

NATO STANDARD

AGeoP-14

**DEFENCE MARITIME GEOSPATIAL
EXCHANGE MODEL, EMBRACING
S-100 AND NGIF DEVELOPMENTS**

Edition A Version 1

MAY 2017



NORTH ATLANTIC TREATY ORGANIZATION

ALLIED GEOGRAPHIC PUBLICATION

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NATO LETTER OF PROMULGATION

12 May 2017

1. The enclosed Allied Geographic Publication AGeoP-14, Edition A, Version 1, DEFENCE MARITIME GEOSPATIAL EXCHANGE MODEL, EMBRACING S-100 AND NGIF DEVELOPMENTS, which has been approved by the nations in the Military Committee Joint Standardization Board, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 6503.
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Edvardas MAŽEIKIS
Major General, LTUAF
Director, NATO Standardization Office

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
EST	The implementing will be possible when Estonian Maritime Administration will produce maritime information according the IHO S-100 standard.
SVN	Slovenia does not produce or develop special geospatial data and products, such as AML, for maritime operations. However, Slovenia can use AML products on SAF vessels and therefore supports the development of Defence Maritime Geospatial Exchange Model and AML+ Product Specifications.
USA	The effective implementation of this standard (AGeoP-14) is, in part, dependent on the NATO Geospatial Information Framework based AML+ product specifications. These product specification are not defined in this edition, but are to be included in future editions. Once these are defined, the U.S will be able to put forward an implementation plan.
<p>Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.</p>	

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TABLE OF CONTENTS

CHAPTER 1	INTRODUCTION.....	1-1
1.1.	BACKGROUND.....	1-1
1.2.	DMGEM OVERVIEW	1-2
1.3.	INTEROPERABILITY REQUIREMENT AND PARTNER INVOLVEMENT	1-2
CHAPTER 2	GENERAL INFORMATION	2-1
2.1.	AIM.....	2-1
2.2.	DEFINITIONS.....	2-1
2.3.	RELATED DOCUMENTS.....	2-1
2.4.	ACRONYMS.....	2-2
CHAPTER 3	DMGEM FRAMEWORK.....	3-3
3.1.	SCOPE.....	3-3
3.2.	CONFORMANCE	3-3
3.3.	CERTIFICATION.....	3-3
3.4.	COMPONENTS OF THE DMGEM.....	3-3
3.5.	DATA PRODUCTS.....	3-5
3.6.	DMGEM CONCEPT MAPPING.....	3-6
3.7.	AML+ SOFTWARE.....	3-6
ANNEX A	S-100 AML+ PRODUCT SPECIFICATIONS	A-1
ANNEX B	NGIF AML+ PRODUCT SPECIFICATIONS	B-1
ANNEX C	DEFINITION AND MANAGEMENT OF THE DMGEM MAPPING	C-1
ANNEX D	CONFORMANCE SUITE.....	D-1

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CHAPTER 1 INTRODUCTION

1.1. BACKGROUND

1. Maritime operations within NATO rely on the provision of timely and suitable geospatial information. This information supports effective decision making to enable the planning and conduct of operations. The NATO Additional Military Layers (AML) concept was developed to address this provision and has been promulgated through NATO STANAG 7170.

2. Subsequently, geospatial information standards have developed in particular within the ISO 19100 series of standards. Frameworks based on these standards have been developed in both the International Hydrographic Organization (IHO) community and in NATO with the advent of the NATO Geospatial Information Framework (NGIF).

3. The Defence Maritime Geospatial Exchange Model defines Product Specifications for maritime geospatial information using both the S-100 and NGIF frameworks. This family of specifications is called AML+ to reflect the evolution of AML and to indicate the broader range of content and supporting systems envisaged for AML+.

4. This Allied Geographic Publication (AGeoP) defines the rules to which AML+ Product Specifications shall be developed and maintained. It also defines the structure of a mapping which ensures harmonization between concepts used in both the S-100 and NGIF frameworks. This document also builds on the NATO Geospatial Metadata Profile laid out in AGeoP-8 in order to ensure consistent metadata across all geospatial products.

5. DMGEM development is directed by the Geospatial Maritime Working Group (GMWG) and all AML+ Product Specifications endorsed by them.

