DGIWG - 500
Implementation Guide to the
DGIWG Feature Data Dictionary (DFDD)

Document Identifier:	HBK-DP-10-001-ed2.2.9- Implementation Guide to the DFDD
Publication Date:	13 January 2010
Edition:	2.2.9
Edition Date:	12 November 2013
Responsible Party:	DGIWG
Audience:	Approved for public release
Abstract:	This document gives guidelines how to use and implement an instance or profile of the DGWIG Feature Data Dictionary

1 Content

1.1 Index of Figures

1.2 References

[1] **ISO 8601** - Data elements and interchange formats - Information interchange – Representation of dates and times

[2] **ISO 19103** - Geographic information - Conceptual schema language

[3] **ISO 19104** - Geographic information - Terminology

[4] **ISO 19105** - Geographic information - Conformance and testing

[5] **ISO 19106** - Geographic information - Profiles

[6] **ISO 19107** - Geographic information - Spatial schema

[7] **ISO 19109** - Geographic information - Rules for application schema

[8] **ISO 19110** - Geographic information - Methodology for feature cataloguing

[9] **ISO 19118** - Geographic information - Encoding

[10] **ISO 19126** - Geographic information - Feature concept dictionaries and registers

[11] **ISO 19131** - Geographic information - Data product specifications

[12] **ISO 19135** - Geographic information - Procedures for item registration

[13] **ISO 19136** - Geographic information - Geography Mark-up Language

[14] **ISO 19137** - Geographic information - Core profile of the spatial schema

[15] **OMG UML Specification**

[16] **STANAG 7074** – DIGEST

[17] **DGIWG - 905** - DGIWG Directives

[18] **DGIWG - ENT-08-101** - DGIWG_Register_Maintenance_Procedures_for_FAD

[19] **Shorter Oxford English Dictionary, 5th edition**

2 Introduction

Information about the battle space has always been crucial to the war fighter. Units working on certain tasks have always required an underpinning geospatial element (maps) with certain qualities to match the task requirements. The underpinning information has always needed to be exchanged and promulgated often providing the same map or chart as an unmistakable situational reference regardless of appropriateness. (Hence the bold requirement for "Fighting off the same map").

In later years it has been recognized and realised that the battle space has dramatically changed and with it has come new perspectives on interoperability and how they should be achieved have been voiced. Deployment of joint coalition forces in international missions has accentuated the need for information that can be ingested by a wide variety of (legacy) systems, but also be interpreted without vagueness. This certainty in interpretation arises from clear definitions of the information components. In reality semantically interoperable data can be exchanged amongst heterogeneous information systems as long as the exchanged information is based on harmonized information models.

In support of this aim, the aspects necessary for the exchange of Digital Geospatial Information (DGI) data are as follows:

- Data structure (including spatial structure and metadata)
- Concept classification and encoding
- Format
- Exchange media
- Administrative procedures

The type of data to be exchanged using this standard includes the digital representation of the following:

- Geographic Feature Geometry and Feature Attribute
- Other Geospatial Information

A suite of standards will facilitate interoperability and compatibility among national and multinational systems and users. Standardisation bodies working in the geospatial domain try to find a greater level of coherence and interoperability between civil and military communities of interest. The resulting standards make it more relevant to take part in joint coalition development programs. It is essential that geospatial implementers involved in the development of National Geospatial Information Infrastructures be advised of the advantages of making their data structures and Feature and Attribute coding schemes compliant with these standards.

Using the DGIWG Feature Data Dictionary (DFDD) in data modelling ensures a very basic level of commonality. Having nations and forces agreeing on and using the same definition of basic concepts is the first step along a complicated road to the new coalition-wide and joint interoperability environment. Using the DFDD will pave the way for building common feature models based on operational requirements. The operational requirements will guide the modeller (and the information provider) to have a proper (sufficiently detailed) set of attribute types linked to the necessary feature types in a certain (data) product (along with other functional requirements).

The DFDD is/was to a wide extent based on member nations of DGIWG having existing feature models or product specifications with their inherited set of attribute types, so users of the DFDD will be able to detect certain elements with a natural coherence, although the DFDD custodians are trying to break with this tradition.

The recommendation to use a baseline of the DFDD in each and every modelling project does come with a warning too: based on the bonds between data models and end user

products it is mandatory for developers and user communities to collaborate. If a product is developed for deployment, all parties need to understand the requirement for commonality. The achieved interoperability is directly linked to the harmony and commonality in (e.g.) basic information component definition, data model, communication models, operational procedures and system integration. DFDD deals exclusively with geospatial feature and attribute information concepts. Concepts with little or no geospatial relevance may be found in the concept dictionaries of other communities of interest (e.g. doctrine, communication, intelligence or CIMIC). Such adjacent dictionaries may or may not exist at this point in time.

3 Scope, description and field of application

3.1 Scope

This document describes the structure and the contents of the DGIWG Feature Concept Dictionary[1] known as the DGIWG Feature Data Dictionary (DFDD). The DFDD was so named previously to ISO 19103's definition of a Concept Dictionary.

It is intended for all users involved in the modelling of Geospatial Information (GI) especially those in the military community. The development of Feature Catalogues based on this document will promote interoperability with other DFDD- based catalogues and data.

On the basis of this document, it is possible to create compliant profiles of the DFDD.

3.2 Brief Description of DFDD

The DFDD is an online resource, maintained and disseminated through a Registry.

The Concepts within the Register are defined in English[2] and will be available in other languages[3].

The DFDD Concepts are published, for informative purposes, in a softcopy database form.

The DGIWG Web Site is available at
https://www.dgiwg.org/

The DGIWG Feature Data Dictionary website is available at https://www.dgiwg.org/FAD

3.3 Field of application

The DFDD is intended to aid in the creation of other Dictionaries and Feature Catalogues. It does not specify a data model or the implementation of data models. The Dictionary does not specify the actual representation of individual instances of each feature and their modelling and representation The dictionary only provides the mechanisms for the definitions and descriptions of real world phenomena.

3.3.1 Organisational Applicability

This document applies to all nations seeking interoperability and to the Topographic, Hydrographic, Aeronautical communities and other organizations operating in the geospatial field. The DFDD has been built to support the unambiguous definition of geospatial concepts. This provides support for the exchange of information between various communities operating in the geospatial field. Use of the DFDD will help avoid redundant developments and cut costs by using a common approach.

3.3.2 Geoscience Applicability

The DFDD is applicable to the geosciences. This is the field of study which describes the spheres of the Earth, the lithosphere, the hydrosphere, the atmosphere and the biosphere. Branches of the geosciences include but are not limited to geodesy, geography (physical and cultural), geology, geophysics, hydrography, oceanography and hydrology. Since the present and more importantly the future areas of interest for research, development, planning and execution of operations are difficult to define, the geosciences field of study has to be interpreted in the broadest sense. Given that the DFDD is an

[1] Feature Concept Dictionary: Set of independent specifications of the feature types, feature attributes, attribute listed values and feature associations that may be used to describe geographic data

[2] English language reference: Shorter Oxford English Dictionary Edition 5

[3] The languages available are stated on the online resource.

evolving, dynamic, geospatial concept dictionary, emerging geospatial data requirements that have not necessarily been dealt with before will have to be considered. Command, Control and Consultation (C3), Positioning, navigation, simulation, targeting, map and chart production, display, and manipulation of data are some applications for this information. All the data in this Dictionary is covered by the terms "geo-data" and DGI. Geo-data will be turned into applications-specific user-oriented "product data" out of the original "non product oriented data".

3.4 Compatibility with other Geographic Information Standards

DGIWG has been working for a number of years to align with other geospatial standards that have been developed by other user communities or by the International Organisation for Standardisation (ISO).

3.4.1 Military Standards (NATO)

DGIWG works closely on de-conflicting and harmonising with NATO and its standardisation bodies. The DFDD will exist within NATO as a core component of the NATO Geospatial Feature Concept Dictionary (NGFCD).
The DFDD forms an integral base for many NATO STANAGs such as AML and MGID by providing the normative dictionary and will maintain being the normative reference for the NGFCD.

