD and other simulation programs beginning in early FY98. In the meantime, DMSO is developing two iterations of HLA 1.0-compliant government software for release in December 1996 and late Spring 1997. This RTI software is being developed by a team from MIT Lincoln Labs in Lexington, MA, and The MITRE Corporation in Reston, VA.

A "familiarization" version of the RTI will be released to the DoD modeling and simulation (M&S) community in December 1996. This software will be released initially as C++ executable code for Sun/Solaris 2.4 computing machines. The DMSO plans to extend RTI version F.0 to other computing platforms (i.e., SGI, HP and IBM), operating systems and languages (i.e., Ada). The familiarization version will be an initial "breadboard" version to provide the basic functionality outlined in the HLA Interface Specification without having to satisfy the performance requirements of large-scale simulation exercises. This version of the RTI, which will be available in

December 1996, can be ordered via an on-line form from the DMSO Home Page at <http://www.dmsso.mil>.

A follow-on version 1.0 of the RTI will be released in late Spring 1997. Like the familiarization RTI software, this software will be released first as C++ executable code for Sun/Solaris computing machines, and then extended to other platforms and languages. This software will have the functionality available in the familiarization version with a higher performance to support larger-scale simulation exercises.

***** Four MRCI experiments underway *****

The Modular Reconfigurable C4I Interface (MRCI) is intended to provide a flexible cost-effective means to adapt command, control, communications, computers, and intelligence (C4I) systems to interoperate with simulations. The primary advantages of this capability are the ability to (1) take modeling & simulation (M&S) to war and to (2) train as you intend to fight. The result for the operational community is: More effective planning, rehearsal, and operations, thus more combat power!

To accomplish this a High Level Architecture (HLA) compliant MRCI will reside between a live C4I system and the HLA Runtime Infrastructure (RTI). The MRCI will consist of three layers: a C4I system-specific interface, a section containing generic modules that transform C4I information into information useable by simulations, and vice versa, and an interface between the generic modules and the RTI.

Four experiments are underway to evaluate the MRCI concept. These experiments include placing MRCI's between the Advanced Field Artillery Tactical Data System (AFATDS) and the Maneuver Control System (MCS), both of which are C4I systems, and semi-automated forces (SAF) and Corps Battle Simulation (CBS), both simulations; between the Contingency Theater Automated Planning System (CTAPS), a C4I system, and SAF; and between AFATDS, MCS, and CTAPS and the Joint Simulation System Testbed simulations.

The MRCI program successfully completed a System Requirements Review on April 23, a Preliminary Design Review on June 11, and a Critical Design Review on August 14. Throughout the process, input from the C4I/M&S community was encouraging. A Test Planning Workshop held on July 17 provided valuable input into the development of MRCI measures of performance and anticipated "lessons learned."

MRCI prototype software is now in full development. Testing and experimentation of the prototypes will occur during the next six months. The MRCI will be used in the Defense Advanced Research Projects Agency's "Synthetic Theater of War" Advanced Concept Technology Demonstration and in early 1997 will also be used in the Joint Simulation System Testbed. Follow-on plans are in preliminary stages as additional requirements and input are gathered from the C4I/M&S community.

The DMSO point of contact for the MRCI is Col. Mark Jefferson, USAF, 703-998-0660. The MRCI program is managed for DMSO by Mr. Tom Tiernan of Naval Research and Development. LT James O'Byrne, USN, and Ms. Cynthia Keune of NReD support Mr. Tiernan.

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

** Oceans

The Ocean Executive Agent (OEA) Office, under the direction of the Oceanographer of the Navy, CNO N096, is now fully manned and based at the Naval Research Laboratory, Washington DC.

Its main function is to coordinate and facilitate the use of ocean data and models in Department of Defense (DoD) simulation programs. As part of the outreach and requirements definition programs, most potential customers have been contacted and OEA representatives continue to participate in meetings and working groups sponsored by the M&S community.

