

An Introduction to the NTSA Standards Standing Committee

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ABSTRACT

As training and simulation technologies evolve, yielding systems of increasing functionality and intricacy, the interfaces within and among these systems have become correspondingly more complex. In turn, the task of building simulation systems to be interoperable and supportable becomes an ever-greater challenge. This circumstance has led the community to increase its interest in standards-based solutions as a means of controlling complexity, risk, and cost.

There are many niches where training and simulation-related standards are presently being defined and applied. Various sectors of the community actively participate in a multitude of standards-development efforts, and these efforts frequently result in the successful implementation of beneficial standards. However, each of these independent activities addresses standards only from a narrow perspective, such as Advanced Distributed Learning or Distributed Mission Operations. It has been suggested that standards have the potential to yield even greater benefits, which the community might maximize by implementing a more systematic approach to their selection and promulgation.

Recognizing this situation, the National Training and Simulation Association (NTSA), an organization representing the training and simulation industry, has formed a Standards Standing Committee (SSC). The SSC's role is to investigate standardization within a larger context, and provide advice on standards to its members. Its membership currently includes personnel from Government and Academia as well as Industry, collectively representing the perspectives of the total training and simulation community.

This paper introduces the newly formed NTSA SSC, and describes its role and mission. This paper will summarize the actions which have been accomplished by the SSC to date, and the potential impact of these achievements. Finally, it describes the goals and planned future activities of the group, their expected benefits, and how interested members of the community can become involved.

ABOUT THE AUTHORS

Mike Finnern is the Senior Technical Advisor for the L-3 Communications Modeling and Simulation Department located at Reston, Virginia. Prior to joining L-3, he served over 28 years on active duty in the Air Force in various assignments in operations, logistics and training support. His final assignment was as Director, Defense Modeling and Simulation Office. His current duties include program management for technical network and analytic support to the Joint Staff and Combatant Commands.

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Roy Scrudder is an Associate Director at the US DoD Modeling and Simulation Coordination Office (M&S CO). He has over 25 years experience in information systems analysis and development. He is a founding member of the NATO Exploratory Team on establishing a Common Standards Profile for NATO M&S. He currently manages the SEDRIS and HLA standards efforts for the M&S CO. Mr. Scrudder chairs the IEEE HLA Evolved Product Development Group and was a member of the Project Development Group for the original IEEE 1516 specifications, serving as the lead editor for the Federation Development and Execution Process.

Eric Anschuetz is the head of the Technology Development and Integration Laboratory Branch at the Naval Air Warfare Center Training Systems Division, Orlando, Florida. He has over 20 years of Modeling and Simulation experience and has developed real-time simulation applications, interfaces, and gateways in Distributed Interactive Simulation and High Level Architecture environments.

William F. Waite is President and co-founder of The Aegis Technologies Group. Mr. Waite has more than 30 years of experience in all phases of M&S and is currently active in the evolution of the M&S profession, industry, and marketplace. He serves on the Board of Directors of the National Training Systems Association and the Society for Modeling and Simulation International, and he serves on the Advisory Council of the Simulation Professional Certification Commission. Mr. Waite is currently the President of the Alabama Modeling and Simulation Council.

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PROBLEM STATEMENT

Annually, the Department of Defense (DoD) invests billions of dollars into the development, operation, and maintenance of a vast array of software Models and Simulations (M&S), encompassing a variety of training, analysis, and other applications. These models range from the very simple to the overwhelmingly complex. One of the greatest challenges faced in the M&S realm is the realistic simulation of highly-sophisticated military weapon systems.

There are numerous reasons why this application is such a challenge. First and foremost is the inherent complexity of the weapon systems themselves. Often, a complex system can only be adequately represented by a complex model. In addition, weapon systems undergo constant change, as vulnerabilities and limitations are discovered and addressed through operational use. Operational capabilities are constantly added and refined, as they are enabled by the latest technological breakthroughs. The widespread application of net-centric architectures, resulting in each weapon system acting as a component in a much larger system-of-systems, substantially increases their interoperability demands. Collectively, these factors result in a high degree of weapon system complexity, affecting both their internal designs, and their interfaces to external systems and the environment.