3.4.2 Aeronautical Standards

DGIWG is working with the International Civil Aviation Organisation (ICAO) and the European Organisation for Safety of Navigation (EUROCONTROL) to align the Dictionary with civil aeronautical standards. This includes ensuring all terms and definitions defined by ICAO are identified within the dictionary. The Aeronautical Information Exchange Model (AIXM) is being used as a baseline to define the suggested aeronautical content of the DFDD.

3.4.3 International Hydrographic Organisation (IHO)

The work with the International Hydrographic Organisation (IHO) has addressed the alignment of DFDD with the IHO S-57 Object Catalogue. This has included the alignment of the geodetic codes and parameters and harmonisation between the S-57 Object Catalogue and the DFDD. The alignment of the catalogue supports the conversion of objects and Attributes from the S-57 catalogue to equivalent combinations in the DFDD.

3.4.4 ISO TC211

DGIWG has participated actively in the work of ISO Technical Committee 211 on Geographic Information/Geomatics to ensure that the generic suite of standards for Geospatial Information being developed supports the needs of the DFDD. The intent is for the DFDD to be compliant with ISO standards primarily 19100 series. This will make the implementation of the DFDD easier since the ISO standards have wide commercial support through industrial consortiums.

Regarding these aspects, the DFDD has been developed upon the principles defined in ISO 19135.

The DGIWG work on feature concept dictionaries has been the basis of the ISO19126 item proposal.

4 The DGIWG Feature Data Dictionary

4.1 Overview

The DFDD provides a means for classification and encoding of real-world phenomena including those which do not have a tangible physical form (for example airspace). It describes the world in terms of Feature Concepts, Attribute Concepts and Value Domains organised in a standardised Registry focused on Geospatial Information. The DFDD does not specify the delineation, modelling or geometry of Features. Attributes are the properties or characteristics to be associated with a Feature in a model.

4.2 The Use of the DFDD

The DFDD has not been developed to satisfy the requirements of any specific application, product or database. It is intended to be independent from the level of resolution (scale), geometric representation or portrayal. The appropriate selection of DFDD Concepts is intended to be implemented as part of the overall solution for an application by means of a database (supported by a data schema or model), a product or a dataset (defined according to a format specification and a data model).

Users of the DFDD are advised that as with any dictionary, there may be more than one way to encode geospatial entities. For example, a heliport can be modelled as a Feature “Heliport” but could also be modelled as a Feature “Aerodrome” associated with the Attribute “Airfield use” containing a Value “Helicopter Site”.

This provides flexibility for modelling geospatial features in a way which is efficient and suitable for a given application regardless of the format or encapsulation. If applications or databases have encoded geospatial entities using different combinations of the DFDD Concepts, a review of the full content of the DFDD should enable the development of a mapping between the two views. Similarly, a database can support the output to many different datasets using different encoding options.

As the DFDD is in constant evolution, It is further recommended not to use the DFDD as dictionary for products in national or organisational environments directly. Users should build in their system a profile of DFDD based on a baseline of reference to keep themselves independent of changes in the DFDD developments.

4.2.1 Representation

The representation of digital geospatial information is beyond the scope of the DFDD and is the subject to other standards and service development activities. The Concept content of the DFDD is intended to be independent of scope, scale and use, merely providing the means for data models and product specifications to model the world. Therefore, portrayal and symbolisation issues should be addressed by product specifications, data exploitation tools and services.

The DFDD uses the terms volume, area, line or point to describe the real world nature of the feature, irrespective of its delineation or geometric construction within an implementation. For example, a Built-up Area may be delineated either as an area or as a point.

4.2.2 Cultural and Linguistic Adaptability (Languages)

The DFDD is a Concept Dictionary maintained in English following the Shorter Oxford English Dictionary (5th edition).

Member Nations can provide the DFDD Custodian with translations of Concepts through their national representative. The provision and maintenance of language translations from Member Nations to the DFDD Custodian is voluntary. The use of translations is for informative purposes only. The translations are available as alternative names and definitions as part of the database of DFDD, hosted on the DGIWG Web Site.

Any translation must be made in line with the content of the original English DFDD.

Note:
Special attention should be paid to cultural and linguistic discrepancies causing terms in one language to have a broader, narrower or semantic shift of meaning to another language. The definitions therefore should be carefully studied, interpreted and translated.

4.3 Organisational Schema

The DFDD consists of different types of Concepts, which are organised into Groups and Subgroups.

4.3.1 Groups

DFDD Concepts are organised in a system of Groups and Subgroups with encoding to help the practical application of the Dictionary. This arrangement of the Dictionary is not meant to appear in any application. It was merely created to provide a more user-friendly search environment, enabling to browse through concepts by thematic classification. The assignment of a Concept to (at least) one Subgroup is mandatory. But the redundant assignment of Concepts is possible, which means one Concept could appear in more than one Subgroup

Every proposal of a new concept shall include a (proposed) Subgroup (see [18] (DGIWG - ENT-08-101 - DGIWG_Register_Maintenance_Procedures_for_FAD))

4.3.2 Concepts

There are two types of Concepts within the DFDD, Feature Concepts and Attribute Concepts.

4.3.2.1 Features

Feature Concepts are abstract specifications of the semantics of a Feature type (ISO 19126), which means that it defines something without giving any implementation restrictions (for example no geometry is given).

4.3.2.2 Attributes

Feature Attribute Concepts are used to describe characteristics of a Feature. Each Attribute Type has a specified data type. Every data type consists of the type itself (integer, text etc.), and optionally its domain (positive, from 0 to 360 etc.) and its unit of measurements (metres, degrees etc.).

The DFDD normally does not restrict the cardinality of attributes used at a specific Feature

4.3.3 General Concept Elements

For every concept, the following mandatory and optional elements shall be identified.

4.3.3.1 Unique Identifier

The Identifier is unique within the Registry and it is represented as a positive integer (i.e., greater than zero) that is used to denote a Concept information register item.

Concepts are registered and maintained within the DGIWG FAD Registry according to ISO 19135. Each registered item on proposal is given a Unique Identifier by the system which remains with this Concept.

This identifier can be used to refer to a specific Concept.

This element is **mandatory**.

4.3.3.2 alphaCode

The alphaCode is represented as a character string containing a concise and preferably human-readable designator that is used to denote a Concept.

The alphaCode is unique and **mandatory** within the Concept Dictionary valid at a given point in time.

In the DFDD the alphaCode is a “short name”, a shortened version of the name written in camelCase and not longer than 30 characters. A properly formed alphaCode satisfies the requirement that after adding an underscore (or space) before each sub-term except the first, the length of the result must not contain more than 30 characters.

If the alphaCode consists of only three sub-terms then its length may be as much as 28 characters. For example, “HumongousDurabilityEquipment” is a valid alphaCode. If the alphaCode consists of seven sub-terms then its length may only be 24 characters. For example, “TheTallWideFatRedHotBall” is a valid alphaCode. In practice, alphaCodes only infrequently exceed 25 characters in length.

Feature Concept alphaCodes follow the UpperCamelCase convention and Attribute and Enumerant Concept alphaCodes follow the lowerCamelCase convention.

Since an “Aircraft Facility Reference Point” Feature Concept contains more than 30 characters, a valid alphaCode would be “AirFacReferencePoint”. Since an “Offshore Construction Primary Structure” Attribute Concept contains more than 30 characters, a valid alphaCode would be “offshoreConstPriStruct”.

In DFDD the alphaCode2 is also **mandatory** and is the legacy FACC-based 5-3-1 Code. For the “Aircraft Facility Reference Point”, for example, the assigned alphaCode2 is “GB047”

4.3.3.3 Name

The name is **mandatory**. It contains a compact and human-readable designator that is used to denote the Concept. This name is unique within the Concept Dictionary and valid at a given point in time.

4.3.3.4 Status

The content of a Register is potentially dynamic. New items will be proposed and accepted or not accepted. Once accepted, items may be subsequently clarified, superseded, or retired. Information elements are required in order to support the management of items throughout their life.
Normally only the valid, superseded, and retired items are exposed when the contents of a register are made available to the public. Proposed and rejected items are part of the approval mechanism and are only required for management of the register. Member Nations shall have access to proposed, rejected and National Extension items because information about them may be useful for the development of new proposals**.**
A Concept in a Register has a period of validity that begins on the date on which the proposal to Register the item was accepted, and ends on the date on which a decision to supersede or retire the Concept has been officially published. Retired and superseded Concepts are no longer valid for use in the development of new product specifications, however they are kept in the Register to support the Through Life Management of systems, applications and data produced pre retirement or supersession.