Incorporating the ocean environment in M&S is both difficult and expensive. A major OEA objective is to demonstrate that the value added is worth the extra time, effort and cost. This point was well illustrated in a presentation by Dr. George Heburn, OEA program manager, at the recent DMSO-sponsored Multi-Resolution Environments in Simulation Conference, where it was shown that high-resolution ocean data made a significant difference in Low Frequency Active (LFA) sonar detection ranges during the Defense Advanced Research Projects Agency's Maritime Simulation Demonstration of Undersea Technologies.

Near-term OEA projects include development of a requirements database; verification, validation and accreditation/certification standards and procedures; an OEA home page; and overseeing administration of DMSO-funded projects, which include the Master Environmental Library, the Distributed Surf Zone Modeling Effort, the Logistics-over-the-Shore (LOTS)-Hindcast of Wave Heights, Currents and Water Level, and the LOTS Assimilation/Fusion of Measured/Modeled Environment.

For information call 202-404-1426 or e-mail oceanea@msis.dmsso.mil.

** Air/Space

The Air and Space Natural Environment Modeling and Simulation Executive Agent (MSEA) Office is located in the Air Force Combat Climatology Center (AFCCC) at Scott AFB, IL. The FY96 program has been executed with the objective of ensuring authoritative representations of the air and space natural environment are defined and accessible to the DoD M&S analysis, acquisition, and training communities when needed.

The MSEA's atmosphere and space environmental requirements study has focused on identifying the requirements of major programs like the Joint Simulation System and the Joint Warfare System. The contractor team began the study in January and is now in the process of validating their findings with the respective users and program offices. Data standardization and accessibility have been enhanced with the addition of AFCCC and the Air Force Global Weather Central (AFGWC) as Master Environmental Library regional sites as part of the Modeling and Simulation Resource Repository (MSRR). AFCCC is the recognized leader in DoD climatological support, while AFGWC provides real-time weather forecasts and products to a variety of Air Force and DoD customers worldwide. Another standardization project involves cataloging weather and space environmental models and algorithms as the Atmosphere and Space Environmental Extension to the Directories database within the MSRR. This will capture key information on existing, reusable models and algorithms and will be readily accessible to and easily used by interested parties.

In the technology arena, the Geophysics Directorate of the Air Force Phillips Lab has undertaken a project to provide improved capabilities to the front-end weather server for a suite of transmissivity models. In addition, the PINPOINT project is focusing on how better to model the effects of the environment on target identification; and the FASTPROP project is working to accelerate propagation models for use in M&S.

The Air and Space MSEA recently underwent several personnel changes on its way to becoming a multi-Service agency. In June Mr. Gary McWilliams arrived to work in the Technology Integration Branch. He is on a DoD Developmental Assignment from the Army Research Labs Battlefield Environment Directorate at Adelphi, Maryland. Air Force Capt Bruce Lambert, already assigned to AFCCC, replaced Air Force Capt Bruce Shapiro in July as the Standardization Branch Chief. Finally, in August Navy CDR Tim Cummings assumed the responsibilities of MSEA Division Chief from Air Force Lt Col Jim Schaefer. CDR Cummings was most recently assigned to the Defense Mapping Agency. Air Force Major (select) Spencer Chapman is scheduled to arrive in December to become the Technology Integration Branch Chief, bringing the Air and Space MSEA staff to a total of five. Also, the MSEA now has a liaison at the DMSO in Alexandria, VA. Dr. Bill Campbell of Abacus Technology Corporation will serve as liaison, reporting directly to the Executive Agent, Air Force Col Frank Routhier. For information call 618-256-3902 or e-mail ms@thunder.safb.af.mil.

** Intelligence

The newest DoD Modeling and Simulation Executive Agent (MSEA) is the Director of the Defense Intelligence Agency (DIA). The Under Secretary of Defense for Acquisition and Technology appointed the DIA Director as MSEA for Representation of Foreign Forces and US National and Joint Intelligence Processes on July 12.

DIA's MSEA responsibilities for authoritative representation of foreign forces and the US National and Joint intelligence processes support Objectives 1, 3, 4, 5, and 6 of the DoD Modeling and Simulation (M&S) Master Plan. The term "foreign forces" includes foreign military forces, systems, behaviors and capabilities.

