"*Delivering Military Advantage through multi-national geospatial interoperability*"

DGIWG 206
Defence Geospatial Feature Concept Dictionary (DGFCD)

Edition 3.0

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Abstract:	This standard provides information on the purpose and structure of data within the Defence Geospatial Information Model (DGIM) part of the Defence Geospatial Information Framework (DGIF).
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i.   Executive Summary

The Defence Geospatial Feature Concept Dictionary (DGFCD) standard is an artefact of the Defence Geospatial Information Framework (DGIF) suite of standards. The DGFCD (DGIWG 206) represents the concepts required by the Defence Geospatial Information Model (DGIM) and serves as the authoritative source for the DGIM. The DGFCD defines the conceptual and logical metamodel including features, attributes, values, datatypes, units of measure, and concepts for enumeration values in the DGIM. Annex A presents compliance criteria, while Annex B provides further technical details for the metamodel and examples in tabular and graphical format.

DGFCD, as a component of the DGIF (DGIWG 200), is designed to be utilized with DGIWG 205 (DGIM) and DGIWG 207 (Defence Geospatial Real World Object Index). A DGIF GML Encoding specification (DGIWG 208) is also available.

ii.   Submitting organizations

Nation	Organization
France	Institut National de l'Information Géographique et Forestière (IGN)
Unites States	National Geospatial Intelligence Agency (NGA)

iii.   Document point of contact

All questions regarding this document shall be directed to the editor (secretariat@dgiwg.org) or the contributor organisations:

iv.   Revision history

Date	Release	Primary clauses modified	Description
2024-07-19	3.0	All	Publication Draft

v.   Future work

Document will be revised as set out in the DGIWG Program of Work (PoW).

1   Introduction

The Defence Geospatial Feature Concept Dictionary (DGFCD) standard (DGIWG 206) is an artefact of the Defence Geospatial Information Framework (DGIF) suite of standards.

The DGFCD is the component of the DGIF constituting a dictionary that defines the semantic content used in the Defence Geospatial Information Model (DGIM) (DGIWG 205). It is the functional replacement for the DGIWG Feature Data Dictionary (DFDD) and as such, it is based on, and builds upon the concepts originally defined in the DFDD. The DGFCD specifically defines the Feature Concepts, Attribute Concepts, Datatypes, Unit of Measures, and Enumeration Values utilized in the DGIM and when derivations of the DGIM schema are created (e.g. data product specifications, profiles, etc.).

The DGIM itself is technology-neutral, platform independent logical model for geospatial vector data. It determines the semantic and the syntactic structure for the data exchange, business rules, and product specifications used to describe geospatial vector data model. It is accompanied by the Defence Geospatial Real World Object Index (DGRWI) which provides an index and a general entry point to the DGIM.

2   Scope

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

The DGFCD conforms to a subset of ISO 19126:2021, *Geographic information – Feature concept dictionaries and registers*, and its information schema. The DGFCD draws upon multiple community dictionaries (e.g., Aeronautical Information Exchange Model (AIXM), IHO S-100, NATO Additional Military Layers (AML), and others) to specify an integrated feature data dictionary tailored to the requirements of defence organisations of nations and NATO.

ISO 19101, *Geographic information – Reference model*, defines a feature as an abstraction of real-world phenomena. Such abstractions may be represented in information systems using a variety of spatial modelling methods, including representations such as vectors, grids, and images. The DGFCD currently covers the representation as vectors. The DGFCD also supports modelling entities that may represent other geospatially-located information that does not correspond to "real world phenomena" e.g. Religious Information.

Information traceability is established from concepts in the DGIM to their specification in the DGFCD, and from there back to appropriate authoritative concept sources, where possible, to maximize semantic integrity when geospatial data is exchanged between DGIF-based and external systems. The DGIM, the DGFCD and the DGRWI taken together answer the information exchange questions of "*what do we mean?*" and "*how do we represent it?*"

DGFCD draws upon recognized content standards, specifications and profiles from both the military (e.g., DGIWG) and civilian sectors (e.g., IHO, ICAO/EUROCONTROL, WMO).

3   Conformance

This specification specifies a geospatial concept dictionary with a structure following ISO 19126. Additions have been introduced to cover specific DGIWG needs and to make the DGFCD fit within the DGIF Collaborative Modelling Environment (DCE) architecture. Further details on Conformance are in Annex A.

4   Normative references

The documents listed in Table are necessary to understanding and using this standard. For dated references, only the cited edition or version applies. For undated references, the latest edition or version of the referenced document (including any amendments) applies.

Table 1: Normative References

Standard or Specification
ISO 19101:2002 - *Geographic information – Reference model*
ISO/TS 19103:2015 - *Geographic information – Conceptual schema language*
ISO 19126:2021 - *Geographic information – Feature concept dictionaries and registers*
ISO 19135:2005 - *Geographic information - Procedures for item registration*
ISO 8601:2004 - *Date and time format*
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 200 - *Defence Geospatial Information Framework (DGIF) 3.0*
DGIWG 205 - *Defence Geospatial Feature Concept Dictionary (DGFCD) 3.0*
DGIWG 207 - *Defence Geospatial Real World Object Index (DGRWI) 3.0*
DGWIG 208 - *Defence Geospatial Information Framework Encoding Specification: GML 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.

Table 1: Informative References

Standard or Specification
DGIWG - 114 - *DGIWG Metadata Foundation*

5   Terms, Definitions, Abbreviations, and Acronyms

5.1   Terms and Definitions

Table Table 3 lists the terms and definitions specific to this standard.

Table 3: Definitions Applicable to this Standard

Term	Definition
AlphaCode	An unique alphanumeic value that may be used to designate this concept for purposes of data exchange

Term	Definition
Attribute	A characteristic of a feature.
Attribute Datatype	Specifies how the value of an Attribute shall be abstractly represented and consists of one or more fields (elements). Each field captures an aspect of information required to completely specify a value in the domain of the datatype. A simple datatype consists of a single field containing a primitive data value (e.g., a real number); a complex datatype consists of multiple fields, at least one of which contains a data value. Others may contain metadata.
Datatype Element	An element (a field) of a complex datatype.
Datatype Listed Values	Values that are members of the domain of a specific enumerated datatype. These listed values are often referred to simply as „enumerants".
Feature	An abstraction of real world phenomena [ISO 19101].
Metaclass	Metaclass is a profile class and a packageable element which may be extended through one or more stereotypes.
Metamodel	Model that defines a modeling language [ISO 19103]
Model	Abstraction of some aspects of reality [ISO 19109]
Physical Quantities	A set of physical quantities that characterize the properties of a phenomenon, body, or substance, where the property has a magnitude that can be expressed as a number (physical value) and a reference quantity – referred to as a „unit of measure".
Stereotype	⟨UML⟩ model element that extends an existing metaclass and enables the use of platform or domain specific terminology or notation in place of, or in addition to, the ones used for the extended metaclass. [ISO 19103]
Units of Measure	A set of units of measure, organized by physical quantity, where a unit of measure is a predefined amount of the concerned physical quantity (for example: a metre „of length" or kilogram „of mass").
531 Code	An unique alphanumeic value that may be used to designate this concept for purposes of data exchange

5.2 Abbreviations & Acronyms

The acronyms used in this standard are specified Table 4.

Table 4: Acronyms Applicable to this Standard

Acronym	Definition
AC	Attribute Concept
AVC	Attribute Value Concept
AIXM	Aeronautical Information Exchange Model
AML	Additional Military Layers
DCE	DGIF Collaborative Environment
DFDD	DGIWG Feature and Attribute Data Dictionary
DGFCD	Defence Geospatial Feature Concept Dictionary
DGIF	Defence Geospatial Information Framework

Acronym	Definition
DGIM	Defence Geospatial Information Model
DGRWI	Defence Geospatial Real World Object Index
DGIWG	Defence Geospatial Information Working Group
FACC	Feature and Attribute Coding Catalog
FDD	Feature Data Dictionary
ICAO	International Civil Aviation Organization
IHO	International Hydrographic Organization
ISO	International Organization for Standardization
NATO	North Atlantic Treaty Organization
OMG	Object Management Group
SI	International System of Units
TS	Technical Specification
UML	Unified Modeling Language
URI	Uniform Resource Identifier

6   Logical Structure

6.1   Conceptual Metamodel

DGIF maintenance and management process are executed in the DGIF Collaborative Environment (DCE). This includes the DGFCD, DGIM, and DGRWI. Consequently, a UML metamodel for DGIF with specific stereotypes has been developed.