Growing Complexity of M&S Systems

As weapon systems are designed and evolve, their corresponding models and simulations must follow suit, in order that they can serve as effective tools for training, performance prediction, test and evaluation, and other applications throughout the operational life

of the weapon system. Models and simulations inherit complexity by virtue of their close relationship to the systems they replicate. In turn, the task of building simulation systems to be interoperable and supportable becomes an ever-greater challenge. As this effect yields simulation systems of increased functionality and intricacy, it follows that the interfaces within and among these simulations also become more difficult.

It has been recognized that continued complexity growth cannot be allowed to proceed unchecked, with a unique solution being developed for every new enhancement or interface added to a simulation. This situation would invariably result in M&S complexity spiraling out of control, with the attendant increase in cost and probable decrease in supportability. There needs to be a way of ensuring that simulations can be implemented and modified in a disciplined, coordinated fashion. This has led the community to increase its interest in standards-based solutions as a means of controlling complexity, risk, and cost.

Current Standards

Standardization is not a new concept within the M&S domain. There are many niches where training and simulation-related standards have been successfully defined and applied, and others where work is ongoing. Various sectors of the community actively participate in a multitude of standards-development efforts, and these efforts frequently result in the successful implementation of beneficial standards. As early as 1989, the organization which eventually became the Simulation Interoperability Standards Organization (SISO) was formed to address standardization of networked simulations¹. SISO has

published a number of standards, which are in common use by developers of such applications.

Another example of an ongoing M&S standardization effort is the DoD's Advanced Distributed Learning (ADL) initiative. ADL has produced a series of standards, called the Sharable Content Object Reference Model (SCORM), which are described as "a collection of standards and specifications adapted from multiple sources to provide a comprehensive suite of e-learning capabilities that enable interoperability, accessibility and reusability of Web-based learning content"². The SCORM standards promise to reduce the cost of interactive courseware by enabling component reuse.

While successful, it should be noted that these and similar efforts are managed as independent activities, generally addressing standards from one specific perspective. It has been suggested that standards have the potential to yield even greater benefits, which the community might maximize by implementing a more systematic approach to their selection and promulgation. As such, the National Training and Simulation Association (NTSA), acting on behalf of the simulation industry, established the initiative described in this paper.

Impediments to Standardization

Standardization has not been fully embraced in all M&S areas, even when the opportunity to do so has been recognized. Sometimes, the technical issues which must be overcome in order to reach a solution can be underestimated. Simulated terrain data has been notoriously difficult to standardize, despite repeated attempts to do so by all of the military branches, thanks to a large number of seemingly insignificant details which, when aggregated, seriously diminish the viability of the standard. Other M&S applications, such as models of various aspects of weapon system performance, have received even less attention; consequently, there is even less understanding of the hidden problems, and standards are lacking in those areas as well.

The competitive nature of the marketplace can also create an obstacle to standardization. When a company can profit from some competitive advantage enabled by the lack of a standard, such as a proprietary technology, it will be resistant to adopting a standard which might eliminate that advantage. It will also

resist sharing its technological solution with its competitors.

When standards do not exist, programs are left to find their own solutions, even when dealing with similar problems. This results in the needless expenditure of redundant effort, and yields solutions with virtually no hope of achieving interoperability at a later time. This situation makes it imperative that these barriers to standardization be overcome.

Future Benefits of Standardization

The benefits of implementing robust standards throughout the M&S domain should be obvious, especially where systems must interface with one another. At a minimum, standards create the potential that uncoordinated projects will yield somewhat compatible solutions. If any chance exists that there will someday be a need for such interface, the definition of relevant standards would seem to be worth the overhead effort invested.

In addition to the growing complexity of the software models themselves, the operating environment of M&S is also evolving. Models and simulations are no longer monolithic applications, controlled by a single entity. More frequently, they are becoming integral components of larger systems. There is no reason to expect this trend to reverse in the foreseeable future; on the contrary, it will likely become even more widespread. For this reason, the definition and adoption of M&S standards will become more important over time.

CURRENT STATE OF STANDARDIZATION IN M&S

Organizationally, there are two distinct roles relative to standard development: 1) the organizational structure that coordinates and approves the use of standards and 2) the organizations that provide the venue for the development of standards. In the following sections, we will describe how those roles are filled in the M&S domain, specifically with respect to defense M&S.

DoD Standards Coordination/Administration Organizations

Within DoD, standards coordination occurs in two avenues: 1) the Defense Standards Program (DSP), which focuses on standards in the broadest sense, and 2) the Information Technology Standards Committee (ITSC). The ITSC reports to the Assistant Secretary of Defense for Networks and Information

Integration/DoD Chief Information Officer (NII/DoD CIO) in his capacity as the DoD Executive Agent for Information Technology Standards. The Modeling and Simulation Coordination Office (M&S CO) formerly the Defense Modeling and Simulation Office (DMSO), has the lead for coordinating M&S community input in both venues.