Key customers of the Intelligence MSEA include the program managers for the Joint Simulation System, the Joint Warfighting System, the Joint Modeling and Simulation System, and the Synthetic Theater of War, and the Directors of Intelligence, or J-2s, for the warfighting Commanders-in-Chief (CINCs).

The need for an Intelligence MSEA became apparent in 1995 when the Military Intelligence Board (MIB), chaired by the Director of the DIA, tasked DIA and the J-2, US Atlantic Command (USACOM), to study ways of improving the simulation of the US intelligence processes in support of USACOM's training mission and related training endeavors for US forces.

Currently used, Aggregate-Level Simulation Protocol-based intelligence simulations require extensive personnel overhead to operate them, do not provide sufficiently robust methods of portraying the battle space for commanders, and do not provide adequate tools to determine the optimum mix of intelligence assets. DIA is leading an MIB study group in developing a Conceptual Model of the Mission Space (CMMS) to portray the US intelligence process end-to-end. The CMMS is divided into four steps: tasking, collection,

reporting and use. It is being coordinated with the DMSO CMMS development process. Ultimately, this CMMS will prove useful for developers of intelligence simulations by defining requirements and providing a road map for portraying the intelligence process.

The development of data to support M&S efforts with more robust representation of foreign forces is based on intelligence programs already under way by DIA and the other MIB components. MIB components are assigned intelligence production tasks based on their Service or CINC Area of Operation responsibilities. Intelligence data for both M&S and other applications will be made available via the Modernized Integrated Data Base (MIDB) for general military intelligence and the Military Equipment Parameters Data Base (MEPED) for technical aspects of foreign weapons and systems.

** Terrain

The Terrain Modeling Project Office (TMPO) has been implementing the FY96 Terrain Execution Plan. The plan is divided into three areas: Requirements, Analysis and Outreach (RAO); Standards, Interoperability and Design (SID); and Research and Development Initiatives (RDI).

The RAO program focuses on numerous conferences, meetings, and working groups. TMPO hosted the Distributed Interactive Simulation-sponsored Interim Simulated Environment Working Group (ISEWG) meeting in June. Program highlights include active participation in the requirements-definition efforts for both the Joint Warfare Simulation and the Joint Simulation System; support to US Army Europe exercises, operations in Bosnia, and evaluation of the use of digital data in modeling and simulation (M&S). TMPO worked closely with the Defense Special Weapons Agency (DSWA) to provide M&S community access to the Synthetic Exercise Environment, a DSWA developed geotypical terrain database production capability. The Benning Project studied high resolution (~1 meter) M&S data requirements and is defining warfighter data needs for Military Operations in Built-up Areas (MOBA). Digital mapping and M&S databases were generated over the McKenna training site from multiple sources using different production methods at resolution levels not previously attained

Within the SID program the Synthetic Environment Data Representation and Interchange Specification (SEDRIS) data model is under review by contractors selected under a Broad Agency announcement, released by STRICOM in November 1995. The Intelligence Community has been approached to participate in SEDRIS review to ensure their M&S related data sets are supported. Similar discussion was held with the Tri-Services Geographic Information System Committee and Federal Geographic Data Committee on Logistics Data to address methods for representing and transmitting detailed 3-D representations of objects. When completed SEDRIS will provide a comprehensive, representational data model for the synthetic environment and provide a robust and powerful interchange mechanism using Application Program Interfaces. The Vector Product Format M&S enhancement process continues using SID program resources. This effort will bring the data producer and M&S consumer closer together and provide insight into follow-on SEDRIS format development.

The RDI major focus has been on development of rapid terrain generation capabilities, commercial alternate sensor exploitation, and dynamic effects on terrain. Rapid terrain generation has seen some breakthrough in linear feature (e.g., road and river) delineation capability; model-based building and road extraction algorithms; and enhanced digital elevation model extraction. An

operations concept and communication network for M&S data and model evaluation is complete and ready for use in the upcoming Force XXI Exercise

The FY97 strategy is being developed in close cooperation with the MSEAs for Air and Space, Ocean, and Intelligence. The major focus will be in the areas of resource repository, data engineering, and dynamic environmental representation.