Status is **mandatory**. There are four different statuses within the DFDD for every specific point of time:

- **Valid**: The Concept is valid and can be used.

- **Superseded** (not valid): The Concept was replaced by other(s). A link to the replacements is given in the DFDD.
- **Retired** (not valid): The Concept is no longer suitable for the DFDD. It should not be used anymore, except in the case where existing product specifications require it. In some cases DFDD recommends a possible replacement to give guidance to the user.
- **Rejected** (not valid): The Concept was proposed and not accepted by the Control Body.

4.3.3.5 Definition

The definition is **mandatory**. It is represented as a Character String containing the definition of the Concept. The definition is a precise statement of the nature, properties, scope, or essential qualities of the Concept.
If a definition is taken from an external source, the lineage information e.g. S57 version 3.1, is used to provide information about that source of reference together with the unique identifier of the Concept in the external source where available (refer to 4.3.3.9).

4.3.3.6 Description

A description is **optional**. Its value enables a better understanding of the meaning and scope of the Concept, often an example is quoted.

4.3.3.7 Alias

An alias is a synonym for a Concept, e.g. Graveyard, Cemetery. Alias is **optional** and there may be multiple aliases.

4.3.3.8 Image

Images are **optional**. The DFDD can store pictures, drawings or schemas for Concepts. These images can help to understand what the Concept is about.

4.3.3.9 Lineage

Lineage is **optional**.

The conditional association reference connects the Concept to a set of sources from which the Concept has been taken.

It consists of four fields:

4.3.3.10 Item Identifier

The item identifier in the source information, for example "buoy"

4.3.3.11 Reference

The reference to the Source, for example “S-32 Ed. 5”

4.3.3.12 Similarity

The similarity of the DFDD concept to the source. There are six types of similarity:

Identical: No change has been made to the specification.

Restyled: The style of the specification has been changed to match the style and structure of other specifications in the register that has imported the specification.

Context Added: The specification includes information about its context that is not explicit in the specification in the external source.

Generalization: The specification of the register item has been generalized to have a broader meaning than the item specified in the external source.

Specialization: The specification of the register item has been specialized to have a narrower meaning than the item specified in the external source.

Unspecified: The nature of the differences between the register item and the similar item in the external source is unspecified.

4.3.3.13 Reference Text

The original text in the source, for example "A floating object moored to the BOTTOM in a particular (charted) place, as an AID TO NAVIGATION or for other specific purposes. Navigational buoys may…"

4.3.4 Attribute Concepts - Basic Types

The following basic types can be found in the DFDD.

4.3.4.1 Boolean

Boolean is a data type that can only adopt the values of “false” or “true”. It can be used for Attributes, whose characteristics can simply be described by “yes” or “no”, or “exists” or “does not exist”.

Type	Name	Definition
Boolean	Man-made	An indication that a Feature is man-made.

4.3.4.2 Count

A Count is a positive whole number or zero. This data type is used for portraying countable items.

Type	Name	Definition
Count	Hospital Bed Count	The number of beds in a hospital.

4.3.4.3 Integer

An Integer is a whole number. Integers are used for Attributes that have a countable characteristic, which, however, can also take negative values (for example the floors of a building under the surface)

Type	Name	Definition
Integer	Upper Address Number	The upper limit of a range of postal address numbers associated with a Feature.

4.3.4.4 Real

A Real is a floating-point number. It is used for all Attributes representing a measured quantity, such as length, speed or frequency information.

Type	Name	Definition
Real	Aerodrome Elevation	The vertical distance above Mean Sea Level (MSL) of the highest point of the landing area.

4.3.4.5 Index

An Index is a whole number that is an identification number or a reference number, be it a simple street number or a registration number.

Type	Name	Definition
Index	Wreck Number	A unique number identifying a wreck or other non-submarine contact.

4.3.4.6 Key

A Key is a character string representing an identifier. It may consist of a combination of any characters.

Type	Name	Definition
Key	ICAO Identifier	The International Civil Aviation Organisation location identifier as designated in ICAO document 7910.

4.3.4.7 Text

For an Attribute of the Text data type, any character string may be entered. It can be for example a name or the differentiated description of a state.

Type	Name	Definition
Text	Touristic Name	A touristic identifier or code that is used to denote a Feature.

4.3.4.8 Structural Text

The Structural Text data type describes a character string that follows a specified pattern for representing data in a standardised format. The simplest instance of a Structural Text is a date. But it can also be an address or the like.

Type	Name	Definition
Structural Text	Activity Duration	The time duration for which an activity is permitted or which is required for an activity to transpire. Formatted in accordance with ISO 8601:2000, 5.5.4.2.1, Basic format, "Representation of time-interval by duration only" as 'PnYnMnDTnHnMnS' (for example: 'P2Y10M15DT10H30M20S' for a time-interval with a duration of two years, 10 months, 15 days, 10 hours, 30 minutes and 20 seconds).

4.3.4.9 Coded Attributes

Coded Attributes are used for representing Feature characteristics that cannot be expressed by numerical values and are too specific to give the user the freedom to add free text in a text field.

This includes:

- Descriptions such as colour or shape
- Attributes that further specify a Feature like Agricultural Facility Type.

Each Enumeration is a Data Type for itself.

It is coded by the old 5-3-1 code of the Attribute Concept it belongs to (starting with a capital letter) followed by the term “code” (for example: UucCode for the coded list for the Attribute Concept “UtilityFacilityType”)

All potential Values are combined in a list and coded by an UpperCamelCase short name.

Example:

Utility Facility Type
”The type of a facility, building, or structure that is used for utility provision purposes.”

Table 1: Example for the data type UucCode

Value	Name	Description
4	**Power**	A structure in which electric power is generated, switched, transformed, and/or converted.
5	**Outfall**	The outlet or structure through which reclaimed water or treated effluent is finally discharged to a receiving body of water.
6	**Intake**	A structure where water is channelled from a body of water for use.
7	**Drinking Water**	A structure used in the process of cleaning water to make it suitable for drinking.
9	**Outbuilding**	A relatively small building that is separate from but is located near a main building and whose utility use has not been determined.
10	**Power Station**	A facility including one or more buildings and equipment used for power generation.
11	**Filtration Plant**	A building that houses equipment through which a liquid or gas is passed in order to separate the fluid from suspended particulate matter.
12	**Cooling**	A facility for the generation of chilled liquid and/or gas for cooling purposes.
18	**Waterwork**	An establishment for storing, purifying, and supplying an area or town with water.

4.3.4.10 Collection

Traditionally, when capturing a Value for a given Attribute of a Feature instance there has been only allowed one choice. A road segment may contain "x" lanes (in which case a single Attribute Value is sufficient). There are cases where multiple Values may be desirable, therefore requiring the capture of more than a single Value for a chosen Attribute.

Consider a fuel depot, which may store several types of fuel (gasoline, diesel, fuel oil, kerosene, etc.). There may be a requirement to capture all of these available fuel facilities using several Values for the Attribute “Available POL”. Other Features such as buoys and lights may also generate a requirement for more than one Value to be captured (for example colour).

If the collection field is empty, only one value is allowed.

If the collection field is not empty, there could be more than one value, either in order (“sequence”) or unsorted (“set”).

When the values are ordered (a “sequence”) typically this is according to descending value predominance or priority; in some cases attributes will specify a particular basis for the ordering.

The field collections is not limited to enumerations but can be used for any datatype.

4.3.4.11 Complete Lists

The Boolean field “complete” indicates if a coded list is complete, so that no other values are possible and therefore for example the NUNANPO value “other” does not make sense and should not be allowed for this list.

For example, 'True', in the case of an enumeration attribute 'Sex' with the domain values of 'Male' and 'Female'.

