DGIWG 200

Defence Geospatial Information Framework (DGIF) Overview

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Abstract:	This document gives an overview on all DGIF artifacts, deliverables and specification and defines basic and conformance classes for DGIF in the area of geospatial vector data
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i.   Document point of contact

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ii.   Revision history

Date	Release	Editors	Primary clauses modified	Description
2017-06-08	0.1	DEU	All	Initial work and rework
2017-06-13	0.2	CAN	All	Review
2017-06-14	0.3	CAN	All	Review
2017-06-14	0.4	DEU	All	Final Draft
2017-06-23	0.5	DEU	All	Incorporate NLD comments

Introduction

The Defence Geospatial Information Framework (DGIF) is a suite of data standards encompassing different types of geospatial, meteorological, oceanographic, and geospatial aeronautical information. It provides a model-based solution allowing for standardised information exchange and the creation of common geospatial product specifications. These standards will provide interoperability bridges between the data schemas of involved nations and they will guarantee consistent data products and services for the end-user of geospatial information.

This document gives a brief overview about DGIF and its most important specifications and documents. It should be regarded as a guide to the various documents that comprise the framework. Therefore, it only provides an overall view and references where to find more detailed information.

1 Scope

DGIF is designed as a framework that will serve various information types within the military geospatial domain. The UML model itself is published by DGIWG alongside the core artifacts documents for information purposes in the file format of the software product Enterprise Architect by SparxSystems Ltd[1].The current published baseline BL 2016-2 addresses only vector data modelling and the development of the first DGIF Data Product Specifications (DPS). It is envisioned that future baselines will cover other areas including, but not limited to: imagery, elevation, and web services.

2 Conformance

Conformance to DGIF is achieved by being conformant to a DGIF product specification. Data Product Specifications define conformance classes.

3 Normative references

The documents listed in Table 1 are important to understand as they are used to develop the DGIF standards. For dated references, only the cited edition or version applies. For undated references, the latest edition or version of the referenced document (including any amendments) applies.

Table 1: Normative References

Standard or Specification
ISO/TS 19103:2005 - Geographic information – Conceptual schema language
ISO 19107:2003 - Geographic information – Spatial schema
ISO 19109:2005 - Geographic information – Rules for application schema
ISO 19110:2005 - Geographic information – Methodology for feature cataloguing
ISO 19111:2003 - Geographic information – Spatial referencing by coordinates
ISO 19112:2003 - Geographic information – Spatial referencing by geographic identifiers
ISO 19115:2003 - Geographic information – Metadata
ISO 19123:2005 - Geographic information – Schema for coverage geometry and functions
ISO 19131:2007 - Geographic information – Data Product Specifications
ISO 19135:2005 - Geographic information – Procedures for item registration
ISO/IEC 19505-1:2012 - Information technology – Object Management Group Unified Modeling Language (OMG UML) - Part 1: Infrastructure.
ISO/IEC 19505-2:2012 - Information technology -- Object Management Group Unified Modeling Language (OMG UML) - Part 2: Superstructure
ISO/IEC 19507:2012 - Information technology -- Object Management Group Object Constraint Language (OCL)
DGIWG -114 – DGIWG Metadata Foundation (DMF)

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[1] http://www.sparxsystems.com/

4 Abbreviations

AIXM	Aeronautical Information Exchange Model
AML	Additional Military Layers
DCE	DGIF Collaborative Modelling Environment
DFDD	DGIWG Feature Data Dictionary
DGFCD	Defence Geospatial Feature Concept Dictionary
DGIF	Defence Geospatial Information Framework
DGIM	Defence Geospatial Information Model
DGIWG	Defence Geospatial Information Working Group
DGRWI	Defence Geospatial Real World Object Index
DMF	DGIWG Metadata Foundation
DPS	Data Product Specification
ENC	Electronic Navigational Chart
EUROCONTROL	European Organisation for the Safety of Air Navigation
GML	Geography Markup Language
ICAO	International Civil Aviation Organization
IHO	International Hydrographic Organization
ISO	International Organization for Standardization
OGC	Open Geospatial Consortium
OMG	Object Management Group
UML	Unified Modeling Language
VMST	Vector Models and Schema Team
W3C	World Wide Web Consortium
WMO	World Meteorological Organization
XSD	XML Schema Document

5 Modelling and Data Product Specifications

The DGIF comprises artifacts and specifications, which describe the various components of the framework. DGIF artifacts are developed and maintained to establish an overall model that describes the "universe of discourse" of geospatial information for which the Military Geospatial Services and Agencies of the DGIWG member states are responsible.

