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NATO MODELLING & SIMULATION GROUP (NMSG)

ALLIED MODELLING & SIMULATION PUBLICATIONS (AMSPs) POLICY DOCUMENT (APD)

Version 1.0

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A.	C-M(2009)0145	NATO Interoperability Policy and NATO Strategy for Enhancing Interoperability
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C.	C-M(2008)0017	NATO Intellectual Property Rights Policy for NATO Standardization Documents and NATO Dispositions Related to the Issue of Copyrights for NATO Standardization Documents
D.	AAP-32	Publishing Standards for Allied Publications
E.	ISO/IEC Guide 2 (© ISO/IEC)	Standardization and Related Activities - General Vocabulary
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G.	AC/323/NMSG(2012)-015	NATO Modelling and Simulation Master Plan
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I.	DI(2003)243	CNAD Letter Tasking NMSG as the Delegated Tasking Authority for NATO M&S Standardization
J.	NATOTerm	The official NATO Terminology Database https://nso.nato.int/natoterm/
K.	ADatP-34	NATO Interoperability Standards and Profiles (NISP)
L.	AC/323(MSG-086)TP/562	NATO MSG-086 Task Group Final Report STO-TR-MSG-086 on “Simulation Interoperability”

CHAPTER 1 INTRODUCTION

1.1. PURPOSE

1. The purpose of this Allied Modelling & Simulation Publication (AMSP) Policy Document (APD) is to describe the Policy and Procedures involved with managing the AMSP series of NATO standards. The APD also provides guidance on selection and use of standards to promote interoperability, best practice and reuse in the Modelling and Simulation (M&S) domain. The APD is intended to address and support in particular, the establishment of a common technical framework to foster interoperability and reuse as defined in the NATO M&S Master Plan[1].

2. In support of the main objective as described above, this APD (that is maintained by the Modelling & Simulation Standards Subgroup (MS3) of NATO Modelling and Simulation Group (NMSG)) describes the policy and procedures that pertain to the AMSP suite of publications.

3. It should be noted that:

   a. The APD and AMSPs avoid duplication of references to non-M&S specific standards as these will be detailed in other NATO documentation.

   b. The standards and other products included in the AMSPs have been chosen as the result of a formal selection process (see section 5.2) by the publication editors.

1.2. RELATIONSHIP WITH OTHER NATO TOOLS AND PUBLICATIONS

1. The APD provides the overarching policy and procedures that covers the creation and maintenance of all the AMSPs. The current list of AMSPs includes:

   a. **AMSP-01:** The NATO M&S Standards Profile (NMSSP). The NMSSP is designed to support the other AMSPs by providing the master list of NMSG approved M&S specific standards. It also provides advice and guidance on M&S architecture and implementation.

   b. **AMSP-02:** NATO M&S as a Service (MSaaS) Governance Policies (under development).

   c. **AMSP-03:** Guidance for M&S Standards in Computer Assisted Exercises (CAX).

   d. **AMSP-04:** NATO Education and Training Network (NETN) Federation & Federation Object Model (FOM) Design.

[1] NATO M&S Master Plan, AC/323/NMSG(2012)-015.

e. **AMSP-05:** NATO CAX Handbook.

f. **AMSP-06:** NATO Reference Mobility Model.

2. Other tools and publications over which the APD provides guidance for interacting by the AMSPs includes:

a. Standardization Agreements (STANAGs) and Standardization Recommendations (STANRECs).

b. The NATO Interoperability Standards and Profiles (NISP)[2] tool.

c. The official NATO Terminology Database (NATOTerm)[3].

