"Delivering Military Advantage through multi-national geospatial interoperability"

DGIWG 200

Defence Geospatial Information Framework (DGIF)

Overview

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

The Defence Geospatial Information Framework (DGIF) is a suite of data standards primarily encompassing vector geospatial information of interest to the defence geospatial community. The purpose of the DGIF is to promote and enable interoperability by serving as the basis for specialized profiles, data product specifications, and as a target for formal mappings from other established community models. This document provides an overview of current and in-development DGIF profiles, mappings, and product specifications in-addition to briefly describing the primary DGIF artefacts. Complete information for the DGIF Artefacts is available in three separate individual standards documents (DGIWG 205, 206, and 207). This standard (DGIWG 200) further describes DGIF conformance and compliance, as well as governance and maintenance principles applied to the suite of standards. Version 3.0 of the DGIF has expanded to include a handbook (Annex A of this document) that provides greater detail concerning the history, data modeling principles, development and maintenance environment, baselines, and implementation and testing information. This new annex is designed to promote a more thorough understanding of the standard for current and future users.

ii.   Submitting organizations

Nation	Organisation
United States	National Geospatial-Intelligence Agency

iii.   Document point of contact

Comments, suggestions, or questions on this document should be addressed to the secretariat@dgiwg.org

iv.   Revision history

Date	Release	Editors	Primary clauses modified	Description
2024-07-30	3.0	USA	All	Publication

v.   Future work

The DGIF will continue to evolve as it seeks to address new requirements and as business and technical processes mature. The DGIF and its component standards will be reviewed and updated accordingly.

1   Introduction

1.1 The Defence Geospatial Information Framework (DGIF) is a suite of data standards primarily encompassing vector geospatial information to address military geospatial requirements in the following domains:

- Topographic
- Maritime
- Aeronautical
- Human Geography

1.2 The DGIF provides a model-based solution allowing for standardised information exchange and the creation of geospatial product specifications from a common basis. The DGIF enables:

- Interoperability across the data schemas of involved nations
- Use of common DGIF-based standards and specifications
- Production and exchange of consistent data products and services for the end-user of geospatial information.
- Analysis of data through common coded attributes

1.3 DGIF Concept

The DGIF is conceptualized as the data-centric, platform-independent, and product-neutral center of a hub and spoke model where it can serve as a target for mapping established community data models and as a common source for profiles supporting a variety of programmes and products specifications. DGIF is positioned to support existing and emerging program requirements, and will grow as it evolves to better address client requirements in the defence geospatial community. Figure 1 depicts the DGIF as a mapping target, a source for specifications, and as a basis for implementation at the national level.

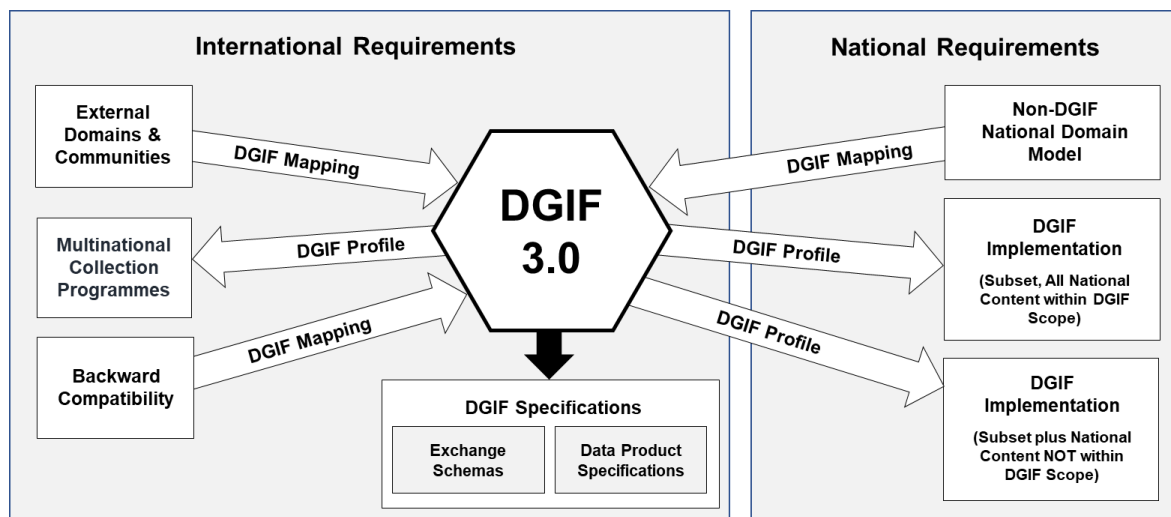**Figure 1: DGIF as the basis of geospatial interoperability**

1.4 DGIF Overview

This DGIWG-200 document provides an overview of the DGIF and its essential specifications and documents. This overview functions as a guide to the documents that comprise the framework. In addition to a handbook (Annex A), this guide also provides references to more detailed information for the DGIF components.