4.3.4.12 Interval Integer / Interval Real

Traditionally, Attributes are single-valued text strings, numbers, or enumerated values. However, at times it is necessary to assign values that fall within intervals. Different

requirements may result in a conflicting requirement to capture values as actual values, flexible variable ranges, or fixed standardised ranges.

Where the data provider is unable to determine the measurement to a required level of precision, it might be possible to determine it as somewhere within an “interval” of possible values. This may be preferable to not capturing the measurement at all. The producer needs the flexibility to vary the interval for each instance of the measurement or represent that some instances are actually captured to the specified precision.

Where the data provider captures aggregations of Features (such as capturing trees as an Area Feature), there may be a need to capture average or aggregated measurements. Using the tree analogy, there may be a need to capture the actual variation, or average, of the diameter of tree stems. Another analogy is the characteristics pertaining to the slope of a road. It may be inefficient to capture the exact slope angle for every segment or profile of the road; the provider may allocate a “slope between m and n” measure to an aggregation of road segments.

Where a data provider is capturing measurements in support of certain standardised models of analysis, it may be mandatory to capture measurements within certain groups of ranges. The DFDD aims to meet all three types of requirements where appropriate.

It is possible to define an interval for the data types Integer and Real, which allows capture of value ranges. The Intervals may be closed or open, e.g. “9-11”, “< 3” or “> 20”.

4.3.5 Data Type Domains

Every data type has a domain, which defines what values are allowed to be stored.

4.3.5.1 Ranges

It may be useful to restrict an Attribute value to a defined range of values. For example the algae coverage of a part of the sea can only be between 0 and 100 % or a length of a Feature is always positive. The DFDD provides for very unambiguous cases a minimum and a maximum value. These two values define a Range in which the Attribute value always must stay in.

4.3.5.2 Text length

It may also be useful to restrict the length of text entries to a specific value.

4.3.6 Reserved Values

There are some values which are reserved for the case that no value is entered. They can be used with all data types (see Examples for Implementation).

ONINAs

The values of “Not Applicable” and “Not Populated” could not easily be distinguished. Therefore the value “No Information” has been introduced.

They can be used with all data types (see Examples for Implementation).

Three different types (ONINA) are used:

Other (for specific enumerations)

For a Feature with this Value, none of the listed Values is applicable, but a Value not listed there is. The actual Value should be laid down in another Attribute or an external document.

No Information (always possible)

There is no information specified regarding the attribute value. Depending on the nature and quality of available source, the state of the data collection/update process, and other conditions, it may not be possible to populate a value

due to lack of knowledge. The reasons for the lack of a value may include, but are not limited to, the following: not populated (for example: the data store has been initialized but not yet populated); unknown (for example: an attempt was made to determine the value but the source materials were inadequate); missing (for example: a determination was attempted and despite source materials being adequate the attempt failed); withheld (for example: a determination was successful but for policy reasons the value was not retained/stored).

Not Applicable (in certain circumstances)

For a Feature with this Value, this Attribute is not applicable, that means that this characteristic does not exist for this specific Feature.

Table 3: ONINAs in different data types

Attribute Type	Other	No Information	Not Applicable
Text	"Other"	"No Information"	"Not Applicable"
Enumeration	999	-999999	998
Numeric	-32764	-999999	-32765

Note: Formerly these kind of values had been called NUNANPOs (Null, Unknown, Not Applicable, Not Populated, Other).

4.3.7 Units of Measurement

Each numeric data type can have at least one unit of measurement. The DFDD references to the Data Types Dictionary[4], which can be browsed on the DGIWG website.

[4] see „Introduction to the Data Type Dictionary" for more details.

Annex A - Conformance

A.1 DFDD Conformance to ISO

The DGIWG Feature Data Dictionary makes use of a common structure and coding scheme that conforms to ISO 19135 (Geographic information — Procedures for item registration), ISO 19110 (Geographic information — Methodology for feature cataloguing), and ISO 19126 (Geographic information – Feature concept dictionaries and registers). This provides for flexible management of Feature information collections and is used as a basis for harmonisation and the establishment of interoperability between different geospatial information communities.

Note: The fact that a Concept Dictionary or Feature Catalogue is DFDD-compliant does not imply conformance to ISO.

A.2 Definition of Conformance

An implementation of the DFDD should indicate the same Concepts as specified within the DFDD to be considered conformant. The statement of conformance pertains to a specific DFDD **point in time.** The implementation using one DFDD at a specific date cannot state conformance with a previous or later date unless the implementation of every DFDD Concept used is compared to its Concept in the previous or later version.

The DFDD is published as a public baseline twice a year. A statement of conformance to a published baseline is recommended.

An implementation claiming conformance with the DFDD shall pass all the requirements described in the DFDD conformance tests (see Conformance Testing)

A.3 Profiles of DFDD

An implementation of the DFDD may include but is not limited to:

- a subset of DFDD (DFDD Profile).
- Extensions; additional Concepts must follow the same rules as existing Features, Attributes and Value Domains within the DFDD.

A.4 Extensions to the DFDD

Individual implementations are not required to use the totality of the DFDD, neither is there a mandatory minimum subset. The DFDD allows for individual communities to define additional Concepts as Extensions.

In order to enhance interoperability, if a Member Nation has a Feature or Attribute Concept unique for their community, the preferred course of action is to submit a proposal for addition into the DFDD according to reference [18]. If this method is not possible or feasible, a member nation may implement the use of an extension of the DFDD for their use. An extension is not published as part of the DFDD nor does it have to be agreed upon by other Member Nations.

A Member Nation is entitled to make its own assessment and judgement, if it decides to implement an extension.

The requirements of conformance are:

- Features, Attributes and Values implemented, which exist within the normative DFDD, shall pass the requirements defined in Conformance Testing
- Features, Attributes and Values implemented, which do not exist within the normative DFDD (Extensions), shall pass the requirements defined in clause E.2.

Annex B - Management of DFDD

B.1 Roles and Responsibilities

This section explains the roles and responsibilities laid out by “ISO 19135, 2005-04-21, N1788”, and how they apply to the DFDD.

Figure 1 shows the organisational relationships for the management of the DFDD Register related to the roles defined in ISO 19135.