The DGIF metamodel is used to derive (e.g., from ISO/TC211) or define needed elements (e.g. feature class, attribute, feature concept, etc.). It defines specific properties (e.g. tagged values) valid for all elements of a specific type (e.g. feature type has an alphaCode and a 531 Code; feature concept has a definition) and the specific properties for GML derivation. It also structures the model and improve readability by using colours for specific stereotypes.

The DGFCD specifies a concept dictionary for geospatial vector data. This dictionary includes feature concepts, attribute concepts with their domain types, units of measure, and accompanying metadata.

Like the DGIM, DGFCD is maintained in the DGIF collaborative modelling environment (DCE) as a collection of concept information, a conceptual metamodel that conforms to the conceptual model of a feature concept dictionary as specified in ISO 19126:2021, *Geographic information – Feature concept dictionaries and registers*. As necessary, the metamodel specified in ISO 19126 has been extended based on the object modelling component of ISO/IEC 19505-2:2012 - *OMG Unified Modeling Language UML, Superstructure*, and ISO 19103:2015, *Geographic information – Conceptual schema language*.

The ISO 19126:2021 metamodel has been simplified in some regards where the functionality is not applicable to the DGFCD. Figure 1 depicts the DGFCD conceptual metamodel.
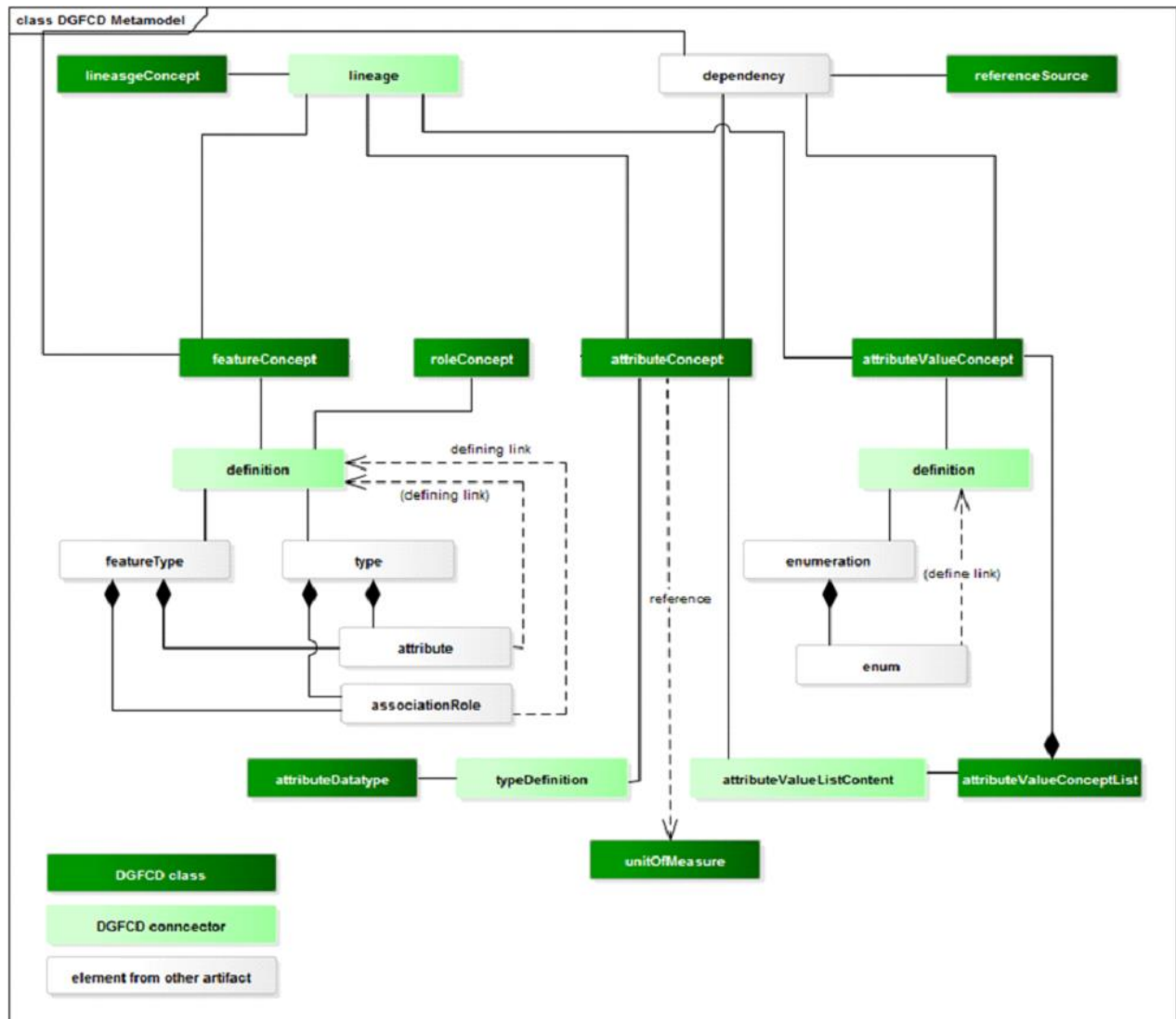
Figure 1: DGCFD Conceptual Metamodel

There are six basic categories of Concepts in the DGFCD metamodel, including: **Feature Concepts**, **Attribute Concepts**, **Attribute Value Concepts**, **Attribute Datatypes**, **Units of Measure,** and **Role Concepts**. These concepts are defined in Annex B, section B.2 and conform to ISO 19103:2015.

Additional elements as **Attribute Value Concept Lists** support the management of the DGFCD. These Concepts are linked and organised using connectors such as **Definition**, **Type Definition**, and **Value List Content**. These connectors are defined in Annex B, section B.3.

7   Common Concept Properties Rules

Each Concept requires basic information for maintenance and management following the principles of item registration by ISO 19135:2005, *Geographic information - Procedures for item registration*. These items of information (Properties) are combined to create the stereotypes defined for each Concept in Annex B. Not all Properties are required for the stereotype construct of every Concept (see Annex B) but there are common Properties that apply to all Concepts including those described below.

7.1 AlphaCode (Class Name)

AlphaCode (Class Name) is a unique alphanumeric value used to designate this concept for the purposes of data interchange between nations, organisations, and within NATO. Even if an information system uses other codes to denote the concept within its boundaries, data sets used in information exchange must only use the AlphaCode specified by the DGCFD or (in technology-specific limited circumstances) the 531-conformant alphanumeric code. AlphaCodes are intended to be the primary unique identifier of concepts in the DGFCD.

The following rules restrict alphaCodes and therefore also the names of all Concepts. They are valid for both. Table 4 provides a summary of these rules.

*   Numeric relation symbols (for example: ">") shall be expressed by "lt", "gt", "lte", "gte", "eq", or "neq":
*   A range shall be expressed with the term "to".
*   A hyphen ("-") shall be removed or replaced by an underscore.
*   A sign ("+" or "-") shall be replaced by either "plus" / "pos" or "minus" / "neg" A dot (".") or comma (",") as radix markers shall be replaced with "r" or treated as a space and be removed.
*   It is possible to use the "e" in base-10 exponent notation.
*   For concepts which names are naturally numeric adding a prefix should be considered.
*   There shall be no diacritics in alphaCodes.
*   There shall be no alphaCode beginning with a non-alphabetic character.
*   There shall be no spaces in an AlphaCode.