2 Scope

DGIF 3.0 builds upon the proven success of 2.0. Like the previous edition, it is a framework supporting the military geospatial domain. Presently, the DGIF 3.0 addresses only vector data for the military geospatial domain. As in the previous edition, the Unified Modeling Language (UML) model itself is published alongside the core artefacts in the current file format of the software product Enterprise Architect by Sparx Systems Ltd[1]. DGIF version 3.0 represents the ongoing evolution of the DGIF model. As envisioned in previous versions of DGIF, future requirements and ongoing technical evolution may drive future versions of the DGIF to an intersection convergence of vector data with other types of military geospatial data including, but not limited to: imagery, metadata, elevation, and web services.

3 Conformance

Conformance to DGIF is achieved via conformance to DGIF-based data product specifications (DPS). DGIF-based DPS will define conformance classes through data exchange or via specific conformance requirements defined by the product specification itself. DGIWG DPS are described in greater detail in Section 5 of this document. DGIF-based DPS represent class 1 profiles of the DGIF, as defined by ISO 19106:2004. Section 8 of this document further describes DGIF compatibility and compliance.

4 References

The normative references in Table 1 represent documents and standards that are key to understanding and using the DGIF and related standards. 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 19106:2004 - *Geographic information – Profiles*
ISO 19112:2003 – *Geographic information – Spatial referencing by geographic identifiers*
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*
DGIWG 101 – *Profile of ISO 19131 – Geographic Information – Data product specification*
DGIWG 205 – *Defence Geospatial Information Model (DGIM) 3.0*
DGIWG 206 – *Defence Geospatial Feature Concept Dictionary (DGFCD) 3.0*
DGIWG 207 – *Defence Geospatial Real World Index (DGRWI) 3.0*
DGIWG 208 – *GML Encoding Schema* 3.0

The informative (non-normative) documents listed in Table 2 are useful to understanding and using this standard. For dated references, only the cited edition or version applies.

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

Table 2: Informative References

Standard or Specification
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 19115-1:2014 – *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 19507:2012 – *Information technology – Object Management Group Object Constraint Language (OCL)*
DGIWG 114 – *DGIWG Metadata Foundation (DMF) 2.0.0*
NATO Standardization Agreement (STANAG) 2592 – *NATO Geospatial Information Framework (NGIF) Edtion 1.0*
NATO Standardization Agreement (STANAG) 2592 – *NATO Geospatial Information Framework (NGIF) Edition 2.0*
NATO Allied Geospatial Publication (AGeoP) 11 – *NATO Geospatial Information Framework (NGIF) Edition A*
NATO Allied Geospatial Publication (AGeoP) 11 – *NATO Geospatial Information Framework (NGIF) Edition B*

5 Acronyms and Abbreviations

Acronyms and names specific to this standard are presented in Table 3.

Table 3: Acronyms in this standard

Acronym	Definition or Name
AIXM	Aeronautical Information Exchange Model
AML	Additional Military Layers
DCE	DGIF Collaborative Modeling 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
GAIT	Geospatial Analysis Integrity Tool
GML	Geography Markup Language
GGDM	Ground-warfighter Geospatial Data Model
ICAO	International Civil Aviation Organization
IHO	International Hydrographic Organization

ISO	International Organization for Standardization
MGCP	Multinational Geospatial Co-Production Program
MUVD	MGCP Urban Vector Data
NAS	National System for Geospatial-Intelligence Application Schema
NATO	North Atlantic Treaty Organization
NGIF	NATO Geospatial Information Framework
OSM	Open Street Map
TRD	Technical Reference Document
UML	Unified Modeling Language
UTRD	Urban Technical Reference Document
VMST	Vector Models and Schema Team
WMO	World Meteorological Organization

6 Information Modeling and Data Product Specifications

The DGIF is comprised of artefacts and specifications, describing the components of the framework. The fundamental DGIF artefacts include:

- The Defence Geospatial Information Model (DGIM), describing the logical data model of the DGIF;
- The Defence Geospatial Feature Concept Dictionary (DGFCD), providing the definitions for the elements in the DGIM;
- the Defence Geospatial Real World Object Index (DGRWI), providing a basic entry point into the model by offering traceability from the commonly used names of real-world phenomena to their representations in the DGIM.