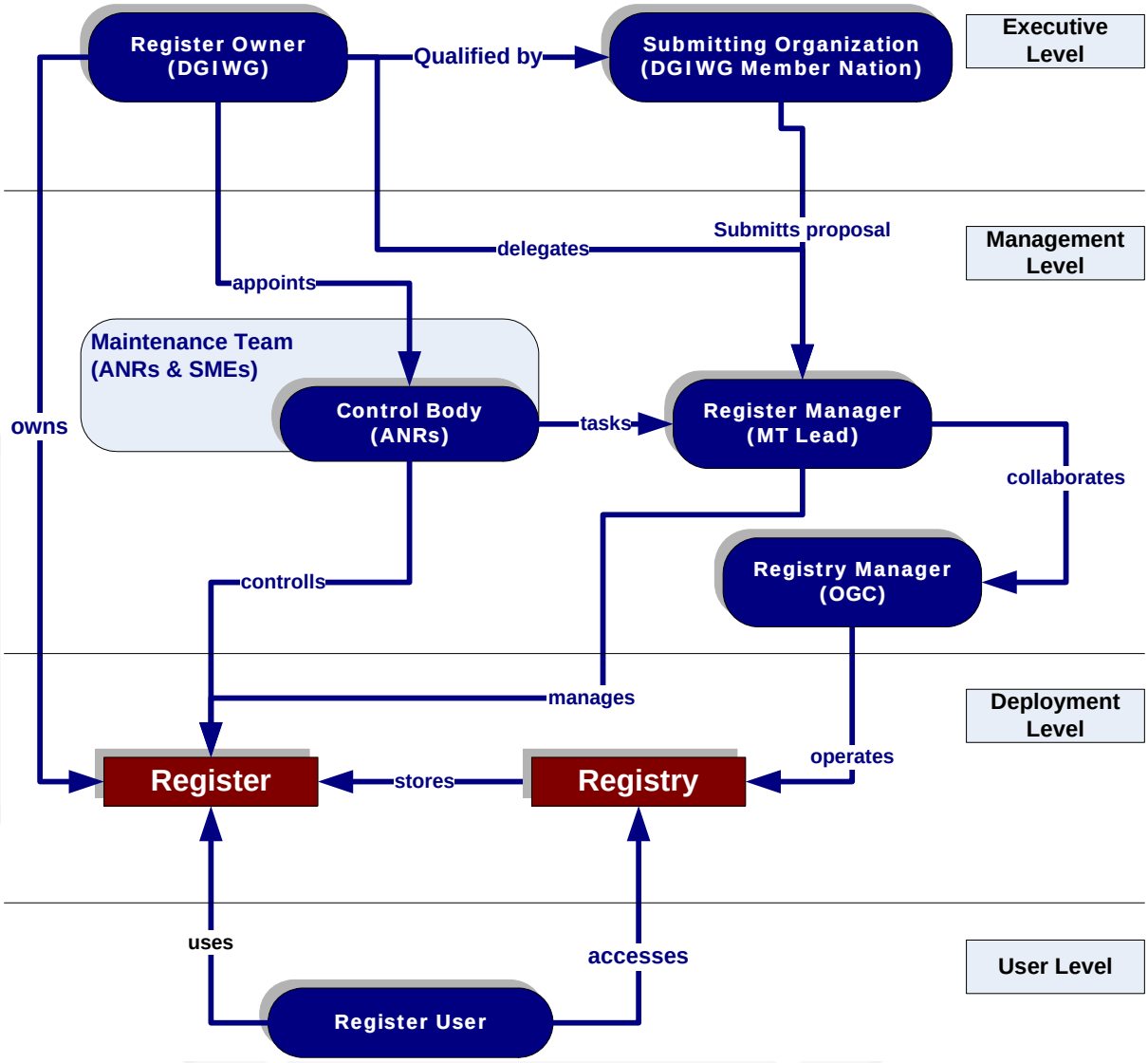


Figure 1: Organisational relationships for the DFDD Register

The role as **Register Owner** is played by DGIWG as an organisation and has the primary responsibility for the management, the dissemination, and the intellectual content of the register.

The Feature and Attribute Data Maintenance Team (FAD MT) is responsible for the day-to-day work on the FAD Registry. This team is comprised of **National Representatives (NR)** and subject matter experts from the Member Nations and experts from DGIWG liaison organisations. The **Control Body** of the FAD Registry is comprised of the **Authorized National Representatives (ANR)**. Each DGIWG nation appoints one ANR.

The Chair of the Maintenance Team (FAD MT) also performs the function of the **Register Manager**. The role of the Register Manager is to manage proposals, to maintain the

registers' content, and to make changes in the registers after approval by the Control Body.

The National Extension Registers' Managers, Maintenance Teams and Control Bodies are appointed by the responsible nation

The **Registry** is hosted by a service provider.

The role as **Registry Manager** is appointed by the service provider of the Registry. The Registry Manager is the person or the organization responsible for the technical day-to-day management of the registry.

The **Submitting Organization** is any DGIWG Member Nation or DGIWG client (see [17],chp. 3.1.5). A Submitting Organisation will submit proposals and appeals to the Register Manager through its ANR.

The DFDD is an evolving dynamic geospatial Concept Dictionary. The Concept Dictionary evolves to consider emerging geospatial data needs that have not necessarily been covered before.

The DFDD is managed by the Feature and Attribute Data Maintenance Team (FAD MT).

The Management Process is described in the "DGIWG Register Maintenance Procedures for FAD" ([18]).

B.2 Backward Compatibility

The Changes in the DFDD will be done according to the ISO 19135.

No information will be deleted from DFDD. Retired Feature Concepts or Attribute Concepts will remain within the Concept Dictionary. They are marked as "non valid". If the DFDD Control Body accepts a change (retirement, supersession, addition, clarification) to DFDD Concepts, the nature, details, and date of the change will be stored within the Register.

Users shall note that the backward compatibility information is attached to the DFDD Concepts. It is not mandatory to include this information in any implementations of the Concepts.

B.3 National and Organizational Registers in the FAD Registry

DGIWG member nations may be afforded their own national extension register to fit their national needs. (see chapter A.4) To establish a national extension the national point of contact or FAD authorized national representative must coordinate with the Register and Registry manager.

DGIWG associate organizations (i.e. defence observers, liaison organizations, etc.) are also allowed to have external registers maintained in the FAD Registry (see chapter A.4)

To add an extension to the FAD Registry an organisation or owner shall contact the FAD Register Manager, who will forward the request to the control body.

The control body will include the request in the next voting cycle and vote on the issue as if it was an addition of a new item.

The organization is allowed to appeal a denial as described in the FAD Registry proposal process.

B.4 Rules for proposing changes to DFDD

In order to ensure the coherence of the register, a Responsible Representative should check that the following criteria are met before submitting a proposal to the register:

- There is no possible overlap with the meaning of a proposed change in a concept and the meaning of a concept already existing in the DFDD.
- The concept proposed must have an alphaCodes, a 531-Code, a name and a definition.
- New codes, names and definitions are not already used within the DFDD, nor within all extensions belonging to the registry. AlphaCodes and names of concepts that are not valid must not be re-used.
- The datatype and unit of measure for the proposed concept (if applicable) should be one of those defined within the DFDD.
- A proposed concept must be assigned to at least one sub group (see 4.3.1)

Annex C - Levels of Modelling

The DFDD is a data model independent Dictionary of geospatial Concepts. There may be many different ways to organise and model the geospatial Concepts from the DFDD; it will be up to the user to decide the best solution to fit their needs. This annex is designed to give users guidance on the different aspects. See Figure 7 also.

C.1 DFDD

(Feature Concept Dictionary)

The DFDD defines a dictionary of Concepts. It does not define data models or implementations of data models. There could be more dictionary-levels above and below the base level 0 (DFDD).

DFDD does not define Catalogues. There are no bindings in the DFDD between Feature and Attribute Concepts, no geometry instructions, no capturing guides or others.

The DFDD defines Concepts as described in 4.3.2. Additionally for Attribute Concepts there is also a data type, unit and eventually a range of allowed values defined.

C.2 Data models

(Feature Concept Dictionaries, Feature Catalogues)

A Logical Data Model (LDM) can consist of a Feature Catalogue and a Feature Concept Dictionary. It defines how Concepts are allowed to interact and relate to each other. A Data model is compliant to DFDD, if it defines Concepts in the same way as DFDD does. This means (by ISO 19135) that the Concepts must use exactly the same name and definition and the same domain (for Attribute Concepts), although the domain for enumerants and lists can be a subset. Because of changes within the content (and structure) of the DFDD, a Data model must refer to a defined date of DFDD. It is possible to compare all models compliant to DFDD with each other. All models are consistent to each other.

A Concept in one model is exactly the same as a Concept in another model if the Concept is derived from DFDD.

C.3 Product Specification

ISO 19131:

"A data product specification is a detailed description of a dataset or dataset series together with additional information that will enable it to be created, supplied to and used by another party. It is a precise technical description of the data product in terms of the requirements that it will or may fulfil. However, the data product specification only defines how the dataset should be. For various reasons, compromises may need to be made in the implementation. The metadata, associated with the product dataset, should reflect how the product dataset actually is.
A data product specification may be created and used on different occasions, by different parties and for different reasons. It may, for example, be used for the original process of collecting data, as well as for products derived from already existing data. It may be created by producers to specify their product, or by users to state their requirements."

A Product Specification profiles a Data Model by introducing a variety of constraints. For example, there might be one or more constraints for a Feature Type such as: allowable geometries; the minimal size "in the real world" for the collection of a geometric instance; the minimum (and/or maximum) required (allowed) attribution; the range of an attribute data type (min/max or enumerates); and other logical characteristics. It might even declare certain requirements for the precision of representation of Real values -- but not specify a particular encoding that satisfies that precision requirement. A Boolean in the Datamodel is still a Boolean in the Product Specification.

C.4 Implementation Specification

The Implementation specification(s) will address the Physical Data Model (PDM) constraints that are imposed by a particular technology. Until that last stage the goal is to have a specification that remains "portable" to many technologies (although perhaps some technologies can not meet all of the requirements of the Product Specification without loss - such loss(es) would be explicitly addressed in the Implementation specification). See Annex Annex D - .