3. Pictorially, the above relationships are shown below in Figure 1:

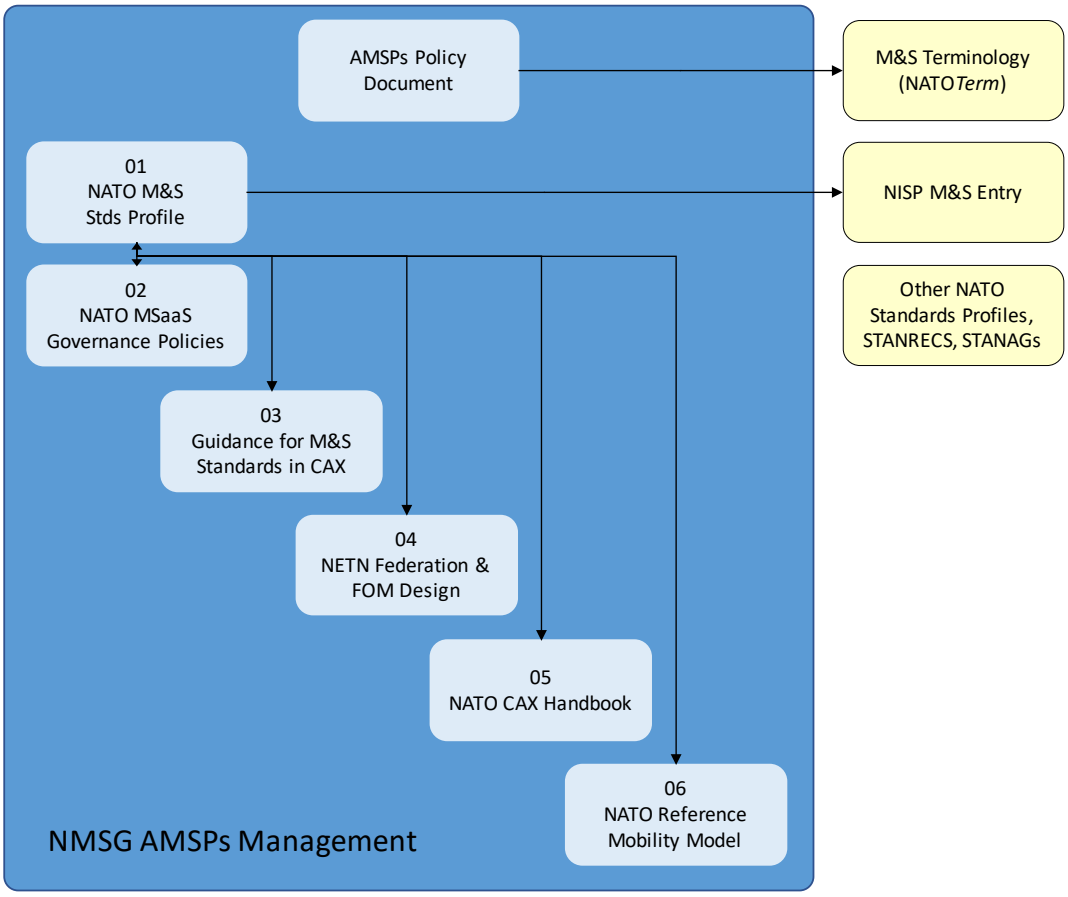

Figure 1: Relationship between AMSPs, the NISP and other NATO publications

[2] https://nhqc3s.hq.nato.int/Apps/Architecture/NISP/
[3] https://nso.nato.int/natoterm

CHAPTER 2 NATO STANDARDIZATION

2.1. BACKGROUND

1. The achievement of Alliance objectives increasingly depends on the smooth and close cooperation among national, multinational and NATO structures, forces and assets. NATO Allies must be interoperable with each other, and when required, with Partners, other Nations, non-governmental and international organizations and other (non-defence) government departments.

2. As set out in the Allies' Political Guidance, NATO must maximize the interoperability and capability of its forces, and further efforts are needed to enhance the interoperability of joint and multinational capabilities as a means of improving the safety of forces as well as their effectiveness and efficiency in support of the full range of Alliance missions. In this, standardization is critical to qualitative defence planning. Standardization should be timely and vigilant in defence planning.

3. Standardization supports achieving, maintaining and enhancing interoperability[4] among Alliance forces and between NATO forces and forces of Partners, thus strengthening the Alliance defence capabilities and enhancing the Alliance's operational effectiveness and efficiency. Standardization in support of interoperability is not an end in itself but is a key enabler and an important capability multiplier.

2.2. DEFINITIONS

1. NATO Standardization is defined as "*the development and implementation of procedures, designs and terminology to the level necessary for the interoperability[5] required by Allies, or to recommend useful practices in multinational cooperation*" (see NATOTerm).

2. The three levels of standardization in NATO are compatibility, interchangeability and commonality as defined in NATOTerm.

3. NATO recognizes the ISO/IEC concept of a standard: a standard is a *document, established by consensus and approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context*"[6].

4. ISO/IEC Guide 2 also emphasizes that "*standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits*".

[4] C-M(2009)0145 – NATO Interoperability Policy and Strategy

[5] Interoperability is the ability to act together coherently, effectively and efficiently to achieve Allied tactical, operational and strategic objectives (NATOTerm)

[6] ISO/IEC Guide 2 - Standardization and Related Activities - General Vocabulary

5. A NATO standard is a standard developed by NATO and promulgated in the framework of the NATO standardization process (see NATOTerm).

2.3. NATO STANDARDIZATION DOCUMENTS - TAXONOMY

The Alliance produces and/or uses the following NATO standardization documents[7]:

1. Covering documents:

    a. NATO Standardization Agreements (STANAGs); and

    b. NATO Standardization Recommendations (STANRECs).

2. Allied Standards:

    a. NATO standards; and

    b. non-NATO (civil and defence) standards used by NATO.

3. Standards-related documents (SRDs), such as:

    a. implementation guides;

    b. catalogues of national data;

    c. user manuals;

    d. handbooks; etc.

2.4. NATO STANDARDIZATION STAKEHOLDERS AND ROLES

1. Allies (NATO Nations). Allies may make standardization proposals and shall provide subject matter experts (SMEs) to develop NATO standardization documents. Allies shall ratify STANAGs within the agreed timelines. They shall implement standards in accordance with their ratification responses and agreed capability targets, in the most expeditious manner in response to Alliance needs. The training of national forces to NATO standards to meet the full range of Alliance missions remains a priority for, and responsibility of, individual Allies.

2. NATO Partners. Many standardization activities are open for Partners. Partners are encouraged to send SMEs to those activities and may make standardization proposals. Partners are invited and encouraged to adopt and implement standards when appropriate. Fully transparent adoption of NATO standards, and training of national forces to those standards, is of particular importance for capabilities to be integrated in NATO training and exercise events, NATO partnership programmes and NATO led-operations.

[7] AAP-03 The Directive for the Production, Maintenance and Management of NATO Standardization Documents

3. NATO Standardization Tasking Authorities[8] (Senior Committees). A NATO senior committee which holds responsibility for any NATO standardization document is a Tasking Authority (TA) in its respective field. TAs share and validate standardization proposals, develop and approve tasks, and produce, agree, review and maintain NATO standardization documents. TAs contribute to the development of interoperability requirements and standardization solutions to those, through the NDPP. All decision making regarding the development, promulgation and review of NATO standardization documents will be made by consensus of Allies in the responsible TA. A Tasking Authority may delegate these functions to another TA, or to a subordinate body called Delegated Tasking Authority (DTA). For purposes of transparency, coordination and efficiency any DTA shall report directly to its TA on standardization decisions.