Table 5: Numeric symbols and their terms and expressions

Numeric symbol	Term	Expression
<	less than	lt
<=	less than or equal	lte
=	Equal	eq
>=	greater than or equal	gte
>	greater than	gt
<>	not equal	neq
+	plus / positive	"plus" or "pos"
-	minus / negative	"minus" or "neg"

Specific rules for the AlphaCode (Class Name) are applied to Concepts include:

- **Feature Concept**: *UpperCamelCase* denotation, starting with an Upper-case letter and reflecting the name of the concept, e.g. *Bridge*, *InlandWater*, or *FloodControlStructure*.

- **Attribute Concept**: *lowerCamelCase* denotation, starting with a lower-case letter and reflecting the name of the concept, e.g. *length*, *structMatType*, or *accessRestriction*.

- **Attribute Value Concept**: *lowerCamelCase* denotation, starting with a lower-case letter and reflecting the name of the concept, e.g. *steel*, *blue*, or *mobileBridge*.

- **Attribute Datatype**: Basic datatypes as full name starting with an upper-case letter and reflecting the name of the datatype in *UpperCamelCase* denotation, e.g. *Real*, *Text*, *Enumeration*, structured text datatypes as combination of the Attribute Concept's alphaCode and the term "StrucText", e.g. *highWaterMonthIntervalStrucText*.

- **Unit of Measure**: *lowerCamelCase* denotation, starting with a lower-case character and reflecting the name of the unit (symbol), e.g. *kilometre*, *volt*, or *cubicMetre*.

- **Role Concept**: *lowerCamelCase* denotation, starting with a lower-case character and reflecting the name of the role concept, e.g. *isDesignatedBy*, or *waterPropertiesDescribedBy*.

7.2 531 Code

A unique alphanumeric value that may be used to designate this concept in technology-specific limited circumstances. Used for the purposes of data interchange in conformance with DGIWG standards. This code structure is the legacy FACC and DFDD 5-3-1 Code. Concepts used in the DGFCD that have lineage from FACC and DFDD retain those same 531 codes. Legacy concepts from FACC and DFDD that are no longer used in DGFCD will not have their 531 codes reused so as to ensure there is no confusion between current and retired concepts. For each DGFCD Concept, the following rules will apply to 531 Code Properties:

- **Feature Concept:** The 531 Code consists of two letters and three digits, e.g. AQ040, BH000, or ZI999.

- **Attribute Concept:** The 531 Code consists of three characters (or, rarely, four characters) starting with a letter, e.g. LZN, B09, or SMC.

- **Attribute Value Concept:** The 531 Code consists of an integer, e.g. 1, 37, 86.

- **Unit of Measure:** The 531 Code consists of an integer, e.g. 1, 22, 31.

- **Role Concept:** The 531 Code consists of five characters, starting with a letter, e.g. TRENG, or Z86ZL

7.3 Full Name

The Full Name Property will be the full written-out version of the alphaCode where all words are capitalized, spaces are allowed, and no abbreviations are used. The following rules apply will apply to the Full Name Properties:

- **Unique Names:** Names of the same type shall be unique. No Element shall have the same name at any point in time except in the case of items related to a different Concepts (Attribute Value Concepts belonging to different attributes are allowed, e.g. 'ash' as a byProduct and as a vegetationSpecies). Multiple items related to the same Concepts may use the same value for name but only one such item may have a status of 'valid'.

- **Unambiguous Names:** Concept names shall be concise, unambiguous and provide the most widely understood English name for the Concept.

- **No Slash:** Use of the slash character to describe an "either / or" situation in Concept name is not allowed.

7.4 Definition

The Definition is a precise statement of the nature, properties, scope, or essential qualities of the concept. Information systems and data sets shall preserve this meaning, neither narrowing, broadening, nor otherwise altering the specified semantic.

There shall be no examples for the concept itself in the definition (can be placed in the description).

> Correct:
> Access Zone: A terrain region between a contact zone and the first passable land transportation route.

> Incorrect:
> Cane: A tract covered mainly by large treelike grasses (e.g. bamboo and sugarcane).

A Concept Definition shall be concise and unambiguous.

Definition style: A proper definition must follow the following pattern: <defined term> : <broader term> <condition>

> EXAMPLES:
> church: House of worship within the Christian religion
> mosque: House of worship within the Islamic religion

7.5 Description

An optional statement of the nature, properties, scope, or non-essential qualities of the concept that are not specified by the definition. Information systems and data sets should consider this information in their design, implementation, and operations, but explicitly honouring this additional information is optional.

7.6 Source

Indication of the source for name, definition, and or description to allow additional research in the management process. The Source can be included if no specific lineage to a defined source exists through the lineageConcept (see **Error! Reference source not found.**).

7.7 Status

The status of the Concept as defined in ISO 19135. Only Concepts designated as "valid" are published for use.

7.8 Used By

Information on the usage of the concept by other DGIWG clients outside the DGIM. Proposed changes to this concept should be communicated to identified client. This is an optional property and is not present on every concept in the current baseline.

7.9 Date Accepted

The date, in the ISO 8601 format, that the Concept was accepted for DGFCD.

7.10 Date Retired

The date, in the ISO 8601 format, that the Concept was retired from DGFCD.

8 Additional Concept Properties Rules

In certain cases, additional information concept properties may be specified.

Spelling conventions in the DGFCD are generally those internationally agreed and adopted by the Defence Geospatial Information Working Group (DGIWG). The DGFCD uses the most recent version of the *Oxford English Dictionary*, as the basis for all spelling. The preferred units of measure are in accordance with ISO 80000 *Quantities and units* (multiple parts). The presentation of numbers follows the convention in which the period ('.') is used as the radix marker (the decimal point), and the comma (',') is used to delimit groups of three digits to the left of the radix marker.

Additional rules apply to specific types of Properties information for each Concept. These are specified in Section **Error! Reference source not found.**.

Only information required for the usage and the compliance testing of the DGFCD is described. The Properties required/optional for each Concept is defined in the Concept stereotypes in Annex B. Additional information for management and maintenance can also be found in the description of the metamodel in **Error! Reference source not found.**.

8.1 Feature Concepts

No additional Properties information are required for Feature Concepts beyond those identified in Section 7 are defined.

8.2 Attribute Concepts

Additional Properties information that apply to Attribute Concepts include:

- **Physical Quantity**: A character string specifying a reference physical quantity for allowed values that may be assigned to the attribute concept if its datatype is based on a numeric representation.

- **Recommended Unit of Measure**: Specification of a recommended unit of measure for the reference physical quantity for allowed values that may be assigned to the attribute concept if its datatype is based on a numeric representation.

- **Non-comparable Unit of Measure**: Specification of a non-comparable unit of measure that is related to the reference physical quantity for allowed values that may be assigned

to the attribute concept if its datatype is based on a numeric representation. A non-comparable unit of measure is one that is not a strict member of the specified physical quantity, but is related to that physical quantity through a complex context-sensitive computation.

8.3 Attribute Value Concepts

Additional Properties information that apply to Attribute Value Concepts include:

- **Attribute Concept**: Every Attribute Value Concept falls under an Attribute Concept. This field specifies the alphaCode of that Attribute Concept.

8.4 Attribute Datatypes

Additional Properties information that apply to Attribute Datatypes include:

- **Datatype Collection**: A textual value indicating the type of collection used if this datatype field stores collections of the specified datatype.

- **Length**: A positive integer (i.e., greater than zero) that specifies the maximum length of character string values that may be assigned to the Datatype if it is based on the Text, Key, or Structured Text representations.

- **Lexical**: A Boolean value indicating the range of character values that may be used in character string values that may be assigned to the Datatype if it is based on the Text or Structured Text representations.

- **Structure Specification**: A character string that specifies a scheme of one or more constraints on the structure of the text values that may be assigned to the Datatype if it is based on the Structured Text representation.

- **Structure Specification (Regular Expression)**: A character string encoding the structure specification in formal regular expression (if possible).

- **Range Minimum**: A value that specifies the minimum end of the range of allowed values that may be assigned to the Datatype if it is based on the Count, Integer or Real representations.

- **Range Maximum**: A value that specifies the maximum end of the range of allowed values that may be assigned to the Datatype if it is based on the Count, Integer or Real representations.

8.5 Units of Measure

Additional Properties information that apply to the Units of Measure include:

- **Conversion Factor for Unit of Measure:** A character string that identifies, in the case of a conventional unit, the base or derived Unit of Measure.