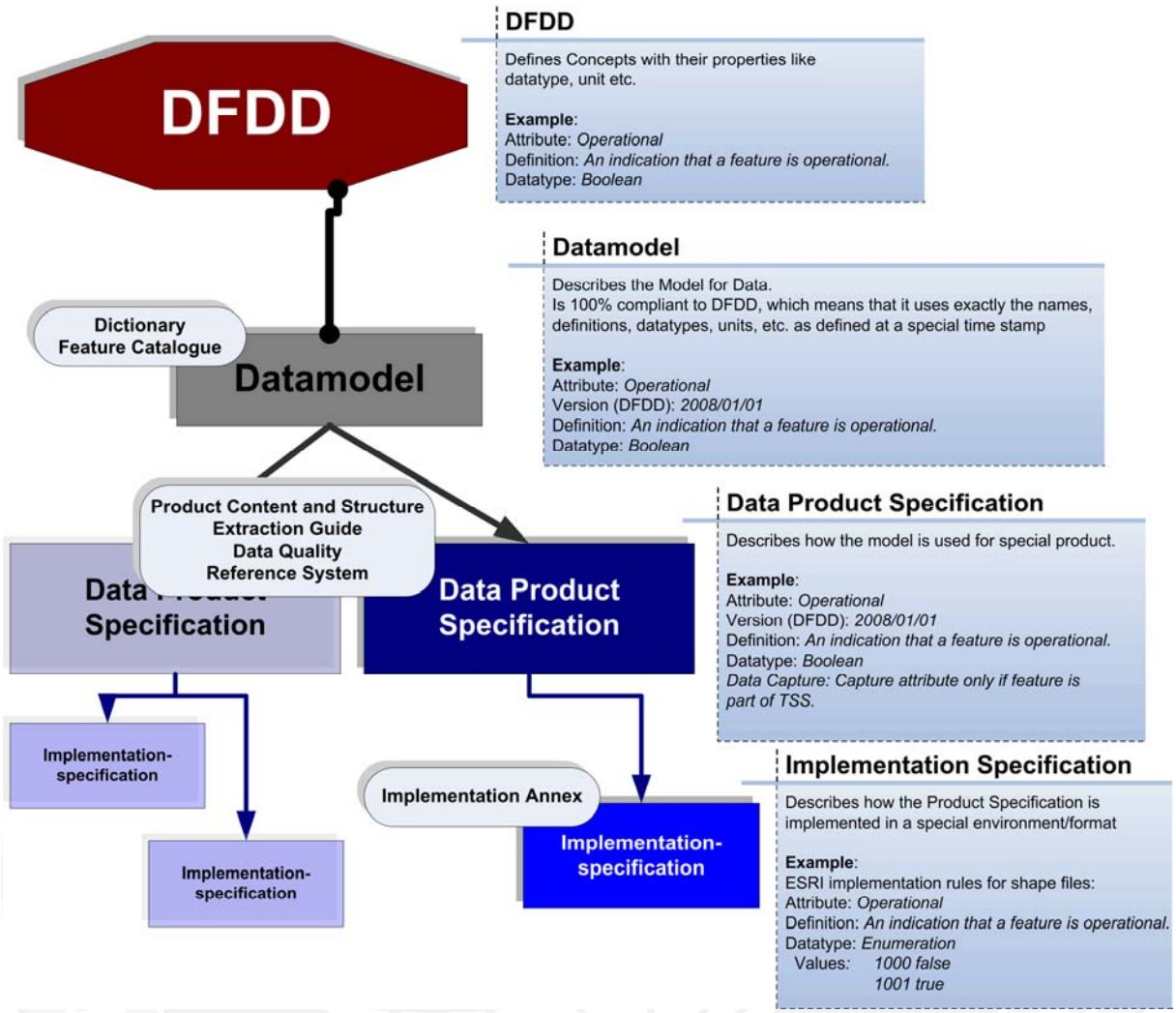


Figure 2: Levels of Modelling

Annex D - Examples for Implementation

As shown throughout this document and especially in Annex B there are differences between the data models and the physical models which cause difficulties in implementing the Concepts in modern Commercial Off The Shelf software (COTS).

For example there are restrictions in modern GIS which do not allow some data types to be implemented in the way they are described in the DFDD.

This is one of the reasons why there are different levels within Annex B.

In some software you cannot implement the data type “Boolean”, as the DFDD defines. An implementation has to be created, which covers the meaning of a Boolean. The way in which this is done must be documented in the implementation specification. As long as the product specification specifies the data type as Boolean, the product is DFDD compliant.

This annex should give you some impression how these “difficult” data types and structures within DFDD can be handled.

D.1 Reserved Words

It is often the case that the legacy 3-character codes for Attribute Concepts are directly used as field names in relational databases. When this practice is employed there will be conflicts between the Reserved Words set aside in SQL (and sometimes additional words reserved by vendor-specific implementations of SQL) and the legacy 3-character codes assigned in the DFDD.

For legacy systems and the use of DFDD prior to Baseline 2011-1.00, it is recommended that relational database implementations avoid Reserved Word violations by appending an underscore (‘_’) to the end of the 3-character code to result in a 4-character field name, as follows:

Table 4: Examples for substitutes

alphaCode	alphaCode2	Field Name
atsRouteSegmentLength	ALL	ALL_
manMade	ASC	ASC_
geomorphicType	GET	GET_
internationConflictType	INT	INT_
length	LEN	LEN_
maximumAltitude	MAX	MAX_
extractionMineType	MIN	MIN_
topmarkShape	TOP	TOP_

D.2 Boolean

A Boolean is defined as a data type consisting of two values, true and false. There are different ways of implementing this:

If considering MS Access and GML as separate Implementations Specifications, then there could be for the data type Boolean:

- In MS Access: "No"/"Yes"
- In GML: XML Schema Boolean ("false"/"true")
- In a GIS: maybe an enumeration with values 1000 and 1001.

D.3 List Attribute

If it is not possible to use a List data type in a GIS, then a work around may be created as a “clone” of the attribute.

For example you can create Product_1, Product_2, Product_3 This Subgroup consists of for the Attribute Product if you need more than one value.

D.4 ONINAS

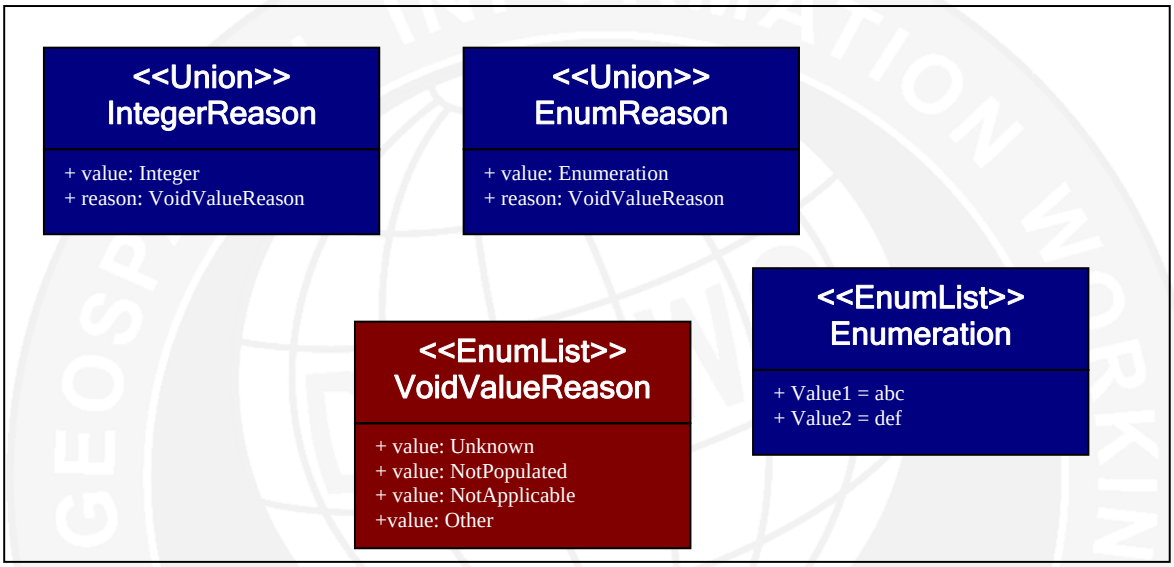
ONINAs can be modelled effectively in GML with the creation of a complex data type:

If the data type “Union” is used, it is possible to build a complex structure where the basic value is split into two, value and ONINA.