4. Committee for Standardization (CS)[9]. The mission of the CS is to exert domain governance for standardization policy and management within the Alliance. The CS is the senior committee for the NDPP planning domain of standardization. Harmonization and coordination of the standardization community are roles of the CS, which is the senior policy committee responsible to the North Atlantic Council (NAC) for standardization policy and management and promoting standardization in the Alliance. The CS, with all stakeholders, should ensure that processes for standards development promote quality and timeliness.

5. NATO Standardization Office (NSO)[10]. The NSO initiates, coordinates, supports or administers all those NATO standardization activities that are conducted under the authority of the CS, provides standardization management support and standardization advice for the standardization community and supports the Military Committee Standardization Boards (MCSBs). The NSO facilitates staff coordination of standardization activities between Tasking Authorities, including through means such as the NATO Standardization Staff Group (NSSG). All NATO standardization documents are promulgated by the Director of the NATO Standardization Office.

6. Other NATO Bodies contribute to NATO standardization in accordance with their respective governing documents.

2.5. NATO POLICY FOR USE OF CIVIL STANDARDS[11]

1. NATO shall adopt and refer to suitable non-NATO standards (civil standards and national defence standards) in lieu of developing NATO standardization documents to the maximum extent. NATO will fully exploit mature national defence standards. NATO shall only develop a standard where no suitable non-NATO standard exists."

[8] These currently include, but are not limited to: the Committee for Standardization (CS), the Conference of National Armaments Directors (CNAD), the Consultation, Command and Control Board (C3B), the Logistics Committee (LC), the Military Committee (MC).

[9] Full and authoritative Terms of Reference for the CS are available at PO(2014)0611.

[10] https://nso.nato.int/nso/

[11] NATO Policy for Standardization (C-M(2009)0315)

2. Non-NATO standards shall be selected for NATO's use based on their utility for the NATO standardization requirement, broad acceptance, accessibility and technical excellence. In general, using civil standards is preferred to using national defence standards. Using civil standards leverages the broader expertise, technology, market and best practices of industry. Compared to developing purely NATO standards, this avoids duplication of effort, reduces NATO's workload, broadens interoperability and can reduce procurement costs.

3. NATO will cooperate with the most suitable SDOs on mutually beneficial standardization projects. When decided by the relevant Tasking Authorities, NATO shall adopt non-NATO standards, transfer NATO standards to civil SDOs or develop new dual use and other standards in collaboration with civil SDOs.

4. NATO will participate in the development/conversion process to ensure that the new civil standard meets NATO requirements. After promulgation of the new civil standard by the respective civil SDO, NATO can adopt it by means of a cover STANAG or STANREC as appropriate. The maintenance of the new civil standard is the responsibility of the civil SDO with NATO participation. Such cooperation between NATO and civil SDOs is regulated by a technical cooperation agreement (TCA) between the parties. The NSO may support the TA/DTA in contacting the SDO and facilitating required cooperation.

2.6. NATO STANDARDIZATION IN M&S DOMAIN

1. The NMSG was officially named as the Delegated Tasking Authority for NATO M&S standardization by CNAD[12]. In that role the NMSG is responsible for the production, management and maintenance of standardization documents in support of NATO Modelling and Simulation activities.

2. The NMSG is part of the NATO Science and Technology Organization (STO). It is assigned responsibility for coordinating and providing technical guidance for NATO M&S activities undertaken by NATO and partner nations.

3. The mission of NMSG is to promote cooperation among Alliance bodies, NATO, and partner nations to maximize the effective utilisation of M&S. Primary mission areas include: M&S standardization, education, and associated science and technology. The activities of the Group are governed by the NATO M&S Master Plan (AC/323/NMSG(2012)-015). The Group provides M&S expertise in support of the tasks and projects within the STO and from other NATO bodies.

4. The administration of M&S activities is the responsibility of the NATO Modelling and Simulation Coordination Office (MSCO) of the NATO Collaboration Support Office (CSO), which is the permanent body in the NATO STO structure.

5. The NMSG has a formal Technical Cooperation Agreement (TCA) with the Simulation Interoperability Standards Organization (SISO) and acts as custodian for that TCA (ref AC/323/NMSG(2019)-117).

[12] As per the CNAD Letter DI(2003)243

6. To achieve the standardization mission of the NMSG, the MS3 was formed as a permanent NMSG subgroup. Specifically, the MS3 was tasked with producing the NMSSP and administering its development and evolution. Creation of the MS3 and its initial Terms of Reference (ToR) were officially approved by the NMSG in October 2007.

2.7. INTELLECTUAL PROPERTY RIGHTS

1. The NATO Policy on Intellectual Property Rights (IPR) for NATO Standards is stated in C-M(2008)0017[13] document and is available on the NSO protected website. The document outlines procedures to ensure the protection of intellectual property rights of NATO standardization community from the civilian standardization community.

2. These procedures will resolve potential conflicts between the objective of standardization (the widespread diffusion of a common technology) and the principles of protecting intellectual property rights (the securing of private monopoly rights over a technology as an incentive to develop new products and processes).

3. The NSO owns the NATO copyrights in all NATO standardization documents and retains the right to exploit such copyrights.