- **Rough Conversion:** A Boolean value indicating, in the case of a 'conventional' Unit of Measure, whether the factor or formula is rough (as opposed to precise).

- **Factor Value:** A numeric value that specifies, in the case of a 'conventional' Unit of Measure, the linear factor 'm' to be used in the formula $y = mx$, where x is a value using this Unit of Measure, and y is the corresponding value using the base Unit of Measure.

- **Formula Constant (A to D)**: A numeric value that specifies, in the case of a 'conventional' Unit of Measure, the value of the 'a' (or 'b', 'c' or 'd') element to be used in

the formula y = (a + bx) / (c + dx), where x is a value using this Unit of Measure, and y is the corresponding value using the base Unit of Measure.

- **Self-Defined Units System**: A Boolean value indicating, in the case of a 'base' Unit of Measure, that the system of units to which this Unit of Measure belongs is not a recognized system (for example: the SI system of units).

- **Symbol**: A character string that specifies the standard symbol used for the Unit of Measure in mathematical formulas.

- **Symbol Code Space**: A character string that specifies the system of units within which this Unit of Measure symbol is specified.

- **Symbol Reference**: A link to the Unified Code for Units of Measure (UCUM)[1].

- **Type**: A character string that specifies the type of the Unit of Measure as distinguished in the SI system of units. One of: { 'base', 'derived', 'conventional' }.

- **Units System**: A character string that specifies, in the case of a 'base' Unit of Measure, the system of units to which this base Unit of Measure is asserted to belong.

9 Governance and Maintenance

The management of the DGIF, including the DGFCD conforms to the governance process established by the DGIWG Vector Data Technical Panel (P1) and is executed by the Vector Models and Schema Team (VMST). See DGIWG 200 – DGIF Annex A for more information.

10 Quality Assurance

Proposed changes to the DGFCD shall be verified to ensure that the proposal conforms to the rules set out in this standard. It is the responsibility of the submitting party to perform this verification. The DGFCD steward will also perform Quality Assurance (QA) checks during the DGIF management cycle. The steward will communicate any identified issues to the originator of the change proposal for resolution prior to the proposal being formally considered for integration into the standard.

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1 http://unitsofmeasure.org/ucum.html

Annex A – Conformance Criteria (Informative)

The DGFCD specifies a concept dictionary for geospatial data. Specific conformance, compliance, and compatibility requirements are discussed in DGIWG 200 – DGIF 3.0, Section 8. In-general, conformance with the DGFCD requires that when DGFCD Concepts are employed within an information system or data set, the semantics (i.e. formalized meaning) of the Concept be preserved and that the logic and other information (e.g. attribution) for the DGFCD-specified Concept is also preserved.

Section 0 identifies the basic Concepts: **Feature Concepts**, **Attribute Concepts**, **Attribute Value Concepts**, **Attribute Datatypes**, **Units of Measure**, and **Role Concepts**.

The following two types of information are (together with a date (of baseline)) alternative means to denote the Concept (conformance to each of these may be determined from the definitions in 0):

- **AlphaCode**
- **531 Code**

The remaining four types of information are primary means of specifying the Concept (see Section 5.2). Conformance to each of these can only be determined by inspection and subjective judgment.

- **Full Name**
- **Definition**
- **Description**
- **Source**

Depending on the type of concept, the DGFCD may specify additional information. This additional information is presented in Section **Error! Reference source not found.** and each item of additional information for a Concept shall be honoured.

Annex B - Metamodel

B.1   Metamodel Hierarchy

The DGIF metamodel consists of many **stereotypes** and their associated **properties**. These stereotypes were created to cover specific requirements for ISO compliance, for example, to follow the defined ISO stereotypes of TC 211 and more important to represent all specific items in the artefacts of DGIF, the Defence Geospatial Information Model (DGIM), the Defence Geospatial Feature Concept Dictionary (DGFCD), and the Defence Geospatial Real World Object Index (DGRWI). The following sections describe the metamodel of the DGFCD. Figure B-1 depicts the hierarchy of elements within the DGIF metamodel, model, and instance.
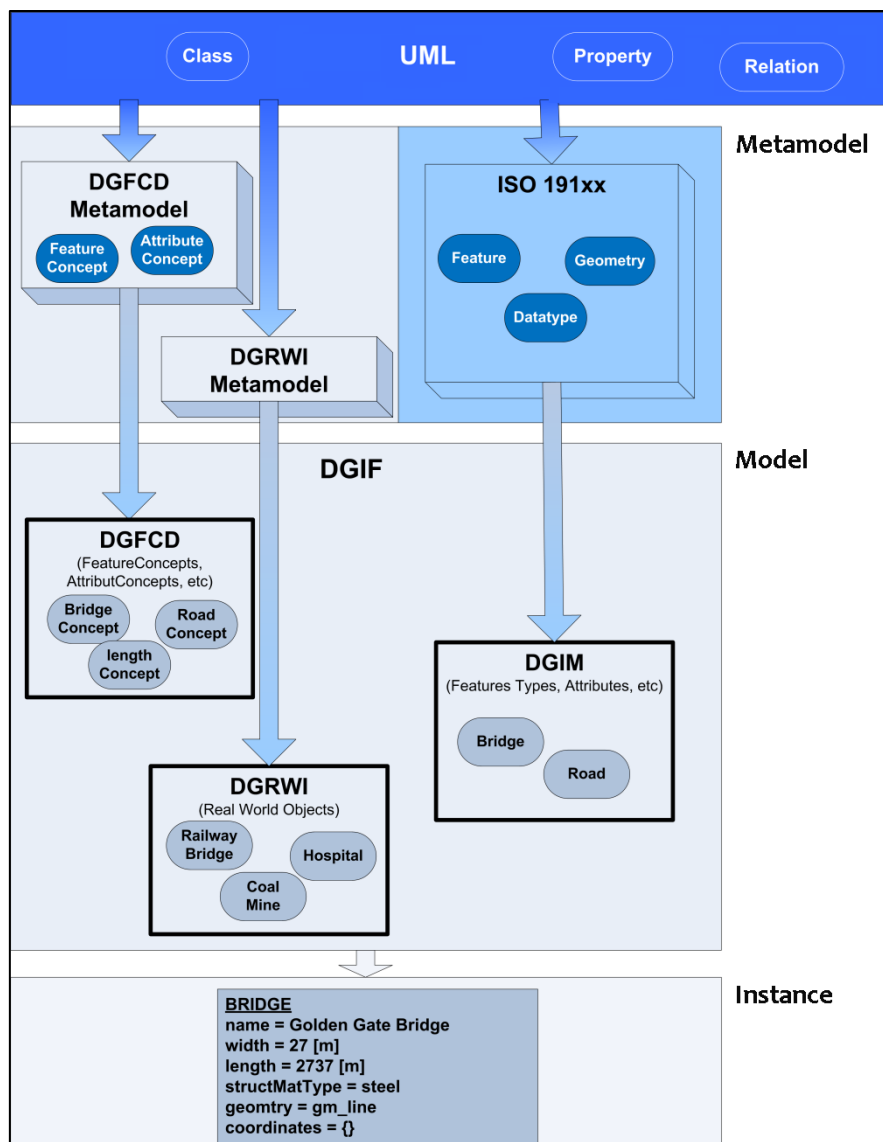
Figure B-1: DGIF Metamodel Hierarchy

B.2   DGFCD stereotypes for classes

The stereotype description consists of information about the Meta Class it extends, the Properties it owns, the links to other stereotypes that may exist, and an example.

The Properties for each Concept are defined in the follow tables. The tables are described using following terms:

- **Item**: The name of the stereotype's property (either a standard UML property or a specially created property for this stereotype)

- **Definition/Content**: The description of the property

- **Datatype**: The name of a general datatype (e.g., Text or Real)

- **Multiplicity**: Defines the allowed number how often a property can be used.

- **Normative**: A Boolean field defining if a property is mandatory to be populated.

- **Generation**: A note about the source of property content if it is not mandatory. Usually properties that have information about generation are populated automatically from other properties.