The Attribute “Length” for example can be of the class “IntegerReason”. If the length is captured, the value is an Integer. If not the data type “VoidValueReason” (an enumeration of ONINAS) is used to store the information for the emptiness of that attribute.

The same can be done with an enumeration attribute, which could be either an “Enumeration” with the original values but also a value out of the “VoidValueReason” enumeration.

Figure 3: Classes for complex ONINAS modelling



D.5 Interval

Following is an example of how to implement an Interval in GML developed by NATO C3A.

The optional attribute intervalAllowed shall be represented as a Boolean that specifies whether the domain of values of the numeric attribute is a numeric interval (i.e., not limited to a single number). When the intervalAllowed is not specified, then the domain of values shall be restricted to a single number.

In general, three elements are required to encode an interval (minimum value, maximum value, range closure), whereas only a single element is required to encode a number.

In addition, the enumeration FR_IntervalType is specified to provide the possible values for the type of a numeric interval (range closure):

- openInterval: The bounded open interval (minimumValue, maximumValue).
- gteLtoInterval: The right half-open bounded interval [minimumValue, maximumValue).
- gtoLeInterval: The left half-open bounded interval (minimumValue, maximumValue].
- closedInterval: The bounded interval [minimumValue, maximumValue].
- gtSemiInterval: The left half-open unbounded interval (minimumValue, +infinity).

- geSemiInterval: The unbounded interval [minimumValue, +infinity).
- ltSemiInterval: The right half-open unbounded interval (-infinity, maximumValue).
- leSemiInterval: The unbounded interval (-infinity, maximumValue].
- singleValue: A single value

In other GIS implementations intervals could be represented by using three different fields. One for the upper value, one for the lower value and one for the type of interval.

Annex E - Conformance Testing

E.1 Implementation of DFDD

This Annex explains the criteria required to be DFDD conformant.

E.1.1 General

Check that the implementation of the DFDD contains the required Items.

Check that the implementations of Extensions are DFDD compliant. Acceptance criteria are specified at E.2

E.1.2 Presence of Required Elements

Check that the implementation's Concept Dictionary fields are as specified within the DFDD.

E.1.2.1 Concepts

Check that the used Concept's alphaCode is the specified one within DFDD.

Check that the used Concept's name is the specified one within DFDD.

Check that the used Concept's definition is the specified one within DFDD.

Check that the used combination of alphaCode, name and Concept definition are the valid combination for the Concept as specified within DFDD.

E.1.2.2 Attribute Concepts

Check that the used Attribute's data type is the specified one for the Attribute within the DFDD.

Check that the used Attribute's unit of measurement is the specified one for the Attribute within the DFDD.

E.2 Extensions

Even though the Extensions may not be intended for inclusion into the normative DFDD, they should be developed to conform to the criteria listed in [18]. This is a mandatory requirement for claim of "Conformance to DFDD with Extensions." Conformance with the acceptance criteria will also increase the likelihood of an Extension being approved for inclusion in the normative DFDD.

E.2.1 Concepts in an Extension

Check that every Concept in the Extension has the two alphaCodes, a name and a definition.

Check that the alphaCodes, name or definition is not already used within the DFDD.

Check that the alphaCodes, name or definition is not used in other Extensions available.

Check that the Concepts in the Extension fulfil the requirements given in Chapter B.4.

Annex F - From lineage to mapping

This annex describes how to use the so-called lineage tables.

Lineage tables are created to show changes between baselines of DFDD. They describe what happened to what Concept at what time and provide guidance on how to proceed.

While mapping tables are used to transform different versions of products into each other by prescribing how to map one item to another the lineage table just recommends how the user could transform his model.

The difference between a mapping table and a lineage table could also be described in the diagram of different models (see Figure 2, pg. 201)

The lineage tables describe how the changes within DFDD can be realised in the Data model. These tables live on the conceptual level of the models.

The mapping tables describe the transformation on the level of product or implementation specifications. Therefore two products could be mapped in different ways although both refer to the same lineage table. The differences can occur because of different content (different Feature-Attribute bindings) or different implementation specifications (if a product can handle complex structures it may be easier to choose another solution than the one recommended in the lineage table).

A lineage table is a recommendation. As long as the model retains DFDD conformance, the developer can choose the way in which it is modelled.

Therefore it is possible to create a mapping table out of a lineage table but it is not recommended to use a lineage table for mapping on its own.

Note:

There is also a lineage table for the transformation between FACC 2.1 and DFDD Baseline 2005-1 available.

All lineage tables are currently distributed via the DGIWG web site in the Microsoft Excel format (xls).

Annex G - Glossary

Following is a list of terms and acronyms.

G.1 Terms

Term	Description
Addition	"Addition is the insertion into a register of an item that describes a concept not described by an item already in the register." (ISO 19135)
Authorized National Representative (ANR)	Voting member in the Control Body
Baseline	An identified point in time when the content of a register is considered to be stable, internally logically consistent and suitable for use "as a whole" in an application (for example: specifying a feature catalogue). A baseline may be established following processing of a related collection of proposals and before a new, typically unrelated, set of proposals is considered.
Clarification	"Clarifications correct errors in spelling, punctuation, or grammar. A clarification shall not cause any substantive semantic or technical change to a registered item." (ISO 19135)
Concept	A concept is an abstract idea or a mental symbol, typically associated with a corresponding representation in language or symbology, that denotes all of the objects in a given category or class of entities, interactions, phenomena, or relationships between them.
Control Body	Group of Authorized National Representatives (ANR) making decisions regarding the content of the register.
Data model (Logical)	The logical conceptual model describing the relations and characteristics of Concepts.
Data model (Physical)	See "Implementation"
data type	"Specification of a value domain with operations allowed on values in this domain." (ISO 19103)
Defence Geospatial Information Working Group (DGIWG)	DGIWG is the multi-national body responsible for geospatial standardization for the defence organizations of member nations.
DGIWG Feature and Attribute Data Dictionary (DFDD)	The Defence Geospatial Information Working Group (DGIWG) Feature and Attribute Data (FAD) Registry contains registers of geographic information concepts used to characterize aspects of real world phenomena for different information communities. In particular, geographic features are real world phenomena associated with a location relative to the surface of the earth, about which data are collected, maintained, and disseminated.
Domain	Every data type has a domain, which defines what values are allowed to be stored.
Encoding	The physical implementation of a logical model
Feature	"Abstraction of real world phenomena." (ISO 19101). A Feature is the instance of a feature type.
Feature and Attribute Coding Catalogue Data Dictionary (FACC)	DGIWG has maintained the Feature and Attribute Coding Catalogue (FACC) as a part of the DIGEST exchange standard and as part of NATO STANAG 7074. The initial version of FACC was developed together with DIGEST version 1 and the latest version was included as part of DIGEST Edition 2.1 issued in September 2000. FACC has been an important part of the standardization of geographic information for the military community by providing the common set of geographic features used in a number of products based on DIGEST.