4. NSO will grant Member States and Partnership for Peace (PfP) countries a license, free of charge, to:

   a. Reproduce, translate and adapt in whole or in part, in any material form, all NATO standardization documents for the Member States' or PfP country's own use;

   b. Issue reproductions of, lend, or communicate, in whole or in part, in any material form, all NATO standardization documents, or translations or adaptations thereof; and

   c. License or permit the sub-licensing of any of these rights to non-member nations or PfP countries.

5. The rights provided above do not extend to commercial sales of the NATO standardization documents.

6. Concerning referenced standards developed by civil organizations, they have specific copyrights requirements, which can be different from one organization to another. It is the responsibility of standards users to check these restrictions and comply with them. The NSO or the NMSG will assume no responsibility for misuse of such copyrights or restrictions by standards users.

[13] C-M(2008)0017 NATO Intellectual Property Rights Policy for NATO Standardization Documents and NATO Dispositions Related to the Issue of Copyrights for NATO Standardization Documents

2.8. NATO STANDARDIZATION DOCUMENTS COPYRIGHT

1. The Director of NSO is responsible for ensuring that NATO standardization documents comply with NATO requirements related to the issue of copyrights for NATO standardization documents (see C-M(2008)0017[14]) and shall include the copyright marker and disclaimer (see AAP-32)[15]. The disclaimer is included in the NATO Letter of Promulgation issued by the Director of NSO.

[14] C-M(2008)0017 NATO Intellectual Property Rights Policy for NATO Standardization Documents and NATO Dispositions Related to the Issue of Copyrights for NATO Standardization Documents
[15] AAP-32 Publishing Standards for Allied Publications

CHAPTER 3 STANDARDS METADATA

3.1. STANDARDS MATURITY STATUS

1. In terms of maturity, standards and guidance documents are characterised as either Current, Emerging, Superseded, Obsolete or Cancelled as appropriate in order to provide alignment with the NATO Interoperability Standards and Profiles (NISP)[16] publication. These categories are defined as follows:

a. **Current:** A current standard is one of the latest issue or amendment and not superseded, obsolete or cancelled. The status usually applies to standards for equipment or processes that are up-to-date or are in-general use.

b. **Emerging:** A standard is considered emerging if it is sufficiently mature to be used within the definition of future planned systems.

c. **Superseded:** A superseded standard is one that has been replaced by a later issue or amendment. They may be superseded by either the same document with a higher issue or amendment level, or by an entirely different standard.

d. **Obsolete:** Obsolete standards contain accurate information at the date of being made obsolete but are no longer applicable to equipment or processes. Provided that subsequent information has not invalidated the content, an obsolete standard could still be of use to historic systems or processes.

e. **Cancelled:** Cancelled standards have been totally withdrawn from service and are not to be used. A particular revision or issue of a document can be classified as cancelled and the next issue or revision of the same document can supersede the cancelled document.

2. Further to the terms of maturity as described above, an additional category of Mandated is also applied where deemed applicable. A mandated standard is a ***current*** standard that requires compliance for Coalition Operations where an entity (Nation/Organization) wishes to participate in a NATO Operation (including training, exercise, real op, etc.), in which case the use of the respective standard(s) is obligatory.

3.2. CHARACTERIZATION OF M&S STANDARDS

1. The purpose of this section is to better specify the term standard, which is widely used in the M&S community, but with different meanings. First, there is a need to distinguish between different types of standards:

[16] ADatP-34 NATO Interoperability Standards and Profiles (NISP)

a. **Official Standards:** Standards are called "official", or "de jure", or "by law", if they are "developed by standards development bodies with legal and recognized standing", such as ISO or SISO. The High Level Architecture (HLA) is a good example of an official M&S standard: it was developed by SISO, published by IEEE and also adopted by NATO via a STANAG. Annex C provides a list of well-known Standards Developing Organizations (SDOs). A majority of M&S standards described in AMSP-01 are official standards in consistency with the NATO definition of standards (see section 2.2.).

b. **De-facto Standards:** De-facto Standards (“in practice”) are standards that have achieved a commonly used position by public acceptance or market forces. They mainly originate from industry and their use has expanded in the wider M&S community for practical reasons. A good example of a "de facto" standard is OpenFlight, which is in large use in the M&S community.

c. **Open Standards:** Several slightly different definitions and meanings can be found that describe this term. AMSP-01 uses the following definition: "Specifications that are developed by an SDO or a consortium to which membership is open and are available to the public for developing compliant products (with or without some license fee)". The use of Open standards in a user application should be without restrictions and the necessary documentation should be available on fair and equitable terms. The key points which qualify standards to be open are:

   (1) Membership to the developing organization is open, thus allowing users to influence the development of standards in a balanced and transparent way;

   (2) Public availability of the standard once it is completed; and

   (3) The option to use it for any purpose as deemed fit (e.g. development of supporting tools).

d. ***"Local"* versus *"International"* Standards:** The term "standard" is used by different communities at different levels: one product or process can be considered a "standard" within a specific organization, but is not in use in a larger national or international community or in a similar but different community. For example, a national Air Force can have its own standard policy and organization and define its own internal set of standards. In this case they can be qualified as "local standards". They may not be used either at "national" level or at the "international" level (such as NATO).