These DGIF artefacts are developed and maintained to establish an overall model that describes the "universe of discourse" for military geospatial information and for which the DGIWG member states are responsible. The development and use of international standardised terminology is a key principle underpinning the DGIF.

The DGIM, DGFCD and DGRWI are the foundation components of DGIF. These components are developed, maintained, and used by the DGIWG Vector Models and Schema Team (VMST).

The VMST maintains the DGIF within the DGIF Collaborative Modeling Environment[2] (DCE). The DCE enables the VMST to manage the DGIF in a dynamic, register-like environment utilizing Unified Modeling Language (UML). The DCE enables detailed change management tracking, collaborative development, and strict oversight of the DGIF model.

As described in Section 9, the DGIWG VMST publishes three baselines of DGIF per year. These baselines are published on the DGIWG website. DGIF 3.0 references the 2024-1[3] model baseline.

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[2] The complete UML model of the DGIM together with the DGFCD and the DGRWI that is managed in the DCE and is published alongside the core artefacts in the file format of the modeling software "Enterprise Architect" of SparxSystems Ltd. A free model browser software package is available at their homepage (http://www.sparxsystems.com/).
[3] 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). These internal baselines are published on the DGIWG website for general usage.

6.1 DGIF Artefacts

The DGIF technical artefacts are maintained for vector data modeling and to support the development of DPS. DGIF-based DPS are discussed in-greater detail in Section 6.2 of this document. These artefacts may be used by other data modeling communities but are not intended for end-users of geospatial information or for use in compliance testing.

6.1.1 Defence Geospatial Information Model (DGIM)

The DGIM specifies a technology-neutral[4] data model for geospatial information for the defence geospatial community. The DGIM establishes a clear, complete, and internally-consistent logical data model as a basis to derive system-specific implementation models/schemas/products in a rigorous manner.

The DGIM leverages and integrates geospatial information modeling practices from multiple community models (e.g., MGCP, AIXM, S-100, GGDM, NAS, and others) whose data can be ingested and exchanged by DGIF compliant systems.

From the DGIM, profiles are derived which will form the foundation of any DGIF vector-based data product specification (DPS) which are outlined in Section 6.2.

Individual items of feature and/or attribute information that are used in the DGIM are defined by name and definition in 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).

Geospatial phenomena in the real-world 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.

A Geography Markup Language (GML) encoding for all DGIM-derived vector data products and schemas is provided.

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

6.1.2 Defence Geospatial Feature Concept Dictionary (DGFCD)

The DGFCD specifies a concept dictionary for geospatial phenomena in support of the DGIM. This dictionary includes international standardised names and definitions for 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 the legacy DGIWG Feature Data Dictionary (DFDD), and other authoritative sources), to specify an integrated feature data dictionary tailored to the requirements of defence organisations of DGIWG member nations and NATO.

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

The DGFCD also supports modeling entities that may represent other geospatially-located information that do not correspond to physical "real-world phenomena" (e.g. statistical areas, language and religious distribution).

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

6.1.3 Defence Geospatial Real World Object Index (DGRWI)

The DGRWI provides an entry point into the DGIM by providing the colloquial names of real-world phenomena and indexing them to their representation in the DGIM. This index simplifies the search of representations of real-world objects in 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 the Feature Type "Extraction Mine" with an attribute of Extraction Mine type = Quarry. In this example a user or an implementer unfamiliar 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. The DGRWI exists to help users and implementers to avoid problems like these.

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

6.2 DGIWG Data Product Specifications

The DGIF is a large and complex model describing geospatial information elements reflecting broad geospatial requirements of NATO, DGIWG member nations, and DGIWG clients. Due to the size and complexity, direct implementation of the DGIF is neither recommended, nor supported by DGIWG. Implementation of similarly large and complex models in an operational environment has historically resulted in significant system performance problems.

Therefore, DGIWG develops and publishes separate Data Product Specifications (DPS) to meet client requirements for data-derived products and exchange. DPS are currently published in-accordance with DGIWG 101 Profile of ISO 19131:2007 – Data Product Specifications. DPS consist of technical artefacts derived directly from foundation DGIF artefacts with defined conformance criteria. The DGIWG provides these artefacts for specific products and describe them within a DGIF-based DPS.

