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**IHO MARINE TRAFFIC MANAGEMENT
PRODUCT SPECIFICATION**

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Marine Traffic Management Product Specification**

**Appendix A
Data Classification and Encoding Guide**

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1 Overview

1.1 Preface

The “Data Classification and Encoding Guide” has been developed to provide consistent, standardized instructions for encoding S-100 compliant Marine Traffic Management (S-127) data.

The purpose of the Data Classification and Encoding Guide is to facilitate S-127 encoding to meet IHO standards for the proper display of Marine Traffic Management information in an ECDIS and other electronic charting displays. This document describes how to encode information that the modeller considers relevant to a Traffic Management data product. The content of a dataset is at the discretion of the producing authority provided that the conventions described within this document are followed. A “producing authority” is a Hydrographic Office (HO) or other organization authorized by a government, to produce definitive nautical information.

The entire S-100 Universal Hydrographic Data Model, including the S-127 Product Specification, is available at the following web site, <http://www.iho.int>.

1.2 S-127 Appendix A - Data Classification and Encoding Guide – Metadata

Note: This information uniquely identifies this Data Classification and Encoding Guide to the Product Specification and provides information about its creation and maintenance.

Metadata	Content
Title:	The International Hydrographic Organization Marine Traffic Management Product Specification, Data Classification and Encoding Guide
Version:	1.0.0
Date:	29 November 2018
Language:	English
Classification:	Unclassified
Contact:	International Hydrographic Organization 4 Quai Antoine 1er B.P. 445 MC 98011 MONACO CEDEX Telephone: +377 93 10 81 00 Fax: +377 93 10 81 40 URL: www.iho.int
Identifier:	S-127 Appendix A Data Classification and Encoding Guide

Maintenance: Changes to S-127 Appendix A; Data Classification and Encoding Guide are coordinated by the IHO Nautical Information Provision Working Group (NIPWG) and must be made available via the IHO web site.

Table 1-1 Marine Traffic Management product specification metadata

1.3 Terms and definitions

This list is identical with the list in the main body of this product specification.

Term	Definition
Aggregation	special form of association that specifies a whole-part relationship between the aggregate (whole) and a component (see composition)
Application	manipulation and processing of data in support of user requirements (ISO 19101)
application schema	conceptual schema for data required by one or more applications (ISO 19101)
Association	semantic relationship between two or more classifiers that specifies connections among their instances NOTE: A binary association is an association among exactly two classifiers (including the possibility of an association from a classifier to itself)
Attribute	named property of an entity NOTE: Describes the geometrical, topological, thematic, or other characteristic of an entity
Boundary	set that represents the limit of an entity (ISO 19107)
Composition	special form of association that specifies a “strong aggregation”. In a composition association, if a container object is deleted then all of the objects it contains are deleted as well.
conceptual model	model that defines concepts of a universe of discourse (ISO 19101)
conceptual schema	formal description of a conceptual model (ISO 19101)
Coverage	feature that acts as a function to return values from its range for any direct position within its spatial, temporal or spatiotemporal domain (ISO 19123) <i>EXAMPLE Raster image, polygon overlay, digital elevation matrix.</i>
Curve	1-dimensional geometric primitive , representing the continuous image of a line

NOTE: The **boundary** of a **curve** is the **set** of **points** at either end of the **curve**. If the **curve** is a cycle, the two ends are identical, and the **curve** (if topologically closed) is considered to not have a boundary. The first **point** is called the **start point**, and the last **point** is the **end point**. Connectivity of the curve is guaranteed by the “continuous image of a line”

data product	dataset or dataset series that conforms to a data product specification
data product specification	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 <i>NOTE: A data product specification provides a description of the universe of discourse and a specification for mapping the universe of discourse to a dataset. It may be used for production, sales, end-use or other purpose.</i>
Dataset	identifiable collection of data (ISO 19115) <i>NOTE: A dataset may be a smaller grouping of data which, though limited by some constraint such as spatial extent or feature type, is located physically within a larger dataset. Theoretically, a dataset may be as small as a single feature contained within a larger dataset. A hardcopy map or chart may be considered a dataset.</i>
dataset series	collection of datasets sharing the same product specification (ISO 19115)
Domain	well-defined set (ISO/TS 19103) <i>NOTE: Well-defined means that the definition is both necessary and sufficient, as everything that satisfies the definition is in the set and everything that does not satisfy the definition is necessarily outside the set.</i>
end point	last point of a curve (ISO 19107)
Enumeration	a fixed list which contains valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list.
Feature	abstraction of real world phenomena (ISO 19101) <i>NOTE: A feature may occur as a type or an instance. Feature type or feature instance shall be used when only one is meant.</i> EXAMPLE: The feature instance named “Turning Torso Tower” may be classified with other phenomena into a feature type “tower”.
feature association	relationship that links instances of one feature type with instances of the same or a different feature type (ISO19110)

NOTE 1; A feature association may occur as a type or an instance. Feature association type or feature association instance is used when only one is meant.

NOTE 2: Feature associations include aggregation of features.

feature attribute

characteristic of a **feature** (ISO 19101)

NOTE 1: A feature attribute may occur as a type or an instance. Feature attribute type or feature attribute instance is used when only one is meant.

NOTE 2: A feature attribute type has a name, a data type and a domain associated to it. A feature attribute for a feature instance has an attribute value taken from the domain.

geographic data

data with implicit or explicit reference to a location relative to the Earth (ISO 19109)

NOTE: Geographic information is also used as a term for information concerning phenomena implicitly or explicitly associated with a location relative to the Earth.

geometric primitive

geometric object representing a single, connected, homogeneous element of geometry

NOTE: Geometric primitives are non-decomposed objects that present information about geometric configuration. They include **points**, **curves**, surface

maximum display scale

the largest value of the ratio of the linear dimensions of features of a dataset presented in the display and the actual dimensions of the features represented (largest scale) of the scale range of the dataset

Metadata

data about data (ISO 19115)

minimum display scale

the smallest value of the ratio of the linear dimensions of features of a dataset presented in the display and the actual dimensions of the features represented (smallest scale) of the scale range of the dataset

Model

abstraction of some aspects of reality (ISO 19109)

Point

0-dimensional geometric primitive, representing a position

NOTE: The **boundary** of a point is the empty set

Portrayal

presentation of information to humans (ISO 19117)

Quality

totality of characteristics of a product that bear on its ability to satisfy stated and implied needs (ISO 19101)

Set

unordered collection of related items (objects or values) with no repetition (ISO 19107)

start point

first point of a curve (ISO 19107)

Surface	connected 2-dimensional geometric primitive, representing the continuous image of a region of a plane NOTE: The boundary of a surface is the set of oriented, closed curves that delineate the limits of the surface
universe of discourse	view of the real or hypothetical world that includes everything of interest (ISO 19101)

Table 1-2 List of terms and definitions

1.4 Abbreviations

Abbreviation	Description
DCEG	Data Classification and Encoding Guide
ECDIS	Electronic Chart Display and Information System
ENC	Electronic Navigational Chart
GML	Geography Markup Language
HO	Hydrographic Office
IHO	International Hydrographic Organization
IMO	International Maritime Organization
ISO	International Organization for Standardization
MTM	Marine Traffic Management
RENC	Regional ENC co-ordinating centre
UML	Unified Modelling Language
URL	Universal Resource Locator
XML	eXtensible Markup Language

Table 1-3 List of abbreviations

1.5 Use of language

Within this document:

“Must” indicates a mandatory requirement;

“Should” indicates an optional requirement, that is the recommended process to be followed, but is not mandatory;

“May” means “allowed to” or “could possibly”, and is not mandatory, or recommended.

1.6 Maintenance

Changes to the Data Classification and Encoding Guide must occur in accordance with the S-127 Product Specification clause 4.3.

2 General

2.1 Introduction

This S-127 Data Classification and Encoding Guide (DCEG) contains rules and guidance for converting data describing the real world into data products that conform to the S-127 specification.

The S-127 specification contains an application schema (UML model) describing the conceptual domain model in terms of classes and relationships, and a Feature Catalogue (see S-127 Annex C) that specifies the data model, i.e., specifies the data model types and associations corresponding to the various classes and relationships in the application schema.

To simplify the DCEG text, the various data model types will be provided without the suffixes “class”, “type” or “instance”; e.g. the term “feature” should be understood as “feature class” or “feature type” or “feature instance” as best fits the immediate context in which it is used (and where there might be confusion, it is written out in full as feature class/type/instance). The model defines real world entities as a combination of descriptive and spatial characteristics (S-127 Product Specification clause 6).

This clause of the DCEG contains general information needed to understand the encoding rules and describes fundamental common rules and constraints. It also describes datasets and metadata. The data model object types used within S-127 and their encoding rules and guidelines are defined in detail in subsequent clauses of this document.

Within this document the features, information types, associations, and attributes appear in **bold text**.

2.2 Descriptive characteristics

2.2.1 Feature

A feature contains descriptive attributes that characterize real world entities.

The word ‘feature’ as used in the ISO 191xx series and in S-100 based product specifications has two distinct but related senses – ‘feature type’ and ‘feature instance’. A feature instance is a single occurrence of the feature and is represented as an object in a dataset.

The location of a feature instance on the Earth’s surface is indicated by a relationship to one or more spatial primitive instances. A feature instance may exist without referencing a spatial primitive instance.

2.2.1.1 Geographic feature class

Geographic (Geo) feature types carry the descriptive characteristics of a real world entity which is provided by a spatial primitive instance.

2.2.1.2 Meta feature class

Meta feature type contains information about other features.

2.2.1.3 Charted background feature

The data product would mostly be visualized as an overlay of an ENC or other GIS applications. Consequently, all necessary descriptive and spatial characteristics to provide a charted background should be provided by the underlying application.

2.2.2 Information type

An information type has no geometry and therefore is not associated to any spatial primitives to indicate its location.

An information type may have attributes and can be associated with features or other information types in order to carry information particular to these associated features or information types.

2.3 Spatial characteristics

2.3.1 Spatial primitives

The allowable spatial primitive for each feature is defined in the Feature Catalogue. Allowable spatial primitives are point, curve, and surface.

Within this document, allowable spatial primitives are included in the description of each feature. For easy reference,

Table 2-1 below summarises the allowable spatial primitives for each feature. In the table, abbreviations are as follows: point (P), curve (C), surface (S), and none (N).

Feature	P	C	S	N
Radio Calling in Point	X	X		
Caution Area	X		X	
Signal Station Warning	X			
Signal Station Traffic	X			
Radar Range			X	
Concentration of Shipping Hazard Area			X	
Pilot District			X	
Pilot Service			X	
Underkeel Clearance Allowance Area			X	
Underkeel Clearance Management Area			X	
Routeing Measure		X	X	
ISPS Code Security Level		X	X	
Waterway Area			X	
Pilot Boarding Place	X		X	
Military Practice Area			X	
Restricted Area, Regulatory			X	
Restricted Area, Navigational			X	
Vessel Traffic Service Area			X	
Place of Refuge			X	
Piracy Risk Area			X	
Local Port Service Area			X	
Ship Reporting Service Area			X	

Table 2-1 Features permitted and their spatial primitives

2.3.2 Capture density guideline

The capture density will follow the recommendation of the S-101 (ENC) DCEG, which states curves and surface boundaries should not be encoded at a point density greater than 0.3 mm at permitted display scale.

A curve consists of one or more curve segments. Each curve segment is defined as a loxodromic line on WGS84, or as an arc or circle. Long lines may need to have additional coordinates inserted to cater for the effects of projection change.

The presentation of line styles may be affected by curve length. Therefore, the encoder must be aware that splitting a curve into numerous small curves may result in poor symbolization.

2.4 Attributes

Attributes may be simple type or complex type. Complex (C) attributes are aggregates of other attributes that can be simple type or complex type attributes. Simple (S) attributes are assigned to one of the types collected at clause 2.4.1.

The binding of attributes to a feature, the binding of attributes to attributes to construct complex attributes, and attribute multiplicity are all defined in the Feature Catalogue.

Within this document, the allowable attributes are included in the description of each feature, as well as the allowable values for enumeration type attributes.

2.4.1 Simple attribute types

Each simple attribute (S) is assigned to one of attribute types in Table 2-2 (in alphabetic order):

Abbreviation	Attribute type	Description
BO	Boolean	A value representing binary logic. The value can be either True or False. The default state for Boolean type attributes (i.e. where the attribute is not populated for the feature) is False.
CL	Code List	<p>A type of flexible enumeration (see “EN” below). A code list type is a list of literals which may be extended only in conformance with specified rules. Attributes of a code list type may take values from the list or other values which are defined according to the rules. The rules should be part of the specification of the individual codelist type. A code list could either be closed (fixed) or open (extensible).</p> <p>A code list type has the following properties:</p> <ol style="list-style-type: none">1. A description of the code list type,2. The URI where the list could be found, and3. An encoding instruction.
DA	Date	<p>A date provides values for year, month and day according to the Gregorian Calendar.</p> <p>Example: 19980918 (YYYYMMDD)</p>

DT	Date and Time	<p>A DateTime is a combination of a date and a time type.</p> <p>Example: 19850412T101530 (YYYYMMDDThhmmss)</p>
EN	Enumeration	<p>A fixed list of valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list.</p>
IN	Integer	<p>A signed integer number. The representation of an integer is encapsulation and usage dependent.</p> <p>Integer attribute values must not be padded by non-significant zeroes. For example, for a number of 19, the value populated for the attribute must be 19 and not 019.</p> <p>Examples: 29, -65547</p>
RE	Real	<p>A signed real (floating point) number consisting of a mantissa and an exponent. The representation of a real is encapsulation and usage dependent.</p> <p>Real attribute values must not be padded by non-significant zeroes. For example, for a signal period of 2.5 seconds, the value populated for the attribute signal period must be 2.5 and not 02.50.</p> <p>Examples: 23.501, -0.0001234, -23.0, 3.141296</p>
TD	Truncated Date	<p>One or more significant components of the modelling date are omitted.</p> <p>Example: ---02-- (Year and date not encoded)</p> <p>The exact format depends on the encoding.</p> <p>A GML dataset would use a GML built-in type and encode it as <gMonth>--02</gMonth>.</p> <p>An 8211 data format based dataset would truncated encode the date as ---02--.</p>
TE	Free text	<p>A CharacterString is an arbitrary-length sequence of characters including accents and special characters from a repertoire of one of the adopted character sets.</p>
TI	Time	<p>A time is given by an hour, minute, and second. Time zone according to UTC is optional. Character encoding of a time is a string that follows the local time.</p> <p>Example: 183059 or 183059+0100 or 183059Z</p>
	URL	<p>A uniform resource locator (URL) is a URI that provides a means of locating the resource by describing its primary access mechanism (RFC 3986).</p> <p>EXAMPLE http://registry.iho.int</p>
	URN	<p>A persistent, location-independent, resource identifier that follows the syntax and semantics for URNs specified in RFC 2141.</p>

	EXAMPLE urn:mrn:iho:s127:1:0:0:RouteingMeasure
--	------------------------------------------------

Table 2-2 Simple attribute types

2.4.2 Mandatory attributes

Some attributes are mandatory and must be populated for a given feature. There are some reasons why attribute values may be considered mandatory:

- They are fundamental to the definition of a marine protected area;
- They are required to support the correct portrayal of a feature instance;
- Certain features make no logical sense without specific attributes;
- Some attributes are required for safety of navigation.

Within this document, mandatory attributes are those with a multiplicity of 1,1 or 1,n (n>1) or 1,*. The attribute multiplicity is identified in the description of each feature class.

For easy reference, Table 2-3 summarises the mandatory attributes for each feature.

Feature	Mandatory Attributes
Radio Calling in Point	trafficFlow
Signal Station Warning	categoryOfSignalStationWarning
Signal Station Traffic	categoryOfSignalStationTraffic
Pilot Service	remotePilot
Underkeel Clearance Management Area	dynamicResource
Routeing Measure	categoryOfRouteingMeasure
ISPS Code Security Level	ispsLevel
Waterway Area	dynamicResource
Local Port Service Area	requirementsForMaintenanceOfListeningWatch
Ship Reporting Service Area	requirementsForMaintenanceOfListeningWatch
Vessel Traffic Service Area	requirementsForMaintenanceOfListeningWatch
Text Placement	textJustification exactly one of: textType, text

Table 2-3 Mandatory attributes for feature classes

2.4.3 Conditional attributes

The feature classes or information types do not contain conditional attributes.

Complex attributes which are assigned to feature classes or information types have at least one sub-attribute which is mandatory (or conditionally mandatory). Mandatory sub-attributes of complex attributes have not been included in Table 2-3. Where the sub-attribute of a complex attribute is conditional, this is indicated in the Remarks sub-clause for the relevant feature class entries in Clause 5.

2.4.4 Missing attribute values

Where a value of a mandatory attribute is not known, the attribute must be populated with an empty (null) value.

Where the value of a non-mandatory attribute is not known, the attribute must not be included in the dataset.

2.4.5 Multiplicity

In order to control the number of allowed attribute values or sub-attribute instances within a complex attribute, S-100 uses the concept of multiplicity. This defines lower and upper limits for the number of values, whether the order of the instances is significant, and if an attribute is mandatory. Common examples are shown in Table 2-4:

Format: MinOccurs, MaxOccurs (a * indicates that infinite instances are possible, the term (ordered) indicates that the order of the provided instances is significant)

Multiplicity	Explanation
0,1	An instance is not required; if provided there must only be one instance.
1,1	An instance is required and there must only be one instance.
0,*	An instance is not required and there can be an infinite number of instances.
1,*	An instance is required and there can be an infinite number of instances.
1,* (ordered)	An instance is required and there can be an infinite number of instances, the order of which is significant.
2,2	Two instances are required and there must be no more than two.

Table 2-4 Multiplicity of attributes

2.4.6 Spatial attribute types

Spatial attribute types must contain a referenced geometry and may be associated with spatial quality attributes. Each spatial attribute instance must be referenced by a feature instance or another spatial attribute instance.

2.4.6.1 Quality of spatial attributes

The quality of spatial attributes in S-127 is described in a **Quality of Non-Bathymetric Data** meta-feature. This meta-feature defines areas within which uniform assessment exists for the quality. It is described in detail later in this document.

If the spatial quality attributes for an individual instance of a spatial primitive differ from the quality indicated in the overlying **Quality of Non-Bathymetric Data** meta-feature, the quality attributes for that instance are carried in an information class called **spatial quality**. Only points and curves can be associated with **spatial quality**. S-127 does not use multi-points. Currently, no use case for associating surfaces with spatial quality attributes is known, therefore this is prohibited. Vertical uncertainty is prohibited for curves as this dimension is not supported by curves.

Note: S-127 does not make use of the S-101 **Quality of Bathymetric Data** meta- feature since depth range uncertainties are not needed. The **Quality of Non-Bathymetric Data** meta-feature has all the quality attributes needed by S-127.

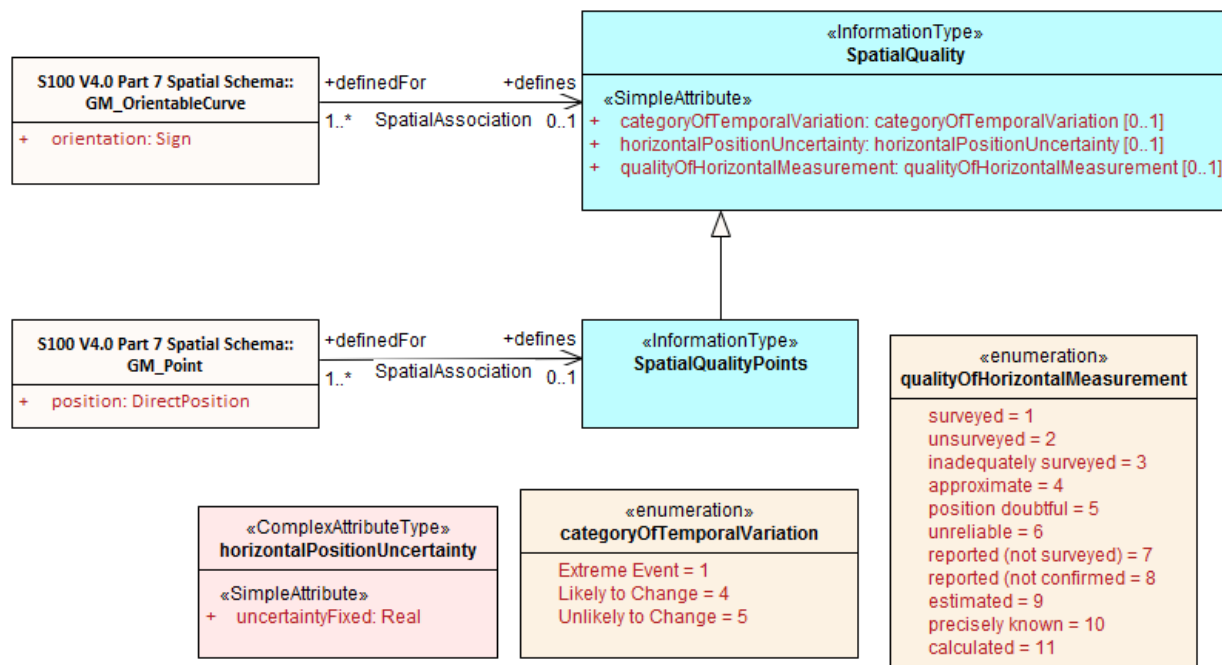


Figure 1 Spatial quality information

2.4.7 Portrayal feature attributes

Marine Traffic Management data products will be used within ECDIS where ENC data is displayed based on the rules defined within the S-101 Portrayal Catalogue. While most ECDIS portrayal is based on attributes describing the instance of a particular feature in the real world, certain feature attributes are used in portrayal rules to provide additional functionality in the ECDIS. Table 2-5 provides a list of attributes which have been adopted from the S-101 (ENC) product specification and which have specific influence on portrayal.

Attribute	Effects on portrayal
displayName	This Boolean attribute determines if the text for a name should be displayed. If not populated the default rules provided in the portrayal catalogue will be used.
information	Population of this complex attribute will result in the display of the magenta information symbol to highlight additional information to the user.
pictorialRepresentation	The population of this Text attribute will result in the display of the magenta information symbol to highlight additional information to the user.
textContent	The population of this complex attribute will result in the display of the magenta information symbol to highlight additional information to the user.

Table 2-5 Attributes which have effects on portrayal

Note: Since S-127 data is scale-independent, the S-101 attribute `scaleMinimum` is superfluous and not used in S-127 datasets except for the cartographic feature `TextPlacement`.

2.4.8 Textual information

Textual information may provide additional information essential to understand the presence of the Marine Traffic Management and other features of an S-127 product. This information may also provide legal information pertaining to the S-127 product features.

The methods to provide textual information vary from the simple provision of short text, to the more structured provision of extensive text. The length of the text determines the method and the attribute selection, see clause 2.4.8.2.

2.4.8.1 Specialized information types for common kinds of textual information

The information types **Restrictions**, **Recommendation**, **Regulations**, or **NauticalInformation** must be used to encode text information when the DCEG allows them to be associated to the feature or information type and the information is of the appropriate kind (a restriction, regulation, etc.).

In exceptional circumstances and only if the use of the information types **Restrictions**, **Recommendation**, or **Regulations** is not sufficient, **NauticalInformation** can be used to encode additional textual information associated to a feature or a group of features.

In some cases, there may be a specialized attribute that is specifically intended for the data in question. If an appropriate specialized attribute is available, it must be used in preference to **information** or **textContent**. For example, feature names will generally be encoded in the **name** sub-attribute of complex attribute **featureName**, instead of **information->text**.

2.4.8.2 Textual information attributes

Textual information which is not appropriate for any of the Text-type attribute (or sub-attribute) allowed for the feature/information type should be encoded using either **information** or **textContent** complex attributes. Generally, either **information** or **textContent** is allowed, but not both.

2.4.8.3 Languages

Both **information** and **textContent** define a **language** sub-attribute for specifying the language in which the text is encoded.

The exchange language for textual information should be English; therefore it is not required to populate the sub-attribute **language** for an English version of textual information.

Languages other than English may be used as a supplementary option, for which **language** must be populated with an appropriate value to indicate the language.

When a national language is used in the textual attributes, the English translation must also exist.

2.4.8.4 Minimal use of generalized text attributes

The complex attributes **information** and **textContent** must not be used when it is possible to encode the information by means of any other attribute. The population of these attributes provides symbols on an ECDIS screen. Therefore producers should carefully consider use of these attributes as the symbol may contribute significantly to ECDIS screen clutter and text attributes should be populated only when the content conveys useful information.

2.4.8.5 Short textual information

The **text** sub-attribute of complex attribute **information** should generally be used for short notes or to transfer information which cannot be encoded by other attributes, or to give brief information about a feature. The use of the complex attribute **information** as a stand-alone complex attribute is intentionally limited to the information types **ContactDetails**, **Applicability**, **NonStandardWorkingDay**, and **ServiceHours**, which do not need the additional attributes defined in **textContent**. The reason for the limited use of **information** as a stand-alone complex attribute is to provide a structured and harmonised approach to textual information within the S-127 product data sets.

The text populated in **text** must not exceed 300 characters. Character strings contained in **text** sub-attribute must be UTF-8 character encoding.

If the **text** sub-attribute of **information** is populated, the **headline**, **fileReference**, and **fileLocator** sub-attributes must not be populated.

2.4.8.6 Complex or lengthy textual information

More complex encodings of text may use either **information** or **textContent**. The feature catalogue and the feature/information type definitions in this DCEG indicate whether **information** or **textContent** is allowed.

The complex attribute **textContent** also has **information** as a complex sub-attribute. If a short note must be encoded in a feature or information type which has only **textContent** as an attribute, it should be encoded as **textContent->information->text**.

Complex text information, such as text longer than 300 characters, formatted text, or HTML extracts from shipping regulations, must be encoded in a file named in either **information->fileReference** or **textContent->information->fileReference**. The construction **textContent->information->fileReference** should be used if the feature/information type provides **textContent** as complex attribute.

The complex attribute **information** defines an optional sub-attribute **headline** which may be used for a short title not exceeding 60 characters. The content should be short but informative – if the textual information is divided into sections, the most relevant section header from the referenced content may be a good choice for **headline**.

The complex attribute **textContent** defines an optional sub-attribute **categoryOfText** for indicating whether the text is the full text from the source, an extract from the source, or a summary prepared by the encoder. Populating **categoryOfText** is recommended whenever the textual information is taken or summarized from a law or regulation.

If it is considered necessary to include a description of the source of the textual information, the sub-attribute **sourceIndication** of **textContent** must be used. Encoding a description of the source is strongly recommended for textual information whose source is considered as information the end-user must have, e.g., because the date of issue must be conveyed or because it cites official regulations which are frequently updated.

COMMENT: Some government documents are frequently updated, e.g., the U.S. Electronic Code of Federal Regulations, which is currently updated every working day even though a particular section may be stable for years.

2.4.9 Attributes referencing external files

2.4.9.1 Predefined derived types

Table 2-6 presents the following predefined derived types which are described in S-100 (§ 1-4.6 in Edition 4.0.0):

Name	Description	Derived from
URI	A uniform resource identifier which character encoding shall follow the syntax rules as defined in RFC 3986. EXAMPLE <code>http://registry.iho.int</code>	CharacterString
URL	A uniform resource locator (URL) is a URI that provides a means of locating the resource by describing its primary access mechanism (RFC 3986). EXAMPLE <code>http://registry.iho.int</code>	URI
URN	A persistent, location-independent, resource identifier that follows the syntax and semantics for URNs specified in RFC 2141. EXAMPLE <code>urn:iho:s101:1:0:0:AnchorageArea</code>	URI

Table 2-6 Predefined derived types

2.4.9.2 Reference to textual files

The information types **Restrictions**, **Recommendation**, **Regulations**, **NauticalInformation** should be used to encode textual information.

The files referenced by **textContent**, sub-complex attribute **information** and its sub attribute **fileReference** must be *.TXT, *.HTM or *.XML files, and may contain formatted text. It is up to the Producing Authority to determine the most suitable means of encoding a particular piece of text. Files must only use UTF-8 character encoding even when the sub-attribute **language** is populated with a language other than English.

If it is necessary to indicate a specific section within a large text file, this may be done by encoding the location in the **fileLocator** sub-attribute of **information**, as described in Table 2-7.

Format	File extension	Content of fileLocator
Text	TXT	The offset of the start of the section relative to the beginning of the file (the first character in the file has offset 0).
HTML	HTM	The HTML fragment identifier, i.e., the value of the HTML <i>name</i> or <i>id</i> attribute of the target (as defined in the relevant HTML specification).
XML	XML	The XML fragment identifier as defined in the relevant specification, e.g., the value of an <i>xml:id</i> attribute.

Table 2-7 Locators for external files

2.4.9.3 Reference to external sources

References to Internet sources should be encoded using the **onlineResource** sub-attribute of **textContent**. Encoders should be aware that systems may not be able to access the Internet, so **onlineResource** should be used only for non-essential information.

Only sources that can be certified as secure should be provided.

2.4.9.4 Reference to graphics

If it is required to indicate a graphic, the complex attribute **graphic** must be used. The sub-attribute **pictorialRepresentation** must be used to indicate the file name (without the path) of the external graphical file. Graphic files that form part of the data product must be content with the characteristics collected in Table 2-8.

Characteristics	Values
Recommended Resolution:	96 DPI
Minimum Size x,y:	200,200 pixels
Maximum Size x,y:	800,800 pixels
Bit Depth:	8 Bit Indexed Colour
Compression:	LZW
Format:	Tiff 6.0
File size	Minimum, consider that 10 Mb is the maximum allowable size of a dataset

Table 2-8 Graphics Characteristics

Additional information about the graphic file may be encoded in other sub-attributes of attribute **graphic**, as described in clause 2.4.13.

2.4.10 Dates

Dates may be complete or truncated values. The definition of the attribute will indicate if it must take a complete value (type *Date* or *DA*) or is allowed to take a truncated value (type *S100_TruncatedDate* or *TD*). Complete and truncated dates are different value types (see S-100 § 1-2 Table 1-2; also Table 2-9 of this DCEG).

For attributes that use the complete date type (type *Date* or *DA*), all their components (year, month, and day) must be specified.

For attributes that use the truncated date type (type *S100_TruncatedDate* or *TD*), zero, one, or two of the year/month/day components may be omitted. If the year component is included, it must be specified using exactly 4 digits.

2.4.10.1 Complete Dates (Informative)

Complete date values must be encoded in conformance with the Date format as specified in S-100 Ed. 4.0.0 (§§ 1-4.5.2) which is the same as the DA format in Table 2-2 in this document. The data values have to be provided in accordance with the Gregorian Calendar starting with four digits for the year, two digits for the month and two digits for the day.

Example: The date 18 September 2010 is encoded as follows:

In the ISO 8211 format: 20100918

In the GML format: <date>2010-09-18</date>

2.4.10.2 Truncated Dates (Informative)

In Truncated Dates one or more components (year, month, or day) of the date is not specified. Truncated date values must be encoded in conformance with the S100_TruncatedDate format or equivalent as specified in S-100 Ed. 4.0.0 (§§ 1-4.5.2 and 3-9) which is the same as the *TD* format in Table 2-2 in this document. If encoding attributes which can take truncated date values (e.g., **fixedDateRange**, **periodicDateRange**, **reportedDate**) and no specific year, month, or day is required, the values must be encoded in conformance with the truncated date format as specified in S-100 (§§ 1-4.5.2 and 3-9 in Edition 4.0.0) which defines a default format (for ISO 8211) but also allows the use of built-in types.