- **DCE Data type**: The datatype that is used in the DCE. In case of big text fields (>255 characters) a specific datatype called "Memo" is used.

B.2.1 featureConcept

B.2.1.1   featureConcept Properties

Table B-1 details the information attached to a featureConcept.

Table B-1: Properties attached to a featureConcept

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
Standard UML properties and other fields						
(class) name	The alphaCode as defined in the DGFCD.	Text	1	YES		String
Alias	The 531-Code as defined in the DGFCD	Text	1	NO	from 531 Code	String
Notes	The combination of definition and description in a structured way.	Text	1	NO	from definition and description	Memo
Stereotype properties (tagged values)						
531 Code	The 531-Code as defined in the DGFCD	Text	1	YES		String

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
fullName	A compact and human-readable designator that is used to denote the concept	Text	1	YES		String
definition	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 is used to provide information about that source of reference.	Text	1	YES		Memo
description	Enables a better understanding of the meaning and scope of the Concept, often an example is quoted	Text	0..1	NO		Memo
source	The source of the concept if no specific lineage exists.	Text	0..1	NO	Only if lineageConcept is not populated	String
synonyms	Aliases or names that are also used to designate this concept.	Text	0..* (semic olon separ ated)	NO		String
usedBy	Shows all clients using the concept.	Text	0..*	NO		String
lineageConcept	Connects the Concept to sources from which the Concept has been taken and can be referred to.	LineageConcept	0..*	NO		LineageConcept
status	The status of the item as defined in ISO 19135 ('valid', 'notValid', 'retired', 'superseded')	RE_ItemStatus	1	YES		RE_ItemStatus

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
dateAccepted	The date the item was accepted and became valid (Ref ISO 8601).	Date	1	YES		String
dateRetired	The date the item was retired (Ref ISO 8601).	Date	1	YES		String

B.2.1.2 featureConcept Links

FeatureTypes are connected to featureConcepts by definition to link the featureType with its name, definition and description. The definition connector is normative information. Figure B-2 depicts an example.
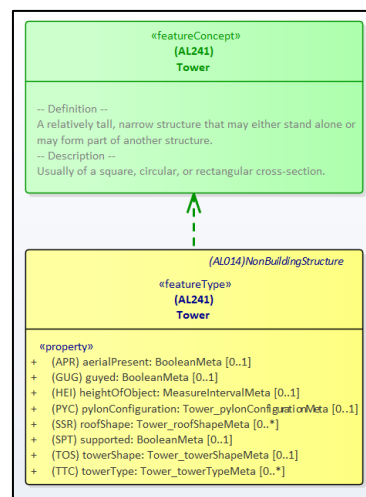
Figure B-2: Example of a featureType connected to its DGFCD definition

B.2.2 attributeConcept

Meta Class: Class

This stereotype represents an attributeConcept as defined in the DGFCD specification.

B.2.2.1 attributeConcept Properties

Table B-2 details the information attached to an attributeConcept.

Table B-2: Properties attached to an attributeConcept

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
Standard UML properties and other fields						
(class) name	The alphaCode as defined in the DGFCD.	Text	1	YES		String

Alias	The 531-Code as defined in the DGFCD	Text	1	NO	from 531 Code	String
Notes	The combination of definition and description in a structured way.	Text	1	NO	from definition and description	Memo
Stereotype properties (tagged values)						
531 Code	The 531-Code as defined in the DGFCD	Text	1	YES		String
fullName	A compact and human-readable designator that is used to denote the concept	Text	1	YES		String
definition	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 is used to provide information about that source of reference.	Text	1	YES		Memo
description	Enables a better understanding of the meaning and scope of the Concept, often an example is quoted	Text	0..1	NO		Memo
source	The source of the concept.	Text	1	NO		String
synonyms	Aliases or names that are also used to designate this concept.	Text	0..* (semicolon separated)	NO		String
usedBy	Shows all clients using the concept.	Text	0..* (comma separated)	NO		String
lineageConcept	Connects the Concept to sources from which	LineageConcept	0..*	NO		LineageConcept

	the Concept has been taken.					
physicalQua ntity	A character string specifying a reference physical quantity for allowed values that may be assigned to the attributeConcept if its datatype is based on a numeric representation	Text	0..*	YES		String
recommende dMeasure	Connects the attributeConcept to attributeConcept.	unitOfMe asure	0..1	YES		unitOfMe asure
nonCompara bleMeasure	A link to a non-comparable unit of measure that is related to the reference physical quantity for allowed values that may be assigned to the attributeConcept if its datatype is based on a numeric representation. A non-comparable unit of measure is one that is not a strict member of the specified physical quantity, but is related to that physical quantity through a complex context-sensitive computation.	unitOfMe asure	0..1	YES		unitOfMe asure
status	The status of the item as defined in ISO 19135 ('valid', 'notValid', 'retired', 'superseded')	RE_Item Status	1	YES		RE_ItemS tatus
dateAccepte d	The date the item was accepted and became valid.	Date	1	YES		String
dateRetired	The date the item was retired.	Date	1	YES		String

B.2.2.2   attributeConcept Links

An attributeConcept is connected via a definition to a featureType or type. The featureType or type uses a property defined by this attributeConcept. The definition as connector is a normative information.

An attributeConcept is connected to an attributeDatatype by a typeDefinition. In the case that the attributeConcept is of type enumeration, it is also connected to the appropriate attributeValueConceptList that stores all attributeValueConcepts related to the attributeConcept by a valueListContent. Figure B-3 depicts an example.
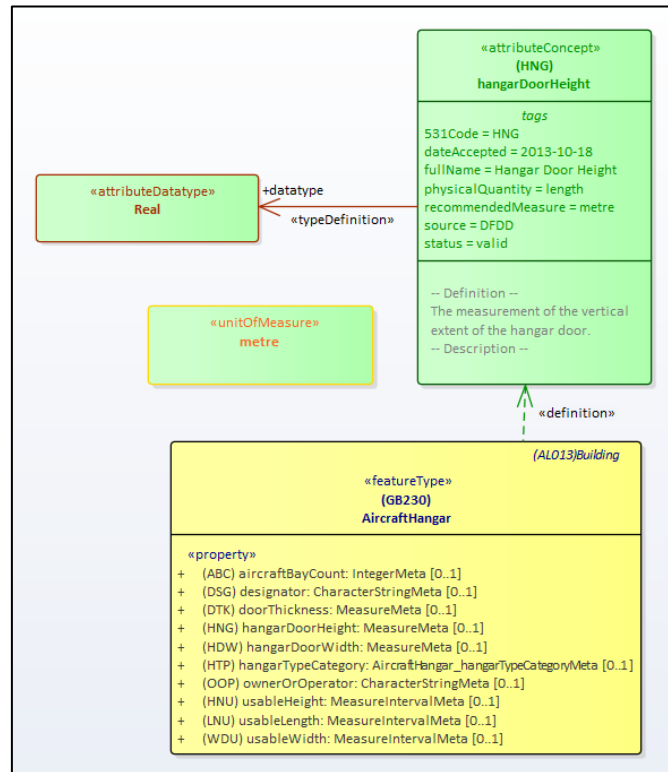
Figure B-3: Example of an attributeConcept linked to featureType

B.2.3 roleConcept

Meta Class: Class

This stereotype represents a roleConcept as defined in the DGFCD specification. The Role Concept defines the nature of the association's relationship.

B.2.3.1   roleConcept Properties

Table B-3 details the information attached to a roleConcept.