A DGIF-based DPS is a separate published standard and is not considered part of the DGIF standard itself. A DGIF-based DPS defines the structure, content and (optionally) the portrayal of the required output. For example, a DPS may 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 following DGIF 2.0-based DPS were published as DGIWG standards and will be updated to DGIF 3.0 in their next version:

- DGIWG 252: Defence Topographic Map for 1:50,000 Scale (DTM50) - Data Product Specification (DPS)
- DGIWG 253: Defence Topographic Exchange (DTOX) Data Product Specification (DPS)
- DGIWG 260: International Program for Human Geography (IPHG) Data Product Specification (DPS)

The following DGIF-based DPS are under development in DGIWG and will be published as DGIF 3.0-based DPS:

- Defence Joint Operations Graphic (Aeronautical) (DJOG(A)) Data Product Specification (DPS)
- Defence Tactical Pilotage Chart (DTPC) Data Product Specification (DPS)
- Defence City Map (DCM) Data Product Specification (DPS)
- Multinational Geospatial Co-Production Program Data Product Specification (DPS)
- MGCP Urban Vector Data (MUVD) Data Product Specification (DPS)

7   Mapping and Lineage Tables

To support users in the conversion of vector data from existing schema or dictionary to DGIF 3.0, formalized mapping tables can be developed and published as supporting documents.

As of the publication of this document, the following mapping tables are in development:

- Open Street Map to DGIM 3.0

Additional mapping tables will be developed as new requirements are identified.

8   Conformance, Compliance, and Compatibility

8.1   DGIF Conformance

DGIWG does not currently support formal conformance directly to the DGIF. Implementation of the entire DGIF by an end user is neither recommended, nor supported by DGIWG. DGIF and its components contain no individual conformance criteria; instead, DGIF conformance with DGIF is met through compliance with the requirements established by a DGIF-based DPS.

8.2   DGIF Compliance

DGIWG Document 101 (Profile of ISO 19131 - Geographic Information - Data product specification) establishes format and content requirements for DGIF-based DPS. Every DGIF-based DPS must define its compliance requirements within the specification itself. The following list outlines the basic types of DGIF compliance.

- Of a **Specification** is where it is derived from DGFCD, DGIM and DGRWI as a class 1 profile[5] (i.e. subset without extension) and conforms to the DGIWG - 101.
- Of a **System** is one that can consume and/or output a DGIF compliant dataset. The ability of a System to consume is referred to as **Level 1** compliance. The ability to output is referred to as **Level 2** compliance.

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[5] Class 1 and Class 2 profiles are as defined by ISO 19106:2004

- Of a **Dataset** or **Product** is, if it is generated or created in conformance with a DGIF-compliant DPS.
- Of a **Schema** is where a schema is derived from DGFCD, DGIM and DGRWI as a class 1 profile (subset without extension).

DGIWG strongly discourages users (e.g. nation or community) from developing DGIF-based DPS without DGIWG collaboration. Externally-developed DPS must be manually validated for DGIF compliance though internal DGIWG review. Substantial revision and rework of the DPS may be required before it will meet minimum DGIF compliance requirements.

8.3 DGIF Compatibility

DGIF **Compatibility** of a **dataset** or **model** is where its applicable content can be mapped to a DGIF-compliant DPS. Therefore, DGIF compatibility implies that an intermediate transformation process is needed for the content to become DGIF compliant. Documenting this transformation logic is the responsibility of the dataset or model owner.

Standardised exchange relies on the generation of DGIF-compliant datasets. Ideally, all major defence geospatial data models should eventually become DGIF-compliant, and at least, DGIF-compatible. To maximum the potential for interoperability, compatibility and compliance should include defence geospatial elements within other related domain models.

DGIF compatibility and compliance must be evaluated against the DGIF-based profile forming the basis of a given DPS. Table 4 provides a summary and examples of DGIF compliance and compatibility types.

Table 4: Example criteria for compliance and compatibility

Type	Example
Compliance	A **product** derived from a DGIF Class 1 profile (subset), e.g. a product whose portrayal rules are using DGIF.[6]
Compliance	A **product** derived from a Class 1 profile (only subset without extension) of DGIF (e.g. a product whose portrayal rules are using DGIF) or a dataset defined by a Level 1 Exchange Product (i.e. a system can consume the data).
Compliance	A **system** is compliant to a DGIF DPS if the system can ingest and export a DGIF conformant 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 DGIF without loss of semantics

9 Governance and Maintenance

9.1 Governance

The management of the DGIF and its artefacts conforms to the governance process established by the DGIWG Vector Data Technical Panel (P1) and executed by the VMST. The scope, roles, and governance process of the VMST are described in an

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

official internal DGIF change management document. Changes to the DGIF standard, its artefacts and content shall conform to the described process. See Annex A.3 for more information.

The VMST is the international forum responsible for providing governance, coordination, prioritization of content development, and notifications for the DGIF, its artefacts, formal profiles, and product specifications. The DGIF and its associated artefacts define the common method for specifying and encoding defence geospatial information.