3.3. STANDARDS CHARACTERISTICS

1. The main qualities that make good standards are the following:

a. Relevance: a standard shall be relevant to the targeted user/developer community;

b. Substantive Content: a standard shall provide meaningful information and/or results;

c. Timely: production and publication shall be done in an efficient manner to ensure the standard is useful to the community;

d. Vetted: The product shall be reviewed and approved through consensus by the technical community to which the product applies;

e. Generality: standards shall be as general as possible to support the broadest community of current and future users;

f. Stability: standards shall be established and changed only as necessary. They shall be prototyped and tested before being proposed for adoption to demonstrate their maturity; and

g. Supportability: Selected standards shall be supported.

2. SDOs generally recognize these important features in their own policy and procedures documents.

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CHAPTER 4 AMSP POLICY

1. As NATO's Delegated Tasking Authority for standardization in M&S domain, the NMSG manages the overall process of approval development, maintenance and evolution of AMSPs in accordance with AAP-03, the Directive for the Production, Maintenance and Management of NATO Standardization Documents:

   a. Assignment of custodianship (a Nation or Organization) of AMSP;

   b. AMSPs shall be reviewed in a period not to exceed two years and any changes made submitted to the NMSG for approval. Upon the NMSG approval, the document shall be posted to the NMSG web site and submitted to NSO for promulgation.

   c. Ensure active promotion and accessibility of standardization products;

   d. AMSP consists of different categories including standards profiles, guideline documents, technical architectures, combination of these, etc.

2. Specifically for standard profiles (e.g. AMSP-01), following rules apply:

   a. Any member of the NMSG MS3, as well as Task Group chairpersons or NMSG members may propose standards for inclusion in, or removal from, the respective standards profile based on the policy outlined in Chapter 6. Proposals will be submitted in the form of a completed standard description consistent with Annex B of AMSP-01. Submissions shall be sent to NMSG via e-mail msg@cso.nato.int

   b. The MS3 votes on the inclusion and retirement of standards in the standards profile by an audio or video teleconference, face-to-face meeting, or email. If a standard receives a 75% vote for inclusion, it will be included. If the 75% threshold is not met, a discussion period of two working weeks (with the exclusion of holidays) shall be observed, followed by an email vote. If the 75% threshold is not met again, then the standard shall not be included. 75% threshold applies to the votes cast. Quorum is established at 75% of MS3 National voting membership.

   c. All email votes in step 'b' shall be held for a period of two calendar weeks.

   d. All standards must be reviewed at least once every five years, and the MS3 membership shall vote for continued inclusion or modification using the voting procedures described in step 'b' above

   e. The process in steps 'a' to 'd' occurs on a continuing basis.

3. Any other comments or proposals regarding the AMSPs may be addressed via the points of contact in Annex A or directly via email (msg@cso.nato.int) to the secretary of MS3.

CHAPTER 5 MODELLING AND SIMULATION STANDARDS EVOLUTION

5.1. RATIONALE FOR THE DEVELOPMENT, SUPPORT AND USE OF M&S STANDARDS

1. M&S technology is becoming a mature industry but is still too diverse in general approaches and technical solutions. A mature M&S community should not depend on unique/proprietary solutions, rather it should actively adopt and use generally accepted standards. Historically, the need for establishing M&S standards became apparent with the emergence of the distributed simulation concept and the associated technology (late-80s, early-90s).

2. Reuse of different simulators/simulation applications developed under different technological approaches and implemented on different platforms is possible via the use of interoperability protocols and/or architecture standards. While simulation interoperability spurred the development of many open standards, there are other types of M&S and M&S-related standards that are of interest. e.g., system engineering practices.

3. After some years of standards development, it appeared that existing standards were only partial solutions to the overall interoperability problem. The current situation is improving, but still more has to be done. Standards development and maintenance is an evolutionary process with existing standards needing to evolve to meet changing requirements. When new requirements emerge or technical innovations become possible, new standards are likely to be needed.

4. M&S standardization is now recognized as indispensable for a mature simulation activity and is a recognized part of the M&S body of knowledge.

5. The benefits of using M&S standards are as follows:

   a. Improved interoperability

      (1) According to the NATO definition, interoperability[17] is “the ability to act together coherently, effectively and efficiently to achieve Allied tactical, operational and strategic objectives”[18]; and

      (2) Interoperability does not only include Simulation to Simulation data exchange, but also interoperability between Simulations and Live systems (e.g. through Link16 with Hardware-in-the-loop or with Command & Control applications through Coalition Battle Management Language, C-BML).

[17] See NATOTerm, the official NATO Terminology Database https://nso.nato.int/natoterm/ .
[18] Specifically for M&S, interoperability can be defined on technical, syntactical, semantic, and pragmatic levels. For further details see NATO MSG-086 Technical Report STO-TR-MSG-086 AC/323(MSG-086)TP/562 on “Simulation Interoperability”.

b. More specific benefits to using standards:

(1) Standards allow people working with different systems to **cooperate** and promote **collective training or experimentation**;

(2) Standards **reduce costs**, including development, lifecycle, and implementer training costs; standards are a natural way to share investments avoiding duplication of efforts on new technologies while reducing risk linked to their use;

(3) Standards can improve operational capabilities by supporting **higher reliability** and facilitating **new technology insertion**;

(4) Standards **protect investment**. For example, scenario descriptions, models and databases may be reused in a variety of applications. Standards also allow upgrading to newer systems or changing to systems from another vendor;

(5) Standards allow **access to the best of the technology** (standards are supposed to represent the state-of-the-art; standards are built on experience and are generally based on more recent technological developments);

(6) Since standards require a **large consensus** and are developed in open organizations (SDOs) there is less reluctance and risk to their use; and

(7) Standards can **reduce complexity** and produce more modular and reconfigurable implementations thus reducing development risk.