Table B-3: Properties attached to a roleConcept

Item	Definition/Content	data Type	Multi-plicity	Norm.	Generation	EA Datatype
Standard UML properties and other fields						
(class) name	The alphaCode as defined in the DGFCD.	String	1	YES		String
Alias	The 531-Code as defined in the DGFCD	String	1	NO	from 531 Code	String
Notes	The combination of definition and description in a structured way.	Memo	1	NO	from definition and description	Memo
Stereotype properties (tagged values)						
531 Code	The 531-Code as defined in the DGFCD: 5 characters, e.g. "TGBER", starting with a letter.	String	1	YES		String
fullName	A compact and human-readable designator that is used to denote the concept	String	1	YES		String
definition	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 is used to provide information about that source of reference.	String	1	YES		Memo
description	Enables a better understanding of the meaning and scope of the Concept, often an example is quoted	String	0..1	NO		Memo

Item	Definition/Content	data Type	Multi-plicity	Norm.	Generation	EA Datatype
source	The source of the concept.	String	1	NO		String
synonyms	Aliases or names that are also used to designate this concept.	String	0..* (semicolon separated)	NO		String
usedBy	Shows all customers using the concept.	String	0..*	NO		String
lineageConcept	Connects the Concept to sources from which the Concept has been taken.	LineageConcept	0..*	NO		LineageConcept
status	The status of the item as defined in ISO 19135 ('valid', 'notValid', 'retired', 'superseded')	RE_ItemStatus	1	YES		RE_ItemStatus
dateAccepted	The date the item was accepted and became valid.	Date	1	YES		String
dateRetired	The date the item was retired.	Date	1	YES		String

B.2.3.2   roleConcept Links

A roleConcept is connected via a definition to a featureType or type with an associationEnd. An associationEnd is a specific property that describes the role of an element (for example a type or featureType) in an association.

The definition as connector is a normative information.

B.2.4 attributeValueConcept

Meta Class: Class

This stereotype represents an attributeValueConcept as defined in the DGFCD specification.

B.2.4.1   attributeValueConcept Properties

Table B-4 depicts the information attached to an attributeValueConcept.

Table B-4: Properties attached to an attributeValueConcept

Item	Definition/Content	Datatype	Multi-plicity	Norm.	Generation	DCE Datatype
Standard UML properties and other fields						
(class) name	The alphaCode as defined in the DGFCD.	Text	1	YES		String
Alias	The combination of 531-Codes of attributeConcept and attributeValueConcept as defined in the DGFCD.	Text	1	NO	from 531 Code	String
Notes	The combination of definition and description in a structured way.	Text	1	NO	from definition and description	Memo
Stereotype properties (tagged values)						
531 Code	The 531-Code as defined in the DGFCD	Text	1	YES		String
fullName	A compact and human-readable designator that is used to denote the concept	Text	1	YES		String
definition	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 is used to provide information about that source of reference.	Text	1	YES		Memo
description	Enables a better understanding of the meaning and scope of the Concept, often an example is quoted	Text	0..1	NO		Memo
source	The source of the concept.	Text	1	NO		String

Item	Definition/Content	Datatype	Multi-plicity	Norm.	Generation	DCE Datatype
synonyms	Aliases or names that are also used to designate this concept.	Text	0..* (semic olon separa ted)	NO		String
usedBy	Shows all clients using the concept.	Text	0..* (comm a separa ted)	NO		String
lineageConcept	Connects the Concept to sources from which the Concept has been taken.	LineageConcept	0..1	NO		Lineage Concept
attributeConcept	The alphaCode of which the AttributeConcept the Value Concept belongs	Text	1	YES		String
status	The status of the item as defined in ISO 19135 ('valid', 'notValid', 'retired', 'superseded')	RE_Item Status	1	YES		RE_Ite mStatus
dateAccepted	The date the item was accepted and became valid.	Date	1	YES		String
dateRetired	The date the item was retired.	Date	1	YES		String

B.2.4.2 attributeValueConcept List

An attributeValueConcept belongs to exactly one attributeValueConceptList. An attributeValueConcept is connected via a definition to the enumeration in which the concept is used. Figure B-4 depicts an example.
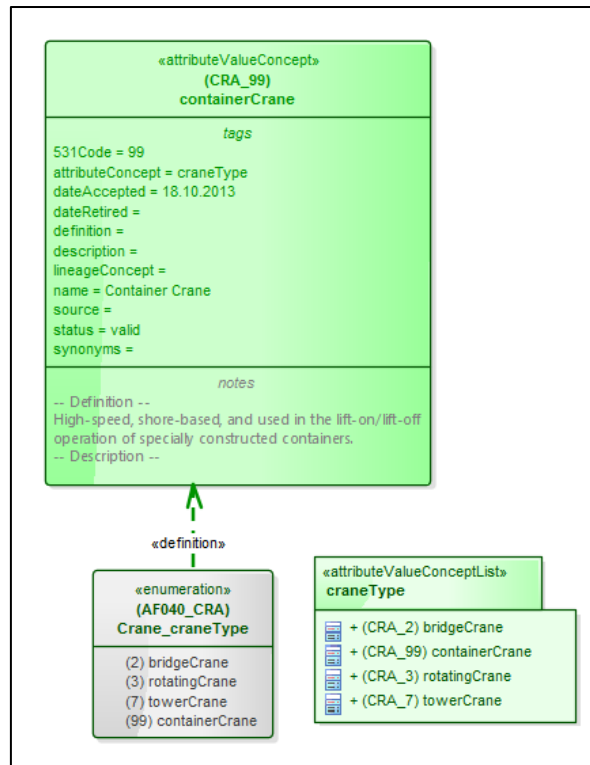
Figure B-4: Example of an attributeValueConcept

B.2.4.3 attributeValueConcept List

Meta Class: Package

The attributeValueConceptList stores all the possible attributeValueConcept for a specific attributeConcept. Its main purpose is to facilitate the management of the DGFCD.

Table B-5 depicts the information attached to an attributeValueConceptList.

Table B-5: Properties attached to an attributeValueConceptList

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
Standard UML properties and other fields						
(class) name	The attributeConcept alphaCode as defined in the DGFCD.	Text	1	YES		String
Alias	The attributeConcept 531-Code of the attributeConcept.	Text	1	YES		String
Stereotype properties (tagged values)						

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
status	The status of the item as defined in ISO 19135 ('valid', 'notValid', 'retired', 'superseded')	RE_ItemStatus	1	YES		RE_Item Status
dateAccepted	The date the item was accepted and became valid.	Date	1	YES		String
dateRetired	The date the item was retired.	Date	1	YES		String

B.2.4.4 attributeValueConceptList Links

An attributeValueConceptList stores attributeValueConcepts. An attributeValueConceptList is connected from its attributeConcept by the connector valueListContent. Figure B-5 depicts an example
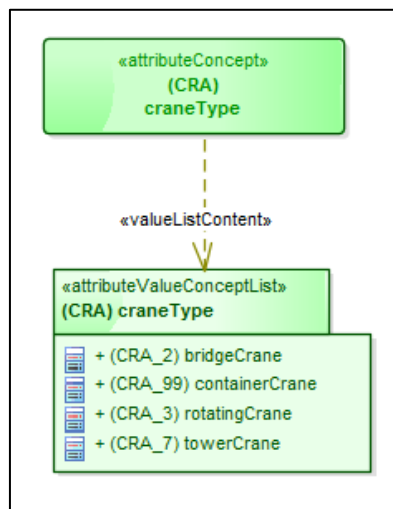

Figure B-5: Example of an attributeConcept linked to an attributeValueConcept

B.2.4.5   AttributeDatatype Concept

Meta Class: Class

The attributeDatatype represents the conceptual Data Type defined in the DGFCD.

B.2.4.5   attributeDatatype Properties

Table B-6 depicts the information attached to an attributeDatatype.