9.2 Maintenance Principles

The DGIF is in continuous development. The VMST, acting upon model design principles and both national and international requirements, revises and enhances the model via maintenance work and consistency checking. New content and capabilities are incorporated on an as-needed basis based on requirements submitted by member nations, NATO, co-production program clients, or other stakeholders.

All DGIWG member nations may submit change proposals to add, remove or alter concepts in the model. Client communities/programmes may submit specific, general, or investigative change requirements through the DGIWG Requirements Manager. All change proposals and/or requirements are evaluated on a case-by-case basis by the VMST.

Configuration management decisions regarding the extension or modification of a complex international data model like DGIF are based on a balance of factors. In considering new or revised capabilities, the model maintenance team must remain grounded in the core purpose of DGIM. Rather than working towards a geospatial information model that attempts to represent the "entire world," DGIF seeks to balance the needs of its users against best-practice modeling solutions which can be implemented within current technologies and the defence geospatial environment.

The development and evolution of the DGIF relies on the design and interoperability principles described in Annex A.3 - DGIF Principles. Changes and enhancements to the model must consider the balance between the user requirements, modeling and maintenance needs, and maintaining a model that can be implemented and supported by suitable software and/or by specific vendors in a Defence context.

Therefore, the best model is a model which effects a compromise with regard to the optimisation for representation, model handling and maintenance, and implementation. Figure 2 illustrates the balance of factors targeted by the DGIF at the intersection of these three factors.
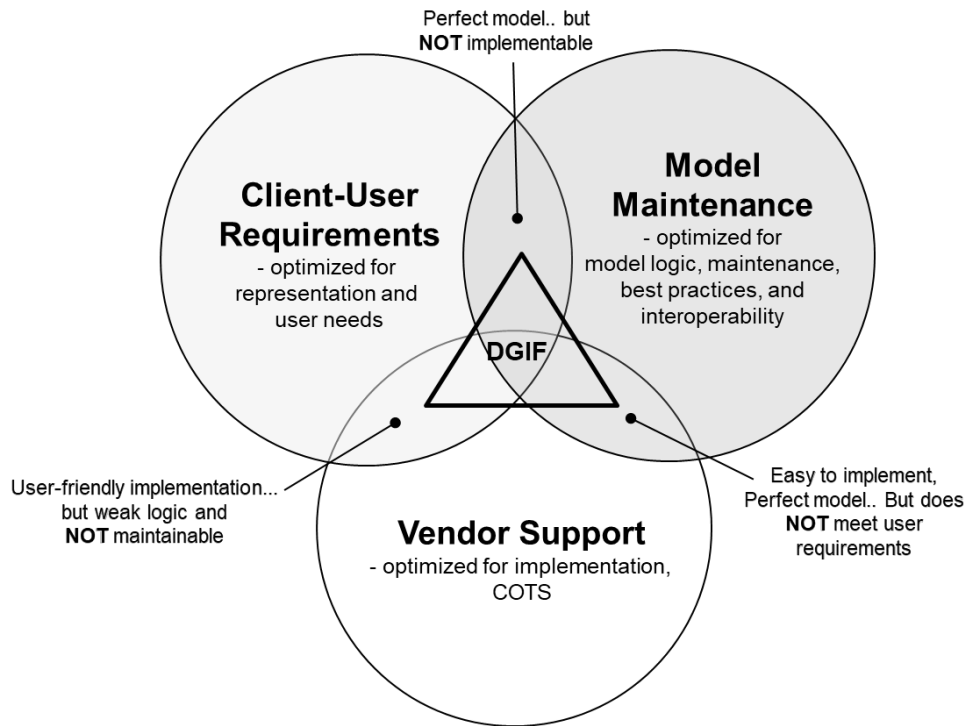
Figure 2: The DGIF Modeling Triangle

10 Online access to documents

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

Annex A - DGIF Handbook

A.1 Background

As previously described, the DGIF is a suite of geospatial data standards enabling interoperability for NATO, DGIWG member nations, and the international defence geospatial community as a whole. The DGIF was developed in response to NATO's adoption of the NATO Geospatial Information Framework (NGIF) 1.0 and its tasking to DGIWG for the maintenance and evolution of the content.

A.1.1 NATO Geospatial Information Framework Requirement

In 2011, NATO developed a requirement for a NATO Geospatial Information Framework (NGIF). This framework was to move NATO beyond a basic geospatial data dictionary to a common geospatial data model and to include a series of product specifications based-on, or harmonized-with, this common data model. This resulted in the adoption of the United States' National System for Geospatial-Intelligence (NSG) Application Schema (NAS) as the basis of NGIF. In 2014, the NGIF version 1.0 was ratified and promulgated as NATO Standardization Agreement (STANAG) 2592 and the accompanying Allied Geospatial publication 11 (AGeoP-11, Edition A).