To encode partial dates in the GML and ISO 8211 data formats:

Description	ISO 8211	GML
No specific year, same day each year	---MMDD	<gMonthDay>--MM-DD</gMonthDay>
No specific year, same month each year	---MM--	<gMonth>--MM</gMonth>
No specific day	YYYYMM--	<gYearMonth>YYYY-MM</gYearMonth>
No specific month and no specific day	YYYY----	<gYear>YYYY</gYear>

Table 2-9 Date encoding in GML and ISO 8211 data formats

Note: YYYY = calendar year; MM = month; DD = day.

The dashes (–) indicating that the year, month, or date which is not specified must be included in the encoding (with no space between the dashes).

2.4.10.3 Start and end of ranges

In accordance with S-100 Ed. 4.0.0 § 3-8, the start and end instants of a range or period are included in the range or period.

EXAMPLE 1: If the beginning of a date range is encoded as the complete date 01 January 2016, the period begins at 00:00:00 on 1 January 2016, and the whole of New Year's Day is included in the period. If the end of the date range is encoded as 01 January 2016, the period ends at 24:00:00 on 1 January 2016, i.e., again the whole of New Year's Day is included in the period.

EXAMPLE 2: If the beginning of a period is encoded in truncated date format as ---01-- (i.e., year and day not specified), the period begins at 00:00:00 on 1 January each year. If the end of the period is encoded as ---01--, the period ends at 24:00:00 on 31 January each year.

Note 1) Particular care should be taken if the start or end date is 28 or 29 February. S-100 Ed. 4.0.0 § 3-8 explains the implications for end of February. For example, the truncated date – – – –02– – will be interpreted as 29 February in leap years and 28 February in non-leap years, while – — –0228 will be interpreted as 28 February in every year.

Note 2) In accordance with ISO practice, 00:00:00 means midnight at the start of a day and 24:00:00 means midnight at the end of a day.

2.4.10.4 Schedules

Weekly service schedules of a feature can be comprehensively described by using the information types **ServiceHours** and **NonStandardWorkingDay**.

EXAMPLE: A feature service is available under normal operation status 24 hours/day on Monday and Wednesday and from 08:00 to 16:00 LT from Thursday to Saturday. The service is not available on public holidays and the 5 of August of each year.

ServiceHours

scheduleByDayOfWeek

categoryOfSchedule =1 (normal operation)

timeIntervalsByDayOfWeek

dayOfWeek =2(Monday), 4(Wednesday)

dayOfWeekIsRange =0 (false)

timeIntervalsByDayofWeek

dayOfWeek =5(Thursday), 7(Saturday)

dayOfWeekIsRange =1 (true)

timeOfDayStart = 080000

timeOfDayEnd = 160000

NonStandardWorkingDay

dateFixed = – – – – 0805 (5 August)

dateVariable = public holidays

If the days of week are known but the hours of availability are unknown, there is no time attribute. Twenty-four availability is indicated by encoding the availability period as 000000-240000. Special cases such as unknown can be explained in the **textContent** or **information** attribute of **ServiceHours**.

To encode two or more periods within the same day, repeat the **timeOfDayStart** and **timeOfDayEnd** attributes. If one of the times is not known, it may be nilled as described in clause 2.4.4.

For example, to encode open hours of 8 a.m. to 12 noon and 1 p.m. to 5 p.m. on Thursdays and Saturdays:

timeIntervalsByDayofWeek

dayOfWeek =5(Thursday), 7(Saturday)

dayOfWeekIsRange =1 (true)

timeOfDayStart = 080000

timeOfDayStart = 130000
timeOfDayEnd = 120000
timeOfDayEnd = 170000

The order of repeated **timeOfDayStart** and **timeOfDayEnd** attributes is significant, since intervals are specified by matching them pairwise in order.

UTC is indicated by the Z suffix. The absence of the Z suffix indicates local time.

2.4.11 Times

If it is required to provide information of the start time and end time of an active period of a feature, it must be encoded using the attributes **timeOfDayStart** and **timeOfDayEnd**. The order has significance.

2.4.12 Combination of date schedules and times

Schedule information can also include time of day. The complex attribute **timeIntervalsByDayofWeek** also includes **timeOfDayStart** and **timeOfDayEnd** attributes to encode the daily start and end times of service. Complete instructions on how to encode schedules are described in clause 2.4.10.4.

2.4.13 Graphic information

A graphic file should be appropriate for the purpose and should supplement the information in terms of navigational relevance. Preferably, the graphic should provide perspective relevant to the view of the mariner. Graphics should be such that all the information in the graphic is legible in the application display.

Graphic information must be encoded using the complex attribute **graphic**. The simple sub-attribute **pictureInformation** should be used to provide credits to the picture creator, copyright owner etc.

The source date can either be of a complete date (see clause 2.4.10.1) or truncated date (see clause 2.4.10.2) type.

Assuming that graphic information provides a coastal view, mariners are interested in knowing from which point on sea that graphic has been taken. The complex attribute **bearingInformation** (see clause 2.4.13.1) provides all necessary information.

2.4.13.1 Bearing information

The most accurate information should be provided if it is necessary to indicate a position from where a picture has been taken. **information** is a sub-complex attribute of **bearingInformation** and should be used to specify that no bearing information can be provided whenever such is the case. The sub-attributes **sectorBearing** and **orientation** can be used to describe a certain level of inaccuracy in the position determination.

2.5 Associations

2.5.1 Introduction

An association expresses a relationship between two classes - features, information types, or a feature and an information type. Objects in the dataset (instances of feature/information types) are related only if the link between them is encoded in the dataset.

EXAMPLE: An **Authority** information type provides the responsible authority information to the abstract **SupervisedArea** feature. An association named Service Control (**srvControl**) is used to relate the two classes; roles are used to convey the meaning of the relationship. The association is inherited by subclasses of **SupervisedArea** and is thereby available to its subclass **MilitaryPracticeArea**.



Figure 2 Information association relating a feature to an information type

An association end may have a multiplicity which describes how many instances the feature or information type instance at the other end is allowed to be linked to. In Figure 2, any single instance of **Authority** may link to any number of **MilitaryPracticeArea** instances.

2.5.2 Association names

The association name is normally provided by the UML diagram at the middle of the connection line/arrow between the two involved classes and can be obtained from the feature and information type tables provided in this document).

Association names may be omitted in the UML diagrams for the following reasons:

- a) the association is defined by an association class, see 2.5.4 (the name of the association class is used);
- b) to avoid cluttering the diagram – however, the name is always documented in the feature/information type tables.

2.5.3 Association roles

Either or both association ends can have a name (role). In Figure 2 the roles are **controlledService** and **controlAuthority**. This association expresses the relationship that a **SupervisedArea** (i.e., its subclasses, because **SupervisedArea** is an abstract feature and there cannot be any direct instances of **SupervisedArea**) may have zero or one controlling **Authorit(ies)**, and an **Authority** may be responsible for any number of **MilitaryPracticeAreas** (or other subclasses of **SupervisedArea**).

Roles may be also omitted from the diagram to reduce clutter – again, the role name is documented in the feature/information type tables.

Note: Instead of documenting every single role, Product Specifications may describe rules for defining default roles.

2.5.4 Association classes

Association classes allow relationships to be characterized by one or more attributes. The attributes of the association class belong to the association itself, not to any of the features or information types it connects. An association class is both an association and a class. Within an S-127 product the

association classes **Permission Type** and **Inclusion Type** may be used for relating vessel classes to feature and information types.

2.5.4.1 Permission Type

This association class specifies the relationship of the vessel class to a feature, e.g., whether access to a feature (or use of a facility) is prohibited or permitted for a specified class of vessel. The class of vessel is described by the simple and complex attributes of the information type **Applicability** such as length, cargo, etc. The attributes of the association class describe the nature of the relationship, i.e., whether access to an area is permitted or prohibited, or whether use of a service is required or recommended.

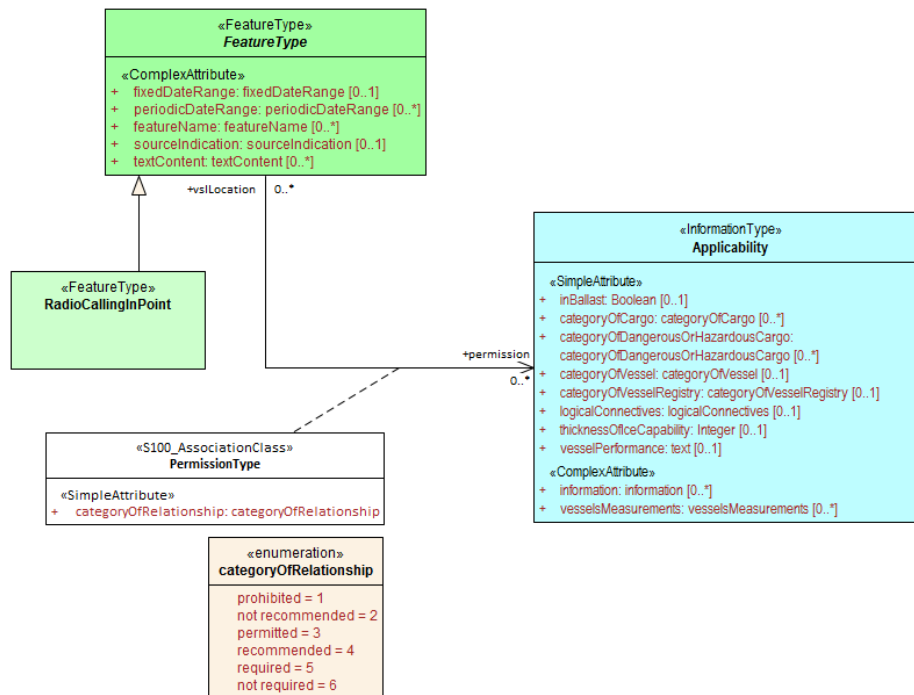


Figure 3 Association class for hypothetical requirement for use of a radio calling in point by a vessel type

EXAMPLE: An association between an **Applicability** instance with attribute **categoryOfDangerousOrHazardousCargo** = Class 3 and an instance of feature **RadioCallingInPoint**, with **Permission Type**'s attribute **categoryOfRelationship** = required, means that vessels carrying flammable liquids (hazardous cargo type class 3 in the IMDG Code) must use the calling-in point at the **RadioCallingInPoint** instance.

2.5.4.2 Inclusion Type

This association class defines whether a specified customer (class of vessels, as described by **Applicability**) is excluded or included from a particular regulation, recommendation, etc. Again, the attributes of the association class describe the nature of the relationship; in this case whether the vessel is included or excluded from the regulation, etc.

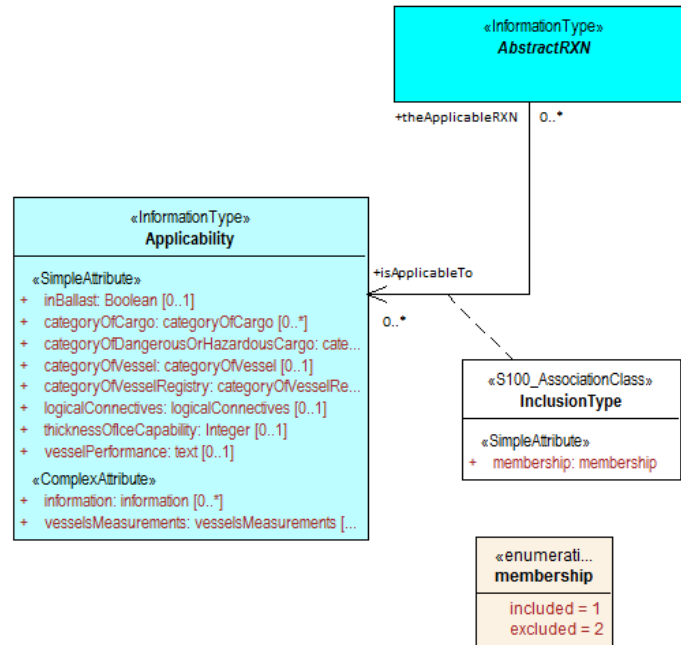


Figure 4 Association class for inclusion of vessel types in regulations

EXAMPLE: An association between an **Applicability** instance with attribute **categoryOfDangerousOrHazardousCargo** = IMDG Code Class 3, with **Inclusion Type**'s attribute **membership** = included, and an association of a **Regulation** instance to the same Inclusion Type, means that the information provided by the **Regulation** (a sub-type of **AbstractRXN**) applies to vessels carrying flammable liquids (hazardous cargo type class 3 in the IMDG Code).

Note (1) Since **AbstractRXN** is an abstract type, it cannot have direct instances in the dataset. Only instances of its (non-abstract) sub-types can be used.

Note (2) Specific tools may use different presentations in their user interfaces, e.g., as two associations (as described in the text of the example), or one association with an association class also shown (as shown in Figure 4).

2.5.5 Use of various associations

2.5.5.1 General

In general, associations must be encoded whenever the relationship is useful for navigation, monitoring, voyage or route planning, or reporting purposes, or any other purpose for which the dataset is intended. The multiplicity lower bound of "0" at an association end means only that the absence of a link to the relevant instance does not invalidate the dataset. The encoding instructions for individual feature and information types describe what associations are allowed and whether they are required or optional.

2.5.5.2 Generic association for uncategorized additional information

Unless other associations are specified, information types are associated to the relevant features using the association name **AdditionalInformation** and the role names **providesInformation** and **informationProvidedFor**.

2.5.5.3 Associations to Restrictions, Recommendation, Regulations, and Nautical Information

The **Restrictions, Recommendation, Regulations, Nautical Information** are associated to the relevant features using the association named **AssociatedRxN** (inherited from their common abstract super-type). The roles at the ends of this association are **appliesInLocation** and **theRxN** (the Restriction, Regulation etc.).

If the regulation applies only to a specific class, or if it mentions an exempt class, an additional association to an **Applicability** object is encoded using the **InclusionType** association class.

2.5.5.4 Conventional Association

Certain features and information types may be permitted or required to have associations to other feature or information types. The allowed or mandatory associations for a feature/information type are shown in the application schema (clause 6 – Product Specification) and listed in the documentation for individual types (Appendix A - DCEG). Definitions of the associations and roles are also given in the DCEG.

2.5.6 Where to Encode Associations

The presentation and management of associations will be determined by the user interface of the encoding software tools. Since S-100 edition 4.0.0 permits feature-information associations to be encoded only from the geographic feature to the information type and not vice versa, the information-to-feature link might be unavailable or treated differently from the feature-to-information link.

2.6 Datasets

2.6.1 Types of Datasets

A dataset is a grouping of features, attributes, geometry and metadata which comprises a specific coverage.

Table 2-10 shows the types of datasets which may be produced and contained within an exchange set:

Dataset	Explanations
New dataset:	Data for an area different (in coverage and/or extent) to existing datasets.
New Edition of a dataset:	A re-issue plus new information which has not been previously distributed by Updates. Each New Edition of a dataset must have the same name as the dataset that it replaces and should have the same spatial extents.
Update dataset	Updated or new information. Contains information about objects being added, modified, or deleted.

Table 2-10 Dataset types

2.6.2 Overlay data sets

S-127 datasets are intended to be used together with S-101 ENC (or similar data products) which will act as a base layer. The base layer is expected to provide navigational and visual context. Generally, an overlay dataset like S-127 does not provide “skin of the earth” coverage and there will be large areas

with no data coverage because the S-127 application schema does not include any feature for designating a region as “other”, or “not an MTM area” (i.e., there is no S-127 feature equivalent to the S-101 Unsurveyed Area). Further, an overlay dataset does not include features that provide auxiliary information such as bathymetry within a routing measure area.

2.6.3 Data coverage

A Marine Traffic Management dataset can contain one or more **DataCoverage** features (see clause 2.6.3). The data boundary is defined by the extent of the **DataCoverage** meta features. Data must only be present within **DataCoverage** meta features.

When a feature extends across datasets of overlapping scale ranges, its geometry must be split at the boundaries of the **DataCoverage** features and its complete attribute description must be repeated in each dataset.

A New edition dataset must not change the extent of the data coverage for the previous edition. Where the extent of the data coverage for a data product is to be changed, this must be done by issuing a New Dataset and terminating the previous one(s).

2.6.4 Discovery metadata

Discovery metadata is intended to allow applications to find out important information about datasets and accompanying support files to be examined without accessing the data itself (or without reading the support file). Discovery metadata includes, but is not limited to:

- information identifying the product specification and encoding format;
- edition and version numbers, production/release date, and other details of data creation and updating;
- data coverage of the dataset;
- summary descriptions of content, purpose, use, and limitations;
- identification and contact information for the producer and distributor of the dataset.

S-127 uses the same components of discovery metadata as S-100. The mandatory components for discovery metadata are defined in S-100 Edition 4.0.0 Appendix 4A-D and consist of:

- 1) Exchange catalogue – a single exchange catalogue for an exchange set. (Subsets of exchange sets are not envisaged.) The elements are defined in S-100 App. 4A § D-2.2 (S100_ExchangeCatalogue).
- 2) Dataset discovery metadata for each dataset in the exchange set. Elements are defined in S-100 App. 4A § D-2.6 (S100_DatasetDiscoveryMetaData). Additional elements have been defined in the main specification.
- 3) Support file discovery metadata for each support file in the exchange set. Elements are defined in S-100 App. 4A § D-2.11 (S100_SupportFileDiscoveryMetaData).

Discovery metadata is generally encoded separately from the dataset itself so as to allow applications to read it without processing the dataset itself (i.e., decrypt, decompress, or load the dataset). The encoding format should be easily machine-readable and therefore may be different from the dataset, e.g., the discovery data may be in XML while the data is encoded as GML 3.2.1 format.

The content and structure of discovery metadata for this product specification is defined in ... (XML format defined by an XML schema available from www.iho.int)

2.6.5 Dataset header metadata

Dataset header metadata contains structural and discovery metadata that apply to the whole dataset and are encoded in the dataset file. The elements are described in S-100 clause 10b-9.6.

2.6.6 Dataset units

The depth, height and positional uncertainty units in a dataset must be metres.

2.6.7 Dataset Coverage

Marine Traffic Management datasets are spatially limited.

In areas which include neighbouring producer nations, producing agencies should co-operate to agree on dataset boundaries and ensure no data overlap. Where possible, adjoining nations should agree on common data boundaries within a technical arrangement based on cartographic convenience and benefit to the mariner.

If an MTM feature extends outside the product coverage and the adjoining object does not exist, e.g. due to delay in the production process by the neighbouring HO product, an indication should be placed at the outer edge of the product.

2.6.8 Dataset Feature Object Identifiers

Each feature and information instance within a dataset must have a unique universal Feature Object Identifier [FOID]. Where a real-world feature has multiple geometric elements within a single dataset due to the dataset scheme, the same FOID may be used to identify multiple instances of the same feature. Features within a dataset may carry multiple geometries.

Features split across multiple datasets may be identified by the same FOID. Features repeated in different scale ranges may be identified by the same FOID.

FOID must not be reused, even when a feature has been deleted. However, the same feature can be deleted and added again later using the same FOID.

FOID may eventually be replaced by Maritime Resource Name (MRN). In this version MRN is not included due to ongoing development on IHO guidelines for the use of MRN.

2.6.9 180° Meridian of Longitude

Datasets must not cross the 180° meridian of longitude.

2.7 Geographic names

2.7.1 Feature names

If it is required to encode an international or national geographic name, it must be done using complex attribute **featureName**.

If it is required to encode a geographic name for which there is no existing feature, an appropriate area feature defined in clause 5 must be created. In order to minimise the data volume, these features should, where possible, use the geometry of existing features.

Geographic names should be encoded with the complex attribute **featureName**. The complex attribute **featureName** consists of the simple sub-attributes **language**, **name** and a Boolean type to indicate whether that particular name is the **displayName** or not.

National geographic names can be left in their original national language in a non-English iteration of the complex attribute **featureName** (but only if the national language can be expressed using lexical level 0 or 1), or transliterated or transcribed and used in an English iteration of the complex attribute **featureName**, in which case the national name should be populated in an additional iteration of the **featureName**.

All area and point features within a Marine Traffic Management product should be encoded using **featureName** if a name is available.

1. A group of features, associated with a particular geographic name, should have the name encoded using **featureName** on an aggregation feature (of type surface or point, or no geometry, as appropriate). The name should not be encoded on the individual hydrographic features.
2. A group of service or forecast areas with the same attribute values associated with the same name should be encoded as spatial attributes of the same feature (so there would be only one feature with multiple spatial attributes for location).
3. Named features listed in Hydrographic Office's Sailing Directions or other documents that may assist in locating service information should be encoded using feature name on the relevant feature (e.g. **WaterwayArea**).

In all instances, if the exact extent of the feature to be named is known, a feature must be created. If the exact extent is not known, or the area is too small, an existing or specifically encoded point feature should be used to encode the geographic name.

2.7.2 Text placement

The cartographic feature **TextPlacement** is used specifically to place text cartographically. The properties of the **TextPlacement** feature are described as follows:

Geometry (point) – the point location of the centre of the text string.

Text type – the attribute (or class) which is to be placed.

Flip bearing – the angle forming a semi-circle within which the text can be placed.

The **TextPlacement** feature is associated to the feature which carries the text being placed. The attribute **textType** determines which text string is to be displayed if more than one is present. The **TextPlacement** feature ensures that as maritime traffic management screen rotates from "north up" (e.g. if display is set to "course up") text can remain readable, or clear other important charted information.

2.8 Scale policy

Marine Traffic Management data must be compiled in the best applicable scale. The use of the data itself is "scale independent". That means that the data can be used at any scale. S-100 allows the association of multiple spatial attributes to a single feature instance. Each of these spatial attributes can in principle be qualified by maximum and minimum scales. **maximumDisplayScale** and **minimumDisplayScale** define the range of display scales within which a particular feature will be portrayed on the display if these scale minimum/maximum functions are enabled in the ECDIS or another GIS device. A geo feature with one or more spatial attributes can utilize the scale minimum and scale maximum attributes on the link to the spatial object. There are essentially two ways in which these attributes may be used.

1. A producer may decide to use only a scale minimum value. This option is employed when the data producer wishes to turn off the display of a feature above certain scales. This is particularly useful in areas with high data density, and when it is expected that the data will be used a larger scale where data clutter might become an issue. Features are therefore encoded with an applicable value, which represents the scale at which the producer wishes to turn off the feature.

2. A producer may decide to provide several pairs of scale minimum and scale maximum values. This decision may be based on the fact that for one particular feature different spatial instances in different scale ranges should be provided to supply this particular feature with more detailed geographic representation at larger scales.

An example can be a building which has two spatial objects associated, first one with only scale minimum value encoded at 21999, and the second spatial object encoded with scale maximum at 22000 and scale minimum encoded with 999999. These values would enable the use of a highly-detailed geometry at larger scales than 22000, and a less detailed geometry at scales of 22000 and less, while the building would be turned off at scales of 999999 and less.

A similar strategy can be followed to enable boundaries to conform to a scale-dependent geometry such as a coastline. Conformance at different scales can be achieved by using minimum/maximum scales on spatial attributes to indicate which particular geometry should be used at a given scale.

Authorities should cooperate at the regional or RENC level to determine a recommended scale range at which the portrayal of the information is suitable and consistent.

Scale
NULL (only allowed on minimum display scale where the maximum display scale = 10,000,000)
1:10,000,000
1:3,500,000
1:1,500,000
1:700,000
1:350,000
1:180,000
1:90,000
1:45,000
1:22,000
1:12,000
1:8,000
1:4,000
1:3,000

1:2,000
1:1,000

Table 2-11 Minimum display and maximum display scales

2.9 Masking

To improve the look and feel of the display of Marine Traffic Management datasets in ECDIS for the mariner certain features, or certain edges of features, should be masked.

2.9.1 Surface features crossing cell boundaries

When a single feature of type surface crosses the boundaries of adjoining Marine Traffic Management products, mask the edge where it shares the geometry of the boundary in each dataset:

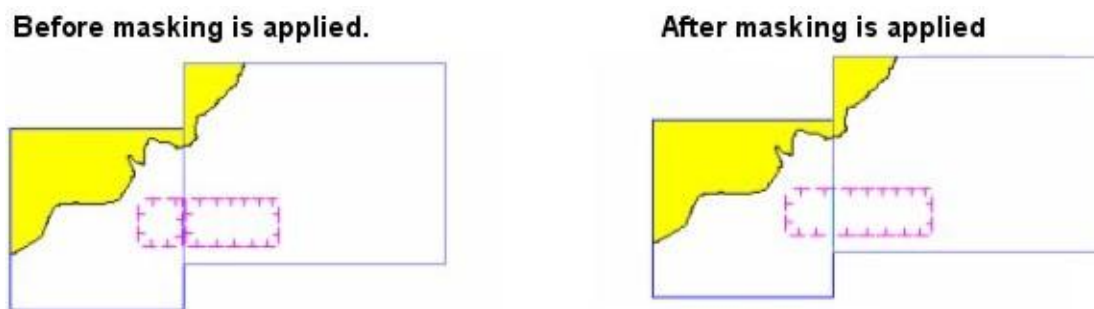


Figure 5 Surface feature crossing MRS products boundaries

This allows the features to be displayed as a single feature of type surface rather than being divided at the dataset product boundary and having the representation of two separate features.

NOTE: Some production software will automatically truncate (mask) features at the cell boundary.

NOTE: Occasionally an edge of the boundary of an area actually coincides with the data product boundary. Where this occurs and the production system applies automatic truncation (masking) of this edge, the compiler must “unmask” that edge so as to avoid the appearance of the area to be “open ended”.

Where features of type surface extend beyond the entire limit of data coverage for the data product (see clause 4.3), all edges of these area features should be masked.

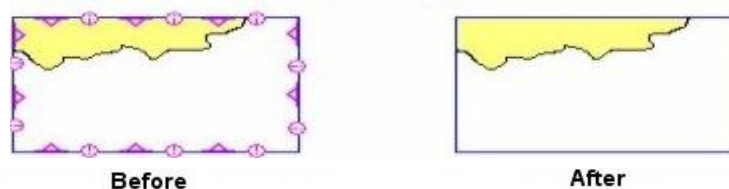


Figure 6 Surface features extending beyond the entire limit of data coverage

Table 2-11 lists those features of type surface that should have edges masked where the boundary of the area crosses or extends beyond the dataset limit or the area of data coverage of the dataset.

Feature Type	Comment
ConcentrationOfShippingHazardArea	
PilotageDistrict	
CautionArea	
RouteingMeasure	
UnderkeelClearanceAllowanceArea	
PilotBoardingPlace	
WaterwayArea	
RestrictedAreaNavigational	
RestrictedAreaRegulatory	
MilitaryPracticeArea	
VesselTrafficServiceArea	
LocalPortServiceArea	
ShipReportingServiceArea	
PlaceOfRefuge	
PiracyRiskArea	
PilotService	
UnderkeelClearanceManagementArea	

Table 2-11 Features of which edges have to be masked when crossing the dataset boundary

2.9.2 “Linear” surface features

If it is required to encode a linear feature when the only allowable primitive for the relevant feature type is surface (e.g. a service area along a track, or channel), a “very narrow surface” should be encoded. The suggested extent is 0.3mm wide at viewing scales (keeping in mind that S-100 permits different spatial attributes at different scales.) An edge of this surface should correspond to the position of the line. All other edges should be masked.

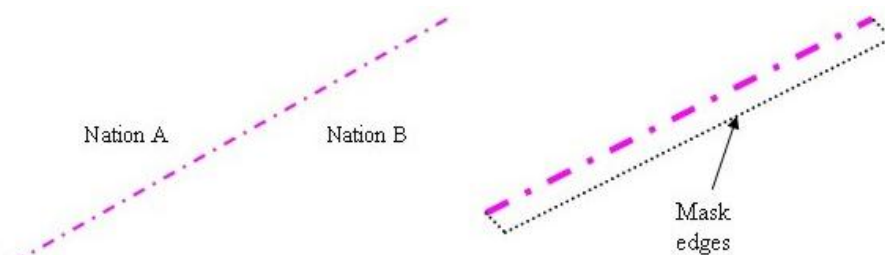


Figure 7 “Linear” Maritime Traffic Management Services

3 Description of table format for feature and information types

X.X Clause heading

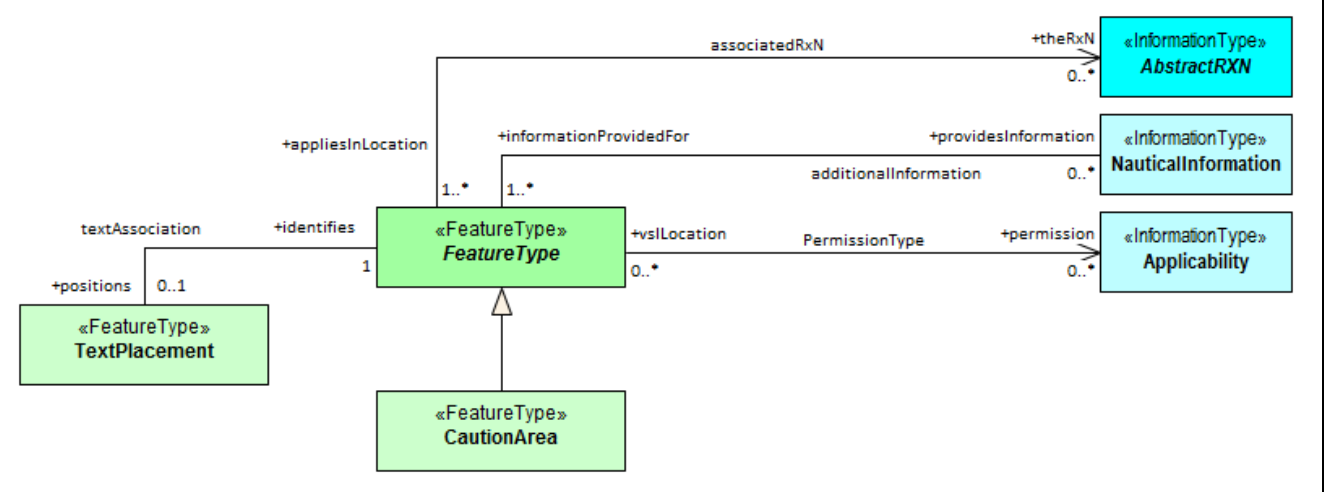
IHO Definition: FEATURE: Definition. (Authority for definition).							
S-127[Geo/Information] Feature: Feature (S-57 Acronym) S-127 feature and corresponding S-57 acronym (if applicable)							
Primitives: Allowable geometric primitive(s) [Point, Curve, Surface]							
<i>Real World</i> Example if real world instance(s) of the Feature.	<i>Paper Chart Symbol</i> Example(s) of paper chart equivalent symbology for the Feature (if applicable).	<i>ECDIS Symbol</i> Example(s) of proposed ECDIS symbology for the Feature.					
S-127 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity			
This section lists the allowable attributes for the S-127 feature. This row is not used in this DCEG. Instead, the attributes are described by the picture below.							
<p>In the S-127 DCEG, the attributes are depicted by UML diagrams showing the direct and inherited attributes for the feature or information class, their complex attributes, and allowable encoding values for enumeration attributes. In the example below, the CautionArea feature has two direct attributes (condition and status, each with multiplicity 0 or 1). They are enumeration attributes, and the allowed values each may take in a CautionArea feature are shown in the “enumeration” boxes. The CautionArea feature also inherits five complex attributes from the abstract class FeatureType; details of the inherited attributes are not shown in the figure but can be seen in the feature table that describes the FeatureType abstract feature.</p> <p>The usual UML conventions apply. For explanations of standard UML notations, see S-100 Part 1. For explanations of the colour conventions, see clause 6.2 in the S-127 (Main) Product Specification.</p> <div><div><div><i>FeatureType</i></div><div>«FeatureType» CautionArea</div><div>«SimpleAttribute» + condition: condition [0..1] + status: status [0..1] «SpatialAttribute» + geometry: PointOrSurface [0..*] «ComplexAttribute» ::FeatureType + fixedDateRange: fixedDateRange [0..1] + periodicDateRange: periodicDateRange [0..*] + featureName: featureName [0..*] + sourceIndication: sourceIndication [0..1] + textContent: textContent [0..*]</div></div><div><div>«enumeration» condition</div><div>under construction = 1 under reclamation = 3 planned construction = 5</div><div>«enumeration» status</div><div>periodic/intermittent = 5 temporary = 7</div></div></div>							
Feature/information associations							
Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
This sub-table is not used in							

this DCEG. Instead, the associations are described by the picture below.							
--------------------------------------------------------------------------	--	--	--	--	--	--	--

In the S-127 DCEG, the associations are depicted by a UML diagram showing the relationships that apply to the class and its super-classes (generalizations). Relationships which are inherited from super-classes are shown by including the super-classes and their associations in the diagram. In the example below, **CautionArea** has no direct associations, but inherits one feature association and three information associations from the abstract class **FeatureType**.