The M&S CO has been designated as the Lead Standardization Activity (LSA) for the "Modeling and Simulation Standards and Methodologies" (MSSM) Standardization Area of the DSP. Each of the Services as well as the US Joint Forces Command (JFCOM) have an M&S standards organization to manage their M&S standardization function. These organizations are listed below:

- Army Modeling and Simulation Office (AMSO)
- Navy Modeling and Simulation Office (NMSO)
- Air Force Agency for Modeling and Simulation (AFAMS)
- Marine Corps Modeling and Simulation Office (MCMISO)
- Joint Forces Command, Joint National Training Capability (JFCOM/JNTC)

Collectively, this body of organizations functions as the M&S Standards Steering Group (MS3G).

In addition to the organizations listed above, the ITSC established technical working groups (TWGs) to oversee standards application areas. The M&S CO director chairs the M&S TWG and represents M&S interests as a member of the ITSC and other TWGs.

At the coalition level, the North Atlantic Treaty Organization (NATO) Standardization Organization (NSO) performs the coordination role, primarily through the publication of standardization agreements (STANAGs). The NSO is comprised of the NATO Committee for Standardization (NCS), the NATO Standardization Staff Group (NSSG), and the NATO Standardization Agency (NSA). The interface to the NSO for M&S standards is through the NATO M&S Group (NMSG). The M&S CO, USJFCOM, Army, and Air Force are all represented in the NMSG.

M&S and M&S-related Standards Development Organizations

Development directly pertaining to M&S and related to M&S concerns occurs through a variety of organizations. The only standards development organization (SDO) focusing specifically on M&S standards is the Simulation Interoperability Standards

Organization (SISO). SISO directly has published standards including Base Object Models and the Real-time Platform Reference Federation Object Model (RPR FOM). SISO is also recognized as a standards developer by the Institute of Electrical and Electronic Engineers (IEEE). Through IEEE, SISO is responsible for the Distributed Interactive Simulation (DIS) and High Level Architecture (HLA) Standards.

In the area of environmental-representation standards targeted specifically towards M&S needs, the International Organization for Standardization (ISO) International Electrotechnical Commission (IEC) publishes the Synthetic Environment Data Representation and Interchange Specification (SEDRIS) standards. Both SISO/IEEE and ISO/IEC are open-standards organizations where the US and other national interests are represented.

Additional M&S standards (and standards that impact M&S) have been developed within DoD, without going through open-standards organizations. These include VV&A Recommended Practices, the Testing and Training Enabling Architecture (TENA), and the Common Training Instrumentation Architecture.

In addition to standards directly applicable to M&S, there are many open standards upon which M&S standards are based (e.g., the Extensible Markup Language (XML) and the Unified Modeling Language (UML)). These standards are produced by a wide variety of SDO (e.g., the World Wide Web Consortium and the Object Management Group for the two examples stated above).

Successes Achieved to Date

To date, the biggest impact for the M&S community has been in the area of simulation interoperability standards, including DIS, HLA, and TENA. Standards for VV&A have also had a major impact in maturing M&S as a discipline. The SEDRIS standards have experienced extensive use, primarily with the Army, and have documented substantial cost savings.

Standards Challenges for M&S

One of the primary challenges in the application of standards within the M&S community has been the fact that so many standards exist from many diverse sources. This has been recently evident in the area of simulation interoperability and has led to a study by the DoD on best path forward for standards in this area.

A similar challenge has arisen in the area of environmental-representation standards where the

SEDRIS and geospatial standards managed by the ISTC Geospatial Working Group overlap.

This later example points out a recurrent theme for standards usage in the M&S community. Because M&S is the business of representing systems and concepts from other communities (e.g., logistics, command and control, geospatial intelligence, etc.), care must be taken to closely coordinate M&S representation standards with the standards from those communities whose systems and concepts M&S represents.

Untapped Potential for Greater Standardization

Achieving Maximum Benefit from Standards

The key issue that the NTSA Standards Standing Committee is challenged with is letting the greater community know what standards are available for their use. In addition, the SSC can also support standardization by identifying emerging requirements for standards

Possible Approaches

The M&S CO is considering taking on the activity of capturing the existing and emerging DoD M&S standards and posting this information on an accessible web site for the standards community to access. In addition to this activity, there is the opportunity to publicize new M&S standards to membership, distribute proposed standards for comment, provide consolidated comments to the developer, and poll the membership for new requirements or potential changes to existing documents.