Concurrent with the adoption, ratification, and promulgation effort, NATO tasked DGIWG with the development of an NGIF version 2.0 to adapt and tailor the NGIF 1.0 model content to more fully meet NATO mission and interoperability requirements. The DGIWG Vector Data Technical Panel (P1) accepted the requirement and created the DGIWG VMST to serve as a development and configuration control body for the future versions of the NGIF.

A.1.2 Defence Geospatial Information Framework

The DGIWG VMST leveraged the NATO requirement to develop NGIF 2.0 as the impetus to develop DGIF. The purpose of DGIF is to address various DGIWG interoperability requirements while meeting NATO requirements. DGIF 2.0 is a direct evolution of the NGIF 1.0. The first version of DGIF is version 2.0.

The DGIWG VMST completed development of DGIF 2.0 and delivered it to NATO in 2016. NATO STANAG 2592 Edition 2.0 directly adopts DGIF 2.0 as the NGIF 2.0. It was ratified by NATO and promulgated in 2018. DGIF 2.0 also served as the basis for various DGIWG mappings and data products specifications. The use of a single common DGIF model supports broader interoperability among DGIWG members and NATO members and clients.

In 2023, NATO tasked DGIWG with the development and delivery of an updated geospatial information framework to form the basis of the NGIF 3.0. DGIWG completed development of the DGIF 3.0 (this document) in early 2024. NATO adoption and promulgation is expected in 2026.

A.2 Purpose

DGIF-based DPS enable interoperability between national data schemas via mapping or direct exchange of DGIF-compliant data sets. They support the creation of consistent data products and services for defence geospatial end-users. DGIF specifications for derived outputs/products are not part of DGIF itself but do represent compliant subsets and specializations of DGIF content.

While DGIF includes components that define semantics (DGIWG 206), structure and syntax (DGIWG 205), and GML encoding (DGIWG 208), it does not include a metadata standard for datasets, series, or services. Additionally, DGIF does not define precisely how DGIF data should be exchanged or encoded via geospatial web services. These areas of standardization are addressed in other parts of DGIWG.

A.3 DGIF Principles

Development of DGIF, and DGIF-based data product specifications, is driven by the requirement to enable data interoperability through the establishment of a common standardised logical data model, including common descriptions of the real-world phenomena suitable for use as a data exchange model; and enable product interoperability through the definition of standardised products/outputs conforming to the common data model. Thus enabling users to "operate off the same product" regardless of the producer. In development and maintenance, the VMST seeks to follow far-reaching design goals, and specific maintenance principles.

A.3.1 Design Goals

DGIF incorporates the following design goals:

1. As a core function, serve as a geospatial data model from which standardised products and outputs are generated which enable interoperability between different national and client data models and schemas.
2. Evolve, publish, and maintain a common geospatial data model that includes standardised defence geospatial concepts.
3. Serve as the basis for international data product specifications for NATO, DGIWG, and the international defence community to include multiple forms of geospatial output (e.g. paper maps, digital/web maps, datasets, and data exchange schemas).
4. Measuring conformance to DGIF is primarily achieved via DGIF-based specifications.
5. Remain data-centric, platform-independent, and neutral to both product and programme.
6. Facilitate the creation, exchange, and interpretation of defence geospatial data via development, publication, and maintenance of documents, schemas and other artefacts based on DGIF.
7. Facilitate the creation, exchange and interpretation of standardised geospatial datasets and outputs as standardised data product specifications derived from the DGIF
8. Support the ingest and transformation of data into a DGIF environment via the development, publication, and maintenance of standardised mappings for community data models (e.g. Open Street Map (OSM), Multinational Geospatial Co-production Program (MGCP), etc.) to enable interoperability between programme participants, nations, and clients.
9. Mapping of national data to DGIF is primarily the responsibility of the nation.
10. Promote potential resource savings and interoperability gains that may be realized in transitioning to DGIF as part of a major system upgrade or refresh; however, do not require the replacement of client or national databases with a DGIF profile.
11. Encourage and foster ongoing collaboration between member nations, partner organizations, and co-production communities to pursue common goals, shared developments, and align requirements and use-cases where possible.

In summary, the DGIF:

- Can serve as data exchange hub.
- Remains data centric and product neutral.
- Provides a basis for standardised specifications and for artefact generation.
- Represents a single mapping target for the community.
- When used as a basis for national models, reduce or eliminate mapping and transformation burden.
- Provides mappings from key community client/source data models.

A.3.2 Modeling Principles

The scope of DGIF is primarily defined by defence geospatial community requirements. The core function of DGIF is to enable interoperability by supporting the exchange of data. Therefore, there must be only one single unambiguous description and structure for any single real-world entity or phenomenon represented in the DGIF.