Note that since the information type **AbstractRXN** is a super-class of the four information types **Regulations**, **Restrictions**, **Recommendations**, and **NauticalInformation** (see clause 7.2), the **AssociatedRXN** relationship of **CautionArea** (or any other sub-class of **FeatureType**) applies to those four classes.

The usual UML conventions apply. For explanations of standard UML notations, see S-100 Part 1. For explanations of the conventions used for associations, see clause 2.5 in this DCEG.



INT 1 Reference: The INT 1 location(s) of the Feature – by INT1 Section and Section Number (if applicable).

X.X.X Sub-clause heading(s) (see S-4 – B-YYY.Y)

Introductory remarks. Includes information regarding the real world entity/situation requiring the encoding of the Feature in the ENC, and where required nautical cartographic principles relevant to the Feature to aid the compiler in determining encoding requirements.

Specific instructions to encode the feature.

Remarks:

- Additional encoding guidance relevant to the feature.

X.X.X.X Sub-sub-clause heading(s) (see S-4 – B-CCC.C)

Clauses related to specific encoding scenarios for the Feature (if required).

Remarks:

- Additional encoding guidance relevant to the scenario (if required).

Distinction: List of features in the Product Specification distinct from the Feature.

Remarks:

S-127 Attribute: Indentation of attributes indicates sub-attributes of complex attributes. Complex attributes may also be sub-attributes of complex attributes, which is indicated by further indentation of the attribute name in the tables.

S-127 Attribute: Attributes shown in grey text are ECDIS “system” attributes which are not visible to the encoder, but are populated by the ENC production system in order to assist with portrayal of ENC data in ECDIS.

S-57 Acronym: S-57 attribute acronyms shown in italic style text have been re-modelled in S-101 from S-57.

Allowable Encoding Value: For (EN) type attributes, the enumerates listed are only those allowable for the particular occurrence of the attribute relevant to the feature. Allowable values may vary for the attribute depending on the feature to which the attribute is bound. Such bindings are defined in the S-127 Feature Catalogue. The full list of enumerates that may be assigned to an attribute in S-127 can be found in the Simple Attributes section of the printed feature catalogue document.

Type: The prefix (C) indicates that the attribute is a complex attribute. Complex attributes are aggregates of other attributes that can be simple type or complex type (see Product Specification main document clause 7.3). The prefix (S) indicates that the attribute is a sub-attribute of a complex attribute. Complex attributes that are sub-attributes of a complex attribute, and their sub-attributes, are indicated by indentation of the attribute name in the S-127 Attribute column.

Association ends and multiplicities: A lower bound of 0 in the multiplicity at any end of an association indicates only that the association is not mandatory for any particular instance of the feature at the other end (i.e., it is not mandatory for an instance of “that” feature type to have an association to a feature of “this” type). A lower bound of “1” means that if an instance of “that” type exists, it must be associated to an instance of “this” type. If the association is actually encoded then it amounts to saying that “this relationship exists between these two instances” and there must be an appropriate feature instance at both ends. Associations that are not mandatory should be encoded if and only if they convey useful information.

4 Metadata Features

4.1 Introduction

The maximum use must be made of meta features to reduce the attribution on individual features. Some meta features are mandatory in a dataset; see S-127 Product Specification main document clauses 10.9 and 10.11.

4.2 Mandatory meta features

The mandatory meta features are given in the following list:

Data Coverage

Quality of non-Bathymetric Data

4.3 Data coverage meta feature

Data Coverage: In order to assist in data discovery, the meta feature **Data Coverage** must be used to provide the area of coverage of the S-127 dataset. This means that **Data Coverage** expresses where the presence or absence of S-127 geographic features is asserted. Unlike S-101 datasets, there is no 'skin of the earth' principle in S-127 and there may be regions covered by a **Data Coverage** but where no geographic S-127 feature is present.

IHO Definition: DATA COVERAGE . A geographical area that describes the coverage and extent of spatial types. (Adapted from S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.210, November 2000).					
S-127 Metadata Feature: Data Coverage (M_COVR)					
Primitives: Surface					
<i>Real World</i>		<i>Paper Chart Symbol</i>		<i>ECDIS Symbol</i>	
S-127 Attribute		S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
<div><div>«FeatureType» S-127 Meta Features::DataCoverage</div><div>«SimpleAttribute» + maximumDisplayScale: Integer + minimumDisplayScale: Integer «SpatialAttribute» + geometry: GM_OrientableSurface [1..*]</div></div>					
There are no associations for Data Coverage features.					
INT 1 Reference: The meta feature Data Coverage encodes the area covered by the dataset. This feature is also used to provide the ECDIS with the scale information necessary for the determination of dataset loading and unloading in relation to the user selected viewing scale in the ECDIS. There must be a minimum of one Data Coverage feature in a dataset. Data Coverage features must cover at least the extent of the spatial types in the dataset, and must not overlap.					

The use of S-127 data is scale-independent (see clause 2.8) and minimum display scale will normally be (null) and maximum display scale 1000 (the extreme values in the table of scales in the S-101 ENC, see Table 2-11). Should a producer need to encode different maximum and minimum display scales from the extreme (i.e., create scale-dependent datasets), the values of maximum and minimum display scales should be harmonized with base layer S-101 datasets (see the S-101 DCEG clause 3.4.1).

Given that S-127 data will overlay ENC and possibly other datasets, the conditions described in S-101 clause 3.4.1 for displaying overscale warnings and setting the viewing scale may be overridden by interoperability constraints or the presence of higher-priority datasets. The specification of such behaviour is out of scope for this document (the S-100 interoperability specification should address it for ECDIS).

Remarks:

- This meta feature is intended to support an indication of coverage.
- Where a dataset consists of only one Data Coverage feature, the value for the maximum display scale populated in the dataset discovery metadata must be the same as the value populated for maximum display scale on the Data Coverage.
- For any **Data Coverage** feature, maximum display scale < minimum display scale.

Distinction: None

4.4 Data Quality

IHO Definition: **DATA QUALITY.** Abstract feature type for data quality meta-features.

S-127 Geo Feature: Data Quality (Abstract)

Primitives: Surface

Real World

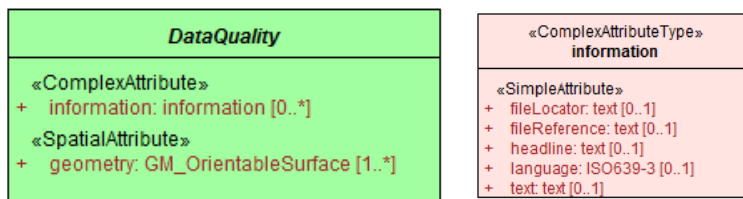
Paper Chart Symbol

ECDIS Symbol

S-127 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.



There are no associations for **Data Quality**.

INT 1 Reference:

[no reference]

Remarks:

[no remarks]

Distinction:

4.5 Quality of Temporal Variation

IHO Definition: **QUALITY OF TEMPORAL VARIATION**. Abstract type for meta-feature which can describe temporal variation.

S-127 Geo Feature: **Quality Of Temporal Variation (Abstract)**

SuperType: Data Quality (Abstract)

Primitives: Surface

Real World

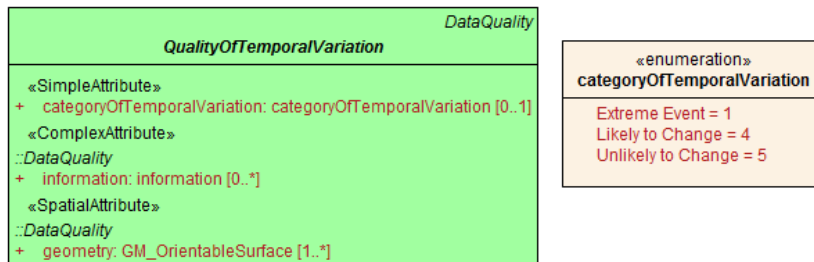
Paper Chart Symbol

ECDIS Symbol

S-127 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.



There are no associations for **Quality Of Temporal Variation**.

INT 1 Reference:

[no reference]

Remarks:

[no remarks]

Distinction:

4.6 Quality of non-bathymetric data

IHO Definition: QUALITY OF NON-BATHYMETRIC DATA. An area within which the best estimate of the overall uncertainty of the data is uniform. The overall uncertainty takes into account for example the source accuracy, chart scale, digitising accuracy etc. (Adapted from S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.208, November 2000).

S-127 Metadata Feature: Quality of non-bathymetric data (M_ACCY)

Primitives: Surface

SuperType: Quality of Temporal Variation (Abstract)

Real World

Paper Chart Symbol

ECDIS Symbol

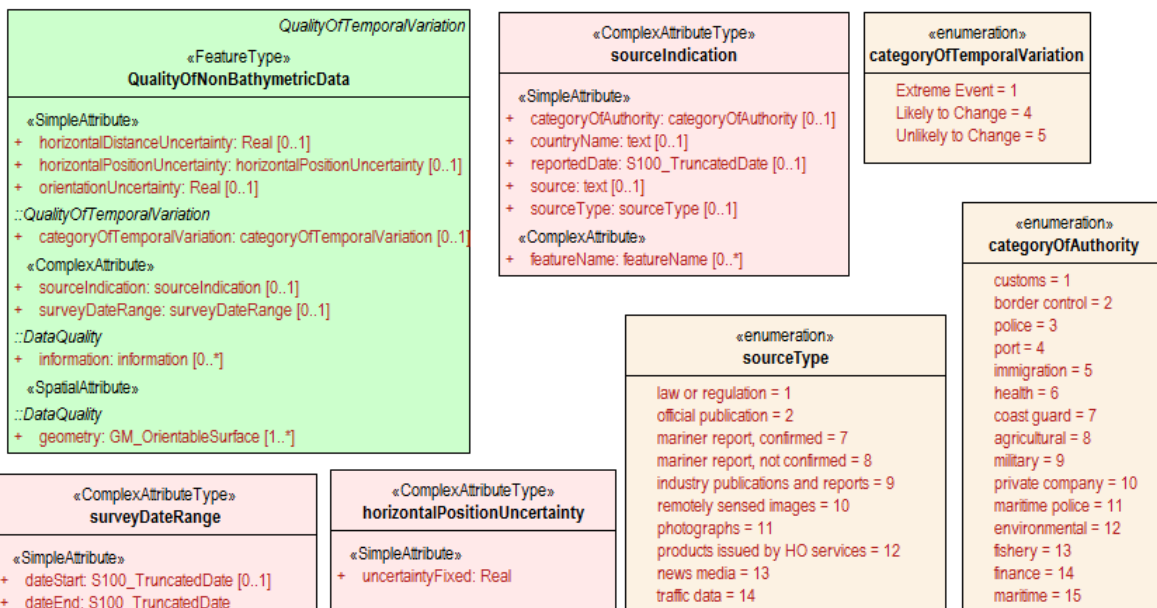
S-127 Attribute

S-57 Acronym

Allowable Encoding Value

Type

Multiplicity



INT 1 Reference:

Quality of positions

The meta feature **Quality of Non-bathymetric Data** may be used to provide an indication of the overall uncertainty of position for all non-bathymetric features. It must not be used to provide the uncertainty of bathymetric information.

The attribute **horizontal position uncertainty** may be applied to any spatial type, in order to qualify the location of a feature.

Horizontal distance uncertainty and **horizontal position uncertainty** must not be applied to the spatial type of any geo feature if they are identical to the **horizontal distance uncertainty** and **position uncertainty** values of the underlying meta feature.

Position uncertainty on the **Quality of Non-bathymetric Data** applies to non-bathymetric data situated within the area, while **position uncertainty** on the associated spatial types qualifies the location of the **Quality of Non-bathymetric Data** feature itself.

Remarks:

- No remarks.

Distinction: [None].

5 Geo Features

This clause describes abstract as well as non-abstract types. The abstract type **Feature Type** cannot be used directly, but defines attributes inherited by its sub-types. The encoding remarks in the description of **Feature Type** apply to its sub-types but may be overridden by remarks in the sub-type.

5.1 Feature Type

IHO Definition: FEATURE TYPE . Generalized feature type which carries all the common attributes									
S-127 Geo Feature: Feature Type (Abstract)									
Primitives: None									
<i>Real World</i>			<i>Paper Chart Symbol</i>			<i>ECDIS Symbol</i>			
S-127 Attribute			S-57 Acronym		Allowable Encoding Value			Type	Multipl icity
Information associations									
Type	Association Name		Class	Role	Mult.	Class		Role	Mult.

Distinction:

5.2 Organisation Contact Area

IHO Definition: ORGANISATION CONTACT AREA. A feature often associated with contact information for an organization that exercises a management role or offers a service in the location.

S-127 Geo Feature: Organisation Contact Area (Abstract)

SuperType: Feature Type (Abstract)

Primitives: None

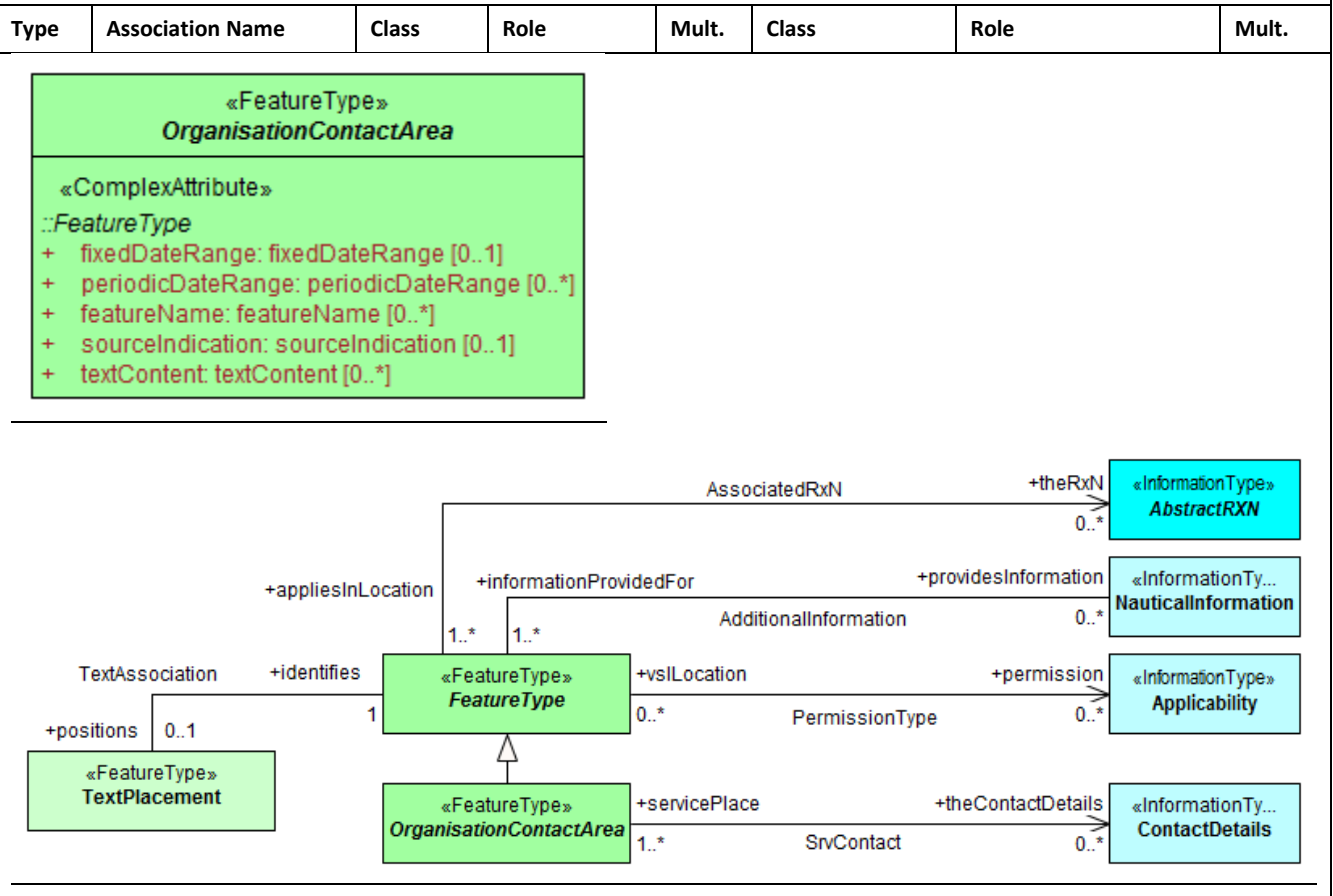
Real World

Paper Chart Symbol

ECDIS Symbol

S-127 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
[No additional attributes]				

Information associations



INT 1 Reference:

[no reference]

Remarks:

- Adds the *SrvContact* association to **Contact Details** for any sub feature class.

Distinction:

5.3 Supervised Area

IHO Definition: **SUPERVISED AREA.** A location which may be supervised by a responsible or controlling authority.

S-127 Geo Feature: Supervised Area (Abstract)

SuperType: Organisation Contact Area (Abstract)

Primitives: None

Real World

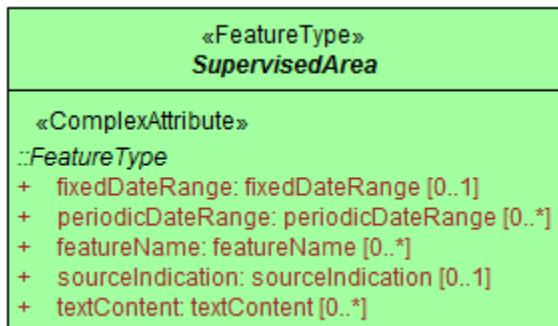
Paper Chart Symbol

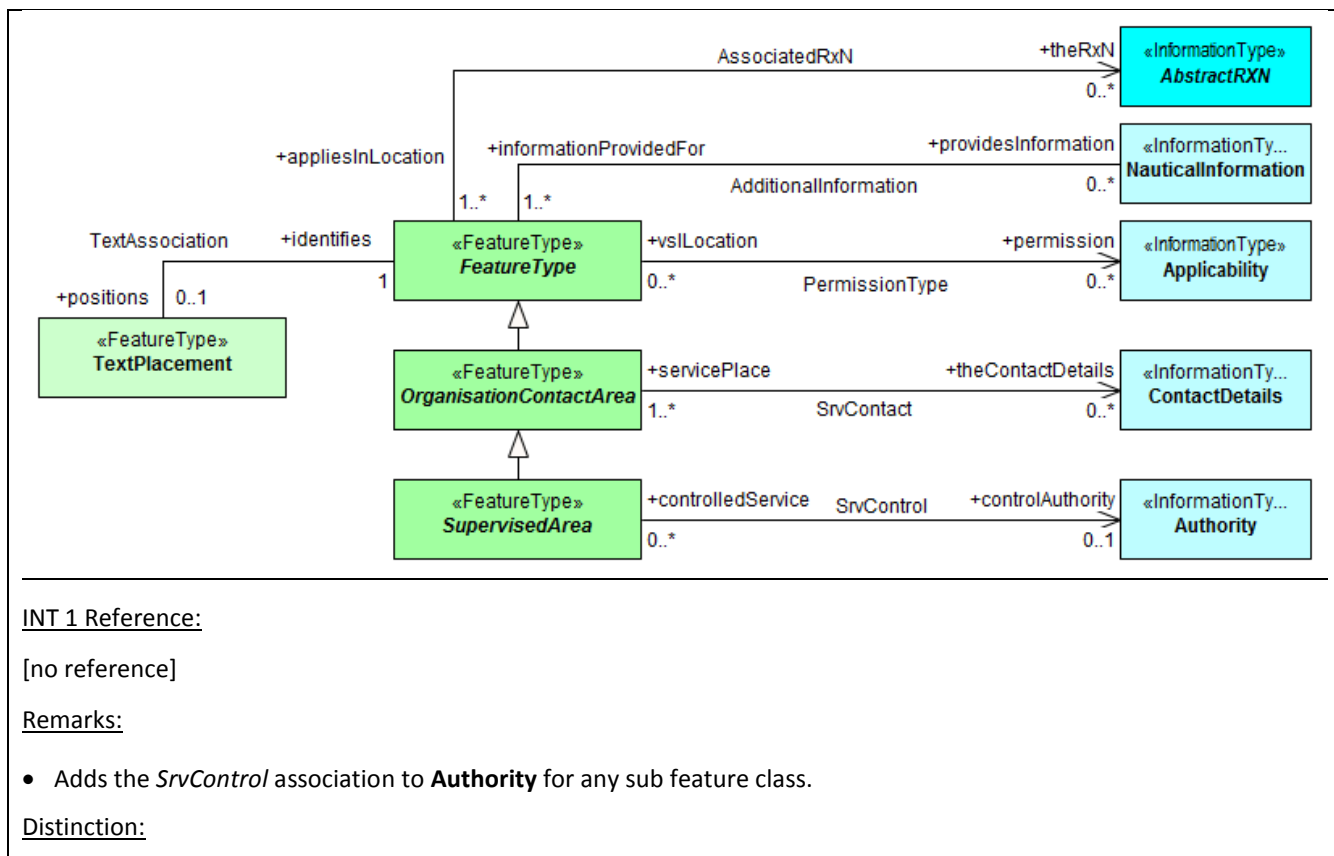
ECDIS Symbol

S-127 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
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5.4 Reportable Service Area

IHO Definition: **REPORTABLE SERVICE AREA.** A service area that generally has requirements for submission of information, including communications not strictly considered “reporting.”

S-127 Geo Feature: Reportable Service Area (Abstract)

SuperType: Supervised Area (Abstract)

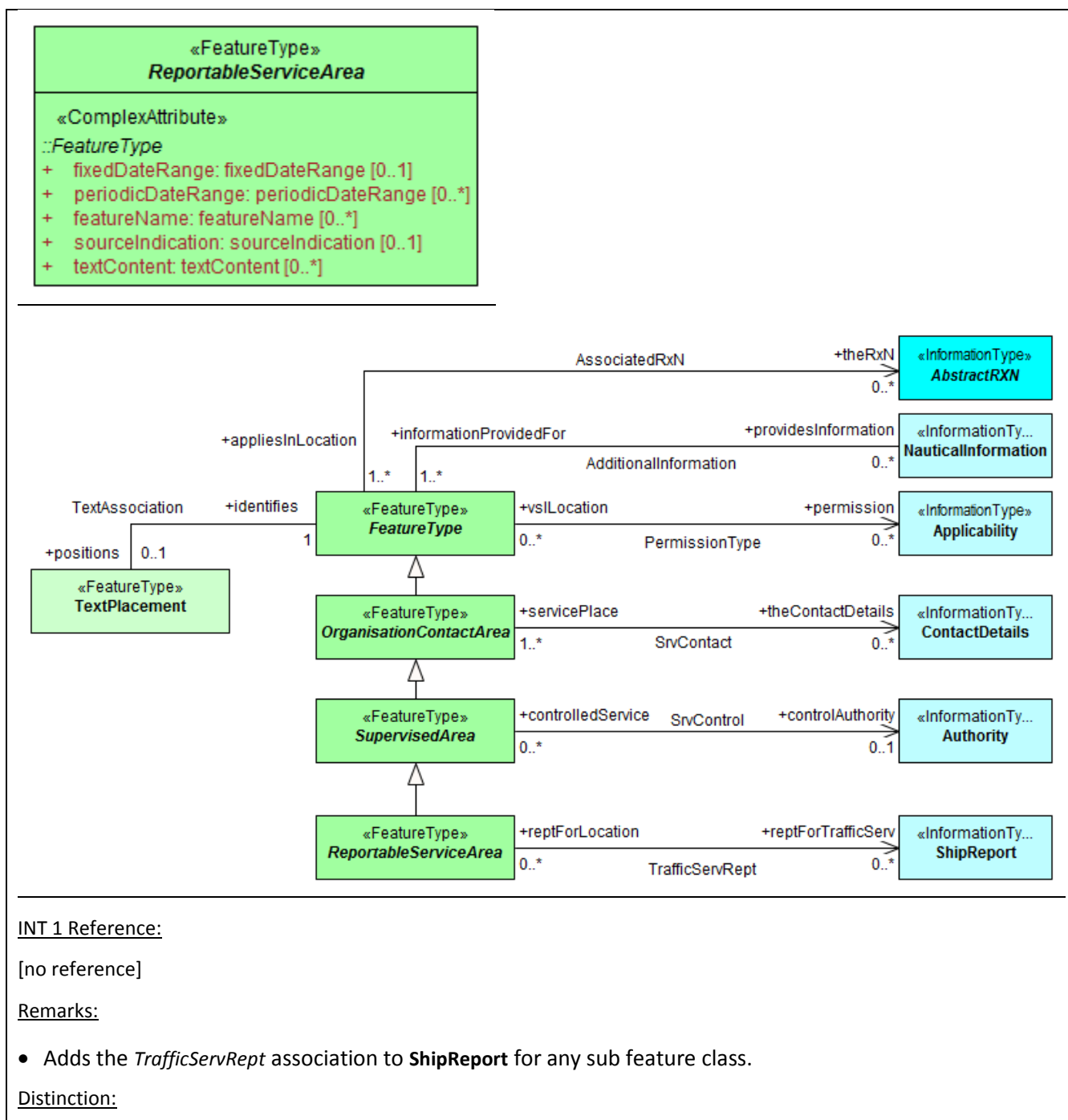
Primitives: None

Real World

Paper Chart Symbol

ECDIS Symbol

S-127 Attribute		S-57 Acronym		Allowable Encoding Value		Type	Multiplicity
<u>Information associations</u>							
Type	Association Name	Class	Role	Mult.	Class	Role	Mult.



5.5 Caution area

IHO Definition: **CAUTION AREA.** Generally, an area where the mariner has to be made aware of circumstances influencing the safety of navigation. (S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.33, November 2000).

S-127 Geo Feature: **Caution area (CTNARE)**

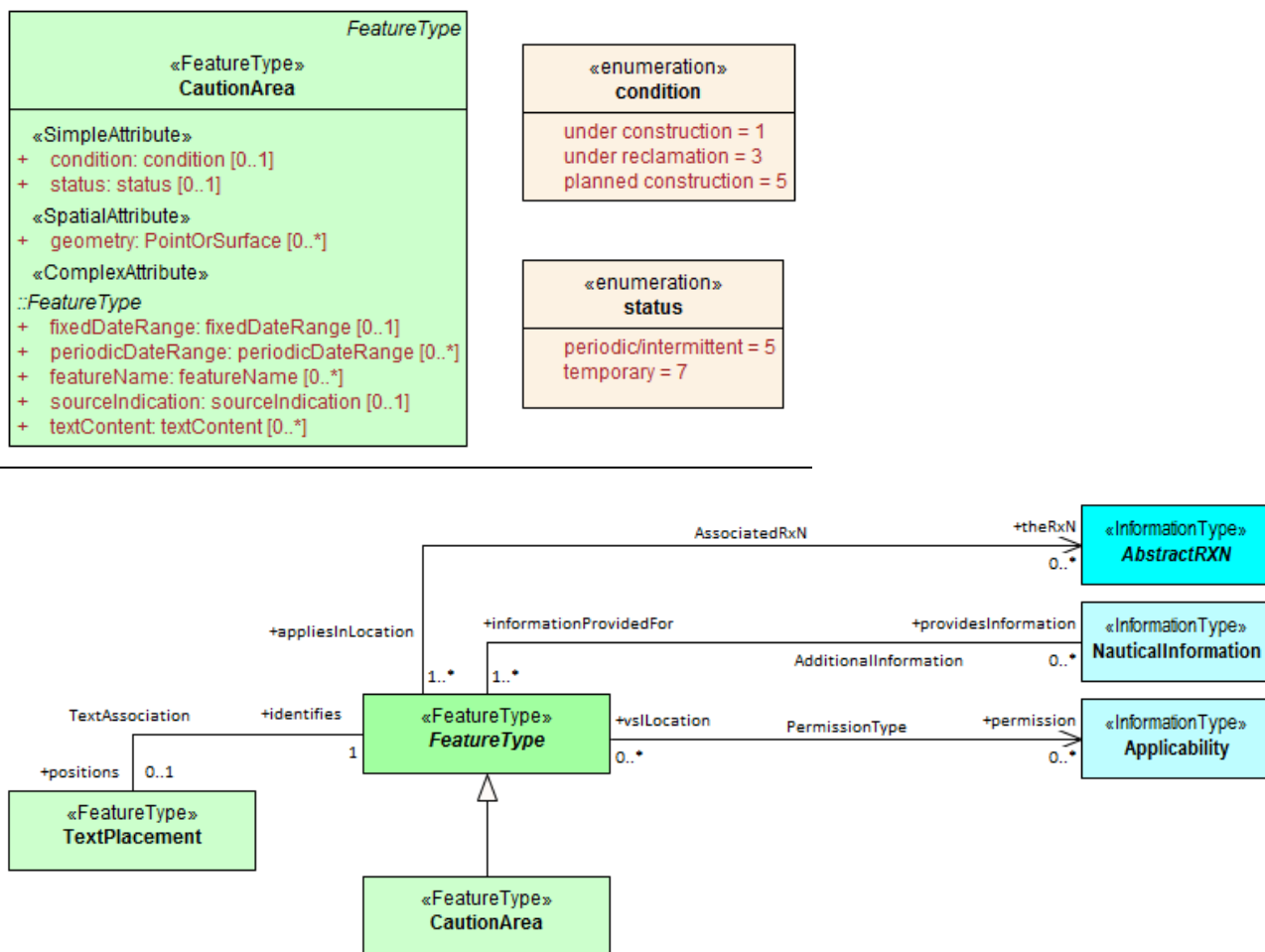
SuperType: Feature Type (Abstract)

Primitives: Point, Surface

S-127 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multipl icity
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Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
------	------------------	-------	------	-------	-------	------	-------



INT 1 Reference:

5.2.1 Caution areas (see S-4 – B-242)

If it is required to identify an area in which the mariner must be aware of circumstances influencing the safety of navigation (for example an area of continually changing depths), and which cannot be encoded using other feature types, it must be done using the feature **Caution Area**. This feature may be required to identify a danger, a risk, a rule or advice that is not directly related to a particular feature.