6. The GMWG is tasked by the NATO Geospatial Board (NGB) (through the Geospatial Requirements Working Group (GRWG) for NATO maritime geospatial requirements and the Joint Geospatial Standards Working Group (JGSWG) for NATO geospatial standardization). For oceanographic and meteorological contents, GMWG liaises with the Military Committee Working Group on Meteorology and Oceanography (MCWG (METOC)).

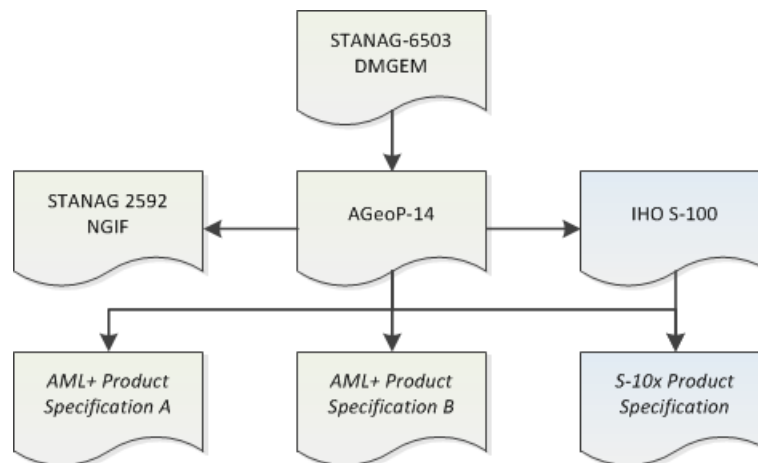


Figure 1: High level overview of DMGEM

1.2. DMGEM OVERVIEW

Figure 1 lays out the overall structure of the DMGEM, the core STANAG and AGeoP lay out the high level requirements and ensure consistency. Subordinate to these documents Data Product Specifications define the content, structure and display of data products for specific applications. Given the broad range of information covered, and the benefits of leveraging civil standards, DMGEM may adopt IHO product specifications where appropriate for instance, a civil specification for Sea Ice information may sufficiently cover military requirements. Secondly (Product Specification B) an S-100 based AML+ Product Specification but NGIF compatible may be developed, this will then be supported in S-100 systems which build on maritime navigation systems WECDIS being an example on this. Finally reflecting the need to provide data products to consumers within C2 systems support NGIF a third variant (Product Specification A) is an NGIF compliant product specification typically supporting delivery via web services over appropriate networks. This architecture is detailed further in section 3.4.

1.3. INTEROPERABILITY REQUIREMENT AND PARTNER INVOLVEMENT

1. DMGEM supports the requirement as stated in NATO Geospatial Policy, MC 0296/2 of “operating off the same map” and the key geospatial deficiencies identified in the NATO Geospatial Deficiencies Matrix (NGDM).
2. NATO and contributing nations need a coherent set of digital geospatial products and standards allowing for the dissemination and management of designated geospatial information meeting operational requirements within the maritime domain.
3. This involves standardized content, structure, organisation and exploitation of geospatial information.

CHAPTER 2 GENERAL INFORMATION

2.1. AIM

The aim of the DMGEM is to specify the content, structure and portrayal of geospatial data products for use across a broad range of systems. These provide the defence maritime user with products to support situational awareness across the full range of maritime operations (AJP-3.1) at every operating level from strategic planning to tactical operation. Such products will cover;

- a. hydrographic information beyond that necessary solely for maritime navigation as defined by International Convention for the Safety of Life at Sea (SOLAS), 1974, Chapter V.
- b. environmental information incorporating oceanographic and meteorological elements.