The following modeling principles are considered essential for the core function of DGIF:

- Model content must focus on the exchange of real-world data.
- Modeling elements supporting only cartographic representation should be avoided, if at-all possible.
- Semantic duplication is to be avoided in the model; there should be only one location within the model to describe any single real-world entity.
- The model is intended for Defence/Military geospatial data exchange & products
- National requirements can be proposed for addition to DGIF, even if such requirements are of interest to only one nation.
- A national profile of DGIF, and any additional nation-specific content, must be managed by the nation that creates it.
- These principles will evolve on an as-needed basis.

Notably, when a requirement is accepted, the end-state modeling solution will not necessarily conform to submitter's proposed solution, but it will always address the "un-met need" represented by the requirement.

The DGIF must represent a holistic approach to modeling geospatial concepts and customer support. Proposed changes and requirements cannot depreciate a capability required by another client, create semantic duplication, introduce inconsistency to established use cases or prevent/restrict model evolution.

While changes may be reversed, the 'undoing' of previously implemented changes will not be undertaken without suitable and compelling justification.

Backwards compatibility of geospatial concepts is maintained, even where changes are made to evolve the model.

A.4 DGIF Tools

A.4.1 DGIF Collaborative Environment (DCE)

The DCE is a cloud-based technology facilitating the multi-national burden-sharing approach to DGIF maintenance and evolution. DGIF is maintained as a UML model within the DCE, providing a collaborative international working and development space.

Enterprise Architect by Sparx Systems Ltd is the software application used to interface with the DCE and the UML model. DGIF change management is carried out within the DCE. In addition to the DGIF model itself, the UML model contains the VMST Management Information and a record of all DGIF Change Proposals.

All DGIWG member nations whose representative(s) complete mandatory DGIF modeling and certification training are authorized to submit change proposals directly to the model via the DCE. Nations who do not yet have a DCE-certified representative can submit a requirement directly to DGIWG or to the VMST where they will be considered by the maintenance team. This approach helps ensure that no single nation bears sole burden for making, managing and implementing change proposals for the DGIF.

A.4.2 Enterprise Architect and ShapeChange

The VMST utilizes tools available within Enterprise Architect and ShapeChange[7] to generate specialized outputs, including GML application schemas, HTML feature catalogues, and MS Excel workbooks which describe all, or a defined subset, of the model's content.

A.5 DGIF Baselines

DGIF is continuously maintained by the VMST. Technical outputs from DGIF such as profiles and DPS are based on specific published DGIF versions and baselines. DGIF baselines, are produced using the tools described in Section A.4.

A DGIF baseline is a technical artefact produced as a standardised output of the VMST Change Proposal (CP) process. Each baseline consists of technical workbook containing updated DGFCD, DGRWI and DGIM content, as well as a copy of the offline model generated from the DCE. Baselines include approved changes to the model.

The VMST executes three voting cycles a year (starting in Jan, Apr, and Sept) producing new baseline technical artefacts in approximately January, May, and August of each year.

In cases where no change proposals were submitted and/or approved, no new baseline is produced for that cycle. Each DGIF baseline is identified by year and version number, e.g. 2019-1, 2019-2, 2019-3. Data Product Specifications and supporting artefacts also reference a specific internal baseline. Figure A-1 illustrates the three annual DGIF cycles as-of the publication of DGIF 3.0.
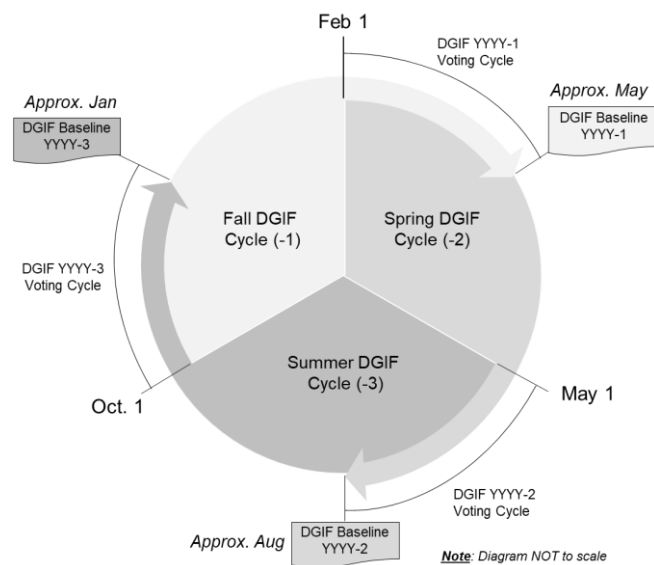