Remarks:

- To encode the relevant cautionary information, an instance of the information type **Nautical Information** (see clause 7.3) must be associated to the **Caution Area**.
- If the information applies to a specific area the **Caution Area** feature should cover only that area.

- If the information to be encoded is spatially linear, this should be encoded using a “very narrow” **Caution Area** feature of type area (approximately 0.2mm wide at the maximum display scale of the ENC data) similar to the method for encoding linear maritime jurisdiction areas (see S-101 DCEG clause 2.5.10).
- Information which may be of use to the mariner, but is not significant to safe navigation and cannot be encoded using other feature types, should be encoded using a different feature type and an associated instance of the information type **Nautical Information** (see clause 7.3), complex attribute **information** (see clause 8.8). This encoding is intended to reduce the number of alarms or indications generated in the ECDIS due to the overuse of **Caution Area** features.
- Notes should be kept to a minimum and be as concise as is compatible with accuracy and intelligibility. Hydrographic terminology (jargon) should be avoided, giving preference to easily understood words, for example “depths” rather than “bathymetry”.
- In order to ensure correct ECDIS display, **Caution Area** features of type surface should not share the geometry of features such as **Depth Contour** (S-101) and other features with higher ECDIS display priorities, as the **Caution Area** will appear to be “open ended”, which may confuse the mariner. Where this occurs, the edge of the **Caution Area** should be extended outward to clear the “shared” edge, sufficient to avoid “duplicate geometry” validation errors (that is, at least 0.3 mm at the maximum display scale for the ENC data).

Distinction: Collision regulations limit; depth discontinuity; information area; obstruction; underwater/awash rock; unsurveyed area; wreck.

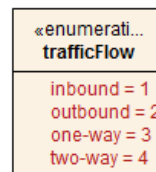
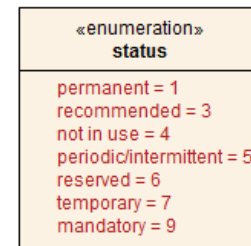
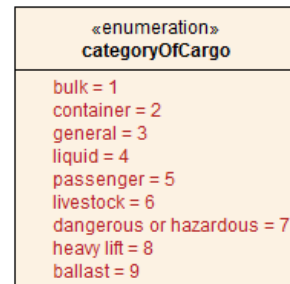
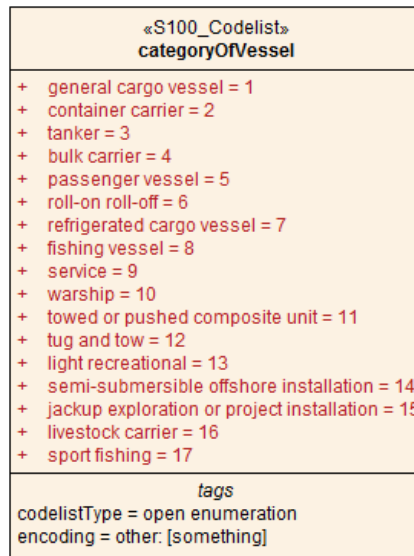
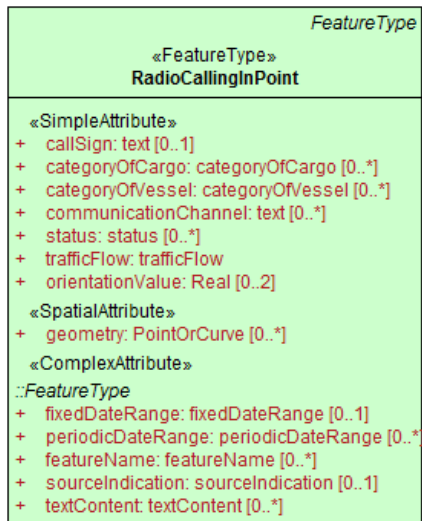
5.6 Radio Calling-In Point

IHO Definition: **RADIO CALLING-IN POINT.** A designated position at which vessels are required to report to a Traffic Control Centre. Also called reporting point or radio reporting point. (IHO Dictionary – S-32).

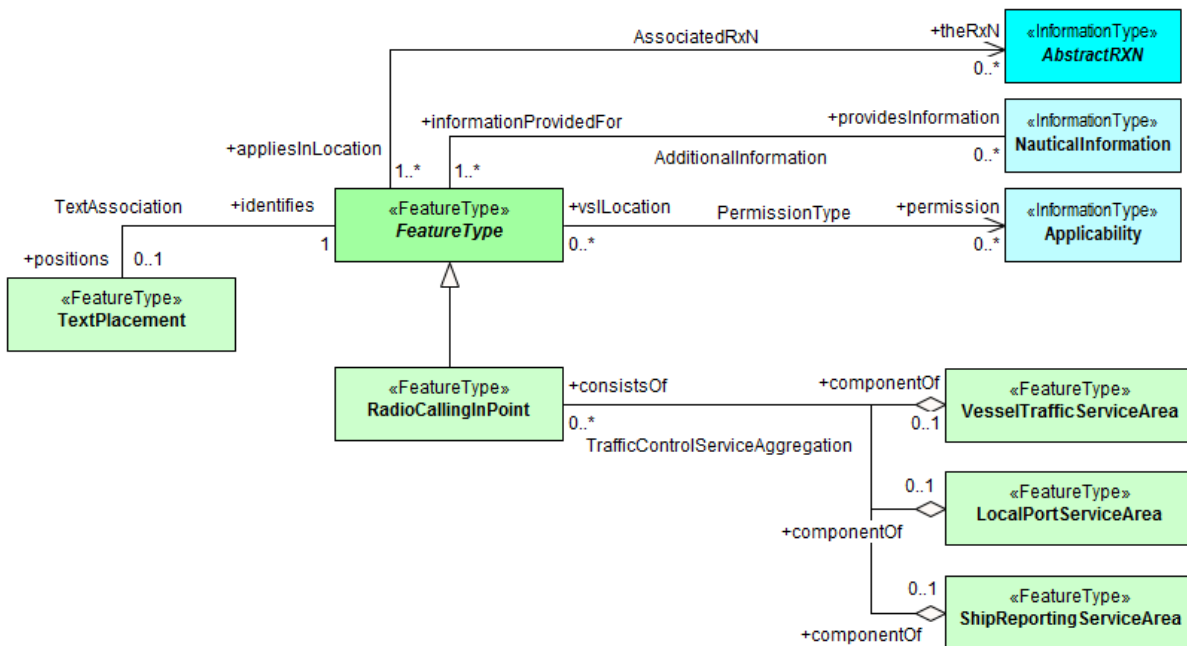
S-127 Geo Feature: Radio calling-in point (RDOCAL)

SuperType: Feature Type (Abstract)

Primitives: Point, Curve



For attributes inherited from FeatureType see the FeatureType table



INT 1 Reference: M 40.1-2

5.6.1 Radio calling-in (reporting) points (see S-4 – B-488.1 and B-488.2)

Radio reporting points, also called radio calling-in points, have been established in certain busy waterways and port approaches to assist traffic control. On passing these points or crossing a defined line, vessels are required to report on VHF to a Traffic Control Centre.

If it is required to encode a radio reporting point or line, it must be done using the feature **Radio Calling-in Point**.

Remarks:

- Each **Radio Calling-In Point** feature of type point must carry at least one orientation. If it is required to encode the reciprocal orientation, to indicate that a bearing and its opposite apply to a **Radio Calling-In Point** feature, it must be done using attribute **trafficFlow** = 4 (two-way). If the same position is used for another orientation (not opposite) of traffic flow, a second **orientationValue** attribute must be encoded.
- The complex attribute **featureName**, sub-attribute **name** is used to encode the name and/or alphanumeric designator of the **Radio Calling-In Point**.
- Regulations, restrictions, and recommendations are encoded using one or more instances of the information classes **Regulations**, **Restrictions**, or **Recommendations**. For example, if the requirement to report by radio relates to certain classes of vessels only.
- An associated instance of the information class **Nautical Information** (see clause 7.3), complex attribute **information** is used to provide additional information, when **Regulations**, **Restrictions**, or **Recommendations** are not appropriate.
- **Radio Calling-In Point** features of type curve must be encoded such that resultant direction of the line (accounting for the direction of digitising and any subsequent reversal of the curve) is related such that the direction of traffic that is required to report is to the right. For curve features, it is not required to populate **orientation**.
- If it is required to encode the area of a Vessel Traffic Service (VTS) containing radio reporting points or requiring periodic position reporting, this should be done using the feature **Vessel Traffic Service Area** (see clause 5.24).
- Each VHF-channel should be indicated, using the attribute **communicationChannel** (see Appendix C-1).
- If it is required to encode the cargo of a vessel required to report when passing the radio calling-in point, this must be done using the **categoryOfCargo** attribute.
- If it is required to encode a specific type of vessel that is required to report when passing the radio calling-in point, this must be done using the **categoryOfVessel** attribute.

Distinction: pilot boarding place; Vessel Traffic Service area.

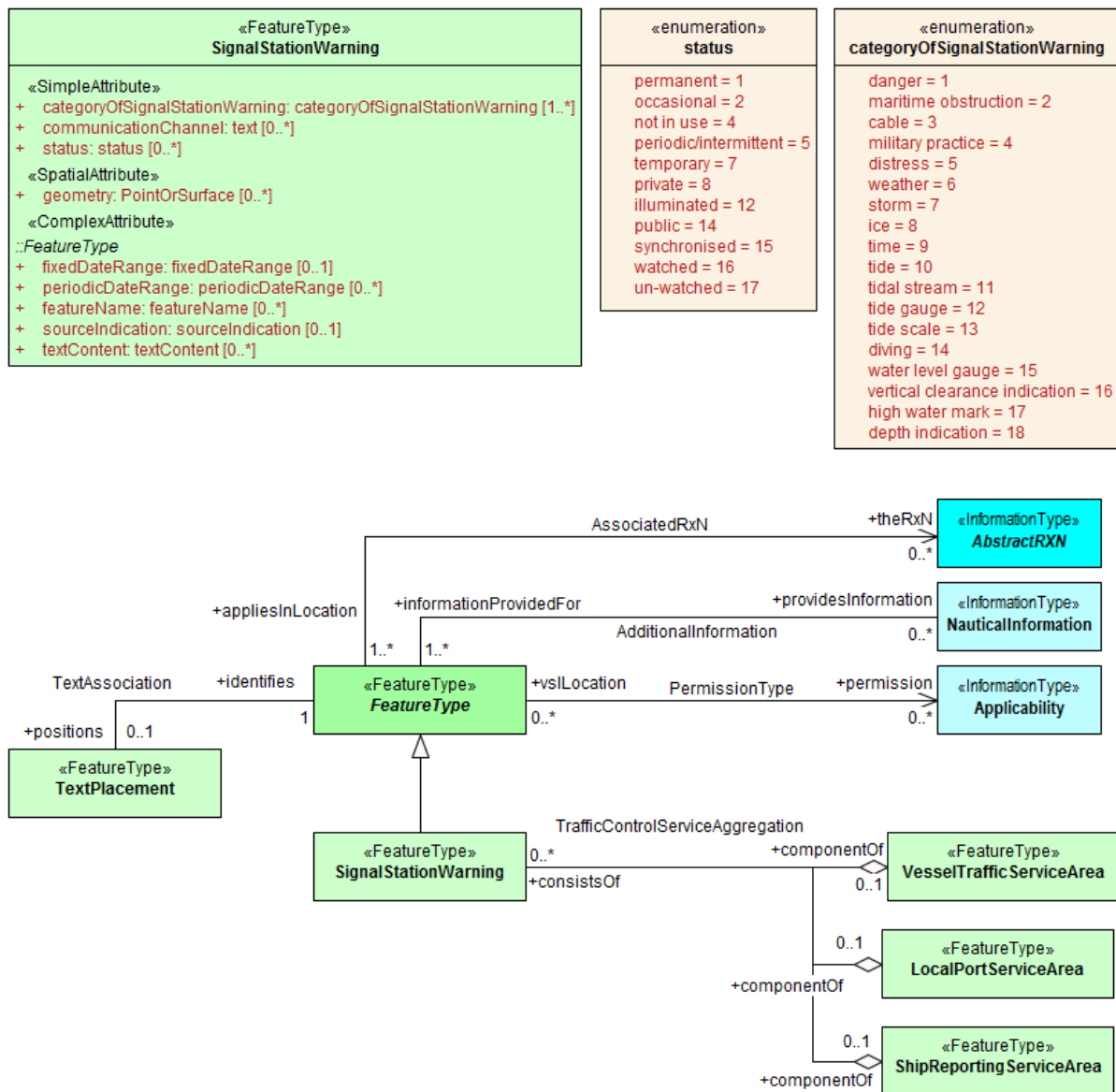
5.7 Warning signal stations

IHO Definition: **SIGNAL STATION, WARNING**. A warning signal station is a place on shore from which warning signals are made to ships at sea. (Adapted from IHO Dictionary – S-32 and Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2012).

S-127 Geo Feature: Signal station warning (SISTAW)

Primitives: Point, Surface

SuperType: Feature Type (Abstract)



INT 1 Reference: T 20, 26, 28-36

5.7.1 Warning signal stations (see S-4 – B-494; B-496-7)

Signal stations communicating visually have declined in importance. They are encoded for their main role of signalling information and instructions, and also as a form of landmark. The signals generally exhibit lights by day and night but may display shapes or flags by day.

If it is required to encode a warning signal station, it must be done using the feature **Signal Station Warning**.

Remarks:

- The **Signal Station Warning** must only be used to describe the function of the signal station, independent of any building or structure that the **Signal Station Warning** is associated with.

- Each VHF-channel should be indicated, using the attribute **communicationChannel** (see Appendix C-1).

Distinction: Signal station, traffic.

5.8 Signal Station Traffic

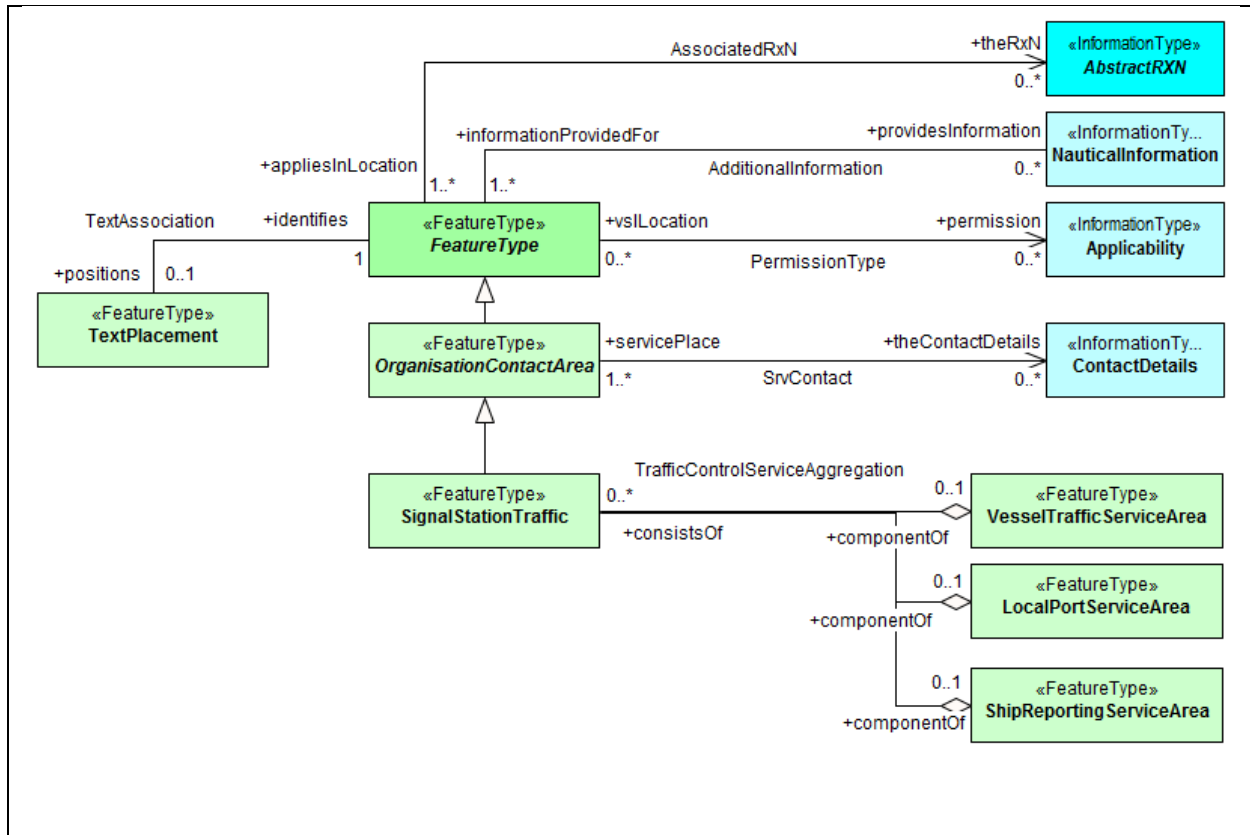
IHO Definition: SIGNAL STATION, TRAFFIC. A traffic signal station is a place on shore from which signals are made to regulate the movement of traffic. (Adapted from IHO Dictionary – S-32 and S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.155, November 2000).

S-127 Geo Feature: Signal station traffic (SISTAT)

SuperType: Organisation Contact Area (Abstract)

Primitives: Point, Surface

«FeatureType» SignalStationTraffic	«enumeration» categoryOfSignalStationTraffic	«enumeration» status
«SimpleAttribute» + categoryOfSignalStationTraffic: categoryOfSignalStationTraffic [1..*] + communicationChannel: text [0..*] + status: status [0..*] «SpatialAttribute» + geometry: PointOrSurface [0..*] «ComplexAttribute» ::FeatureType + fixedDateRange: fixedDateRange [0..1] + periodicDateRange: periodicDateRange [0..*] + featureName: featureName [0..*] + sourceIndication: sourceIndication [0..1] + textContent: textContent [0..*]	port control = 1 port entry and departure = 2 international port traffic = 3 berthing = 4 dock = 5 lock = 6 flood barrage = 7 bridge passage = 8 dredging = 9 traffic control light = 10 oncoming traffic indication = 13	permanent = 1 occasional = 2 not in use = 4 periodic/intermittent = 5 temporary = 7 private = 8 illuminated = 12 public = 14 synchronised = 15 watched = 16 un-watched = 17



INT 1 Reference: T 21-25.2

5.8.1 Traffic signal stations (see S-4 – B-494-5)

Signal stations communicating visually have declined in importance. They are encoded on the largest maximum display scale ENC data not only for their main role of signalling information and instructions but also as a form of landmark. The signals generally exhibit lights by day and night but may display shapes or flags by day.

The nature of traffic signals varies from country to country and even from port to port. For charting purposes traffic signals can be considered to include, for instance:

- Port entry and departure signals;
- Lock, docking, and berthing signals;
- Bridge signals;
- International traffic signals.

If it is required to encode a traffic signal station, it must be done using the feature **Signal Station Traffic**.

Remarks:

- **Signal Station Traffic** should not be used to encode a bridge light marking the centre of a navigable span.
- The **Signal Station Traffic** must only be used to describe the function of the signal station, independent of any building or structure that the **Signal Station Traffic** is associated with.
- Each VHF-channel should be indicated, using the attribute **communicationChannel** (see Appendix C-1).

Distinction: Signal station, warning.

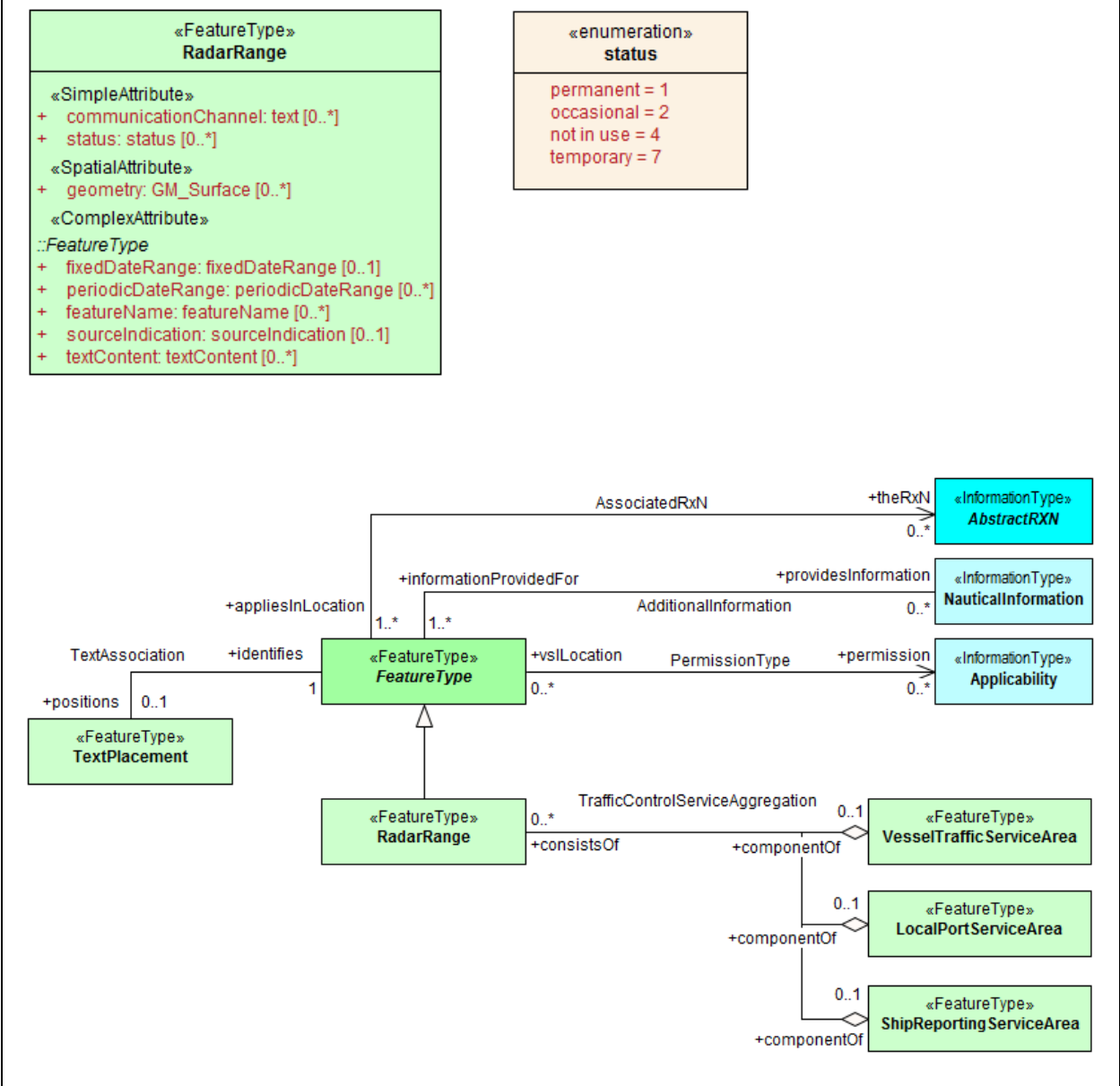
5.9 Radar Range

IHO Definition: RADAR RANGE. Indicates the coverage of a sea area by a radar surveillance station. Inside this area a vessel may request shore-based radar assistance, particularly in poor visibility. (Adapted from Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2010).

S-127 Geo Feature: Radar range (RAD RNG)

SuperType: Feature type (Abstract)

Primitives: Surface



INT 1 Reference: M 31

5.9.1 Radar ranges (see S-4 – B-487.1)

Many large ports have a radar surveillance system covering their approaches to provide guidance for vessels, particularly in poor visibility. The maximum range of the system forms an arc or series of overlapping arcs.

If it is required to encode a radar range, it must be done using the feature **Radar Range**.

Remarks:

- Each VHF-channel should be indicated, using the attribute **communicationChannel** (see Appendix C-1).

Distinction: Vessel Traffic Service area.

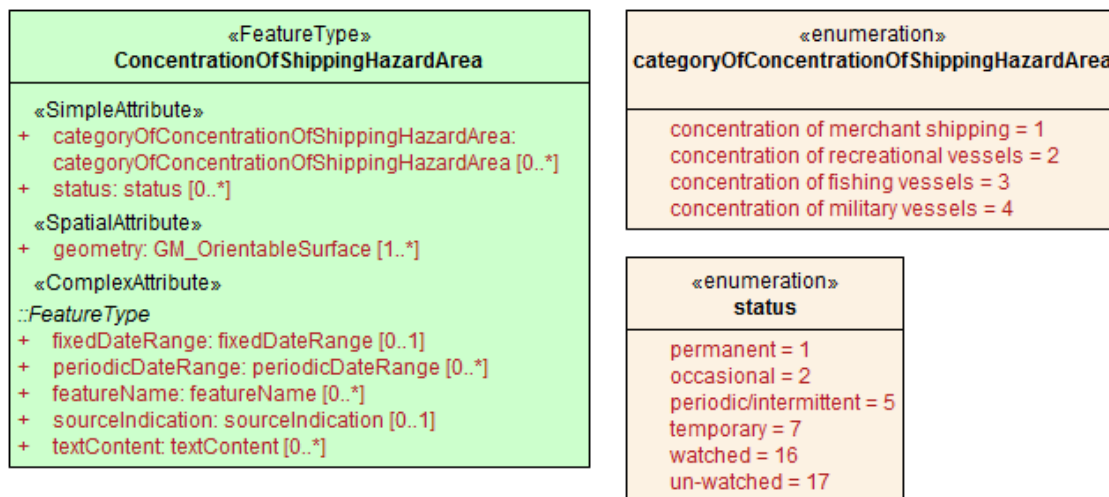
5.10 Concentration of Shipping Hazard Area

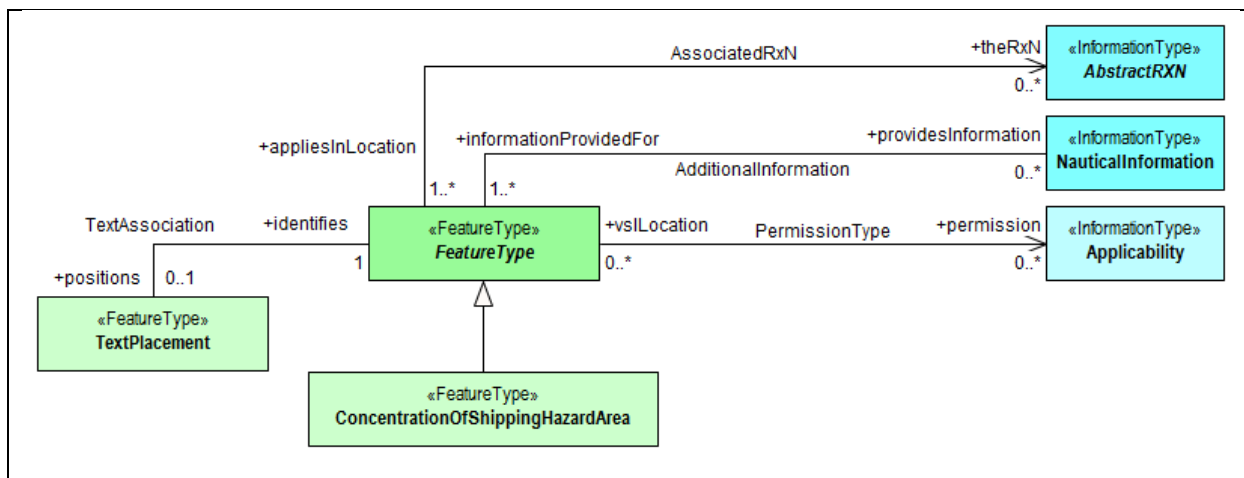
IHO Definition: Concentration of shipping hazard area. An area where hazards, caused by concentrations of shipping, may occur. Hazards are risks to shipping, which stem from sources other than shoal water or obstructions.

S-127 Geo Feature: Concentration of shipping hazard area (CONSHA)

SuperType: Feature Type (Abstract)

Primitives: Surface





INT 1 Reference:

In many waterways the amount of regular occurring ship traffic, fishing activities and similar frequent or in-frequent concentrations of vessels of various size can impose a hazard to safe navigation. If it is required to encode such an area of concentrations of shipping, it must be done using the feature **Concentration Of Shipping Hazard Area**.

Remarks:

- To encode the relevant regulations or notes, an instance of the information class **Regulations**, **Recommendations**, **Restrictions**, or **Nautical Information** (see clause 7.3) must be associated to the **Concentration of shipping hazard area**. The **Nautical Information** class should be used only if none of the other three are suitable.

Distinction: Piracy Risk Area, Military Practice Area, Waterway Area

5.11 Pilotage District

IHO Definition: **PILOTAGE DISTRICT**. An area within which a pilotage direction exists. Such directions are regulated by a competent harbour authority which dictates circumstances under which they apply. (UK Pilotage Act 1987).