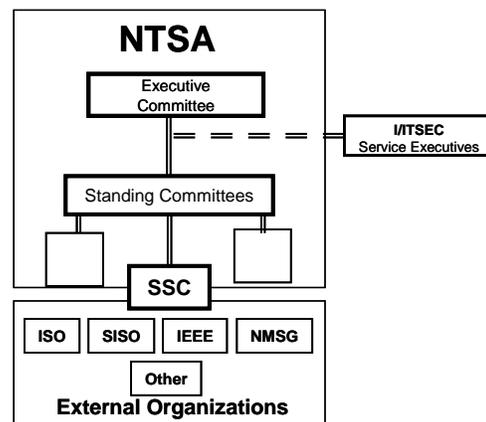
INTRODUCTION TO SSC

History

The topic of Standards and how they impact the training and simulation communities has been the subject of several Interservice/Industry Training Simulation and Education Conference (IITSEC) Papers and Special Events in recent years. At the 2005 Kick-Off meeting, the IITSEC Service Executives recognized the ongoing Industry and DoD interest in standards. They asked NTSA to consider the establishment of a Standards Working Group for the purpose of recommending options to best take advantage of that special interest and the influence of IITSEC as the premier training, simulation and education venue for DoD and Industry. As the IITSEC sponsor, NTSA facilitates the ongoing interface between government and industry related to Modeling, Simulation and Training issues³. Honoring

that request, a Standards Working Group composed of Service and Industry representatives was stood up and held its first meeting at the 2005 IITSEC Abstract Review. The working group met several times and collected background information on standards and standards organizations and focused on potential opportunities for NTSA and IITSEC in a value-added role. The group determined that the issue of standards is much broader than the conference event alone, and that NTSA, using the forum of IITSEC and other venues, could be a vehicle for establishing business cases for standards. In addition, the working group felt that NTSA could establish a group to facilitate discussion and education of standards and standards issues. As a result, they recommended that NTSA establish a permanent Standards Standing Committee.

NTSA Standing Committees provide a focused level of effort in support of the association's objectives, serve at the direction of the President, NTSA, and are endorsed by the NTSA Executive Committee. Term of service for Standing Committees is ongoing and at the discretion of the President, NTSA.



The SSC will interface with other standards development and standards focused organizations. Within the IITSEC organization and process, the SSC sponsors the insertion of Standards as a functional topic area within the Policy, Standards, Management and Acquisition Subcommittee. The purpose of this action is to solicit professional papers relating to standards to encourage pronency and education.

Membership

Membership of the SSC is voluntary and includes three representatives from Industry, one member from each Military Service (USA, USN, USMC and USAF), one member from OSD P&R representing the Joint

Community and one member from Academia. Membership terms are at least annual and as approved by the sponsoring organization.

Purpose and Mission

The NTSA Executive Committee directed that a Standards Standing Committee be established to support NTSA and IITSEC and facilitate an interface to other venues (e.g. government agencies, industry, SISO, etc.) for the purpose of:

- Defining what standards mean to this community
- Identify/research current needs/gaps/education
- Establish/encourage proponenty

The mission of the committee is to contribute, through the emphasis of standards, to the operational readiness and mission effectiveness in providing security for the United States and its citizens by:

- Building a knowledge-based environment through common standards (e.g. interoperability, data, policy, processes and security), to deter aggression against our nation and allies, and if this fails, fight and win!
- Facilitating the rapid development and transfer of knowledge-based data to the war-fighter and other responders
- Ensuring the systematic growth, development and application of simulation and training systems, products and services

The SSC will promote the future of standards in a knowledge-based environment by:

- Communicating to policy makers and the public this industry's commitment to standards
- Fostering research and education programs aimed at advancing the state of standards for this industry and identifying Best Practices
- Representing the common interests and commitment of the simulation and training industry relative to standards
- Providing information to NTSA Leadership enabling it to educate members of congress and selected congressional staff members on the importance of standards for our industry
- Advocating initiatives that help strengthen and preserve the training systems industrial base through the development and promotion of standards-based design and development

- Working to broaden the influence of NTSA within standards development and implementation bodies

SSC ACTIVITIES

Collaboration & Participation with Other Organizations

One significant component of the concept of operations of the NTSA Standards Standing Committee is to establish, maintain and employ constructive collaborative relationships with other organizations with related interest in standards for modeling and simulation.