2.2. DEFINITIONS

AML+

a unified range of digital geospatial data products designed to satisfy NATO non-navigational maritime defence requirements, which is an evolution of Additional Military Layers (AML), and that is aligned with contemporary geospatial standards, including the NATO Geospatial Information Framework (NGIF)

2.3. RELATED DOCUMENTS

International standards:

International Maritime Organization (IMO)

1. International Convention for the Safety of Life at Sea (SOLAS), 1 November 1974 (as amended);

International Hydrographic Organization (IHO)

2. IHO S-100 2.0.0 - IHO Universal Hydrographic Data Model
3. IHO S-99 1.1.0 - Operational Procedures for the Organization and Management of the S-100 Geospatial Information Registry
4. S-102, Edition 1.0.0, April 2012: Bathymetric Surface Product Specification;

North Atlantic Treaty Organization (NATO)

5. MC 0296/2 NATO Geospatial Policy
6. AJP-3.1 ALLIED JOINT MARITIME OPERATIONS

7. STANAG 4564 – WARSHIP ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS (WECDIS);
 8. STANAG 7170 – Additional Military Layers (AML) – Digital Geospatial Data Products
 9. STANAG 2592 - NATO Geospatial Information Framework (NIGIF)
 10. STANAG 2586 - NATO Geospatial Metadata Profile
- Other related documents:
11. The Recognized Environmental Picture (REP) Concept (Draft)
 12. AJP-3.17 Allied Joint Doctrine for Geospatial Support.

2.4. ACRONYMS

AGeoP	Allied Geographic Publication
AJP	Allied Joint Publication
AML	Additional Military Layers
DCEG	Data Classification and Encoding Guide
DMGEM	Defence Maritime Geospatial Exchange Model
ENC	Electronic Navigational Chart
GI	Geospatial Information
GIRD	Geospatial Information Requirements Documentation
GMWG	Geospatial Maritime Working Group
GRWG	Geospatial Requirements Working Group
HTML	HyperText Markup Language
IHO	International Hydrographic Organization
ISO	International Organization for Standardization
JGSWG	Joint Geospatial Standards Working Group
MCWG	Military Committee Working Group
METOC	Meteorological, Oceanography
NATO	North Atlantic Treaty Organization
NGB	NATO Geospatial Board
NGDM	NATO Geospatial Deficiency Matrix
NGFCD	NATO Geospatial Feature Concept Dictionary
NGIF	NATO Geospatial Information Framework
NGIM	NATO Geospatial Information Model
NGMP	NATO Geospatial Metadata Profile
SOLAS	Safety of Life at Sea
STANAG	Standardisation Agreement
UML	Unified Modeling Language
URL	Uniform Resource Locator
WECDIS	Warship Electronic Chart Display and Information System
XML	Extensible Markup Language
XSLT	Extensible Stylesheet Language Transformations

CHAPTER 3 DMGEM FRAMEWORK

3.1. SCOPE

The DMGEM expresses the requirements for the creation and maintenance of AML+ Product Specifications, data products and software for the production and exploitation of AML+ data products. It also defines the required mappings and their maintenance.

3.2. CONFORMANCE

Conformance to DMGEM may apply to:

- A geospatial data product claiming conformance to one of the AML+ Product Specifications. It shall pass the test module defined in Annex D.3.
- A product specification conformant to AML+. It shall pass the test module defined in Annex D.2.

The test modules defined in annex D constitute the fundamental mechanism to evaluate the conformance of data products and product specifications.

The conformance of software and systems supporting the production or exploitation of DMGEM data products is outside

3.3. CERTIFICATION

Certification is a process which generally involves performance tests (including the conformance tests documented herein) and quality assurance tests. This is also outside of the scope of this standard.

3.4. COMPONENTS OF THE DMGEM

1. The components of DMGEM are shown in figure 2. Data Product Specifications form the fundamental component and define the content and structure of a dataset. These consist of a number of constituent parts.