Figure A-1: Annual DGIF Maintenance Cycle (Internal Baselines)

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[7] https://shapechange.net/

A new version of the DGIF standard includes a specific DGIF baseline. This baseline is formally packaged and published as a set of artefacts. For example, DGIF 2.0 included Baseline 2016-2 as part of the formal package. DGIF 3.0 includes Baseline 2024-1 and all subsequent baselines produced until the next full version of DGIF is published (i.e. DGIF 4.0). New baselines produced after publication of a new DGIF version are considered part of that major version of the standard. For example, DGIF 2.0 was published with Baseline 2016-2; however, all baselines from 2016-3 through 2023-3 are valid DGIF 2.0 baselines. Figure A-2 Illustrates the distinction between DGIF baselines and major versions of DGIF.

New versions of DGIF and an accompanying baseline are developed and published based on requirements from client organisations or programmes. Minor version baselines may be developed published based on specific client requirements (e.g. DGIF 3.1).
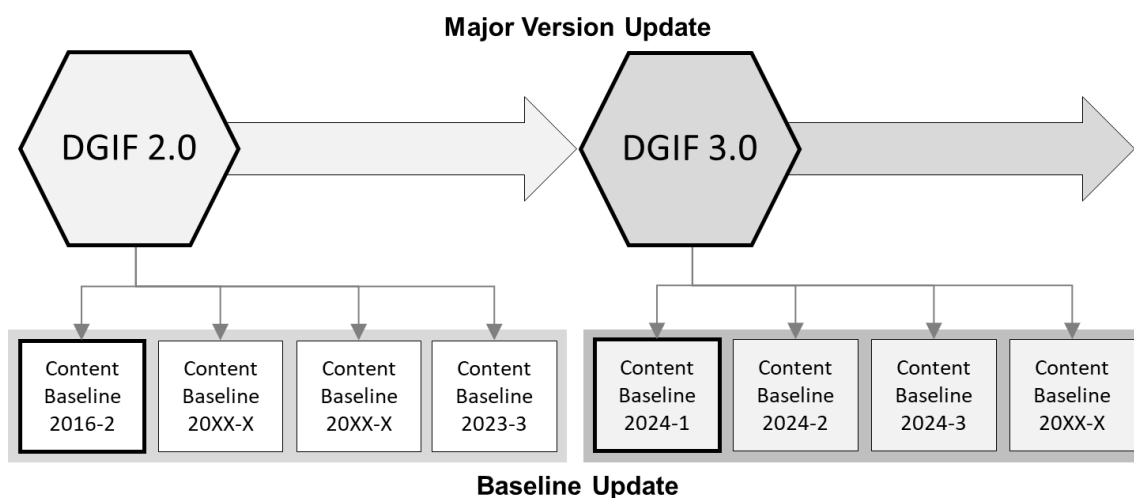

Figure A-2: DGIF Versions and Baselines

Baseline technical artefacts (DGIM, DGFCD, and DGRWI) are utilized by the VMST and serve as the technical basis for DGIF profiles, mappings, and the DPS produced for DGIWG members and clients. Users typically interact with DGIF through the implementation of one or more of these standardised outputs rather than via the DCE baseline itself. As previously noted, an offline version of the model baseline and workbook is published at the end of each maintenance cycle and is made available on the DGIWG website.

The VMST can also provide support for the generation of documentation to support the efficient usage and exploitation of DGIF. For example, additional mapping tables that specify the formal relationship between DGIF and another community data model.

A.6 Implementation, Testing and Validation

It is the responsibility of individual nations to ensure their compliance to the DGIF standard. DGIWG has not identified specific tools for testing/validating a dataset or products for DGIF compliance. Testing and validation is largely confined to a growing body of DGIF-based DPS utilizing various custom and commercial validation tools utilized at a national or co-production program level. For example, the Geospatial Analysis Integrity Tool (GAIT) is approved for use by the Multinational Geospatial Co-Production Program (MGCP) to validate data produced to the MGCP Urban Technical Reference Document (UTRD) specification. The UTRD specification is based on DGIF 2.0. Future versions of MGCP specifications will be based on DGIF 3.0 and are expected to continue to use the GAIT tool.

At this time, DGIWG has not elected to develop stand-alone documentation to support implementation, testing, and validation of DGIF; however, several DGIWG members have implemented DGIF-based DPS at a national level. These nations and their best-practises constitute a growing body of technical knowledge and expertise available to new DGIF users. DGIF implementation support must be specifically requested at the national level. DGIWG will facilitate the availability of test data sets to DGIF participating nations.