Feature and Attribute Data Maintenance Team (FAD MT)	Group of national representatives, technical experts and delegates from liaised organisations responsible for the operational work on the register.
Feature Attribute	"Characteristic of a feature" (ISO 19101). The specific Attribute on a Feature
Feature Attribute Concept	"Abstract specification of the semantics of a feature attribute type" (ISO 19126)
Feature Attribute Type	The implementation of a Feature Attribute Concept (by adding restrictions and specifications)
Feature Catalogue	"Catalogue containing definitions and descriptions of the feature types, feature attributes, and feature associations occurring in one or more sets of geographic data, together with any feature operations that may be applied." (ISO 19110)
Feature Concept	"Abstract specification of the semantics of a feature type" (ISO 19126)
Feature Concept Dictionary	"Dictionary containing definitions and descriptions of feature concepts and feature-related concepts." (ISO 19126)
Feature Type	The implementation of a Feature Concept (by adding restrictions and specifications like geometry)
Identifier	"Linguistically independent sequence of characters capable of uniquely and permanently identifying that with which it is associated. [adapted from ISO/IEC 11179-3]" (ISO 19135)
Implementation (Physical)	Implementation of a Logical Data Model (LDM) in a special environment.
NUNANPO	Acronym for "Null, Unknown, Not Applicable, Not Populated, Other", values that are reserved for the case that no value is entered.
ONINA	Acronym for "Other, No Information, Not Applicable" values that are reserved for the case that no value is entered.
Product Specification	"A data product specification is a detailed description of a dataset or dataset series together with additional information that will enable it to be created, supplied to and used by another party." (ISO 19131)
Profile	"Set of one or more base standards or subsets of base standards, and, where applicable, the identification of chosen clauses, classes, options and parameters of those base standards, that are necessary for accomplishing a particular function [adapted from ISO/IEC TR 10000-1:1998]" (ISO 19106)
Register	"Set of files containing identifiers assigned to items with descriptions of the associated items." (ISO 19135) The DFDD is maintained in a Register
Register Manager	"Organization to which management of a register has been delegated by the register owner." (ISO 19135) The Register of the DFDD Register is the chairman of the FAD MT
Registry	"Information system on which a register is maintained." (ISO 19135)
Registry Manager	A registry manager is a person or an organization responsible for the day-to-day management of a registry. A registry manager may engage a third-part service provider to perform this service." (ISO 19135)
Register Owner	"Organization that establishes a register." (ISO 19135) The owner of the DFDD is the DGIWG.
National Representative (NR)	National Representative allowed to propose and discuss and being responsible for a proposal.
Retirement	"Submitting organizations may submit requests for retirement of registered items that are no longer useful for producing data. Retirement shall be accomplished by leaving the item in the register, marking it retired, and including the date on which it was retired." (ISO 19135)
Schema	"Formal description of a model" (ISO 19101)

Supersession	“Modification of a registered item that results in substantive semantic or technical change shall be accomplished by including a new item in the register with a new identifier and the date on which it superseded the original item (8.9.6). The original item shall remain in the register but shall include the date at which it was superseded, and a reference to the item that superseded it.” (ISO 19135).
Value	The specific Value in a coded list (Enumeration or List) that is used for a Feature Attribute.
value	The value of a Feature Attribute (for example a number or a string, like the length or the name)

G.2 Acronyms and Abbreviations

Acronym	Term
AIXM	Aeronautical Information Exchange Model
AML	Additional Military Layer
ANR	Authorized National Representative
C3	Consultation, Command and Control
CB	Control Body
CIMIC	Civil-Military Co-operation
DFDD	DGIWG Feature Data Dictionary
DGI	Digital Geographic Information
DGIS	Digital Geographic Information System
DGIWG	Defence Geospatial Information Working Group
DIGEST	Digital Geographic Information Exchange Standard
EDCS	Environmental Data Coding Specification, ISO 18025
EUROCONTROL	European Organisation for Safety of Navigation
FACC	Feature and Attribute Coding Catalogue Data Dictionary
FAD MT	Feature and Attribute Data Maintenance Team
GIS	Geographic Information System
GML	Geography Markup Language, ISO 19136
ICAO	International Civil Aviation Organisation
IHO	International Hydrographic Organization
IMO	International Maritime Organization
ISO	International Organization for Standardization
MC&G	Mapping Charting & Geodesy
MGCP	Multinational Geospatial Co-production Program
NATO	North Atlantic Treaty Organization
NBI	No Business Interest
NGFCD	NATO Geospatial Feature Concept Dictionary
NR	National Representative
NUNANPO	Null, Unknown, Not Applicable, Not Populated, Other
OGC	Open Geospatial Consortium
ONINA	Other, No Information, Not Applicable
SEDRIS	Synthetic Environment Data Representation and Interchange Specification (see also EDCS)
STANAG	NATO Standardization Agreement
TC 211	ISO Technical Committee 211 (on Geographic Information/Geomatics)
UML	Unified Modelling Language

Annex H - Record of Changes

HBK Version	Change date	Publishing date	Chapter	Issue / Justification
2.2	01 Jul 2010	15 July 2010	4.3.3.2	Clarification of the description regarding the length of alphaCodes to ensure a consistent use of codes.
2.2	01 Jul 2010	15 July 2010	4.3.2.2	Changed the alphaCodes of enumeration values to lowerCamelCase convention.
2.2	01 Jul 2010	15 July 2010	Annex D.1	Added a description of the “reserved word” issue and how to handle it in legacy systems.
2.2.1	01 Jul 2010	15 July 2010	Annex H	Introduced annex H to the handbook to record changes made.
2.2.2	19 Jul 2010	19 July 2010	Annex H	Editorial changes
2.2.2	19 Jul 2010	19 July 2010	4.3.2.2	Editorial changes
2.2.2	19 Jul 2010	19 July 2010	D.1	Editorial changes, changed baseline in third paragraph to BL 2010-1.01
2.2.3	05 Apr 2011	23 June 2011	4.3.1 4.3.2 Annex B.3 Annex B.4	Statements added to clarify mandatory/optional status of several elements (4.3.1 and 4.3.2) and several sentences rephrased in a more normative language. New criteria (B.3) of “no mixed concepts” added. Rules and pattern for Definition updated. Parts B.4.1 (Avoid renaming concepts) and B.4.2 (Self-supersessions) added.
2.2.6	05.Jan 2012	21 May 2012	1.2	Changed [15] to refer to OMG, added [17] DGIWG Directives and [18] DGIWG-ENT-08-101 to the list.
2.2.6	05.Jan 2012	21 May 2012	4.3.4.1.9	Changed “Coded list” to “Enumeration”
2.2.6	05.Jan 2012	21 May 2012	4.3.4.1.9	Added another value to the enumeration to stay in sync with current baseline of DFDD:
2.2.6	05.Jan 2012	21 May 2012	Table 2	Removed Thousand-Separator to avoid confusion between American and European style.
2.2.6	05.Jan 2012	21 May 2012	A.4	Corrected reference from annex B.2.1 to [18]
2.2.6	05.Jan 2012	21 May 2012	B.1	Clarified the role of submitting organization (referencing DGIWG directives)
2.2.6	05.Jan 2012	21 May 2012	B.2	Removed chapter since the “proposal process” is covered by [18]
2.2.6	05.Jan 2012	21 May 2012	B.3.	Removed chapter since the “criteria for proposing” are covered by [18]
2.2.6	05.Jan 2012	21 May 2012	F	Corrected reference of figure 5 of page 27 to figure 2 of page 21.
2.2.7	02 Feb 2012	21 May 2012	D.1	Moved the list of “reserved words” to the management document and just leave a general statement how to work around possible implementations problems.

2.2.8	03 May 2012	21 May 2012	1.2	Added SOED as reference.
2.2.8	03 May 2012	21 May 2012	4.3.1	Added a reference to DGIWG ENT-08-101 Enhanced language in last paragraph.
2.2.8	03 May 2012	21 May 2012	4.3.3.1.2	Added “or zero” to the definition of Count.
2.2.8	03 May 2012	21 May 2012	4.3.3.1.6	Changed “identification number” to “indentifier” since it could include characters.
2.2.8	03 May 2012	21 May 2012	4.3.3.1.12	changed “n and n” to “m and n” in the example of a slope.
2.2.8	03 May 2012	21 May 2012	4.3.3.2.3	Removed the paragraph about NUNANPOs since they are legacy and ONINAS were introduced.
2.2.8	03 May 2012	21 May 2012	Table 3	corrected misspelling “ONANIs” to “ONINAs”
2.2.8	03 May 2012	21 May 2012	4.3.3.2.3	Rewrote chapter to fit the removal of the NUNANPOs aspects.
2.2.8	03 May 2012	21 May 2012	D.4	Exchanged “NUNAPO” with “ONINA” in the whole chapter.
2.2.9	18 September 2013	12 November 2013	B.4 All	Added paragraph B.4. Editorial changes through whole document.