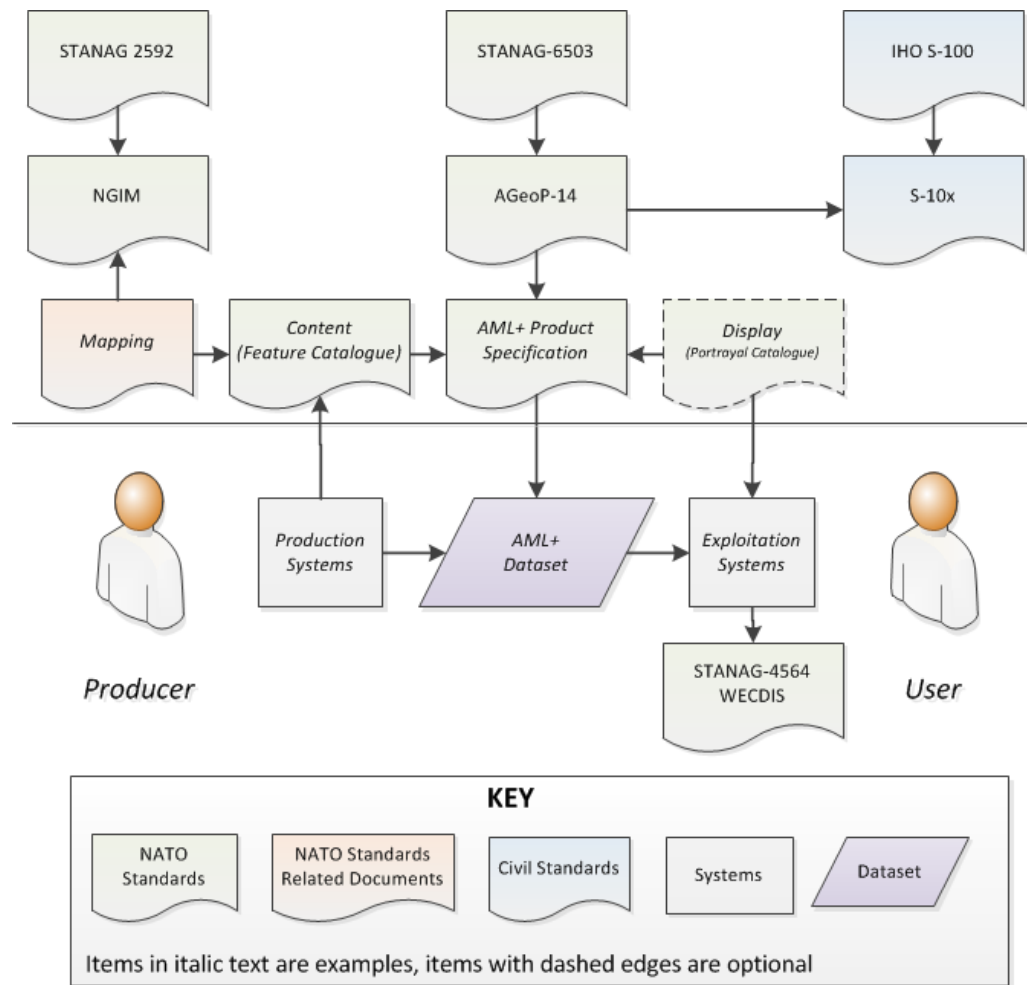


Figure 2: DMGEM Architectural Components
 (Components within the green outline form the components of DMGEM. Its supporting elements within both S-100 and NGIF are also shown)

2. Product Specifications are included by reference to a civilian standard or are documented in an Allied Geographic Publication. Product Specifications may conform to the S-100 standard or the NGIF framework. Supporting documents such as mappings between data models are developed and maintained by the GMWG as Standards Related Documents.

3.4.1. Registers

Concepts such as features, attributes and symbols used within AML_ Product Specifications will be stored in a Register. AML+ will utilize both the IHO GI Registry and the NATO NGFCD for this purpose.

3.4.2. Product Specifications

1. DMGEM defines a set of AML+ Product Specifications, the rules for the creation and maintenance of AML+ S-100 based Product Specifications are defined in Annex A. S-100 based Product Specifications include an application schema and feature catalogue, they may also include a portrayal catalogue and data capture guide. Product Specifications will utilize the content of S-100 in order to provide specifications for metadata and encoding. All profiling and extensions to S-100 are detailed within this AGeoP. S-100 based AML+ Product Specifications are also registered within the S-100 Product Specification register.

2. Similarly, rules for AML+ Product Specifications conforming to the NGIF framework are specified in Annex B. In edition 1 of this AGeoP Annex B is empty and awaits the completion of a Product Specification profile within NGIF.

3.5. DATA PRODUCTS

AML+ Data Products shall conform to a specified AML+ Product Specification.

AML+ Data Product Specifications comprise;

3.5.1. S-100 Based

Identifier - S-102

Title – *Bathymetric Surface Product Specification*

Purpose – *For the provision of detailed bathymetric information.*

Edition – 1.0.0

Date – *April 2012*

Notes – *S-102 1.0.0 does not define Portrayal. This should be addressed separately and it is intended to provide a Portrayal Catalogue as a component of a future version.*

3.5.2. NGIF Based

No NGIF based Product Specifications are specified in Edition A of this AGeoP.