S-127 Geo Feature: Pilotage district

SuperType: Feature type (Abstract)

Primitives: Surface

Distinction: Pilot boarding place, Pilot Service

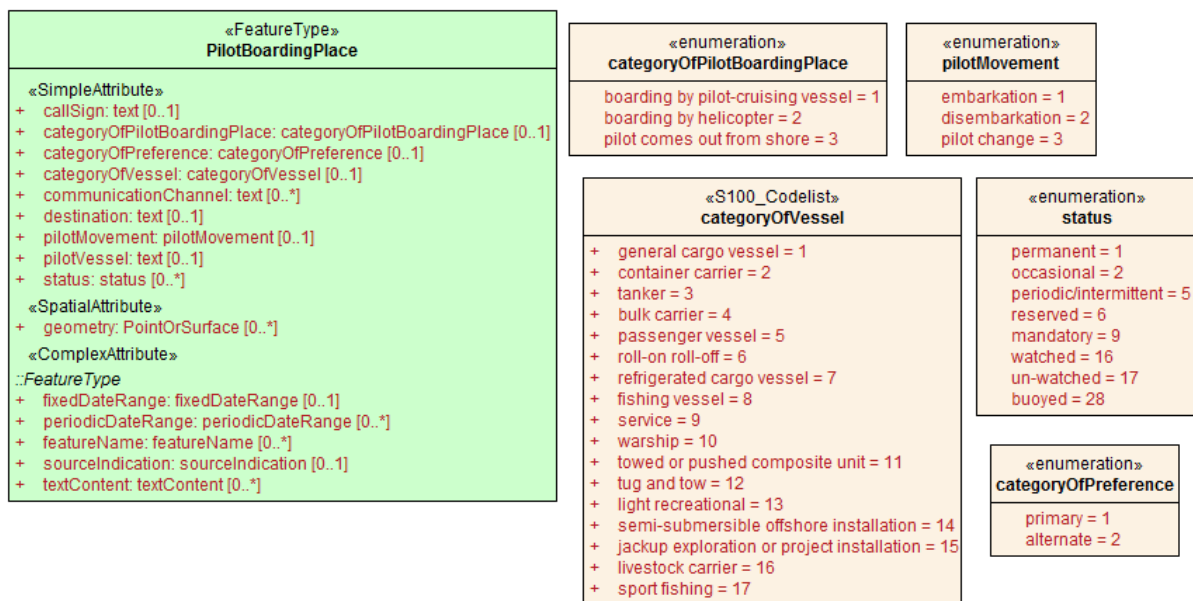
5.12 Pilot Boarding Place

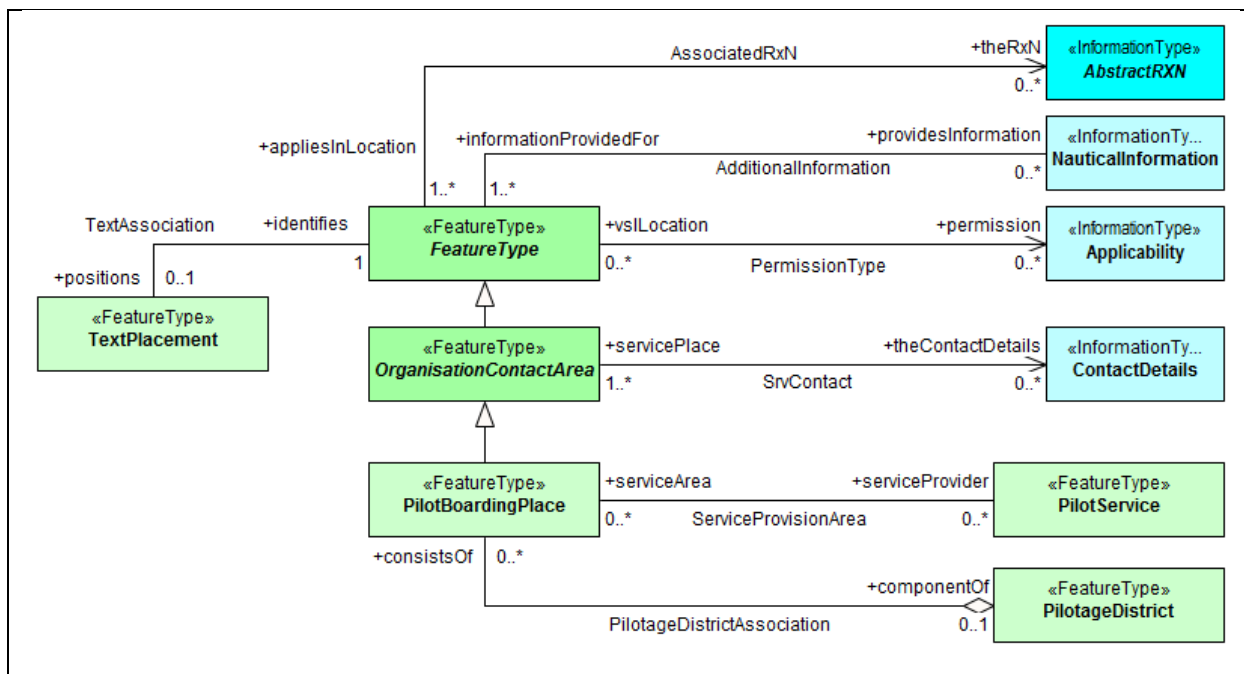
IHO Definition: **PILOT BOARDING PLACE**. A location offshore where a pilot may board a vessel in preparation to piloting it through local waters. (Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2010).

S-127 Geo Feature: Pilot boarding place (PILBOP)

SuperType: Organisation Contact Area (Abstract)

Primitives: Point, Surface





INT 1 Reference: T 1.1-4

5.12.1 Pilot boarding places (see S-4 – B-491.1-2)

For a pilot boarding place, the pilot vessel may either cruise in the area or come out on request. Off some large ports pilots on outgoing ships may be disembarked at a different location. Pilots may board from a helicopter; it is then less important for a ship to reach the exact position of the boarding place but an approximate position should still be encoded. Some pilot stations are used solely for long-distance (deep-sea) pilots. Pilots may be in constant attendance, in regular attendance at certain limited times, or available by previous arrangement only. The primary purpose of encoded pilotage information is to show the position of the facility. Because of the many variations in the service provided, the main source of information on pilotage must be in an associated publication or product.

If it is required to encode a pilot boarding place, it must be done using the feature **Pilot Boarding Place**.

Remarks:

- If it is required to encode the ship to shore or shore to ship contact information, it must be done using the information class **Contact Details** (see clause 7.8). The **Contact Details** must be associated to the **Pilot Boarding Place** feature using the association *AdditionalInformation*.
- If it is required to encode the area in which pilotage regulations apply, it should be done using the feature **Pilotage District** (see clause 5.11). The relationship between the pilotage district and any associated pilot boarding places should be encoded using the feature association *PilotageDistrictAssociation* (see clause 5.11 and Appendix C-1).

Distinction: Pilotage district, Pilot Service

5.13 Pilot Service

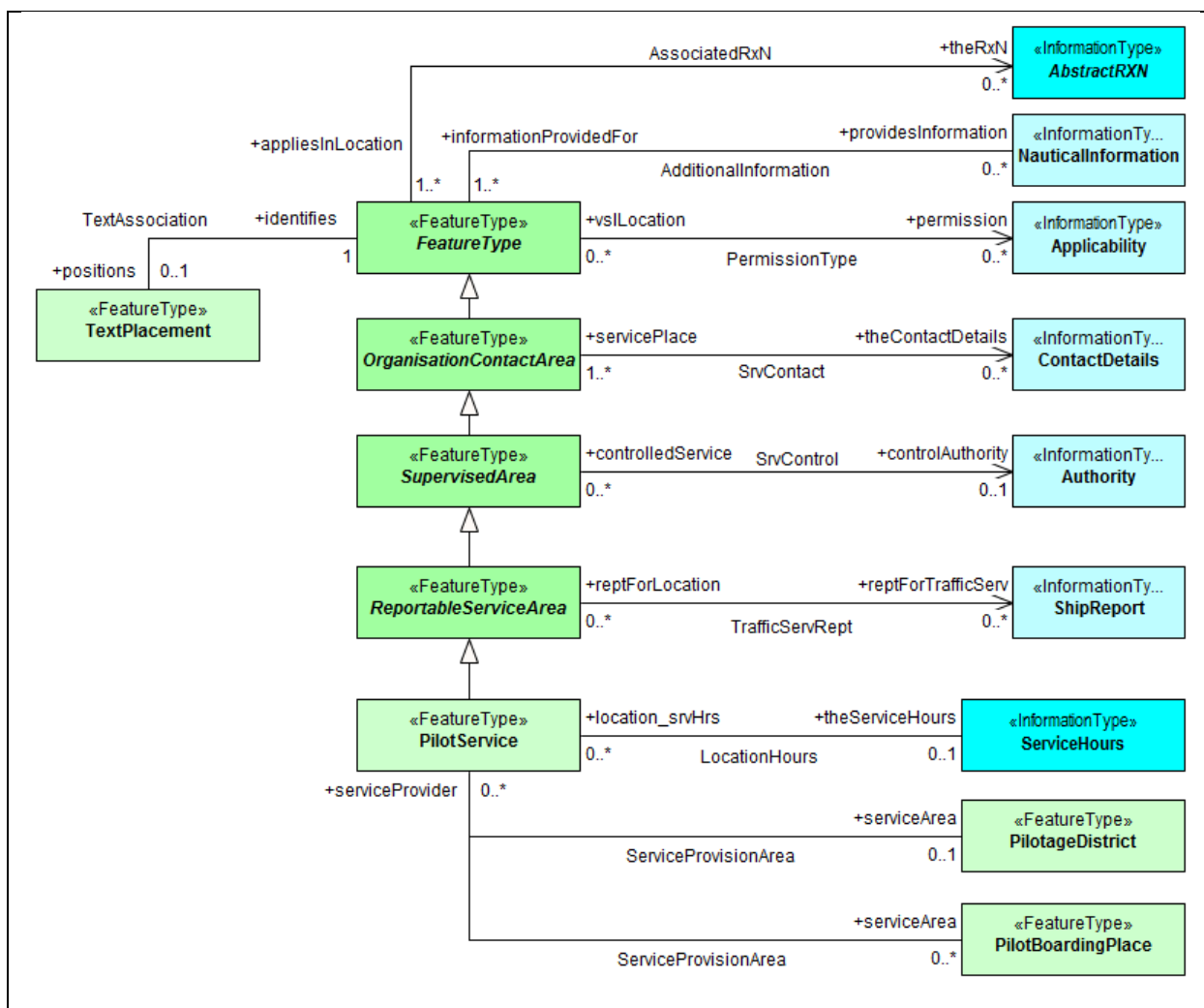
IHO Definition: **PILOT SERVICE:** The service provided by a person who directs the movements of a vessel through pilot waters, usually a person who has demonstrated extensive knowledge of channels, aids to navigation, dangers to navigation, etc., in a particular area and is licensed for that area. (adapted from IHO Dictionary, S-32, 5th Edition, 3843)

S-127 Geo Feature: Pilot service (PLTSRV)

SuperType: Reportable Service Area (Abstract)

Primitives: Surface

«FeatureType» PilotService	«enumeration» categoryOfPilot	«enumeration» pilotQualification
<div>«SimpleAttribute» + categoryOfPilot: categoryOfPilot [0..*] + pilotQualification: pilotQualification [0..1] + pilotRequest: text [0..1] + remotePilot: Boolean</div> <div>«ComplexAttribute» + noticeTime: noticeTime [0..1]</div> <div>::FeatureType + fixedDateRange: fixedDateRange [0..1] + periodicDateRange: periodicDateRange [0..*] + featureName: featureName [0..*] + sourceIndication: sourceIndication [0..1] + textContent: textContent [0..*]</div> <div>«SpatialAttribute» + geometry: GM_OrientableSurface [0..*]</div>	<div>pilot = 1 deep sea = 2 harbour = 3 bar = 4 river = 5 channel = 6 lake = 7</div>	<div>government pilot = 1 pilot approved by government = 2 state pilot = 3 federal pilot = 4 company pilot = 5 local pilot = 6 citizen with sufficient local knowledge = 7 citizen with doubtful local knowledge = 8</div>



INT 1 Reference:

5.13.1 Pilot service (see S-4 – B-490)

When it is required to encode individual pilot services within a pilot district, this must be done using the feature **Pilot Service**.

Remarks:

- If it is required to encode the ship to shore or shore to ship contact information, it must be done using the information class **Contact Details** (see clause 7.8). The **Contact Details** must be associated to the **Pilot Service** feature using the association *AdditionalInformation*.

Distinction: List of features in the Product Specification distinct from the Feature.

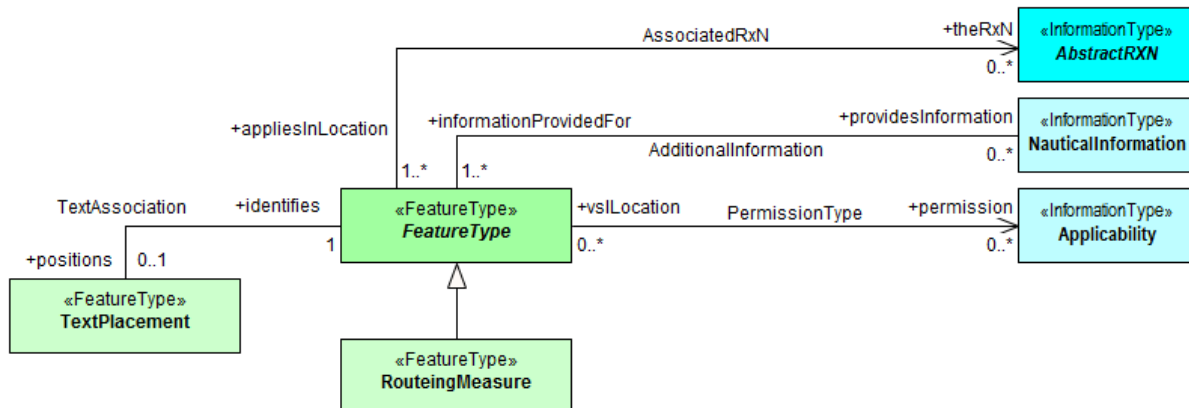
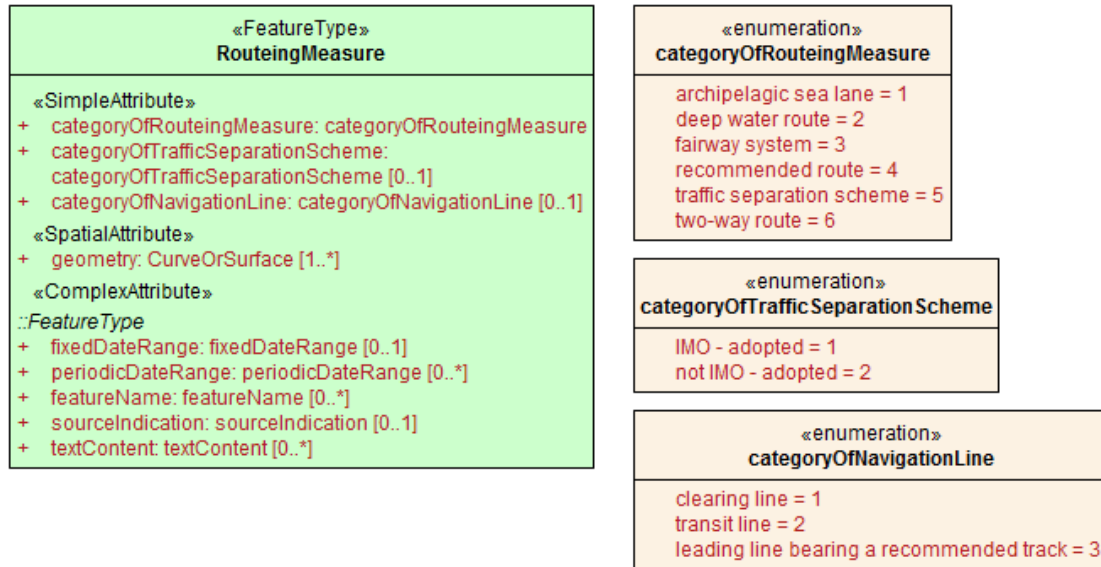
5.14 Routeing Measure

IHO Definition: ROUTEING MEASURE: An area or line designating the limits or central line of a routeing measure (or part of a routeing measure). Routeing measures include traffic separation schemes, deep-water routes, two-way routes, archipelagic sea lanes, and fairway systems. (NIPWG).

S-127 Geo Feature: Routing Measure

SuperType: Feature Type (Abstract)

Primitives: Curve, Surface



INT 1 Reference:

5.14.1 Routeing Measure (see S-4 – B-432 - 436)

The **Routeing Measure** feature is a simplification of the tracks and routes features in the ENC. A **Routeing Measure** feature is created by combining the spatial extents of the tracks and routes feature instances which together make up a specific track or route. The purpose of this feature in S-127 is to provide an indication of the existence of a route or track, as well as physical locations to which specific information can be associated in the form of information types. In S-127, each **Routeing Measure** feature has only a category attribute that indicates the type of track or route.

The table below indicates which S-101 features can be combined to create **Routeing Measure** features of each category. Note that line features are used if not covered by an appropriate track/route feature, or if information must be associated to the line that cannot be associated to an area feature.

A suggested guide for deciding whether component S-101 features should be combined is whether they are aggregated to the same (or related) aggregate track/route features. E.g., combine TSS Lane Part and TSS Roundabout features that are associated with the same **Traffic Separation Scheme** feature in the ENC via a "Traffic Separation Scheme Aggregation" association. (**Traffic Separation Scheme** is an aggregate feature in S-101 that does not have its own geometry.)

Category of routeing measure	S-101 features used
recommended route	Navigation line
	Recommended track
	Recommended route centreline (only if not covered by an area track/route feature)
	Recommended traffic lane part
fairway system	Fairways
two-way route	Two-way route part
	Two-way route
	Recommended traffic lane part (when adjoining a two-way route)
deep-water route	Deep water route centreline (only if not covered by an area track/route feature)
	Deep water route part
	Deep water route
	Recommended traffic lane part (when adjoining a deep-water route)
traffic separation scheme	Inshore traffic zone
	Precautionary area
	Traffic separation scheme lane part
	Traffic separation zone
	Traffic separation line (only if not covered by an area track/route feature)

	Traffic separation scheme boundary (only if not covered by an area track/route feature)	
	Traffic separation scheme crossing	
	Traffic separation scheme roundabout	
archipelagic sea lane	Archipelagic sea lane area	
	Archipelagic sea lane axis (only if not covered by an area track/route feature)	

Remarks:

- If different information must be associated to different parts of the track/route, create different **Routeing Measure** features.
- If it is required to define the IMO status of a **Routeing Measure** with **categoryOfRouteingMeasure** set to 5: traffic separation, this must be done using the attribute **categoryOfTrafficSeparationScheme**.
- If it is required to define a clearing line or a transit line (such as a measured distance) this must be done using the attribute **categoryOfNavigationLine**.

Distinction: Radio calling in point, Radar range, Waterway area

5.15 Waterway Area

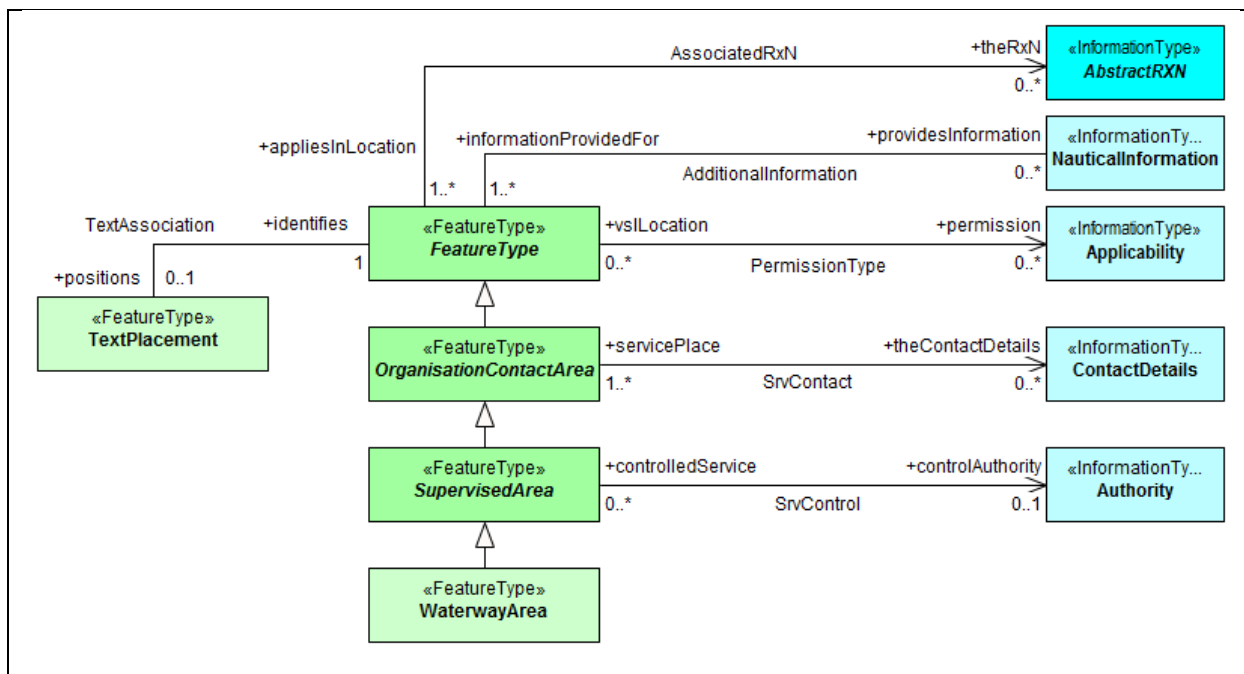
IHO Definition: WATERWAY AREA: A line of water (river, channel, etc.) which can be utilized for communication or transport (IHO Dictionary, S-32, 5th Edition, 5881)

S-127 Geo Feature: Waterway area (WATARE)

SuperType: Supervised Area (Abstract)

Primitives: Surface

<p>«FeatureType» WaterwayArea</p> <p>«SimpleAttribute»</p> <ul style="list-style-type: none"> + siltationRate: text [0..1] + status: status [0..*] + dynamicResource: dynamicResource <p>«SpatialAttribute»</p> <ul style="list-style-type: none"> + geometry: GM_OrientableSurface [1..*] <p>«ComplexAttribute»</p> <p>::FeatureType</p> <ul style="list-style-type: none"> + fixedDateRange: fixedDateRange [0..1] + periodicDateRange: periodicDateRange [0..*] + featureName: featureName [0..*] + sourceIndication: sourceIndication [0..1] + textContent: textContent [0..*] 	<p>«enumeration» dynamicResource</p> <ul style="list-style-type: none"> static = 1 mandatory external dynamic = 2 optional external dynamic = 3 onboard dynamic = 4 	<p>«enumeration» status</p> <ul style="list-style-type: none"> permanent = 1 occasional = 2 recommended = 3 not in use = 4 periodic/intermittent = 5 reserved = 6 temporary = 7 private = 8 mandatory = 9 buoyed = 28
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



5.15.1 Waterway areas

Waterways can be encoded to indicate how specific sections of water have been divided for various administrative purposes such as for organizing traffic and managing the available water column. When it is required to encode a section of water as a waterway, this must be done using the feature **Waterway Area**. A waterway area must declare how a vessel must use either a shore-based or other resource to obtain up-to-date information about the waterway, by using the attribute **dynamicResource**.

Remarks:

- When it is required to encode the siltation rate of a waterway, this must be done using the attribute **siltationRate**.

Distinction: Underkeel Clearance Management Area, Underkeel Clearance Allowance Area, Routeing Measure

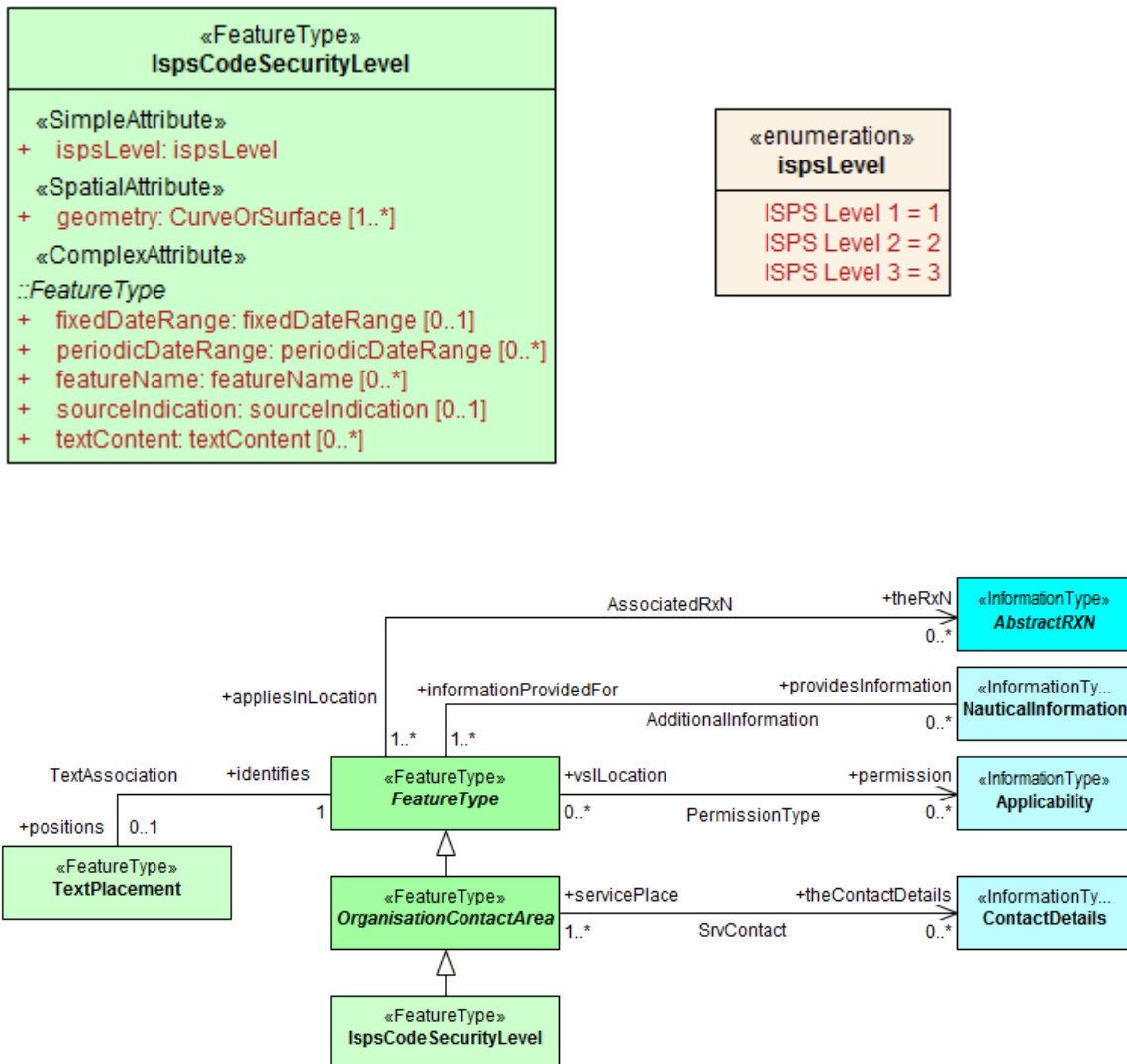
5.16 ISPS Code Security Level

IHO Definition: **SECURITY LEVEL ACCORDING TO ISPS CODE:** The area to which an International Ship and Port Facility Security (ISPS) level applies.

S-127 Geo Feature: Security level according to ISPS Code (SECLVL)

SuperType: Organisation Contact Area (Abstract)

Primitives: Curve, Surface



5.16.1 ISPS Code Security Level areas

When it is required to encode the security level of an area, such as a port or area of a port, this must be done using the feature ISPS Code Security Level. The specific ISPS level is encoded in the attribute **ispsLevel**.

Remarks:

- When it is required to encode the ISPS Code Security Level but exact level is unknown, a null value can be given and any clarifying remarks added to an associated **Nautical Information**.
- The International Ship and Port Facility Security (ISPS) Code is an amendment to the Safety of Life at Sea (SOLAS) Convention (1974/1988) on minimum security arrangements for ships, ports and government agencies. Having come into force in 2004, it prescribes responsibilities to governments, shipping companies, shipboard personnel, and port/facility personnel to "detect security threats and take preventative measures against security incidents affecting ships or port facilities used in international trade

Distinction: Concentration Of Shipping Hazard Area; Restricted Area Regulatory; Restricted Area Navigational; Piracy Risk Area.

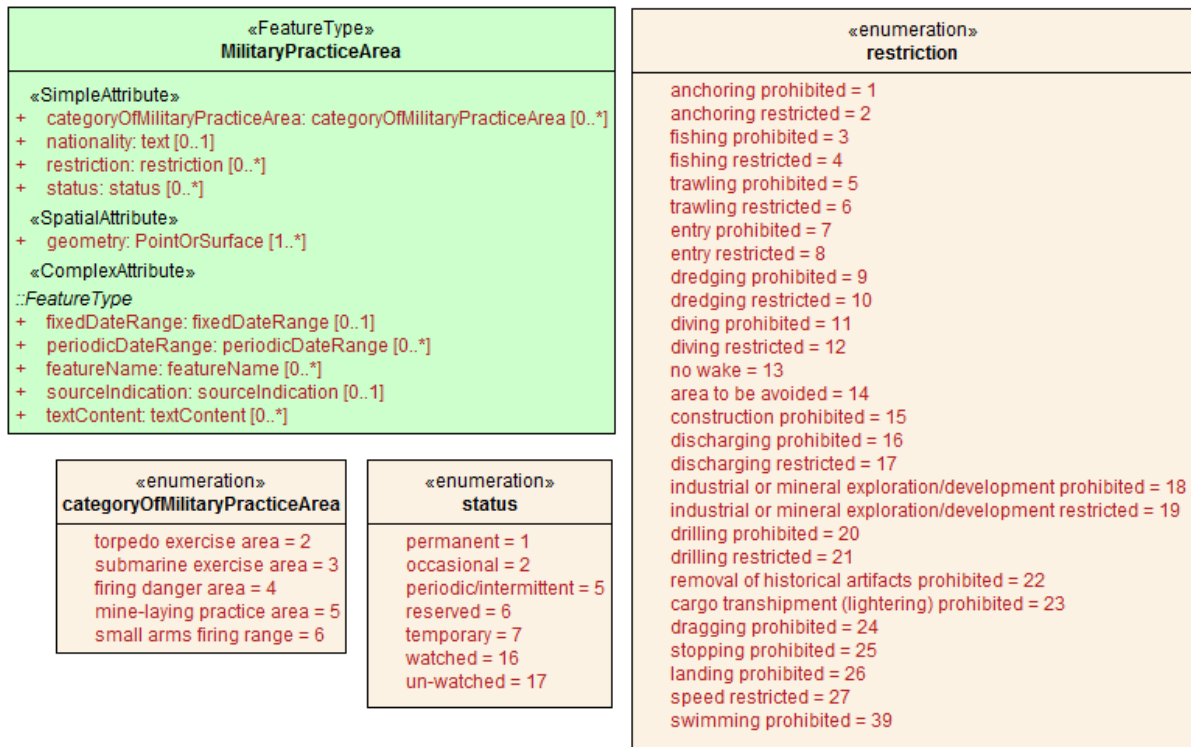
5.17 Military Practice Area

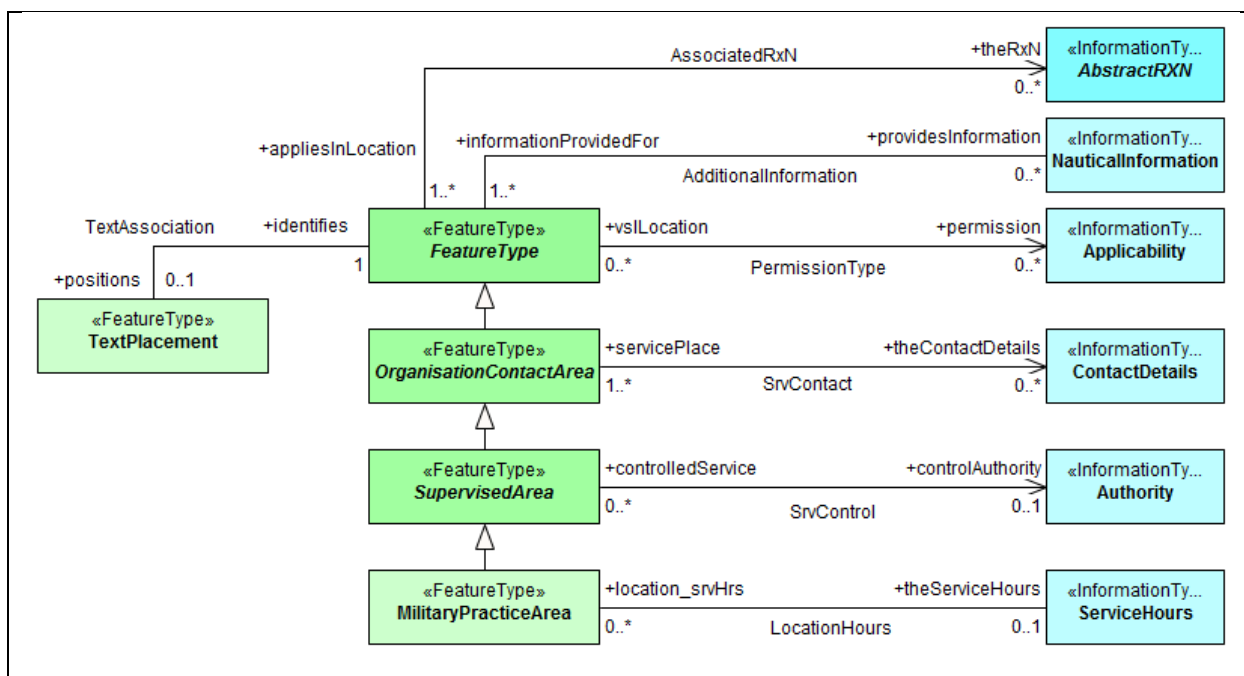
IHO Definition: **MILITARY PRACTICE AREA.** An area within which naval, military or aerial exercises are carried out. Also called an exercise area. (Adapted from IHO Dictionary – S-32).