6. From an industry perspective, use of standards facilitates co-operation among traditional competitors on large multinational programmes:

a. No one feels in a dominant position;

b. Use of standards avoids lengthy negotiations; and

c. Use of standards are neither an unacceptable constraint nor a performance overhead; on the contrary, standards are an enabler for asset protection and industrial co-operation as standards allow everybody to ‘speak the same language’ and understand each other.

5.2. DEVELOPMENT OF STANDARDS

1. The process of developing standards varies depending on the SDO involved, but most of the steps are common, especially across SDOs developing open standards. All SDOs establish policies, procedures and processes, and ensure they are followed. The main steps in a typical SDO process are:

a. **A need is identified and described**, along with identification of key individuals and organizations that will participate in the standards development. If the SDO approves a standard proposal, a working group is formed to develop it. Working group membership in the standards development process must not be unduly restrictive. Voting rights are uniformly and fairly applied;

b. The majority of the effort and time in the standards developing process is the **development of a draft specification** for balloting. This is true for both open standards development processes as well as closed processes such as the development of a proprietary standard. Typically, a series of drafts are developed, reviewed, commented upon, and comments resolved until the working group agrees that sufficient consensus has been achieved to proceed to balloting. Note that ideally the drafting process should not be a paper exercise only. Standards that are being developed should be validated in experiments and/or exercises as much as possible to build confidence and experience and to discover performance or implementation issues. At each stage of development, members are allowed to comment and given sufficient time to do so;

c. The **balloting process** is usually a more formal process than the draft development described in step ‘b’. Typically all objections require the specification of alternate text to satisfy the commenter (where during the drafting process, less precise comments and identification of concerns are permitted). Balloting processes have a threshold in terms of a percentage of votes that must agree to pass the ballot. If that threshold is not reached, then a recirculation of the ballot is required, after making modifications to the balloted specification to address comments. Finally, consensus, but not unanimity, must be achieved;

d. Once the ballot is passed, the SDO **publishes the specification**. The standard is made readily available (with or without license fee). Then a **maintenance period** is started. During the maintenance period, any errors and problems are reported to a maintenance group; and

e. At the end of a specified period (typically 5 years) the SDO requires that the standard be reviewed, and as needed it may be **reaffirmed without changes, revised, or retired**.

2. For open standards processes, the steps above typically take 2-3 years. Standards that do not go through open balloting can have much shorter revision cycles. Note that open standards don’t necessarily have to be developed from scratch. They may be based on an existing proprietary proposal(s) that is/are opened for community review in order to become an open standard. The SDOs that are most relevant to the M&S community are briefly described in Annex C.

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CHAPTER 6 POLICY FOR STANDARDS' SELECTION FOR INCLUSION IN M&S STANDARD PROFILES

1. The scope of standards that are considered for inclusion in the M&S standards profiles (such as AMSP-01) include:

   a. M&S development, integration and employment standards that have been widely adopted and commonly used, and standards that have the potential to be used by, and are available to, NATO;

   b. Standards that are specific to M&S, as well as general purpose standards for systems and software engineering (e.g. programming language standards) that have specific implications for M&S; and

   c. Technical interoperability standards, data standards and best practices.

2. Except 'Cancelled' standards, all other maturity levels of M&S related standards specified in section 3.1 are considered for inclusion in the AMSP-01

3. The M&S standard profiles should contain mainly 'open' standards and attempt to avoid proprietary standards. Although this is not always possible those proprietary standards that are chosen must be common or de facto standards such that they can be opened and converted by a suitable array of Commercial-Off-The-Shelf (COTS) tools.

4. Standards that are mostly relevant to a specific community may still be considered for inclusion if they are critically important for that community to achieve interoperability

5. The M&S standard profiles should not include:

   a. Local standards as defined in section 3.2.d.

   b. Standards that will require a fee to implement. For example, if those implementing the standard must pay a royalty fee to the publisher of the standard for every instance of use. This does not imply that a standard will be precluded from the AMSPs just because products based on the standard are sold or licensed. Also, this does not mean that the standard profile excludes standards for which the user must pay a fee to obtain a copy (e.g. IEEE standards); and;

   c. General information technology and software engineering related standards (e.g. programming languages such as C++) unless they have a specific implication for M&S.

6. Should a standard included in an M&S standard profile become obsolete, it will not be removed from the document as long as it is not superseded by another suitable standard. However, the description of such standard will reflect its status as accordingly.

CHAPTER 7 RECOMMENDATIONS

This document has set policies and procedures to manage the generation and maintenance of AMSPs. Specific recommendations emerging from the policy document are:

1. Given the role and mandate of the NMSG, as the Delegated Tasking Authority for standardization in NATO M&S domain, the MS3 sub group of the NMSG is the appropriate body to implement and manage the task of developing and maintaining the various AMSPs. The NMSG should continue tasking the MS3 subgroup to manage the process of review and maintenance of the AMSPs. In addition, the role of the NATO MSCO as a permanent office in charge of supporting this activity and the focal point is to be emphasized. This NMSG task should be formalized in the next update of the NATO M&S Master Plan.

2. Where gaps or unnecessary overlaps in M&S standards are identified, there is a need that NMSG and nations cooperate with the M&S community, and actively solicit support of SDOs, in particular SISO, in trying to fill the major gaps and align overlapping standards.

3. NATO organizations (including STO Panels and CMRE), member and partner nations be encouraged to contribute in offering additional standards for consideration, and consider active participation in the MS.