Table B-6: Properties attached to an attributeDatatype

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
Standard UML properties and other fields						
(class) name	The alphaCode as defined in the DGFCD.	Text	1	YES		String
Alias	The 531-Codes as defined in the DGFCD.	Text	1	NO	from 531 Code	String
Notes	The structure spec-ification of the Data Type	Text	1	NO	from structSpec	Memo
Stereotype properties (tagged values)						
fullName	A compact and hu-man-readable des-ignator that is used to denote the con-cept	Text	1	YES		String
definition	A precise state-ment of the nature, properties, scope, or essential quali-ties of the Concept. If a definition is taken from an ex-ternal source, the lineage information is used to provide information about that source of refer-ence.	Text	1	YES		Memo
description	Enables a better understanding of the meaning and scope of the Con-cept, often an ex-ample is quoted	Text	0..1	NO		Memo
source	The source of the concept.	Text	1	NO		String
synonyms	Aliases or names that are also used to designate this concept.	Text	0..* (semi-colon sepa-rated)	NO		String
collection	*(not used yet)*					

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
Implementa-tion Specific	An indication that the realisation of an attributeDataType is implementation specific and may vary from system to system.	Boolean	0..1	NO		Boolean
length	A positive integer (i.e., greater than zero) that specify symbols the maxi-mum length of character string values that may be assigned to the Data Type if it is based on the Text, Key, or Structured Text representa-tions.	Integer	0..1	NO		Integer
lexical	A Boolean value in-dicating the range of character values that may be used in character string values that may be assigned to the Data Type if it is based on the Text or Structured Text representations.	Boolean	1	NO		Boolean
rangeMin	A value that speci-fies the minimum end of the range of allowed values that may be assigned to the Data Type if it is based on the Count, Integer or Real representa-tions.	Real	0..1	NO		Real

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
rangeMax	A value that speci-fies the maximum end of the range of allowed values that may be assigned to the Data Type if it is based on the Count, Integer or Real representa-tions.	Real	0..1	NO		Real
structSpec	A character string that specifies a scheme of one or more constraints on the structure of the text values that may be assigned to the Data Type if it is based on the Structured Text representation	Text	0..1	NO		Memo
structSpecReg Ex	A character string expressed in Regu-lar Expressions to describe the struc-ture specification in a formal way.	Text	0..1	NO		String
usedBy	Shows all clients using the concept.	Text	0..* (com ma sepa-rated)	NO		String
lineageCon-cept	Connects the Con-cept to sources from which the Concept has been taken.	Lineage-Concept	0..1	NO		Lineage-Concept
status	The status of the item as defined in ISO 19135 ('valid', 'notValid', 'retired', 'superseded')	RE_Item-Status	1	YES		RE_Item-Status
dateAccepted	The date the item was accepted and became valid.	Date	1	YES		String
dateRetired	The date the item was retired.	Date	1	YES		String

B.2.4.6   attributeDatatype Links

An attributeDatatype is connected via typeDefinition to an attributeConcept. Figure B-6 depicts an example.
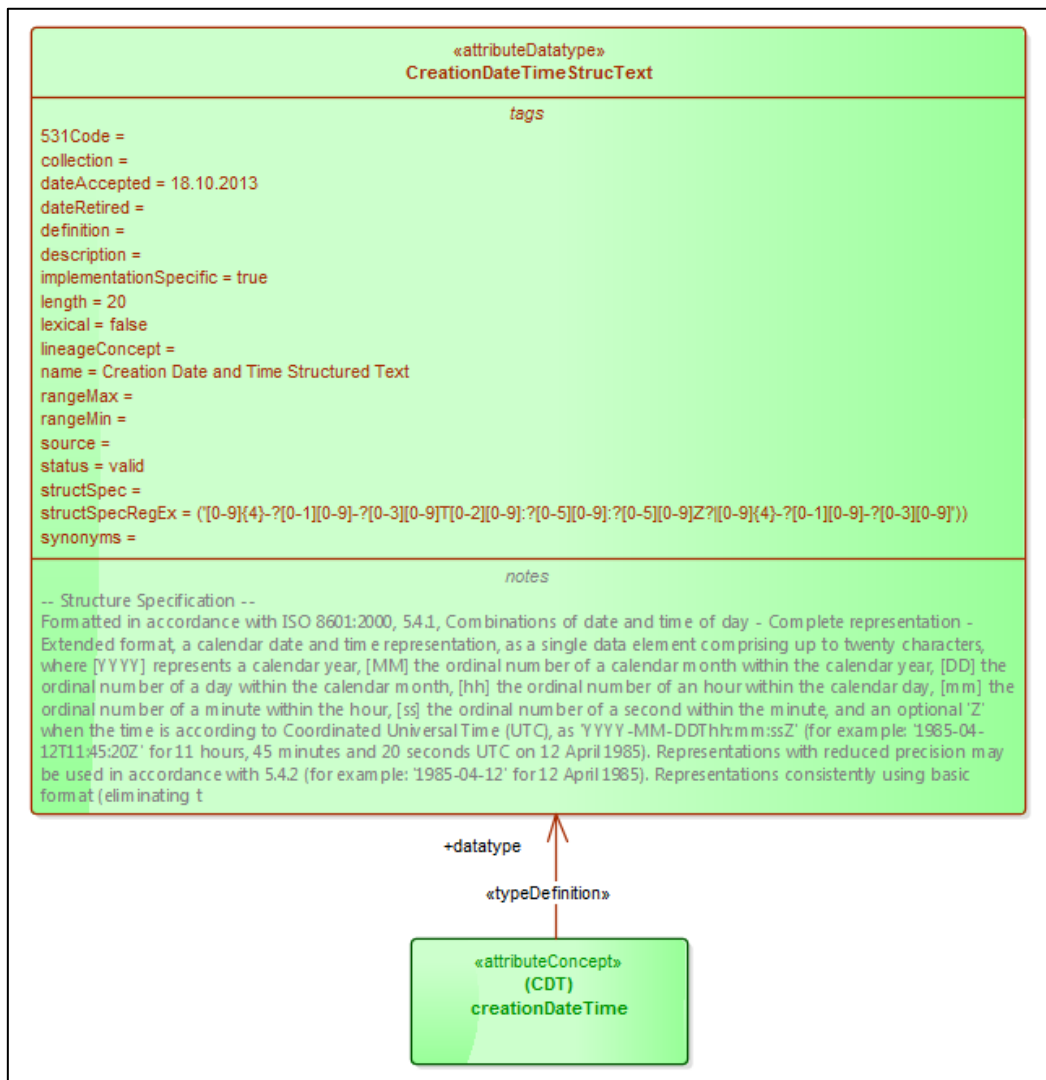

Figure B-6: Example of an attributeDatatype

B.2.5 unitOfMeasureConcept

Meta Class: Class

The unitOfMeasure represents the conceptual unit of measure defined in the DGFCD.

B. 2.5.1 unitOfMeasure Properties

Table B-7 below details names, definitions, and other details for the properties attached to a unitOfMeasure.

Table B-7: unitOfMeasure Properties

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
Standard UML properties and other fields						
(class) name	The alphaCode as defined in the DGFCD.	Text	1	YES		String
Alias	The 531-Codes as defined in the DGFCD.	Text	1	NO	from 531 Code	String
Notes	The structure speci-fication of the Data Type	Text	1	NO	from structSpec	Memo
Stereotype properties (tagged values)						
531 Code	The 531-Code as defined in the DGFCD	Text	1	YES		String
fullName	A compact and hu-man-readable des-ignator that is used to denote the con-cept	Text	1	YES		String
Definition	A precise statement of the nature, prop-erties, scope, or es-sential qualities of the Concept. If a definition is taken from an exter-nal source, the line-age information is used to provide in-formation about that source of reference.	Text	1	YES		Memo
Description	Enables a better un-derstanding of the meaning and scope of the Concept, of-ten an example is quoted	Text	0..1	NO		Memo
Source	The source of the concept.	Text	1	NO		String
Synonyms	Aliases or names that are also used to designate this con-cept.	Text	0..* (semi-colon sepa-rated)	NO		String

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
conversion-FactorUom	Identifies, in the case of a 'conventional' Unit of Measure, the preferred (base or derived) Unit of Measure.	Text	0..1	NO		String
conver-sionRough	A Boolean value indicating, in the case of a 'conventional' Unit of Measure, whether the factor or formula is rough (as opposed to 'precise').	Boolean	1	NO		Boolean
factorValue	A numeric value that specifies, in the case of a 'conventional' Unit of Measure, the linear factor 'm' to be used in the formula y = mx, where x is a value using this Unit of Measure, and y is the corresponding value using the base Unit of Measure.	Real	0..1	NO		Real
formulaCon-stantA	A numeric value that specifies, in the case of a 'conventional' Unit of Measure, the value of the 'a' element to be used in the formula y = (a + bx) / (c + dx), where x is a value using this Unit of Measure, and y is the corresponding value using the base Unit of Measure.	Real	0..1	NO		Real