S-127 Geo Feature: Military practice area (MIPARE)

SuperType: Supervised Area (Abstract)

Primitives: Point, Surface





INT 1 Reference: N 30-33

5.17.1 Military practice areas (see S-4 – B-441.1-6)

Military practice (or exercise) areas at sea are of various types and may be classified as follows with regard to their significance for the mariner:

- Firing danger areas, sometimes called firing practice areas, i.e. permanent or temporary ranges, including bombing, torpedo, and missile ranges.
- Mine-laying practice (and counter-measures) areas.
- Submarine exercise areas.
- Other exercise areas.

Some degree of restriction on navigation and other rights may be implied by the encoding of military practice areas. There may be varying interpretations of the validity of the restrictions and possible infringement of the rights of innocent passage through territorial waters and elsewhere. Where it is thought desirable to depict such areas, even though clear range procedure may be observed, or the areas appear to be a derogation of the freedom of the seas, mariners should be informed (not necessarily on ENCs) that publication of the details of a law or regulation is solely for the safety and convenience of shipping and implies no recognition of the international validity of the law or regulation. By this means infringements are not condoned but the mariner receives a warning which may be necessary for their safety.

If it is required to encode a military practice area, it must be done using the feature **Military Practice Area**.

Remarks:

- Submarine exercise areas should generally not be encoded where submarines exercise over wide areas which it would not be practicable to depict, and over which cautions (to keep a good look out for them) are unlikely to be effective. They may, however, be encoded where they occur in or near major shipping lanes or port approaches.
- Firing danger areas at sea are frequently marked by IALA special buoys sometimes laid around the

perimeter of the area and/or by specially erected lights, beacons, and targets. If required, all such features which could assist the navigator in identifying their position, or could be a hazard, must be encoded in the normal way.

- The existence of mine-laying (and counter-measures/clearance) practice areas implies the possibility of unexploded mines or depth charges on the sea floor, and also the presence of harmless practice mines.

Distinction: restricted area navigational; restricted area regulatory.

5.18 Restricted Area Regulatory

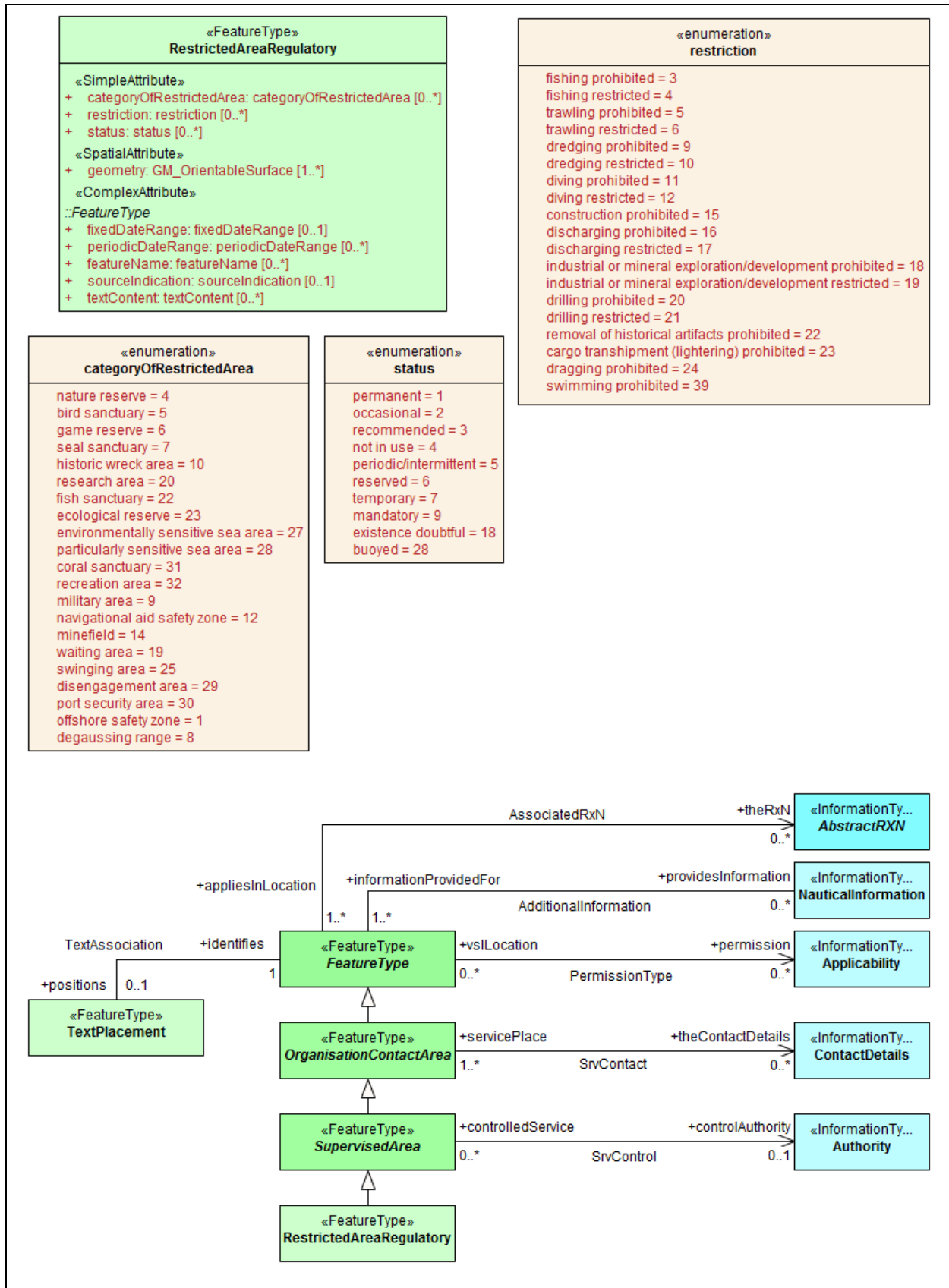
IHO Definition: **RESTRICTED AREA.** A specified area on land or water designated by an appropriate authority within which access or navigation is restricted in accordance with certain specified conditions. (Adapted from IHO Dictionary – S-32).

A regulatory restricted area is an area where the restrictions have no direct impact on the navigation of a vessel in the area, but impact on the activities that can take place within the area.

S-127 Geo Feature: Restricted area regulatory (*RESARE*)

SuperType: Supervised Area (Abstract)

Primitives: Surface



INT 1 Reference: L 3; N 21-22, 25, 31, 34, 63

5.18.1 Restricted areas in general (see S-4 – B-422; B-437.1-7; B-439; B-439.2-4; B-441.1; B-445.9; B-445.11-12; B-446.4 and B-448.1)

If it is required to encode a regulatory restricted area, it must be done using the feature **Restricted Area Regulatory**, or using other features having the attribute **restriction (Military Practice Area, Piracy Risk Area)**.

Remarks:

- No remarks.

Distinction: military practice area; restricted area navigational.

5.19 Restricted Area Navigational

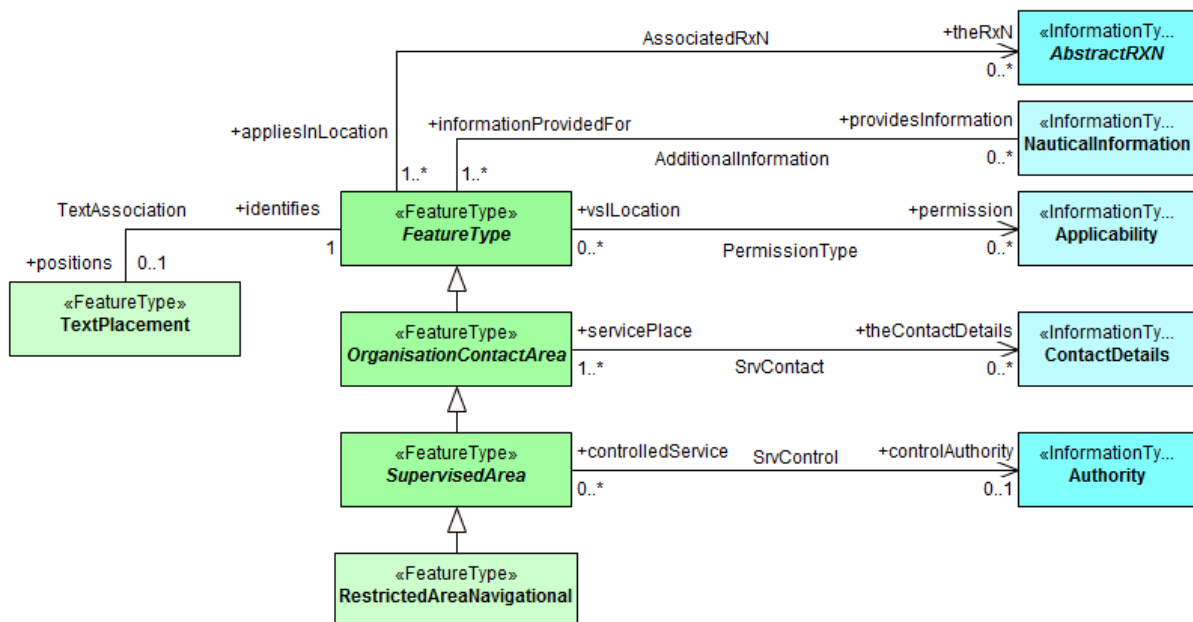
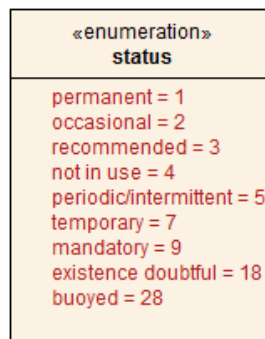
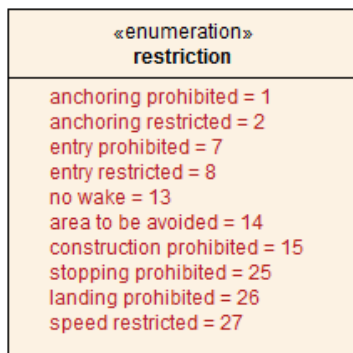
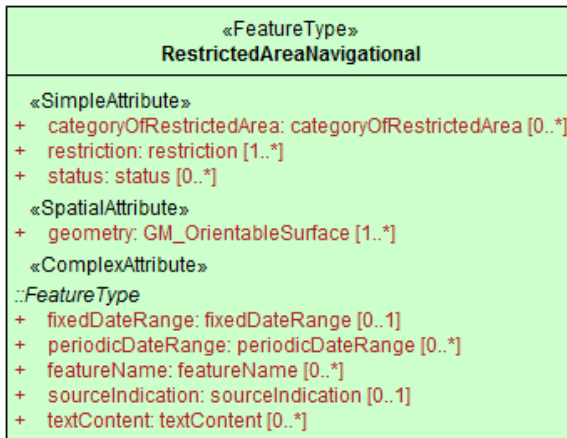
IHO Definition: RESTRICTED AREA. A specified area on land or water designated by an appropriate authority within which access or navigation is restricted in accordance with certain specified conditions. (Adapted from IHO Dictionary – S-32).

A navigational restricted area is an area where the restrictions have a direct impact on the navigation of a vessel in the area.

S-127 Geo Feature: Restricted area navigational (RESARE)

SuperType: Supervised Area (Abstract)

Primitives: Surface



INT 1 Reference: L 3; N 21-22, 25, 31, 34, 63

5.19.1 Restricted areas in general (see S-4 – B-422; B-430.2; B-431.4; B-435.7; B-435.11; B-437.1-7; B-439; B-439.2-4; B-441,1; B-445.9; B-445.11-12; B-446.4 and B-448.1)

If it is required to encode a regulatory restricted area, it must be done using the feature **Restricted Area Regulatory**, or using other features having the attribute **restriction** (**Military Practice Area**, **Piracy Risk Area**).

Remarks:

- **Restricted Area Navigational** must only be encoded if one of the allowable values for **restriction** applies for the area.
- The term “no anchoring area” is used to identify the IMO routeing measure of that name. Such areas, where required, must be encoded as **Restricted Area Navigational** with attribute **restriction** = 1 (anchoring prohibited).

Distinction: military practice area; restricted area navigational.

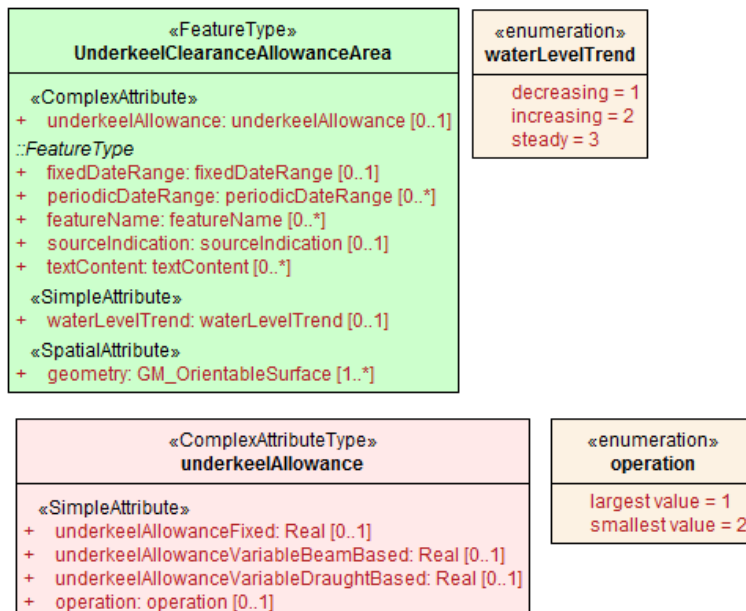
5.20 Underkeel Clearance Allowance Area

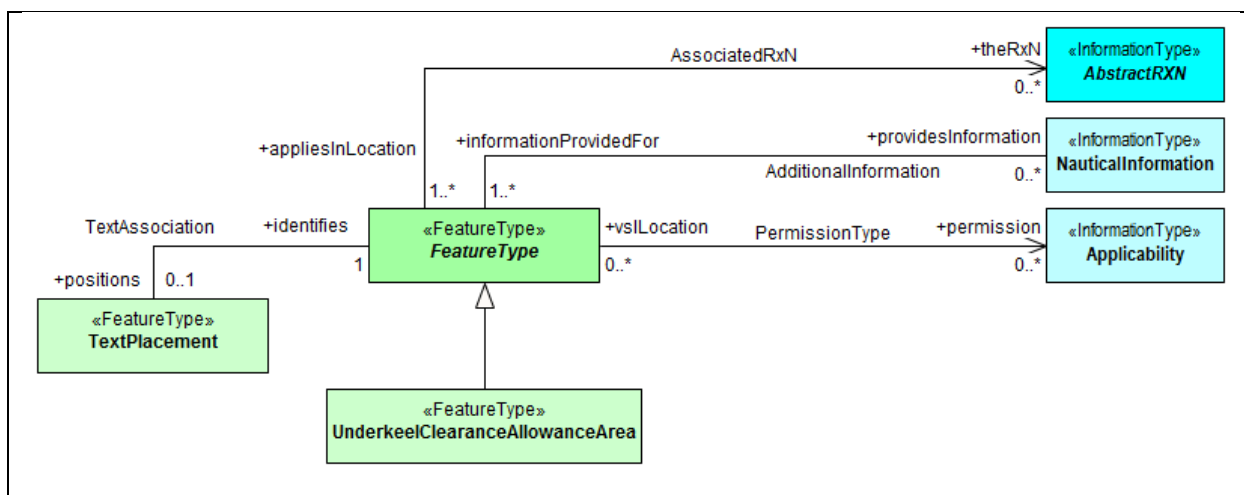
IHO Definition: UNDERKEEL CLEARANCE ALLOWANCE AREA: An area for which an authority has stated underkeel allowance requirements.

S-127 Geo Feature: Underkeel clearance allowance area (UKAARE)

SuperType: Feature Type (Abstract)

Primitives: Point, Surface





5.20.1 Underkeel clearance allowance areas

If it is required to encode an area with underkeel allowance requirements, it must be done using the feature **Underkeel Clearance Allowance Area**. This feature class has the options to encode a fixed allowance value or a variable allowance value as a percentage of the either the draught or the beam of the vessel.

Remarks:

- If it is required to encode a fixed underkeel allowance, this must be done using the attribute **Underkeel allowance fixed**. The fixed underkeel allowance value must be encoded as metres, in a resolution of 0.1m
- If it is required to encode a variable underkeel allowance as a factor of the ship's draught, this must be done using the attributes **Underkeel allowance variable draught based** and **operation**. The percentage of the draught is encoded in the **Underkeel allowance variable draught based**, and the **operation** attribute is used to indicate is it is the largest value of the draught that is used.
- If it is required to encode a variable underkeel allowance as a factor of the ship's beam, this must be done using the attributes **Underkeel allowance variable beam based** and **operation**. The percentage of the beam is encoded in the **Underkeel allowance variable beam based**, and the **operation** attribute is used to indicate is it is the largest width of the beam that is used.
- If it is required to encode a water level trend that is a condition of the underkeel allowance, this must be done using the attribute **water level trend**.
- If there are different underkeel allowance conditions depending on the water level trend, several overlapping instances of **Underkeel Clearance Allowance Area** must be encoded to capture all conditions.

Distinction: Underkeel Clearance Management Area, Waterway area

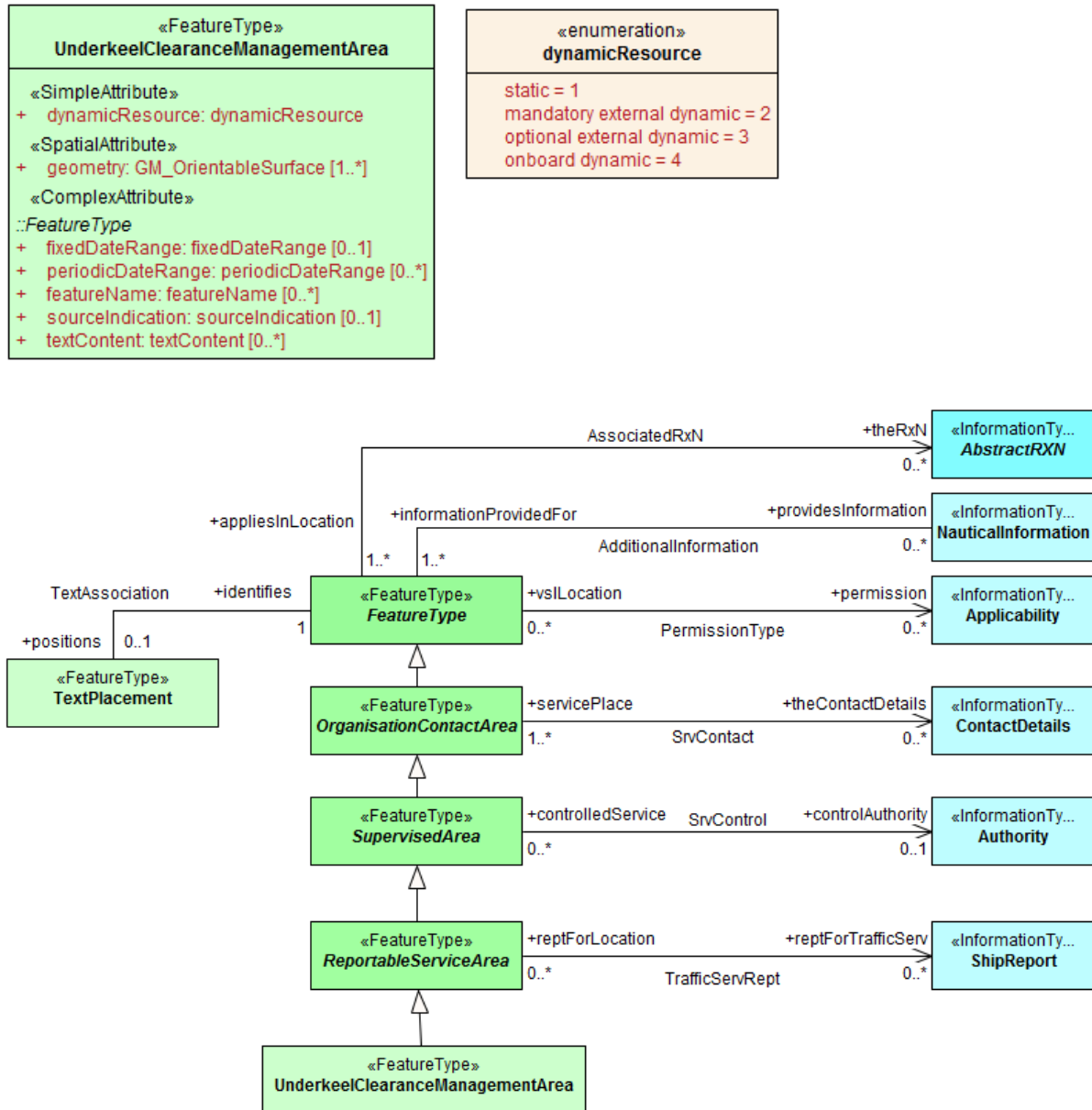
5.21 Underkeel Clearance Management Area

IHO Definition: UNDERKEEL CLEARANCE MANAGEMENT AREA: An area for which an authority permits use of dynamic underkeel clearance information or provides dynamic information related to underkeel clearances. (NIPWG).

S-127 Geo Feature: Underkeel Clearance Management Area

SuperType: Reportable Service Area (Abstract)

Primitives: Allowable geometric primitive(s) **Surface**



5.21.1 Underkeel clearance management areas

If it is required to encode an underkeel clearance management area where an appropriate authority has permitted the use of dynamic underkeel clearance information, it must be done using **Underkeel Clearance Management Area**. The attribute **dynamicResource** is used to indicate what kind of dynamic underkeel clearance information is provided.

If the value of **dynamicResource** is either 2:mandatory external dynamic or 3:optional external dynamic, the external source must be encoded in an associated **Contact Details** instance.

Distinction: Underkeel Clearance Allowance Area, Waterway area

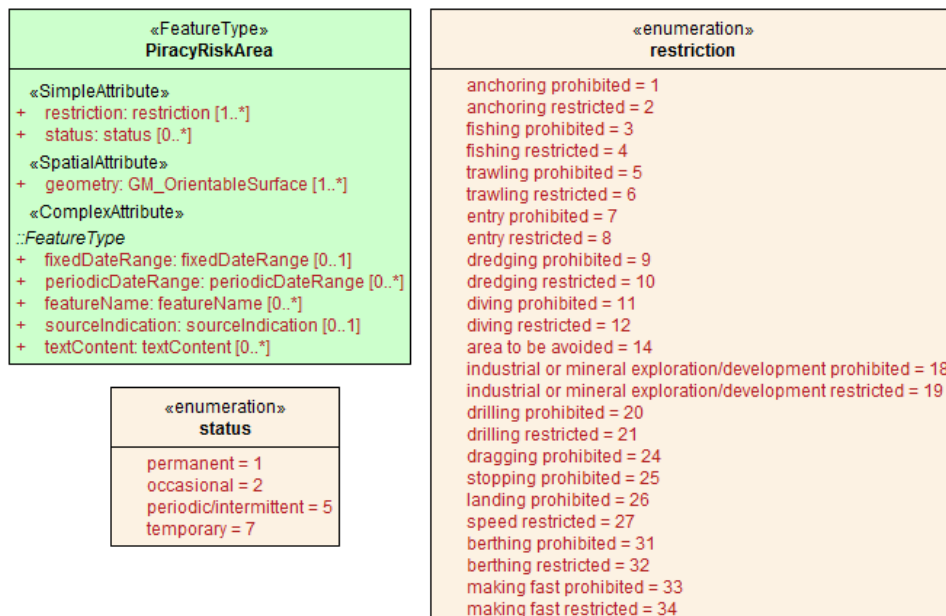
5.22 Piracy Risk Area

IHO Definition: **PIRACY AND ARMED ROBBERY RISK AREA:** An area where there is an increased risk of piracy or armed robbery.

S-127 Geo Feature: Piracy Risk Area (PIRARE)

SuperType: Reportable Service Area (Abstract)

Primitives: Surface



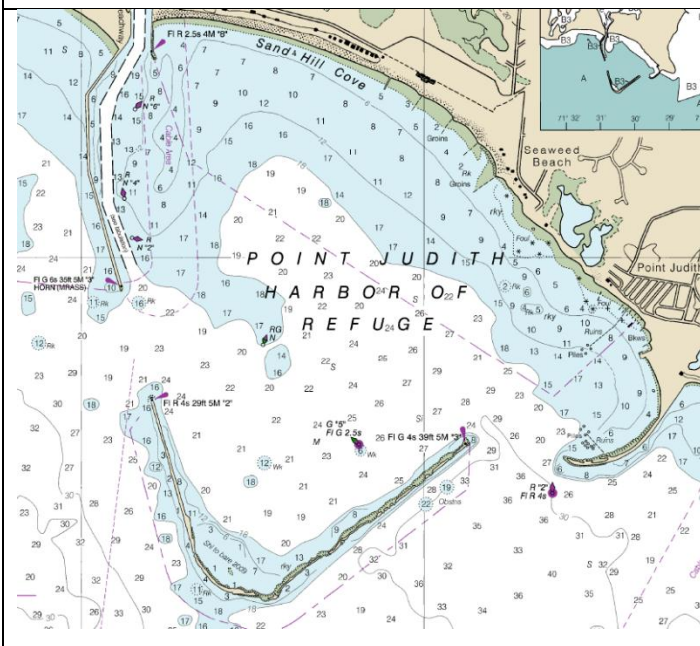
5.23 Place of Refuge

IHO Definition: PLACE OF REFUGE: A place where a ship in need of assistance can take action to enable it to stabilize its condition and reduce the hazards to navigation, and to protect human life and the environment. (NIPWG).

S-127 Geo Feature: Place of refuge

SuperType: Reportable Service Area (Abstract)

Primitives: Point, Surface



«FeatureType»
PlaceOfRefuge

«SimpleAttribute»

+ status: status [0..*]
+ communicationChannel: text [0..*]

«SpatialAttribute»

+ geometry: PointOrSurface [1..*]

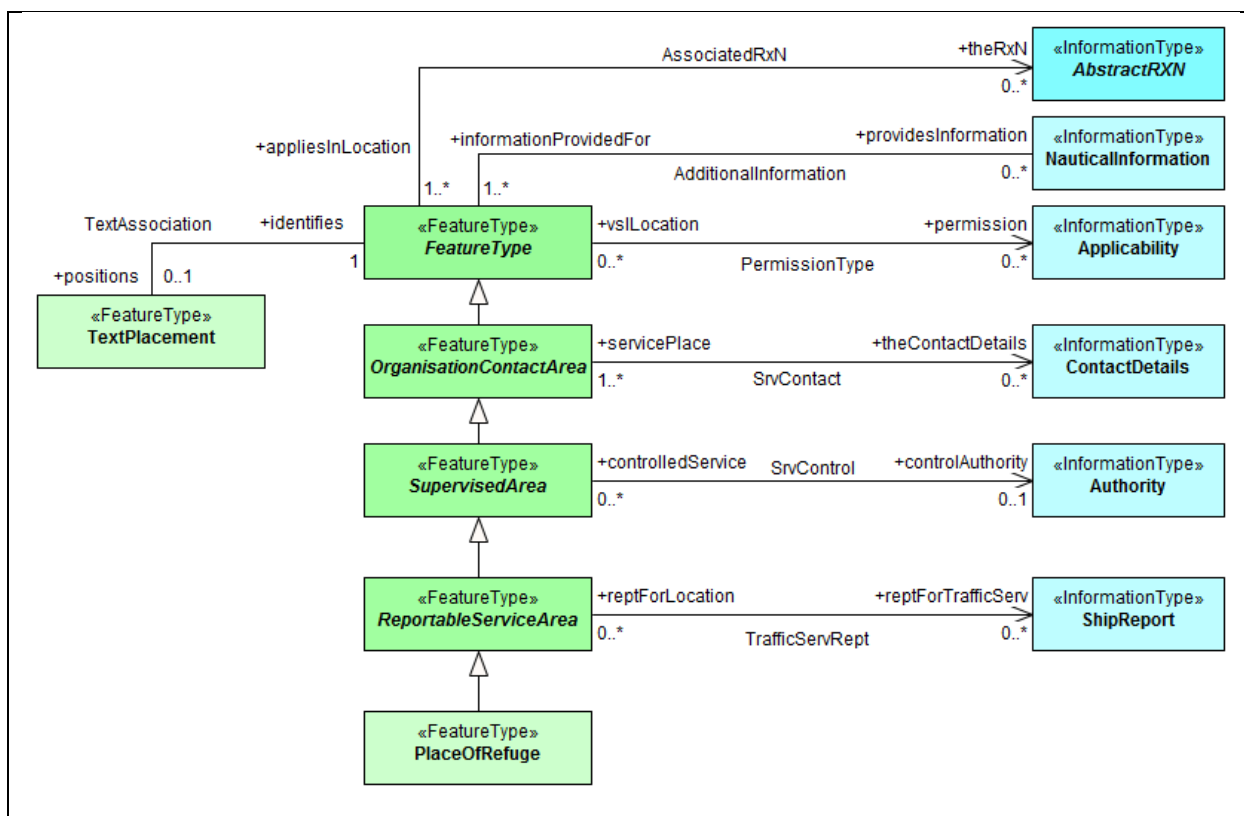
«ComplexAttribute»

..FeatureType

+ fixedDateRange: fixedDateRange [0..1]
+ periodicDateRange: periodicDateRange [0..*]
+ featureName: featureName [0..*]
+ sourceIndication: sourceIndication [0..1]
+ textContent: textContent [0..*]

«enumeration»
status

permanent = 1
occasional = 2
recommended = 3
not in use = 4
periodic/intermittent = 5
reserved = 6
temporary = 7
private = 8
mandatory = 9
buoyed = 28



5.23.1 Place of refuge (see S-4 – B-493.4)

If it is required to encode a place refuge for a ship or mariners, it must be done using the feature class **Place of refuge**. If the place of refuge is equipped with communication equipment, the VHF communication channel can be described in the attribute **communicationChannel**. Communication information for authorities located at other places (or whose location is irrelevant or unknown) may be encoded in an associated **Contact Details** object.