4. The NMSG shall increase efforts to actively disseminate and promote the use of the AMSPs inside and outside NATO.

5. The NMSG should continue developing and maintaining the NATO M&S Terminology in the framework of NATOTerm database that covers terms and definitions that are relevant to the NATO M&S domain in consistency with national glossaries.

6. This policy document should be reviewed and updated as necessary but at least once every five (5) years. MS3 will be responsible for conducting the reviews.

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ANNEX A POINTS OF CONTACT

NATO Modelling and Simulation Standards Subgroup (msg@cso.nato.int)

MS3 Chair	Grant BAILEY	Grant.Bailey127@mod.gov.uk
MS3 Secretary	Adrian VOICULET	adrian.voiculet@cso.nato.int

National Points of Contact

AUS	Australian Defence Simulation and Training Centre	ADSTC@defence.gov.au
CAN	DND M&S Coordination Office	DND-CAF_MSCO@forces.gc.ca
CZE	Dalibor PROCHAZKA	dalibor.prochazka@unob.cz
DEU	DEU M&S Coordination Office	BAAINBwT1.6-MSCO@bundeswehr.org
ESP	Mario DE LA FUENTE MARTIN	cooperacionid@mde.es
FIN	Harri PIETILA	harri.pietila@mil.fi
FRA	Patrick GRELIER	patrick.grelier@intradef.gouv.fr
GBR	Grant BAILEY	Grant.Bailey127@mod.gov.uk
ITA	Agatino MURSIA	agatino.mursia@leonardocompany.com
NLD	Wim HUISKAMP	wim.huiskamp@tno.nl
NOR	Ole Martin MEVASSVIK	FFI-NMSG-MS3@ffi.no
NZL	Iain GILLIES	I.Gillies@dta.mil.nz
SWE	Fredrik JONSSON	fredrik.m.jonsson@mil.se
TUR	Mr Huseyin Bugra Han AYYILDIZ	hayyildiz@ssm.gov.tr
USA	US DoD M&S Coordination Office	osd.ask.msco@mail.mil

Points of Contact in NATO Organizations

M&S CoE	Roberto CENSORI	mscoe.ms08@smd.difesa.it
NIAG	Patrice LE LEYDOUR	patrice.leleydour@thalesgroup.com
STO	Adrian VOICULET	adrian.voiculet@cso.nato.int

ANNEX B ACRONYMS

A

AAP	Allied Administrative Publication
AMSP	Allied Modelling and Simulation Publication
AP	Allied Publication
APD	AMSP Policy Document

C

C-BML	Coalition Battle Management Language
C3B	Consultation, Command and Control Board
CAX	Computer Assisted Exercise
CMRE	Centre for Maritime Research and Experimentation (STO)
CNAD	Conference of National Armaments Directors (NATO)
COTS	Commercial Off-The-Shelf
CS	Committee for Standardization (NATO)
CSO	Collaboration Support Office

D

DND	Department of National Defence
DoD	Department of Defence
DTA	Delegated Tasking Authority

G

GIS	Geographic Information System
GML	Geographic Markup Language
GM-VV	Generic Methodology for Verification and Validation

F

FOM	Federation Object Model (HLA)

H

HLA	High Level Architecture

I

IEC	International Electrotechnical Commission of ISO
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IPR	Intellectual Property Rights
ISO	International Organization for Standardization
IT	Information Technology

L

LC	Logistics Committee

M

M&S	Modelling and Simulation
MC	Military Committee (NATO)
MCSB	Military Committee Standardization Board (NATO)
MSaaS	Modelling and Simulation as a Service
MSCO	Modelling and Simulation Coordination Office
MSG	Modelling and Simulation Group (NATO)
MS3	Modelling and Simulation Standards Subgroup (subgroup of NMSG)

N

NAC	North Atlantic Council
NATO	North Atlantic Treaty Organization
NATOTerm	The NATO Official Terminology Database (https://nso.nato.int/natoterm)

NDPP	NATO Defence Planning Process
NETN	NATO Education and Training Network
NMSG	NATO Modelling and Simulation Group
NMSSP	NATO M&S Standards Profile
NAC	North Atlantic Council
NDPP	NATO Defence Planning Procerss
NISP	NATO Interoperability Standards and Profiles
NSO	NATO Standardization Office
NSSG	NATO Standardization Staff Group

O

OGC	Open Geospatial Consortium
OTAN	Organisation du Traité de l'Atlantique Nord

P

PfP	Partnership for Peace (NATO)

S

SDO	Standards Developing Organization
SISO	Simulation Interoperability Standards Organization
SME	Subject Matter Expert
SRD	Standards Related Document
STANAG	Standardization Agreement (NATO)
STANREC	Standardization Recommendation (NATO)
STO	Science and Technology Organization