The fundamental DGIF artifacts are the Defence Geospatial Information Model (DGIM) which describes the main model, the Defence Geospatial Feature Concept Dictionary (DGFCD) which provides the definitions for the elements in the DGIM, and the Defence Geospatial Real World Object Index (DGRWI) which provides an entry point into the model for the layman by offering traceability from the commonly used names of Real World Phenomena to their representations in the DGIM.

The DGIM, DGFCD and DGRWI are the foundation of the vector data component within DGIF. They are developed, maintained, and used by the DGIWG Vector Models and Schema Team (VMST). DGIF v2.0 references the 2016-2[2] Baseline of the model and comprises only specifications related to vector data.

5.1 Vector Data Artifacts

The vector data artifacts are mainly maintained for the purpose of vector data modelling and the development of vector data product specifications. These artifacts may be used by other data modelling communities but are not meant for end users of geospatial information or for compliance testing.

5.1.1 Defence Geospatial Information Model

The DGIM specifies a logical model for geospatial data for the defence and intelligence community that is technology neutral[3].

The DGIM ensures that there is a clear, complete, and internally-consistent DGIF logical geospatial data model that may be used to derive system-specific implementation models/schemas/products in a rigorous manner.

The DGIM leverages and integrates geospatial information modelling practices from multiple community models (e.g., MGCP, AIXM, ENC, AML, GGDM, and others) whose data can be used and exchanged by DGIF compliant systems.

From the DGIM, profiles are derived which will form the foundation of any DGIF vector data product specification.

Individual items of feature and/or attribute information that are used in the DGIM are defined by the Defence Geospatial Feature Concept Dictionary (DGFCD). Through the DGFCD the DGIM draws upon recognized content standards, specifications and profiles from both the military (e.g. DGIWG) and civilian sectors (e.g. IHO, ICAO/EUROCONTROL, WMO).

Real world phenomena are identified in the Defence Geospatial Real World Object Index (DGRWI) which can be used as an entry point to their representation in the DGIM.

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[2] Maintenance, refinement and the integration of enhancements are done on a regular basis (three times a year) by the VMST. The naming scheme for baselines is YEAR/NUMBER OF VOTING CYCLE IN THE APPROPRIATE YEAR. (e.g.2016-2, shows a baseline derived from the second voting cycle of 2016). From time to time one of these internal baselines is published for general usage.

[3] DGIM is "technology neutral" in terms of the implementation technology; however, for the modelling itself the software suite "Enterprise Architect" is necessary.

An encoding for all vector data products derived from the DGIM is provided. The used standard is the Geography Markup Language (GML).

The DGIM is managed in the DGIF Collaborative Modelling Environment[4] (DCE) based on the Unified Modelling Language (UML). It is maintained by the VMST in a dynamic, register-like approach allowing flexibility in a strict documented process.

The DGIM is defined in the document "DGIWG 205: Defence Geospatial Information Model (DGIM)".

5.1.2 Defence Geospatial Feature Concept Dictionary

The DGFCD specifies a concept dictionary for geospatial phenomena in support of the DGIM. This dictionary includes feature concepts, attribute concepts, attribute value concepts, datatypes, units of measure, and accompanying metadata.

The DGFCD draws upon multiple community dictionaries (e.g. Aeronautical Information Exchange Model (AIXM), IHO S-100, NATO Additional Military Layers (AML), and others) and the DGIWG Feature Data Dictionary (DFDD) to specify an integrated feature data dictionary tailored to the requirements of Defence organisations of DGIWG member nations and NATO.

The DGFCD also supports modelling entities that may represent other geospatially-located information that do not correspond to physical "real world phenomena" e.g. Religious Information.

The dictionary can be utilized by other organisations or nations but is strictly bound to the DGIM since it represents only concepts that are required by the DGIM.