3.6. DMGEM CONCEPT MAPPING

In order to enable the conversion of data between AML+ Product Specifications based on S-100 and NGIF a Concept Mapping is required. The structure and maintenance of a Concept Mapping is defined in Annex C. Each S-100 based AML+ Product Specification must have such a mapping. NGIF based Product Specifications do not require a mapping as they use the items from the NGIM directly

3.7. AML+ SOFTWARE

1. Systems for the creation and use of AML+ datasets must adhere to the DMGEM Framework and AML+ Product Specifications.
2. AML+ as defined in this AGeoP is a mandated product for WECDIS as defined in STANAG 4564.

ANNEX A S-100 AML+ PRODUCT SPECIFICATIONS

A-1. AML+ Data Product Specifications may be developed using S-100. These shall follow the structure laid out in S-100 Part 11 and should use elements from the various S-100 charters as required. Where appropriate aspects of existing S-100 Data Product Specifications may be reused.

A-2. When more experience of developing S-100 based AML+ Data Product Specifications this section may be further developed to include rules for AML+ Data Product Specifications.

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ANNEX B NGIF AML+ PRODUCT SPECIFICATIONS
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In Edition A of this AGeoP NGIF based AML+ Product Specifications are not defined. In future when a profile for Data Product Specifications is included as part of NGIF this section will be completed.

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ANNEX C DEFINITION AND MANAGEMENT OF THE DMGEM MAPPING
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C.1. OVERVIEW

For each S-100 Based AML+ Data Product Specification a Concept Mapping to the NGIF NGIM shall be provided. This ensures compatibility with NGIF and will support the exchange of AML+ datasets using NGIF. This Annex defines the structure and content of the mapping and details its maintenance. The mappings shall exist as Standards Related Documents and be managed by the custodian of the related Data Product Specification.

C.2. CONCEPT MAPPING STRUCTURE

1. A concept mapping shall relate concepts from one data model to another. An example is shown in Table C.1.
2. For each data model columns for the following information shall be present;
 - Feature
 - Attribute
 - Attribute Value
3. A single column indicates the Mapping Status which can be one of three values;
 - Valid Mapping
 - Partial Mapping
 - No Mapping

S-57 ENC			Mapping Status	NGIM		
Feature	Attribute	Attribute Value		Attribute Value	Attribute	Feature
Buoy Lateral						Buoy
	Buoy Shape				Buoy Shape	
		Barrel		Barrel		
		Can		Can		
		Conical		Conical		
				Diamond		
		Ice buoy		Ice Buoy		
		Pillar		Pillar		
		Spar		Spar		
		Spherical		Spherical		
		Super-buoy		Super-buoy		
	Category of Lateral Mark					Buoy Type
		Port hand lateral		Port hand edge		
		Starboard hand lateral		Starboard hand edge		
		Preferred to Starboard		Preferred Channel to Starboard		
		Preferred to Port		Preferred Channel to Port		

Table C.1. – Example DMGEM Conceptual Mapping

C.3. CONCEPT MAPPING MAINTENANCE

The concept mapping shall be produced as baseline versions based on versions of AML+ product specifications or baselines of the NGIM.

ANNEX D CONFORMANCE SUITE

D.1. OVERVIEW

D.2. AML+ PRODUCT SPECIFICATIONS

D.2.1. S-100 AML+

S-100 based AML+ Product Specifications shall conform to the following requirements;

D.2.1.1. Conformance to S-100 Part 11

Confirm that the content and structure of the Product Specification is consistent with S-100 Part 11.

D.2.1.2. Conformance to AGeoP-14 Annex A

Confirm that the content and structure of the Product Specification is consistent with Annex A of this AGeoP.

D.3. AML+ DATA PRODUCTS

D.3.1. S-100 AML+

S-100 based AML+ Data Products shall conform to the following requirements;

D.3.1.1. Conformance to the Product Specification

Confirm that the content and structure of the Data Product fulfils all requirements laid out in the Product Specification and component elements referenced by it.

AGeoP-14(A)(1)