T

TA	Tasking Authority
TC	Technical Committee
TCA	Technical Cooperation Agreement

TG	Task Group
TOR	Terms of Reference

U

UCATT	Urban Combat Advanced Training Technology
URL	Uniform Resource Locator

ANNEX C STANDARDS DEVELOPING ORGANIZATIONS OF INTEREST TO NATO M&S

C.1. INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

The International Organization for Standardization, widely known as ISO, is an international-standard-setting body that promulgates world-wide proprietary industrial and commercial standards. ISO is composed of representatives from various national standards organizations, and acts as a consortium with strong links to member governments. Founded on 23 February 1947, the organization, headquartered in Geneva, Switzerland, has members from more than 160 countries and over 780 technical bodies to take care of standards development. While ISO defines itself as a non-governmental organization, its ability to set standards that often become law, either through treaties or national standards, makes it more powerful than most non-governmental organizations. ISO standards are developed by technical committees comprising experts from the industrial, technical and business sectors which have asked for the standards, and which subsequently put them to use. Many groups wish to contribute to the process of the development of International Standards, because they are affected by those standards. They participate in the technical work of ISO through national delegations appointed by the member bodies of ISO or through liaison organizations of international or broadly-based groups. Since 1947, the ISO has published more than 21 000 International Standards. The ISO's work program ranges from standards for traditional activities, such as agriculture and construction, through mechanical engineering, to medical devices, to the newest information technology developments, such as the digital coding of audio-visual signals for multimedia applications. ISO is officially recognized by NATO as an SDO, under a Technical Cooperation Agreement (TCA) signed by NSO. With the exception of a small number of isolated standards, ISO standards are normally not available free of charge, but for a purchase fee. The official URL for access to ISO Standards is www.iso.org

C.2. THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS STANDARDS ASSOCIATION (IEEE-SA)

The IEEE is one of the leading standards development organizations in the world. IEEE performs its standards development and maintenance functions through the IEEE Standards Association (IEEE-SA). IEEE standards affect modelling and simulation as well as a wide range of industries including: power and energy, biomedical and healthcare, Information Technology (IT), telecommunications, transportation, nanotechnology, information assurance, and many more. Individuals, including IEEE members of any grade, IEEE Society affiliates, or non-IEEE members are eligible for IEEE-SA membership. Corporate Membership is designed for corporations, government agencies, trade associations, user groups, universities and other standards developing organizations that want to actively participate in standards development. All IEEE members (individual or corporate) are entitled to ballot on an unlimited number of proposed standards projects. Non-members of the IEEE can participate in the balloting process by paying a “balloting fee”. Currently, IEEE

collection of standards consists of more than 1,300 IEEE standards, including projects under development. At the present time, IEEE is officially recognized by NATO. IEEE Standards Association ("IEEE-SA") offers copyright permission, on a non-discriminatory basis, for any and all uses. IEEE-SA associated materials include IEEE standards and drafts, IEEE-SA policies, procedures, by-laws and publications associated with the IEEE Standards Information Network ("IEEE-SIN"). The payment of royalty may be required, depending on the amount of material to be utilized and/or the intended use of those materials. The official URL for access to IEEE Standards is http://standards.ieee.org

C.3. THE SIMULATION INTEROPERABILITY STANDARDS ORGANIZATION (SISO)

SISO is an international organization dedicated to the promotion of modelling and simulation interoperability and reuse for the benefit of a broad range of M&S communities. SISO's Standards Activity Committee develops and supports simulation interoperability standards, both independently and in conjunction with other organizations. SISO is a Category C Liaison Organization with ISO/IEC (JTC 1) for the development of standards for the representation and interchange of data regarding Synthetic Environment Data Representation and Interchange Specification (SEDRIS). Each person who registers for and attends a Simulation Interoperability Workshop (SIW) is considered a member of SISO, effective as of the date of such registration. SISO membership automatically expires at the end of any calendar year in which a member fails to attend at least one SISO Workshop. SISO membership exceeds 1400 individuals from 28 countries, representing over 400 organizations. Currently, more than 35 SISO Standards and Reference products have been developed and approved. SISO is officially recognized by NATO as an SDO, under a TCA signed by the NMSG in 2007 and reaffirmed in 2019. SISO standards are normally free of charge. The official website for SISO standards is www.sisostds.org.

C.4. THE OPEN GEOSPATIAL CONSORTIUM (OGC)

The OGC is an international voluntary consensus standards organization (not for profit). In the OGC, more than 50 commercial, governmental, non-profit and research organizations worldwide collaborate in an open consensus process encouraging development and implementation of standards for geospatial content and services, sensor web and Internet of Things, GIS data processing and data sharing. Prior to 2004, the organization was known as Open GIS Consortium. Most of the OGC standards are based on a generalized architecture captured in a set of documents collectively called the Abstract Specification, which describes a basic data model for geographic features to be represented. Atop the Abstract Specification is a growing number of specifications, or standards, that have been (or are being) developed to serve specific needs for interoperable location and geospatial technology, including GIS. The OGC is divided into three operational units: The Specification program, the Interoperability Program, and Outreach and Community Adoption. The OGC has a close relationship with ISO/TC 211 (Geographic Information/Geomatics). The OGC abstract specification is being progressively replaced by volumes from the ISO 19100 series under development by this committee. Further, the OGC standards Web Map

Service, GML, Web Feature Service, Observations and Measurements, and Simple Features Access have become ISO standards. Further information can be found at www.opengeospatial.org.

C.5. THE NORTH ATLANTIC TREATY ORGANIZATION (NATO)

The standardization activity in NATO is complex and covers multiple domains. As stated in the paragraph 2.6., the NATO STO's NMSG is the Delegated Tasking Authority for standardization in NATO M&S domain. Dedicated NMSG Task Groups were established with the aim to develop NATO standardization documents. The efforts of several NMSG Task Groups were continued by SISO and resulted in M&S standards (e.g. C-BML, GM-VV, UCATT, etc.). In the framework established by the NATO Standardization Policy, NMSG is actively involved in the SISO activities to ensure that the standards developed by SISO meet NATO requirements so they could be adopted by NATO via covering STANAGs/STANRECs. More details on the standardization process in NATO are available on the NATO Standardization Office website: https://nso.nato.int/nso/