For information call 703-275-8397, or e-mail halls@dma.gov or rjacob@msis.dmsomil

***** MSOSA *****

The (MSOSA) should be the first place to check when you need assistance in employing Modeling & Simulation (M&S)

The prototype MSOSA continues to serve an ever increasing number of M&S users within the Department of Defense (DoD). Since DMSO placed the prototype MSOSA into operation in December 1995, it has provided operational M&S advice and coordination assistance to hundreds of DoD activities.

The MSOSA is a contractor-staffed activity that operates under the direction of DMSO's Director of Operations. It is staffed with subject-matter experts who collectively have expertise in all of the operational and technical aspects of M&S. These experts serve as information brokers who direct those who request their assistance to sources of information and resources that can satisfy their M&S support requirements.

The MSOSA was created in response to the perceived need for better coordination and asset sharing within the DoD M&S community. A special task force, as well as several independent studies, concluded that a general lack of knowledge about already existing assets was prevalent among DoD activities, and that many inefficient employment decisions were being made. Preliminary reports indicate that the MSOSA is already having a very positive effect. Surveys of customers gathered over the first eight months of operation indicate that the activity has helped them avoid spending more than \$4 million on M&S software, hardware, and man-hours of support.

The Modeling and Simulation Working Group (MSWG) is currently assessing the metrics that measure the MSOSA's performance, but preliminary indications are favorable. It is anticipated that the Executive Council for M&S will approve continued operation of the MSOSA beyond its one-year trial period.

The MSOSA is presently providing its services free of charge to DoD customers. At the direction of the DoD Executive Council for Modeling and Simulation (EXCIMS), it has focused its support on the training community, but within the limits of its resources it has been responding to requests for assistance from the analysis and acquisition communities as well.

For assistance call the MSOSA Help Desk from 7 a.m. to 6 p.m. Eastern Standard Time, Monday through Friday at 703-998-1623. The Fax number is 703-998-1625. There are also toll free numbers for customers outside of the Washington, DC area. In the United States call 800-510-6399, in Germany call 01308 19147, and in the United Kingdom call 05008 92487. E-mail the Help Desk at msosahelps@msosa.mil.inter.net.

As a registered site in the Modeling and Simulation Resource Repository, information and services are also available on the World Wide Web via the MSOSA Home Page at <http://www.msosa.mil.inter.net>.

***** JWID showcases COMPASS *****

For the second consecutive year, a DMSO-sponsored project was a highlight of the Joint Warrior Interoperability Demonstration (JWID).

JWID 96, sponsored by the US Army and hosted by the US Central Command (USCENTCOM) in August, showcased emerging technology designed to solve interoperability problems for the joint warfighter. DMSO's demonstration showcased the Common Operational Modeling, Planning and Simulation Strategy (COMPASS). COMPASS services were used to interoperate a wide variety of systems, including TAMPS, AFMSS, MCS/P Beta, ACPT, ACZES, CBR Planner, CTAPS CPA, SOFPARS, ACAAM, CAPS, EADSIM, FLAMES, ModSAF, OMEGA and Powerscene.

Based on a scenario that involved a Flexible Deterrent Option (FDO) in the USCENTCOM Area of Responsibility, JWID 96 used seven major sites for the Joint Task Force and Service component headquarters. The headquarters sites included the National Command Authority at the Joint Demonstration Evaluation Facility in Virginia; the CENTCOM Commander-in-Chief and the Joint Special Operations Task Force at MacDill AFB, FL; the Combined Joint Task Force at Ft. Bragg, NC; the Army Forces at Ft. Gordon, GA; the Air Forces at Shaw AFB, SC; the Navy Forces on the USS Kearsarge afloat; and the Marine Forces at Camp Lejeune, NC.

Located at all seven JWID 96 sites, COMPASS brought distributed collaborative planning (DCP) services and access to distributed M&S resources to the joint plan development process. COMPASS services allowed operational planners at all sites to develop joint plans in every warfare area in collaborative sessions, then assess, rehearse and refine those plans using a variety of models and simulations.