The DGFCD is maintained along with the DGIM in the DCE. Changes in the DGFCD are usually only made in the case that the DGIM is changing. It is maintained by the VMST.

The DGFCD is defined in the document "DGIWG 206: Defence Geospatial Feature Concept Dictionary (DGFCD)".

5.1.3 Defence Geospatial Real World Object Index

The DGFCD provides all concepts required by the DGIM and is the authoritative source for the model. It is accompanied by the DGRWI which provides a Real World Index for the DGIM.

The DGRWI provides an entry point into the DGIM by providing an indexing from names of Real World Phenomena to their representation in the DGIM. This index simplifies the identification and extraction of real world objects from the DGIM.

Commonly used names for real world phenomena/real world objects may not be represented as explicit Feature Types in the DGIM. For example, a Real World Object of Quarry is implemented as a Feature Type Extraction Mine with an attribute of Extraction mine type = Quarry. In this example a user or an implementer non-conversant with the DGIM may wrongly assume that Quarry is not a represented concept in the defined schema because it is not a unique Feature Type on its own.

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[4] The complete UML model of the DGIM together with the DGFCD and the DGRWI that is managed in the DCE is published alongside the core artifacts in the file format of the modelling software "Enterprise Architect" of SparxSystems Ltd. A free model browser software package is available at their homepage (http://www.sparxsystems.com/).

Along with the DGIM and the DGFCD, the DGRWI is maintained in the DCE. Changes in the DGRWI are usually only made in the case that the DGIM is changing. Change proposals to the DGIM and DGRWI are processed by the VMST.

The DGRWI is defined in the document "DGIWG 207: Defence Geospatial Real World Object Index (DGRWI)".

5.2 From Model to Data Product Specifications

The DGIF is a large complex model describing the geospatial information elements needed to reflect the information requirement stated by NATO and nations. It is therefore not meant to be implemented directly or used in an operational environment. The complexity may even overwhelm current commercial GIS software products.

Therefore, Data Product Specifications (DPS) are developed and published. These consist of artifacts on their own that are derived from the foundation artifacts. DGIWG provides these artifacts for a specific product and describes them explicitly in a DPS.

A DPS defines the structure, content and (optionally) the representation of a data set. For example, a DPS could serve as an instruction for the creation of an analogue map, for the provision of geospatial data using web services or the exchange of geospatial data using data files.

The current baseline of DGIF comprises a DPS for the Defence Topographic Map for 1:50,000 Scale (DTM50). **It can be found in the document "DGIWG 252: Defence Topographic Map for 1:50,000 Scale (DTM50) - Data Product Specification (DPS)".**

Furthermore, there is a DPS for data exchange. An exchange product is not meant for representation to the end user. It should allow for the provision of the full content of a vector dataset, preferably without loss of complexity.

A currently available exchange specification is described in "DGIWG 253-1: Defence Topographic Exchange (DTOX) ".

6 Mapping and lineage tables

To support users in the conversion of vector data from an existing schema or dictionary to DGIF, the following set of tables have been produced and are provided as support documents.

- MGCP TRD 4 to DGIM 2016-2 Mapping Table
- DFDD 2013-1 to DGFCD 2016-2 Lineage Table
- NGIM 1 to DGIM 2016-2 Lineage Table

7 Compliance and Compatibility

DGIF compliance and compatibility, respectively, refers to all DGIF artifacts (DGFCD, DGIM and DGRWI) in combination, therefore there is no compliance to e.g. DGFCD only.

DGIM, DGFCD and DGRWI are not meant to be directly provided to, or used by, the end user. The core of interoperability in the context of DGIF is based on product specifications.

Compliance to DGIF can therefore only be achieved by compliance testing to one or more products defined by DGIF.

Table 2 illustrates this and lists examples.