Several organizations exist within the M&S standards community of practice, whose existence, mission, resources, and enterprise operations are particularly relevant to the SSC. These organizations all have existing membership, ongoing operations, and inter-organizational affiliations; and they provide products and services to their membership and to the larger M&S community of practice in areas related to greater or lesser degree to standards. Significantly, each such organization has particular attributes that permits it to serve most effectively one or another of the special roles necessary for the evolution of a robust M&S industrial standards environment. A provisional enumeration of organizations known to have vested interests in M&S standards management include (but are not limited to) the following:

US GOVERNMENT:

- U.S. Dept of Defense, Office of Secretary of Defense (DoD)
- U.S. Military Services: Army, Navy, Air Force and Marines
- U.S. Department of Homeland Security (DoHS)
- U.S Department of Commerce and the National Institute of Standards and Technology (NIST)
- U. S. Department of Energy (DoE)
- U.S. House of Representatives Caucus on Modeling and Simulation

PROFESSIONAL SOCIETIES:

- Simulation Interoperability Standards Organization (SISO)
- Society for Modeling and Simulation International [SCS]
- Association for Computing Machinery, Special Interest Group on Simulation (ACM SIGSIM)
- Institute of Electrical and Electronics Engineers, Inc. (IEEE)

- The International Council on Systems Engineering (INCOSE)
- The Institute for Operations Research and the Management Sciences (INFORMS)
- Military Operations Research Society (MORS)

INDUSTRIAL DEVELOPMENT

ORGANIZATIONS:

- *SimSummit* Round Table
- National Center for Simulation (NCS)
- Virginia Modeling, Analysis and Simulation Center (VMASC)
- Alabama Modeling and Simulation Council (AMSC)
- New England Modeling and Simulation Consortium (NEMSC)
- Mid-Atlantic Institute for Simulation and Analysis (MAISA)
- The Object Management Group (OMG)

The need exists for the SSC to appreciate this existing environment and to coordinate its own resource, activities, work-product, and influence in order to produce together, the most efficient accomplishment of those objectives that are shared with these existing agencies.

Strategies associated with pursuit of such inter-organization cooperation include: a) establishing consensus agreement of current needs and desired future states for M&S standards; b) aligning our respective mission intentions and operational agendas; c) establishing mechanisms for effective collaboration; and d) cooperating to conduct an effective campaign for M&S standards within the M&S community of practice.

Consensus on needs and desiderata for M&S standards, and the ways and means whereby standards can contribute to technical competency and cost-effective business practice is necessary to serve as a basis of confidence that cooperative programs of activity can be defined and reasonably allocated across the organizational domain. Comparison of mission commitment and programmatic operational agendas, as well as considering the kinds of value-offerings intended to be produced by each organization provides a clear expression of the 'field-of-play' upon which cooperative opportunities may be identified and pursued. Mechanisms facilitating cooperation may include point-to point operational agreements or the establishment of a broader multi-agency coordination via existing milieu such as *SimSummit*, the US Congressional Caucus forum, or the generation of

special purpose fora. Finally, concrete cooperation in establishing M&S standards requirements, surveying and evaluating existing standards, developing or modifying emerging standards, and conducting of events in such a way that multiple-organizational contributions and benefits may be realized are readily conceivable.

The intention and expectation of the NTSA SSC is to operate in cooperation with allied organizations to pursue M&S standards development use for the entire M&S community, focusing particularly on the NTSA membership's needs and contributory capabilities, and leveraging the commitment, and special provenance of similarly minded organizations

CONCLUSION

The goal of this paper has been to provide an introduction to the NTSA Standards Standing Committee. The reader should now have a better understanding of the background, genesis, and role of the SSC based on the interest in standards within the M&S community, goals and objectives, and collaboration with other organizations.

It should be clear that NTSA has not established the SSC for the purpose of creating, managing, or serving as a repository for M&S standards. Those roles are already served by existing government and non-government agencies representing many diverse interests. Rather, the SSC has been established to contribute to the operational readiness and mission effectiveness of the United States through the use of standardization as well as to promote the future of standards in a knowledge-based environment in part by publicizing existing standards and influencing standards on behalf of the M&S community.

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