Where possible the full extent of the place of refuge area should be encoded using surface geometry. When it is not possible to define the area, point geometry can be placed in a central place of the area.

Authorities may designate any other location (port, harbour, a sheltered place along the coastline, etc.) as a place of refuge for a specific occurrence without designating it as a permanent or general place of refuge. Such places should not normally be encoded as **Place Of Refuge** features without consulting the responsible authority.

The relevant IMO circular and policies issued by maritime authorities on places of refuge make it abundantly clear that designated places are not the only possibilities for refuge, however, data producers may, as a precaution, include general information about places of refuge with their datasets. Such general information may be encoded as a note advising mariners that other places of refuge may be arranged for a particular incident with the consent of the appropriate authorities. Such a note might be encoded as a **Nautical Information** object associated to appropriate geographic features.

Distinction: Nil

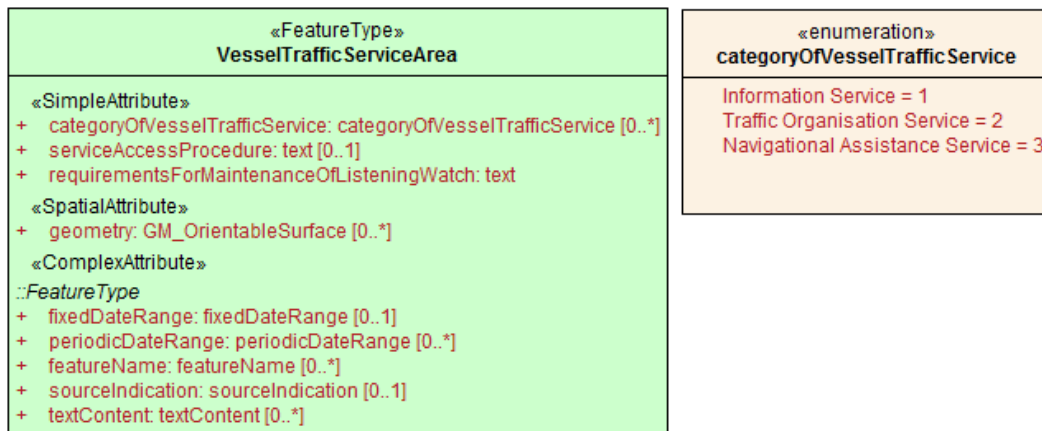
5.24 Vessel Traffic Service Area

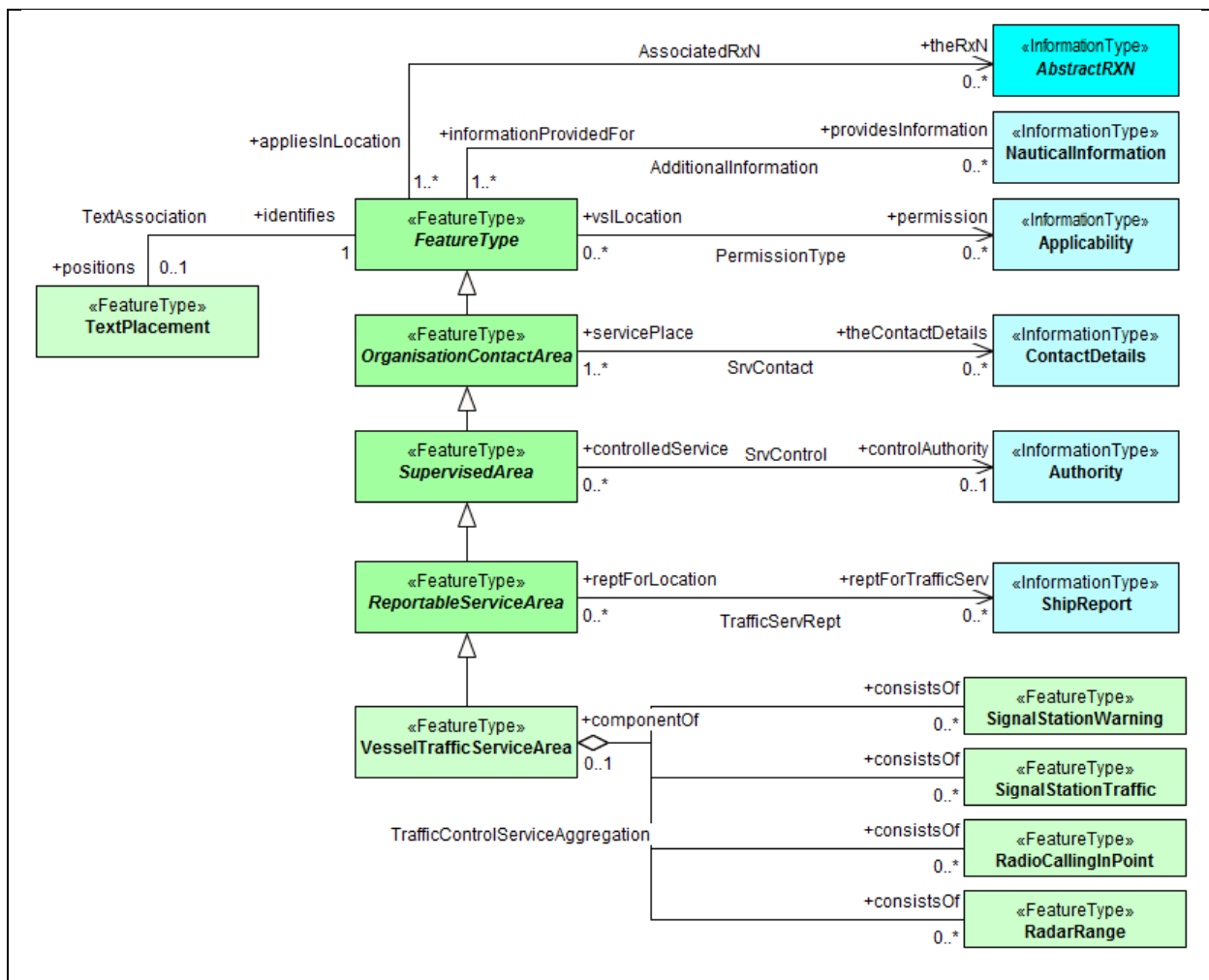
IHO Definition: Vessel Traffic Service Area: The area of any service implemented by a relevant authority primarily designed to improve safety and efficiency of traffic flow and the protection of the environment. It may range from simple information messages, to extensive organisation of the traffic involving national or regional schemes. (NIPWG).

S-127 Geo Feature: Vessel Traffic Service Area

SuperType: Reportable Service Area (Abstract)

Primitives: Surface





5.24.1 Vessel Traffic Service Area (see S-4 – B-488.3)

A Vessel Traffic Service (VTS) is a service implemented by a competent authority to improve the safety and efficiency of vessel traffic operations and to protect the environment. A VTS provides, from one or more traffic control centres, a number of services which may include:

- Traffic management for the safe and efficient movement of vessels within the area, usually including mandatory reporting;
- Navigational assistance to support onboard decision making, usually on request (see also S-4 B-487.2 for radar reference lines);
- Information for vessels operating in the area, for example: on arrival, berthing, anchoring, and departure from ports; about movements of other vessels; on navigational hazards; regarding weather. These may be regularly broadcast or be available on request.

A VTS service area may range from supporting entry and departure to an individual port to a much larger regional VTS (possibly containing local VTS) that may provide services to vessels in the outer approaches to ports or transiting through the region. Consequently, there may be VTS within VTS and also overlapping VTS, making it difficult for the mariner to always be aware which VTS area is applicable. Therefore, wherever the information is available, limits of VTS areas should be charted, at least on the largest scale chart and on appropriate smaller scales where navigation is practicable and/or to assist passage planning.

If it is required to encode a Vessel Traffic Service Area, it must be done using the feature class **Vessel Traffic Service Area**. The type of VTS is encoded in the **categoryOfVesselTrafficService** attribute. If it is required to associate related Radio Calling-In Points, Signal Stations (Warning or Traffic), or Radar Ranges this must be done using the association *TrafficControlServiceAggregation*.

A ship reporting service may be operated by the VTS, and if it is required to encoding an associated ship reporting service, this must be done by encoding a **Ship Reporting Service Area** (see 5.25).

Remarks:

- If it is required to describe the procedures for accessing the VTS services, this must be done using the **serviceAccessProcedure** attribute.
- The requirements for maintaining listening watch within the VTS area must be encoded in a summarized form using the **requirementsForMaintenanceOfListeningWatch** attribute. Any detailed elaborations should be encoded in the **textContent** attribute. As a text attribute, this can be populated with the text “not specified”, “unknown”, etc., if the requirements are unknown. If it is known that there are no listening watch requirements, the attribute must be encoded with “not applicable”. (There may be a general requirement in the applicable national shipping regulations instead of or in addition to a specific requirement.)

Distinction: Radio Calling-In Point; Signal Station Warning; Radar Range; Signal Station Traffic.

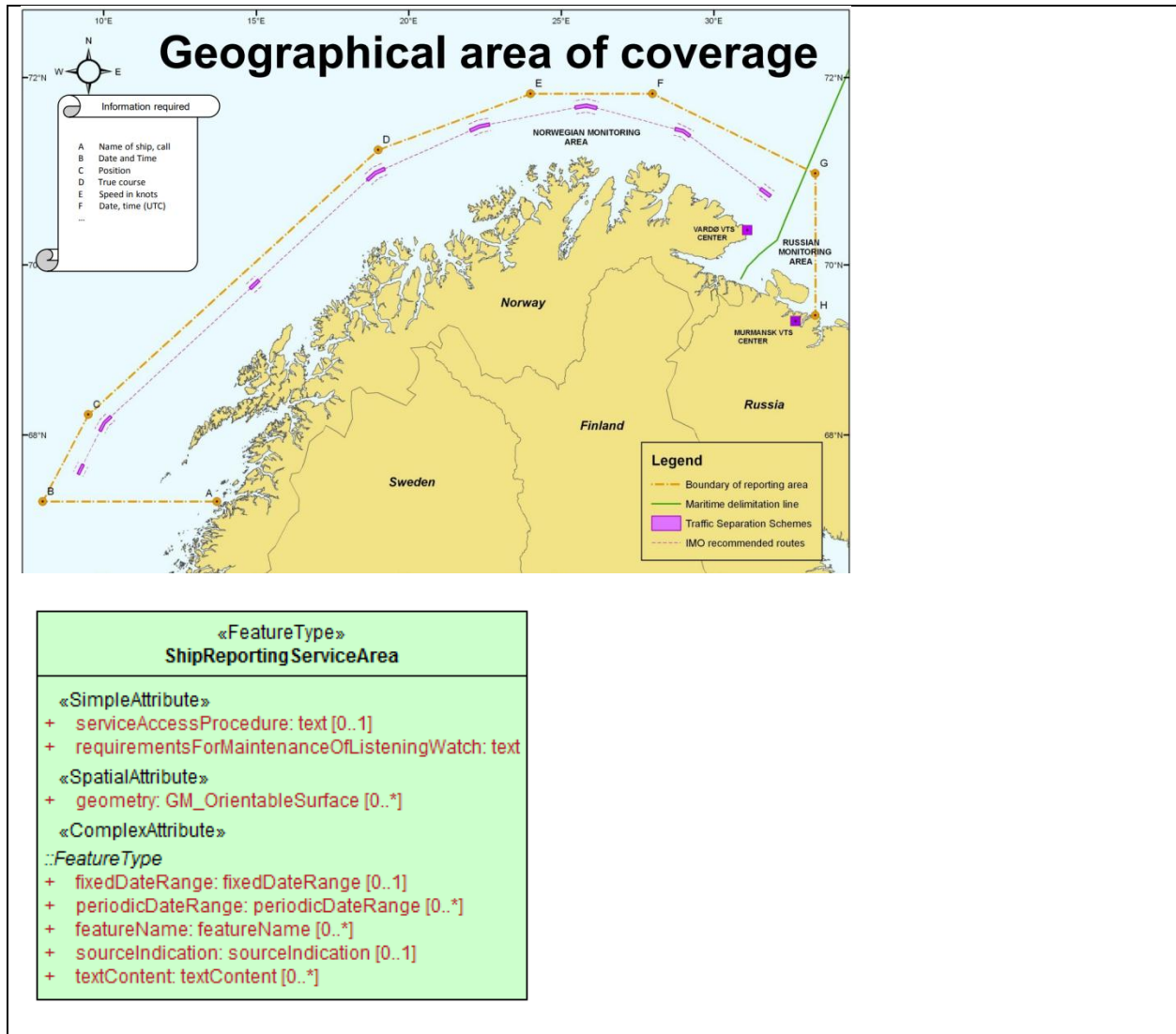
5.25 Ship Reporting Service Area

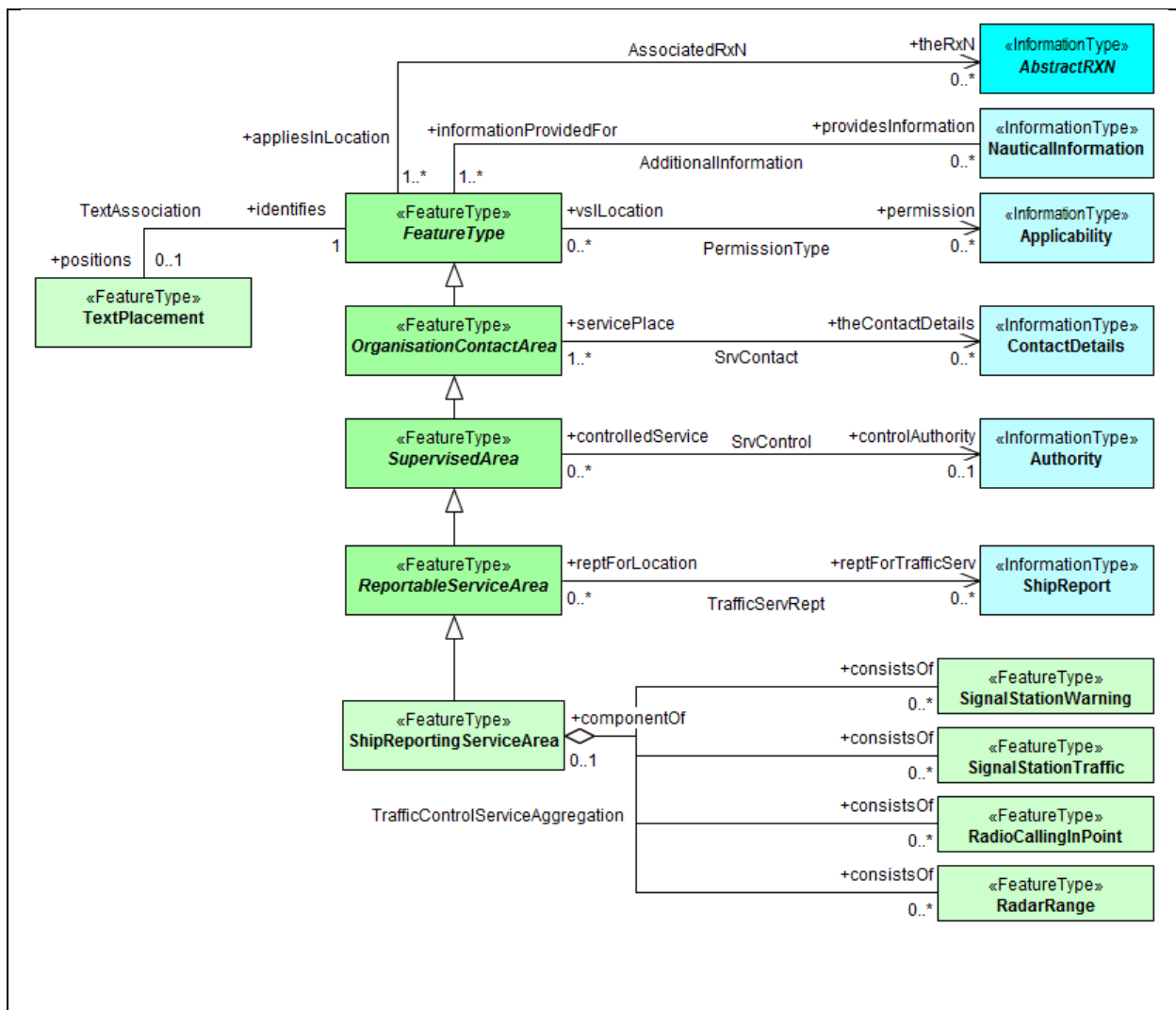
IHO Definition: Ship Reporting Service Area: A service established by a relevant authority consisting of one or more reporting points or lines at which ships are required to report their identity, course, speed and other data to the monitoring authority (NIPWG).

S-127 Geo Feature: Ship Reporting Service Area

SuperType: Reportable Service Area (Abstract)

Primitives: Surface





5.25.1 Ship Reporting Service Area

IMO MSC 43(64) states that the objectives of a ship reporting system should be based upon:

“the improvement of the safety of life at sea, the safety and efficiency of navigation and/or to increase the protection of the marine environment. They may or may not be operated as part of a vessel traffic service.”

As such, the Ship Reporting Service (SRS) contributes to the traffic situational awareness of a Coastal administration either by being informed of the ships heading into its waters or the ones already transiting it. Based on the information collected, a Coastal administration can initiate an intervention plan if required.

An SRS is generally regional in scale and may provide services to vessels in the outer approaches to ports or transiting through the region. Therefore, wherever the information is available, limits of SRS areas should be charted, at least on the largest scale chart and on appropriate smaller scales where navigation is practicable and/or to assist passage planning. The service can range from providing information and guidelines on reporting formalities and when, what and how to report in a specific port to a full exchange of information in a Single Window ship reporting system. A reportable area may also be encoded as an Ship Reporting Service area.

If it is required to encode a Ship Reporting Service, it must be done using the feature class **Ship Reporting Service Area**. If it is required to associate related Radio Calling-In Points or VTS this must be done using the association *TrafficControlServiceAggregation*.

If it is required to encode a Ship Reporting Service that is operated by a VTS, this must be done by encoding coincident Ship Reporting Service and VTS areas.

Remarks:

- If it is required to describe the procedures for accessing the SRS services, this must be done using the **serviceAccessProcedure** attribute.
- The requirements for maintaining listening watch within the VTS area must be encoded in a summarized form using the **requirementsForMaintenanceOfListeningWatch** attribute. Any detailed elaborations should be encoded in the **textContent** attribute. As a text attribute, this can be populated with the text “not specified”, “unknown”, etc., if the requirements are unknown. If it is known that there are no listening watch requirements, the attribute must be encoded with “not applicable”.

Distinction: Vessel Traffic Service; Radio Calling-In Point; Signal Station Warning; Radar Range; Signal Station Traffic.

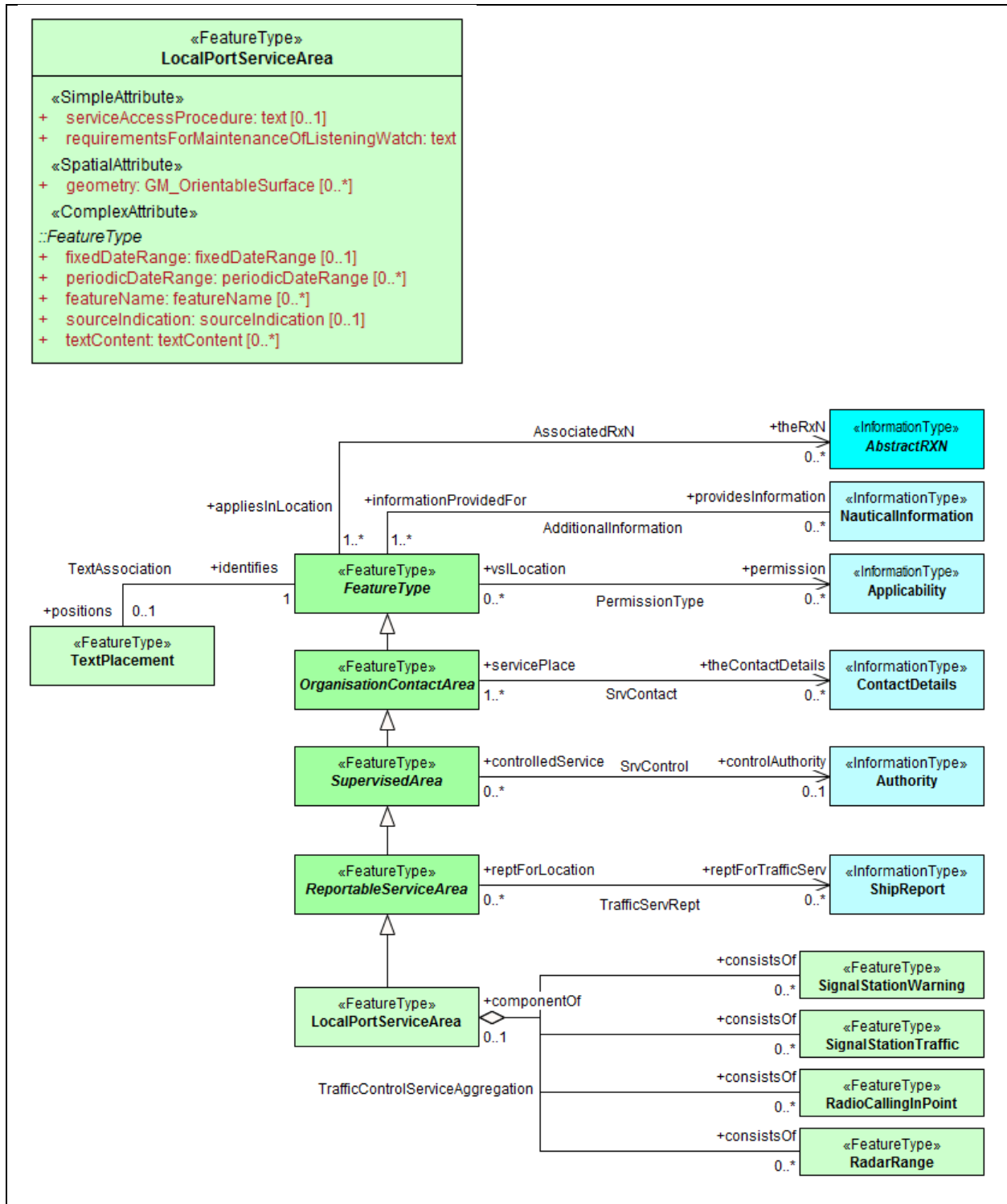
5.26 Local Port Service Area

IHO Definition: **Local Port Service Area:** A service established to provide port information without interaction between the customer and the service provider. This information could be inter alia berthing information, availability of port services, shipping schedules, meteorological and hydrological data. (NIPWG).

S-127 Geo Feature: Local Port Service Area

SuperType: Reportable Service Area (Abstract)

Primitives: Surface



5.26.1 Local Port Service Area

The Local Port Service (LPS) aims facilitating the exchange of information and coordination among key stakeholders during each phase of a ship transit. To promote an optimal coordination and efficient operations all along the transportation chain, the exchange of information must be done in a timely manner. This allows all actors involved in LPS to take specific actions at the right moment either to respond or to adapt to new situations, such as delay, premature departure/arrival, incident, and so forth.

A LPS cover an individual port and may provide services to vessels in the outer approaches to the port or that are transiting through the region. It may be difficult for the mariner to always be aware which LPS area is applicable. Therefore, wherever the information is available, limits of LPS areas should be charted, at least on the largest scale chart and on appropriate smaller scales where navigation is practicable and/or to assist passage planning.

If it is required to encode a Local Port Service Area, it must be done using the feature class **Local Port Service Area**. If it is required to associate related Radio Calling-In Points, Signal Stations (Warning or Traffic), or Radar Ranges this must be done using the association *TrafficControlServiceAggregation*.

Remarks:

- If it is required to describe the procedures for accessing the port services, this must be done using the **serviceAccessProcedure** attribute.
- The requirements for maintaining listening watch within the area must be encoded using the **requirementsForMaintenanceOfListeningWatch** attribute. As a text attribute, this can be populated with the text “not specified”, “unknown”, etc., if the requirements are unknown.

Distinction: Vessel Traffic Service Area, Ship Reporting Service Area, Radio Calling-In Point; Signal Station Warning; Radar Range; Signal Station Traffic.

6 Cartographic Features

This product specification uses the **Text Placement** cartographic features derived from S-101 (version 1.0). The structure of the feature and its usage are the same as in S-101 but the feature specification in S-127 omits elements which are not relevant to marine protected areas, for example, ‘light characteristic’ is omitted as a listed value for the attribute **text type**.

6.1 Text Placement

IHO Definition: **TEXT PLACEMENT:** The Text Placement feature is used in association with the Feature Name attribute or a light description to optimise text positioning in ECDIS.

S-122 Cartographic Feature: Text Placement

Primitives: Point

<i>Real World</i>	<i>Paper Chart Symbol</i>	<i>ECDIS Symbol</i>

S-122 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity																
<div><div><div>«FeatureType» TextPlacement</div><div>«SimpleAttribute» + flipBearing: Real [0..1] + scaleMinimum: Integer [0..1] + textJustification: textJustification + text: text [0..1] + textType: textType [0..1] «SpatialAttribute» + geometry: GM_Point [1..*]</div></div><div><div>«enumeration» textJustification left = 1 centred = 2 right = 3</div><div>«enumeration» textType feature name = 1</div></div></div>																				
<div>Information associations</div> <table><tr><th>Type</th><th>Association Name</th><th>Class</th><th>Role</th><th>Mult.</th><th>Class</th><th>Role</th><th>Mult.</th></tr><tr><td colspan="8"><div><div><div>+identifies</div><div>1</div><div>«FeatureType» FeatureType</div></div><div>TextAssociation</div><div><div>+positions</div><div>0..1</div><div>«FeatureType» TextPlacement</div></div></div></td></tr></table>					Type	Association Name	Class	Role	Mult.	Class	Role	Mult.	<div><div><div>+identifies</div><div>1</div><div>«FeatureType» FeatureType</div></div><div>TextAssociation</div><div><div>+positions</div><div>0..1</div><div>«FeatureType» TextPlacement</div></div></div>							
Type	Association Name	Class	Role	Mult.	Class	Role	Mult.													
<div><div><div>+identifies</div><div>1</div><div>«FeatureType» FeatureType</div></div><div>TextAssociation</div><div><div>+positions</div><div>0..1</div><div>«FeatureType» TextPlacement</div></div></div>																				
<div><div>6.1.1 Text Placement</div><div>If it is required to place text to improve clarity of display, it must be done using the cartographic feature Text Placement. The Text Placement feature must be associated with the relevant geo feature using the association <i>TextAssociation</i>.</div><div>Remarks:<ul style="list-style-type: none">The Text Placement feature is used by the ECDIS to position the associated text, which has been populated using an attribute(s) for the related feature. This attribute is identified by populating the attribute text type. Alternatively, the text to be displayed may be encoded using the attribute text.Only one of the attributes text or text type is allowable for each instance of Text Placement.Text Placement should only be associated with features of type point, and used in areas where it is important that text clear navigationally relevant areas, for example shipping channels and dredged areas.</div><div>Distinction:</div></div>																				

7 Information types

7.1 Information Type

IHO Definition: INFORMATIONTYPE . Generalized information type which carries all the common attributes							
S-127 Information Feature: Information Type (Abstract)							
Primitives: None							
<i>Real World</i>		<i>Paper Chart Symbol</i>		<i>ECDIS Symbol</i>			
S-127 Attribute		S-57 Acronym	Allowable Encoding Value	Type	Multipl icity		
<div><div><div><div>«InformationType» InformationType</div><div>«ComplexAttribute» + fixedDateRange: fixedDateRange [0..1] + periodicDateRange: periodicDateRange [0..*] + featureName: featureName [0..*] + sourceIndication: sourceIndication [0..*]</div></div><div><div>«ComplexAttributeType» fixedDateRange</div><div>«SimpleAttribute» + dateStart: S100_TruncatedDate [0..1] + dateEnd: S100_TruncatedDate [0..1]</div></div><div><div>«ComplexAttributeType» periodicDateRange</div><div>«SimpleAttribute» + dateStart: S100_TruncatedDate + dateEnd: S100_TruncatedDate</div></div></div><div><div>«ComplexAttributeType» sourceIndication</div><div>«SimpleAttribute» + categoryOfAuthority: categoryOfAuthority [0..1] + countryName: text [0..1] + reportedDate: S100_TruncatedDate [0..1] + source: text [0..1] + sourceType: sourceType [0..1] «ComplexAttribute» + featureName: featureName [0..*]</div></div><div><div>«ComplexAttributeType» featureName</div><div>«SimpleAttribute» + displayName: Boolean [0..1] + language: ISO639-3 [0..1] + name: text</div></div><div><div>«enumeration» categoryOfAuthority</div><div>customs = 1 border control = 2 police = 3 port = 4 immigration = 5 health = 6 coast guard = 7 agricultural = 8 military = 9 private company = 10 maritime police = 11 environmental = 12 fishery = 13 finance = 14 maritime = 15</div></div><div><div>«enumeration» sourceType</div><div>law or regulation = 1 official publication = 2 mariner report, confirmed = 7 mariner report, not confirmed = 8 industry publications and reports = 9 remotely sensed images = 10 photographs = 11 products issued by HO services = 12 news media = 13 traffic data = 14</div></div></div>							
Information associations							
Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
«InformationType» InformationType	+informationProvidedFor			1..*	+providesInformation	«InformationType» NauticalInformation	0..*
AdditionalInformation							
INT 1 Reference:							
Where a complex attribute has all its sub-attributes optional (e.g., multiplicity 0..1 or 0..*), at least one of the sub-attributes must be populated.							
The featureName attribute of an instance of an information type can be used for a short title that is either a proper name (if such is relevant) or which describes the instance. For example, the featureName attribute of an Authority information type can be the name of a government agency.							

featureName attributes of information types should not duplicate the geographic feature name of an associated feature, but should pertain to the information instance itself.

The **featureName** attribute should be populated only if the value conveys useful information to the end user. Some examples of such situations are:

- providing the name of an organisation, such as the name of an Authority.
- distinguishing between instances – if multiple instances of the same information type are associated to the same feature type (or another information type), the different instances may be given descriptive names to make it easier for the mariner to distinguish their content.

Some information instances are associated to multiple features, in which case its name should be general enough to be relevant to all the features.

For example, if naming **Regulations** instances describing fishing regulations for protected areas, consider whether (for example) there is a general regulation applicable to all protected areas in a jurisdiction and an exceptional regulations object associated to a single area or a subset of areas in the jurisdiction. In this situation, the general regulations may be encoded with the name “General fishing regulations for Marine Conservation Areas” and associated to several MPA features, while a specific MPA feature can also have a specific regulation whose name is “Special fishing regulations for (named area)”.

The **featureName** attribute in complex attribute **sourceIndication** is intended for the name of the source.

The **AdditionalInformation** association to a **NauticalInformation** object can be used to attach an additional chunk of information to an information type, and there is no applicable specific information type or association. This should be used sparingly if at all.