COMPASS demonstrated its services in a variety of planning arenas, to include the development of joint air/ground operations, Theater Missile Defense, air defense, special operations, and chemical/biological agent effects. Operational plans were developed in DCP sessions at the various JWID 96 sites, then passed to the M&S Operations Support Cell at Naval Research and Development (NRaD), San Diego, CA, for plan assessment. M&S results were summarized and presented in operational terms to the planner for use in assessing, refining and/or rehearsing the plan. The Operations Support Cell at NRaD was a prototype of an operational support cell to be incorporated into the broader DoD M&S Operational Support Activity.

JWID 96 provided a forum for demonstrating to a wide audience the benefits of M&S to the joint warfighter and its potential impact on the modern battlefield.

***** USD(A&T) Letter *****

MEMORANDUM FOR: SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF

UNDER SECRETARIES OF DEFENSE
ASSISTANT SECRETARIES OF DEFENSE
GENERAL COUNCIL OF THE DEPARTMENT OF DEFENSE
INSPECTOR GENERAL OF THE DEPARTMENT OF DEFENSE
DIRECTOR, OPERATIONAL TEST AND EVALUATION
ASSISTANTS TO THE SECRETARY OF DEFENSE
DIRECTOR OF ADMINISTRATION AND MANAGEMENT
DIRECTORS OF THE DEFENSE AGENCIES

SUBJECT: DoD High Level Architecture (HLA) for Simulations

References: (a) DoD Directive 5000.59, "DoD Modeling and Simulation (M&S) Management," January 4, 1994
(b) DoD 5000.59-P, "DoD Modeling and Simulation Master Plan (MSMP)," October 1995

Under the authority of reference (a), and as prescribed by reference (b), I designate the High Level Architecture as the standard technical architecture for all DoD simulations.

The baseline HLA is defined by three inter-related elements: HLA Rules Version 1.0 (v.1.0), HLA Interface Specification v.1.0, and HLA Object Model Template v.1.0. The evolution of the HLA will be managed by the DoD Executive Council for Modeling and Simulation (EXCIMS) through its Architecture Management Group (AMG). This structure provides a means for the DoD Components to identify and address any emergent issues in subsequent refinements to the HLA. Compliance with the HLA does not mandate the use of any particular implementation of supporting software such as the Runtime Infrastructure.

DoD Components shall review all of their simulation projects and programs by the second quarter fiscal year (FY) 1997 in order to establish plans for near-term compliance with the HLA. The Department shall cease further development or modification of all simulations which have not achieved, or are not in the process of achieving, HLA-compliance by the first day of FY 1999, and shall retire any non-compliant simulations by the first day of FY 2001. EXCIMS is to monitor progress and advise me if any emergent events affect their viability.

To monitor compliance with the HLA, the DoD Components shall submit an initial report to the Defense Modeling and Simulation Office (DMSO) by June 30, 1997, which summarizes their HLA-compliance intentions for each simulation the Component owns or sponsors, organized into three categories:

- * HLA-compliance actions initiated immediately
- * HLA-compliance actions initiated at a specified future date
- * no HLA compliance planned (thus requiring eventual retirement or a waiver)

The DoD Components shall submit periodic updates to these initial reports as required to ensure their accuracy and completeness. DMSO shall establish a mechanism to provide for formal certification of compliance and shall provide me with periodic reports on the Department's progress towards compliance with the HLA.

If a Component believes it is impractical for a simulation to comply with the HLA, or that HLA-compliance cannot be achieved in a timely manner, it may submit a waiver request to the Director of Defense Research and Engineering, the Chair of the EXCIMS. In consultation with the EXCIMS and its Training, Analysis, and Acquisition Councils, I will then decide if an exception to the HLA-compliance requirement is warranted, and if so, the form of that exception.

This mandate for HLA-compliance supersedes all previous requirements for DoD simulations to comply with other simulation standards such as Distributed Interactive Simulation or Aggregate-Level Simulation Protocol. It is expected that new industry standards to support the HLA will emerge. In consultation with the EXCIMS and its AMG, I will evaluate the suitability of such standards for the Department as they are established.

The DoD point of contact for the HLA is the Defense Modeling and Simulation Office at (703) 998-0660 or hla@dmsomil. The HLA documents are available at <http://www.dmsomil/>.

Paul G. Kaminski