Table 2: Examples for compliance and compatibility criteria

Type	Example
Compliance	A **product** derived from DGIM from a profile level 1 (only subset without extension), e.g. a product whose portrayal rules are using DGIM.[5]
Compliance	A **product** derived from a level 1 profile (only subset without extension) of DGIM (e.g. a product whose portrayal rules are using DGIM) or a dataset defined by a level 1 Exchange Product.
Compliance	A **system** is compliant to DGIF DPS if the system can consume (level 1) and produce (level 2) a DGIF compliant dataset.
Compliance	A **service** is compliant if it provides a DGIF compliant dataset.
Compatibility	A **dataset** in which __all__ of the model/content can be mapped to DGIM without loss of semantics

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[5] For more information on the profile levels see document "DGIWG - 113 DGIWG Profiles of ISO 19107 and GML realization"

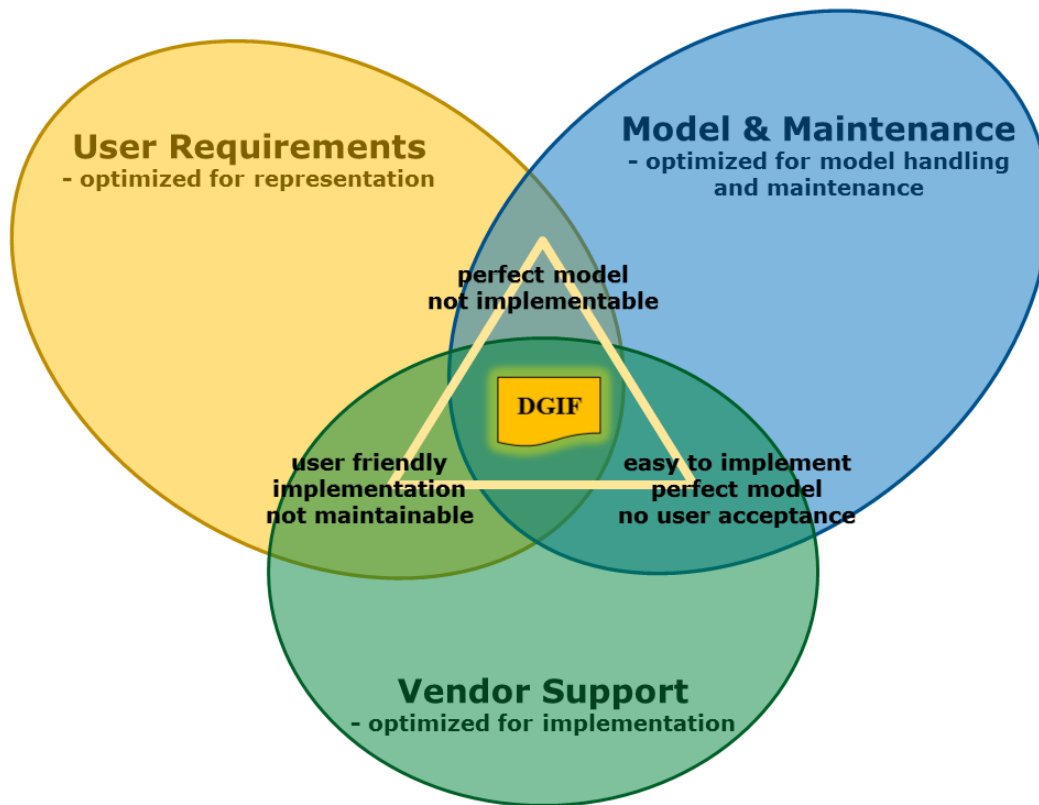# 8   Maintenance Principles

Figure 1: Principals of the DGIF development

The DGIF is and will be under constant development. The VMST regularly revises and enhances the model by doing maintenance work and checking its consistency and incorporating new model elements requested by nations, NATO or other stakeholders.

Decisions on the extension or the maintenance of such a complex model like DGIF should be based on principles to support the determination of what should be done or what should not be done. It is very important to keep the purpose of DGIM in mind in order to avoid going in a direction that results in a model that "tries to represent the entire world". Such a model would be too complex to be handled and thus becomes useless.

Therefore, further developments and evolution of DGIF should rely on the principals depicted in Figure 1. Working on the model should always consider a balance among focusing on the user requirements, modelling and maintenance issues, and adapting the model to achieve the best support by software of a specific vendor.

Therefore, the best model is a model which effects a compromise with regard to the optimisation for representation, model handling and maintenance, and implementation.

9   Online access to documents

All the mentioned artifacts and documents can be downloaded from the official DGIWG web site using https://www.dgiwg.org/.