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
formulaCon-stantB	A numeric value that specifies, in the case of a 'conven-tional' Unit of Meas-ure, the value of the 'b' element to be used in the formula $y = (a + bx) / (c + dx)$, where x is a value using this Unit of Measure, and y is the corresponding value using the base Unit of Meas-ure	Real	0..1	NO		Real
formulaCon-stantC	A numeric value that specifies, in the case of a 'conven-tional' Unit of Meas-ure, the value of the 'c' element to be used in the formula $y = (a + bx) / (c + dx)$, where x is a value using this Unit of Measure, and y is the corresponding value using the base Unit of Meas-ure	Real	0..1	NO		Real
formulaCon-stantD	A numeric value that specifies, in the case of a 'conven-tional' Unit of Meas-ure, the value of the 'd' element to be used in the formula $y = (a + bx) / (c + dx)$, where x is a value using this Unit of Measure, and y is the corresponding value using the base Unit of Meas-ure	Real	0..1	NO		Real

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
selfDefine-dUnitsSystem	A Boolean value in-dicating, in the case of a 'base' Unit of Measure, that the system of units to which this Unit of Measure belongs is not a recognized system (for exam-ple: the SI system of units).	Boolean	1	NO		Boolean
Symbol	A character string that specifies the standard symbol used for the Unit of Measure in mathe-matical formulas.	Text	1	YES		String
sym-bolCodeSpace	A character string that specifies the system of units within which this Unit of Measure symbol is specified.	Text	0..1	NO		String
symbolRefer-ence	A link to the Unified Code for Units of Measure (UCUM).	URI	0..1	NO		URL
type	A character string that specifies the type of the Unit of Measure as distin-guished in the SI system of units. One of: { 'base', 'de-rived', 'conventional' }.	uomType-List	1	YES		uomType-List
usedBy	Shows all clients us-ing the concept.	String	0..*	NO		String
unitsSystem	A character string that specifies, in the case of a 'base' Unit of Measure, the sys-tem of units to which this base Unit of Measure is asserted to belong	String	0..1	NO		String

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
lineageCon-cept	Connects the Con-cept to sources from which the Concept has been taken.	Lineage-Concept	0..1	NO		Lineage-Concept
status	The status of the item as defined in ISO 19135 ('valid', 'notValid', 'retired', 'superseded')	RE_Item-Status	1	YES		RE_Item-Status
dateAccepted	The date the item was accepted and became valid.	Date	1	YES		String
dateRetired	The date the item was retired.	Date	1	YES		String

B.2.5.2 unitOfMeasure Links

A unitOfMeasure is a data type for the attributeConcept properties nonComparableMeasure and recommendedMeasure. Figure B-7 depicts an example.
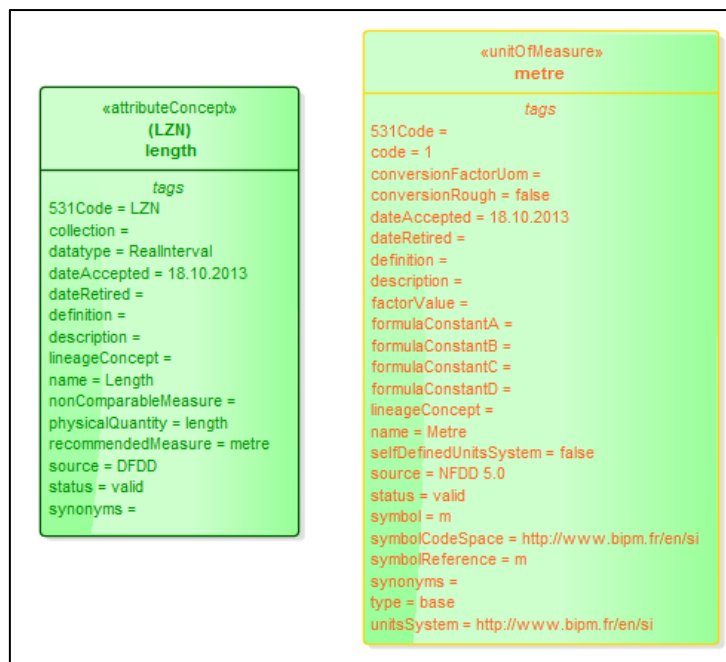

Figure B-7: Example of a nonComparableMeasure and recommendedMeasure

B.2.6 lineageConcept

Meta Class: Class

The lineageConcept specifies the basis of the DGIF Concept (e.g. buoy concept from S-100)

B.2.6.1 lineageConcept Properties

Table B-8 specifies the information attached to a lineageConcept.

Table B-8: Properties attached to a lineageConcept

Item	Definition/Content	dataType	Multi-plicity	Norm.	Generation	DCE Datatype
Standard UML properties and other fields						
(class) name	The alphaCode of the Concept in the source	Text	1	YES		String
Notes	The reference text in the source.	Memo	1	NO	from refer-enceText	Memo
Stereotype properties (tagged values)						
itemIdentifier	The identification of the Concept in the reference.	Text	1	YES		String
itemName	The official name of the concept or item in the source.	Text	1	YES		String
referenceText	A precise statement of the nature, prop-erties, scope, or es-sential qualities of the Concept in the reference.	Text	1	YES		Memo
referenceURI	A link to the Concept in the reference.	URI	0..1	NO		URI

B.2.6.2 lineageConcept Links

A LineageConcept is connected to a concept via the connector "lineage".

B.2.7 referenceSource

Class: Information Item

This stereotype represents a reference source, for example a document containing back-ground information or that supports the justification for the existence of a concept, for example, a NATO STANAG requiring a precise definition for a concept.

B.2.7.1 referenceSource Properties

Table B-9 depicts the information attached to a referenceSource.

Table B-9: Properties attached to a referenceSource

Item	Definition/Content	Datatype	Multi-plicity	Norm.	Generation	DCE Datatype
Standard UML properties and other fields						
(class) name	The name of the document	Text	1	YES		String
Notes	Notes about the document.	Text	0..1	NO		Memo
Stereotype properties (tagged values)						
Date	The date of the publishing or authoring of the document	Date	0..1	YES		String
Version	The version of the source	Text	0..1	YES		String
responsibleParty	The organisation, etc. responsible for the source.	Text	0..1	YES		String
sourceAssess-ment	An assessment of the source	Text	0..1	YES		String

B.2.7.2 referenceSource Links

A referenceSource can be linked to a concept via a dependency.

B.3   DGFCD Sterotypes for Connectors

The Defence Geospatial Feature Concept Dictionary (DGFCD) consists of following stereotypes for connectors. Each stereotype description consists of information about the Meta Class it extends, the properties it owns, the links to other stereotypes that may exist, and an example.

B.3.1 Definition

Meta Class: Dependency

This stereotype represents the connection between the DGFCD and the DGIM. Each entity or enumeration using a concept from the DGFCD is connected to the specific concept via a definition.

Source Class	Source Role	Source Mult	Target Class	Target Role	Target Mult	Dir
Entity	Entity	1..*	Concept	Definition	1..*	->

B.3.2 typeDefinition

Meta Class: Association

This stereotype represents the connection between an attributeConcept and the attributeDatatype.

Source Class	Source Role	Source Mult	Target Class	Target Role	Target Mult	Dir
attributeConcept	attribute	1..*	attributeDatatype	type	0..1	->

B.3.3 lineage

This stereotype represents the connection between a concept in the DGFCD and a lineageConcept from which the concept or parts of it are derived from.

Source Class	Source Role	Source Mult	Target Class	Target Role	Target Mult	Dir
LineageConcept	Origin	1..*	Concept	Concept	1..*	->

Stereotype properties (tagged values)						
similarity	The similarity between the Concept in the reference and in the DGFCD.	Similarity List	1	YES		Similarity List

B.3.4 valueListContent

Meta Class: Dependency

This stereotype represents the connection between an attributeConcept and its attributeValue-ConceptList.

Source Class	Source Role	Source Mult	Target Class	Target Role	Target Mult	Dir
attributeConcept		1	attributeValue-ConceptList		1	->