Remarks:

- No remarks.

Distinction:

7.2 AbstractRxN

IHO Definition: ABSTRACTRXN. An abstract superclass for information types that encode rules, recommendations, and general information in text or graphic form.

Remark: Subtypes of **AbstractRxN** carry the same attributes, but differ in the nature of information they encode. There are currently four such subtypes: **Regulations**, **Restrictions**, **Recommendations**, and **Nautical Information**.

S-127 Information Type: AbstractRxN (Abstract)

Supertype: InformationType

Primitives: None

Real World

Paper Chart Symbol

ECDIS Symbol

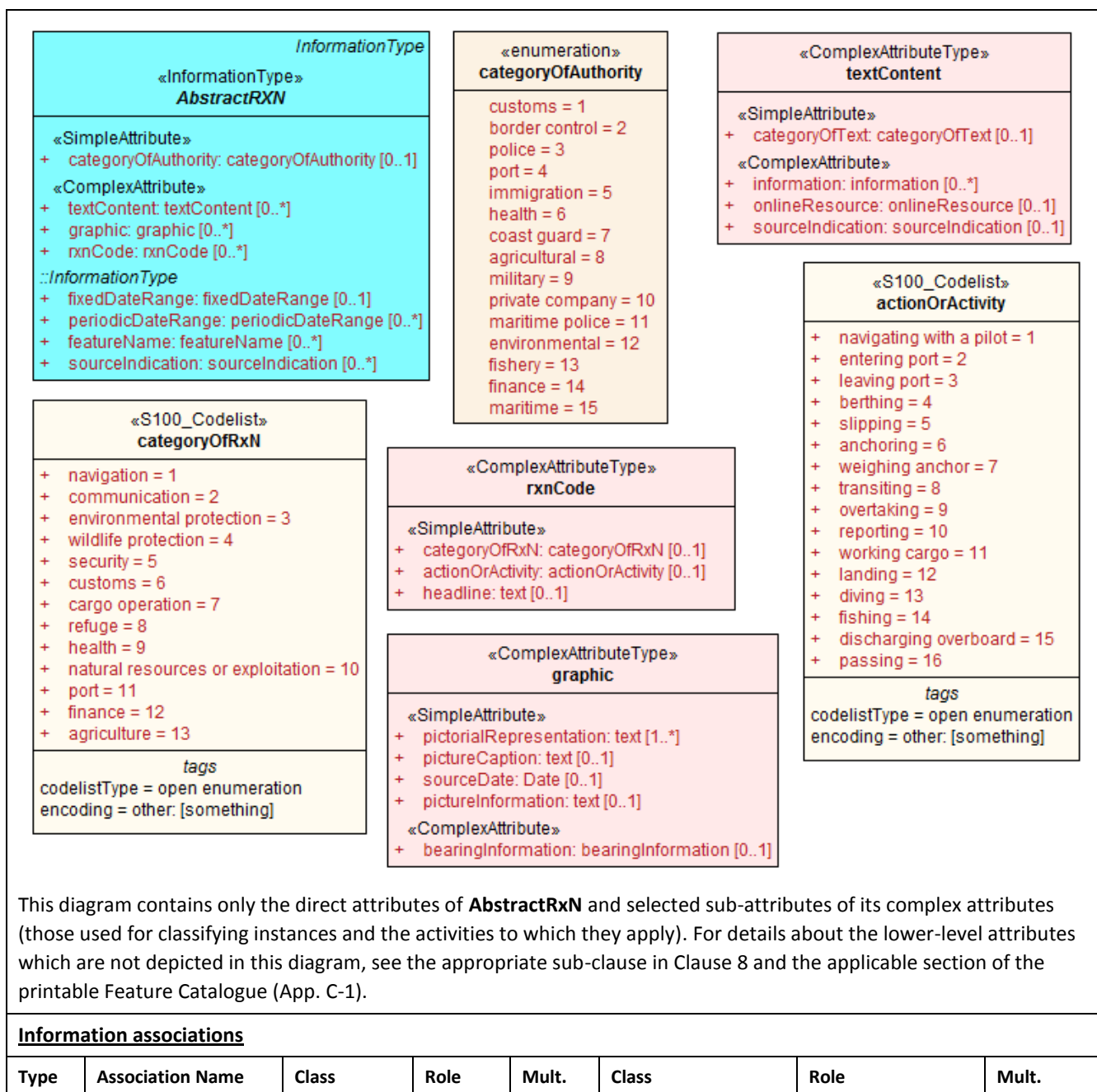
S-127 Attribute

S-57 Acronym

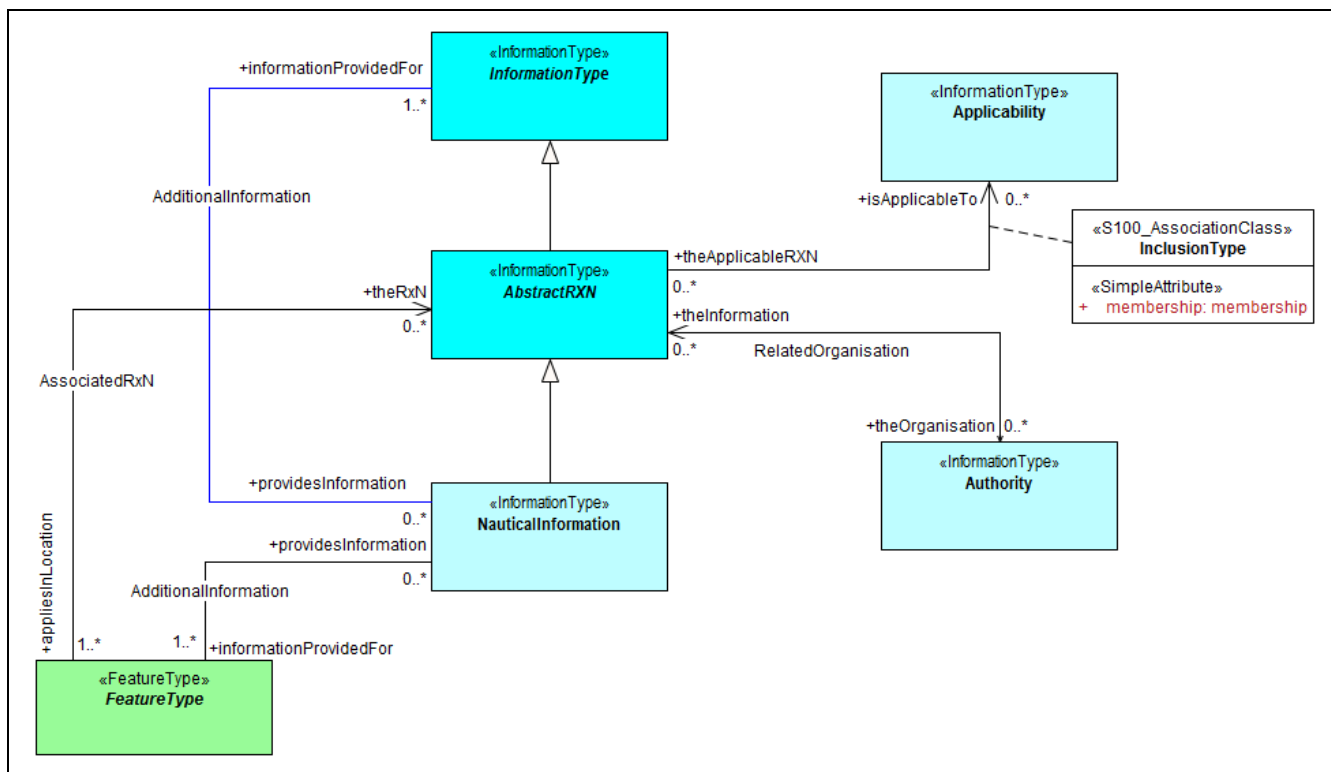
Allowable Encoding Value

Type

Multiplicity



Real World		Paper Chart Symbol		ECDIS Symbol			
S-127 Attribute		S-57 Acronym	Allowable Encoding Value		Type	Multiplicity	
<div><div>«InformationType» NauticalInformation</div><div>«SimpleAttribute» ::AbstractRXN + categoryOfAuthority: categoryOfAuthority [0..1] «ComplexAttribute» ::AbstractRXN + textContent: textContent [0..*] + graphic: graphic [0..*] + rxnCode: rxnCode [0..*] ::InformationType + fixedDateRange: fixedDateRange [0..1] + periodicDateRange: periodicDateRange [0..*] + featureName: featureName [0..*] + sourceIndication: sourceIndication [0..*]</div></div>		<div>«enumeration» categoryOfAuthority customs = 1 border control = 2 police = 3 port = 4 immigration = 5 health = 6 coast guard = 7 agricultural = 8 military = 9 private company = 10 maritime police = 11 environmental = 12 fishery = 13 finance = 14 maritime = 15</div>	<div>«ComplexAttributeType» textContent «SimpleAttribute» + categoryOfText: categoryOfText [0..1] «ComplexAttribute» + information: information [0..*] + onlineResource: onlineResource [0..1] + sourceIndication: sourceIndication [0..1]</div>		<div>«S100_Codelist» actionOrActivity + navigating with a pilot = 1 + entering port = 2 + leaving port = 3 + berthing = 4 + slipping = 5 + anchoring = 6 + weighing anchor = 7 + transiting = 8 + overtaking = 9 + reporting = 10 + working cargo = 11 + landing = 12 + diving = 13 + fishing = 14 + discharging overboard = 15 + passing = 16 tags codelistType = open enumeration encoding = other: [something]</div>		
<div>«S100_Codelist» categoryOfRxN + navigation = 1 + communication = 2 + environmental protection = 3 + wildlife protection = 4 + security = 5 + customs = 6 + cargo operation = 7 + refuge = 8 + health = 9 + natural resources or exploitation = 10 + port = 11 + finance = 12 + agriculture = 13 tags codelistType = open enumeration encoding = other: [something]</div>		<div>«ComplexAttributeType» rxnCode «SimpleAttribute» + categoryOfRxN: categoryOfRxN [0..1] + actionOrActivity: actionOrActivity [0..1] + headline: text [0..1]</div>	<div>«ComplexAttributeType» graphic «SimpleAttribute» + pictorialRepresentation: text [1..*] + pictureCaption: text [0..1] + sourceDate: Date [0..1] + pictureInformation: text [0..1] «ComplexAttribute» + bearingInformation: bearingInformation [0..1]</div>				
Information associations							
Role Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity



INT 1 Reference:

Nautical information is intended for material that is largely informative in nature, of which does not fit into the category of regulation, recommendation, or restriction.

Remarks:

- Association *AdditionalInformation* may be with a geographic feature or an information type. Association *AssociatedRXN* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.
- In theory, **Nautical Information** can be associated with any geographic feature through either an *AdditionalInformation* or *AssociatedRXN* association. *AdditionalInformation* should be used only when the information encoded in **Nautical Information** is general in nature and does not supplement information encoded in a **Regulations, Restrictions, or Recommendations** object associated to the same feature.
- According to a purely theoretical reading of the model, **Nautical Information** can be associated to another **Nautical Information, Regulations, Restrictions, or Recommendations** instance using the *AdditionalInformation* association inherited from **Information Type**. This is not permitted due to the undefined semantics of chaining RxN types (i.e., such chaining has little or no significant meaning and has not been given any special meaning in the model).

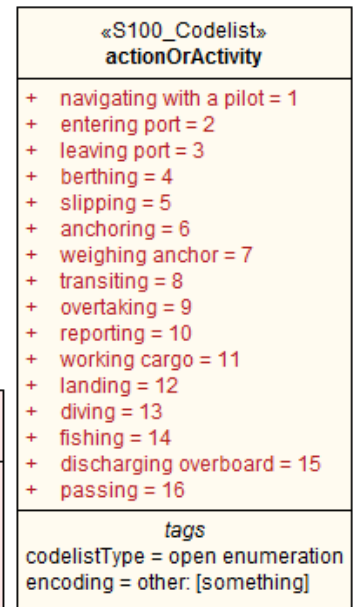
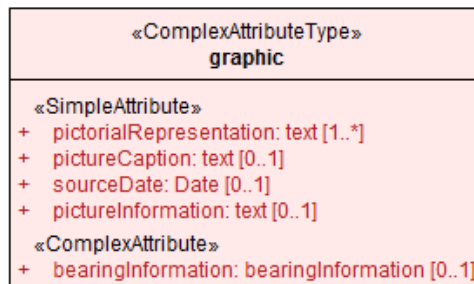
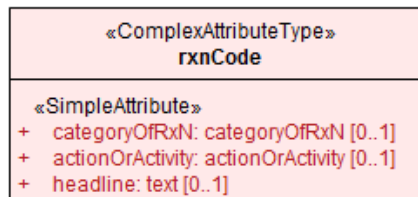
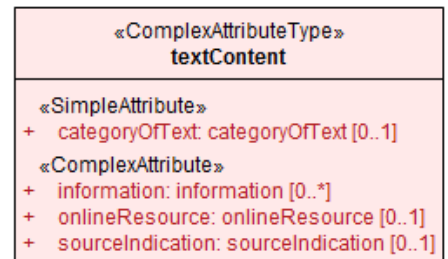
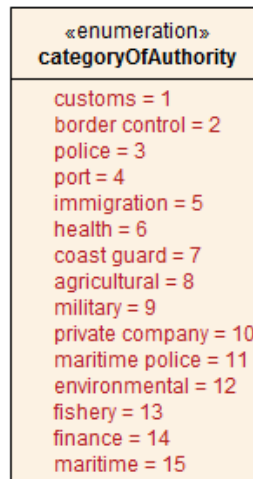
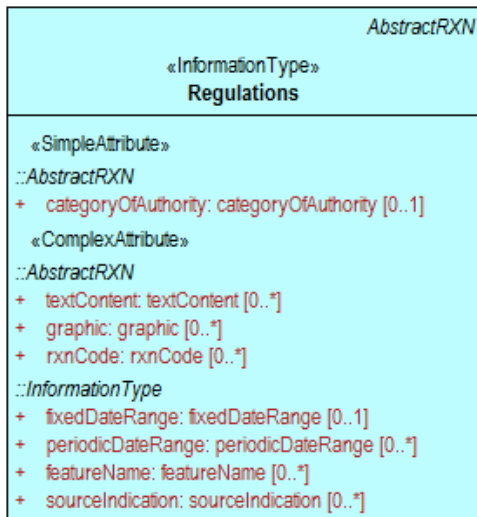
Distinction: **Regulations, Recommendations, Restrictions**

7.4 Regulations

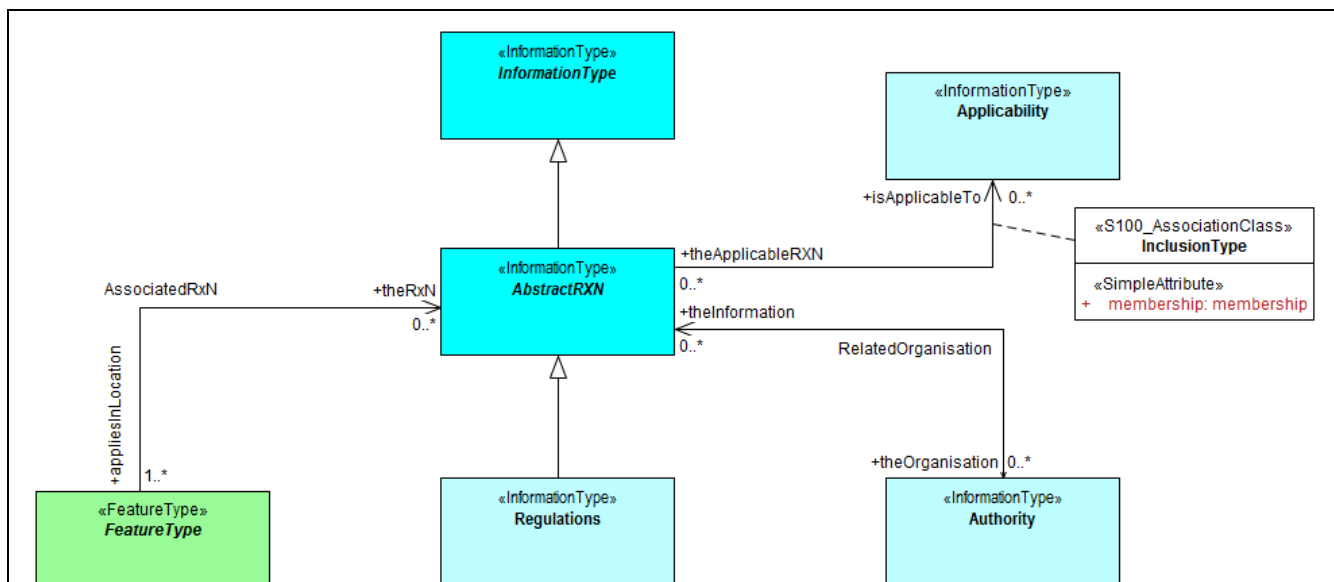
IHO Definition: **REGULATIONS** Regulations for a related area or facility.

S-127 Information Feature: Regulations

Supertype: AbstractRXN

Primitives: None*Real World**Paper Chart Symbol**ECDIS Symbol***S-127 Attribute****S-57 Acronym****Allowable Encoding Value****Type****Multiplicity****Information associations**

Role Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
-----------	------------------	-------	------	-------	-------	------	--------------



INT 1 Reference:

Regulations features are intended to be used for official rules, laws, and similar source material, i.e., sources that have the force of law or are mandated by a controlling authority. They will generally originate from some kind of administration or authority, including port authorities.

Remarks:

- Association *AssociatedRxN* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction: **Nautical Information, Recommendations, Restrictions**

7.5 Restrictions

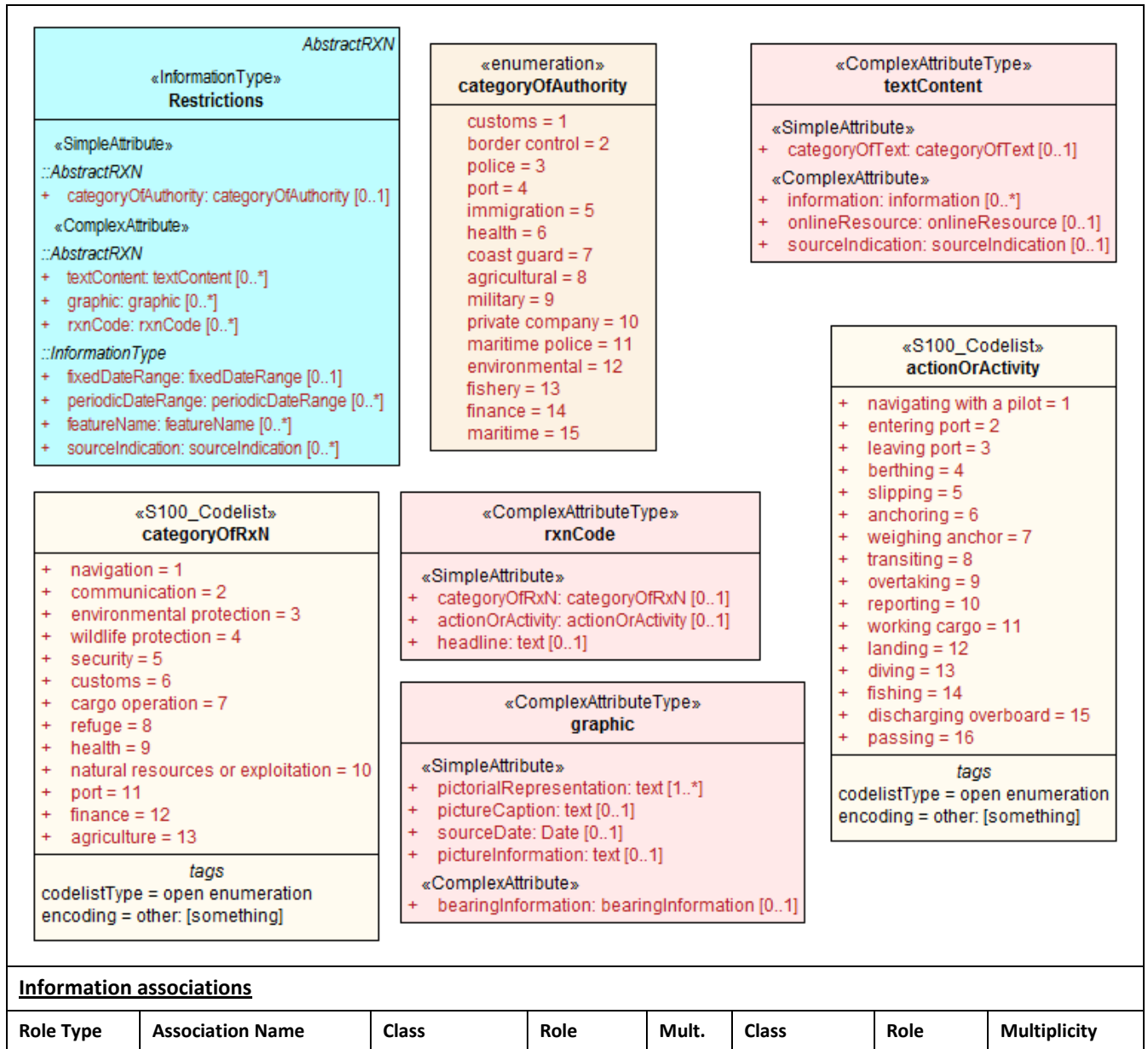
IHO Definition: **RESTRICTIONS** Restrictions for a related area or facility.

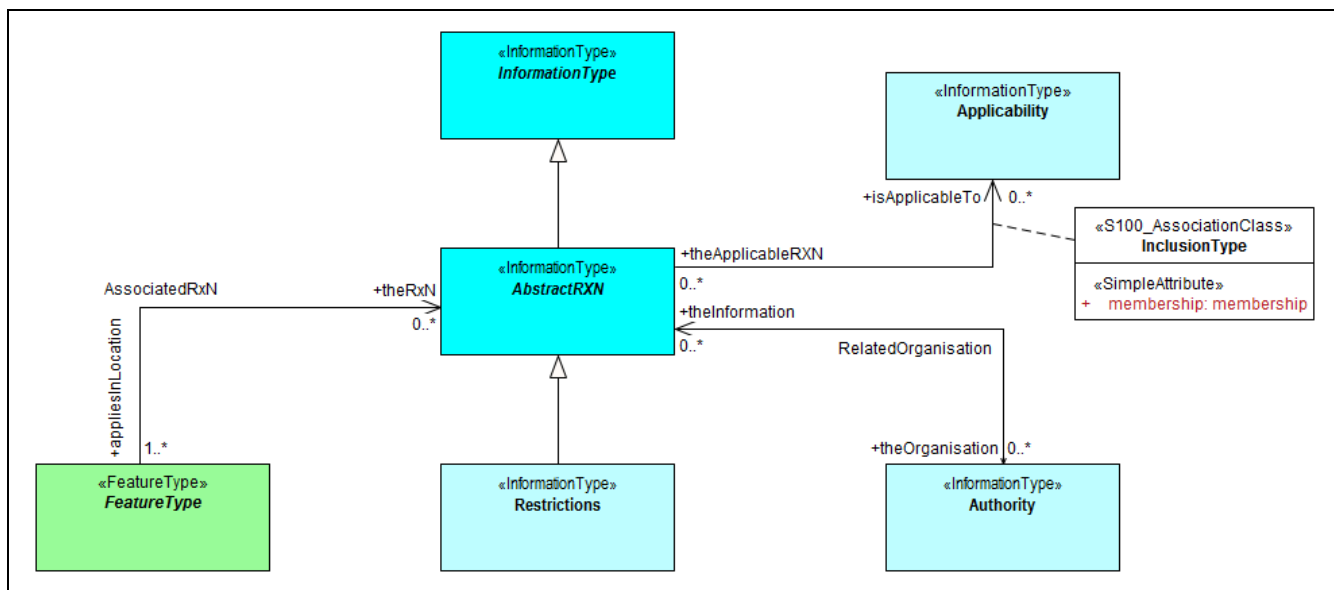
S-127 Information Feature: Restrictions

Supertype: AbstractRxN

Primitives: None

<i>Real World</i>	<i>Paper Chart Symbol</i>	<i>ECDIS Symbol</i>			
S-127 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity	





INT 1 Reference:

Restrictions is intended for restrictions that constrain the activities of vessels temporarily with or without the legal force, or for longer terms without the force of law; they may be issued by a local authority such as a port captain or US Coast Guard district.

Remarks:

- Association *AssociatedRxN* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction: **Nautical Information, Recommendations, Regulations**

7.6 Recommendations

IHO Definition: **RECOMMENDATIONS** Recommendations for a related area or facility.

S-127 Information Feature: Recommendations

Supertype: AbstractRXN

Primitives: None

Real World

Paper Chart Symbol

ECDIS Symbol

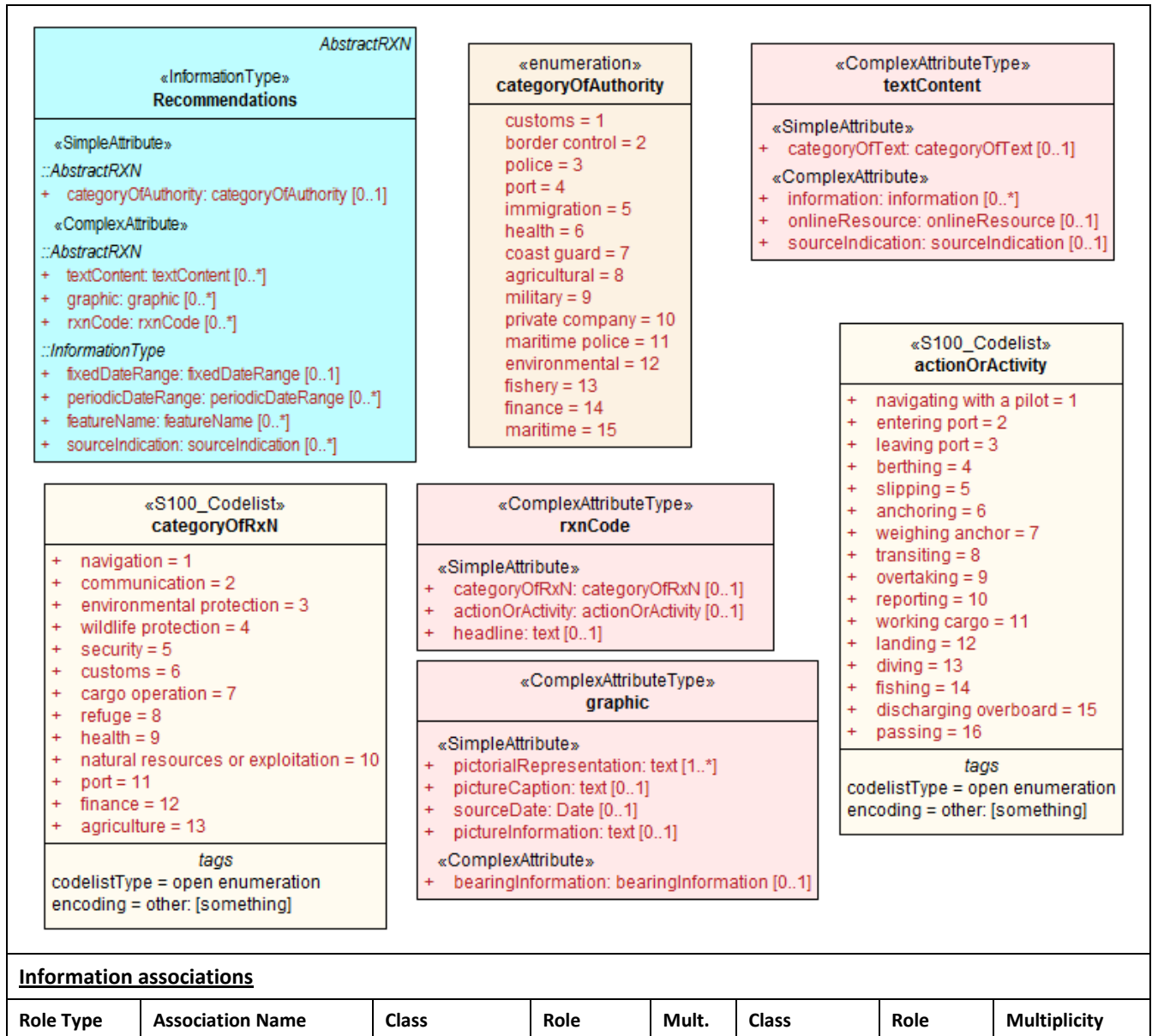
S-127 Attribute

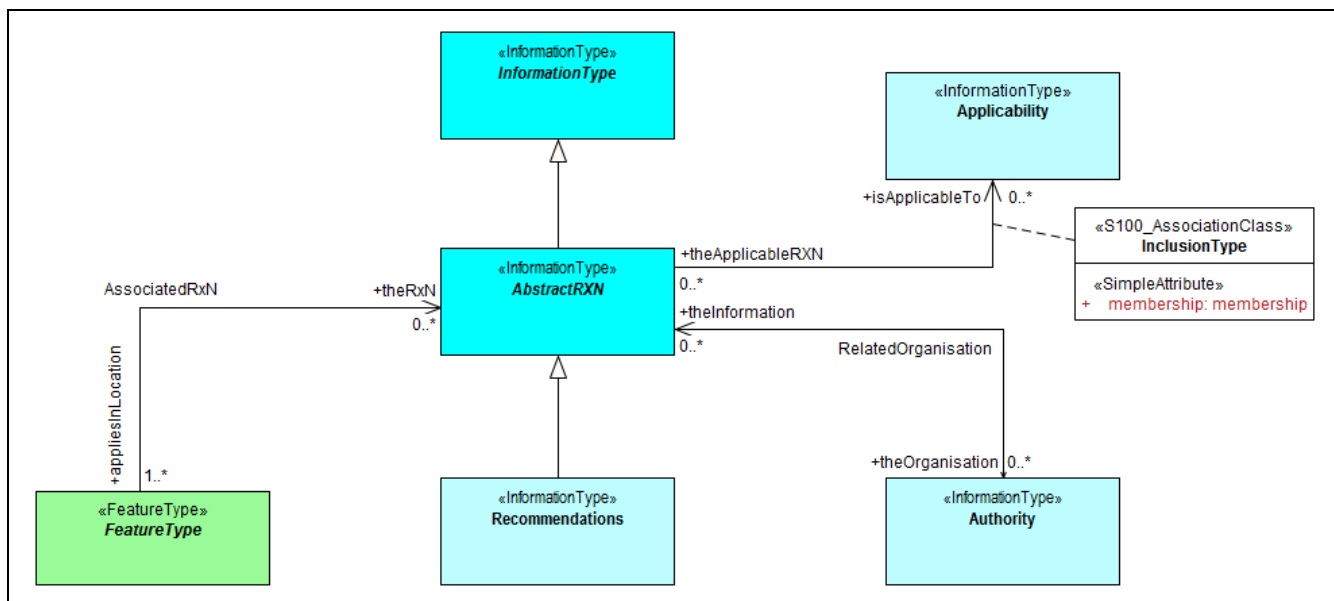
S-57 Acronym

Allowable Encoding Value

Type

Multiplicity





INT 1 Reference:

Remarks:

- Association *AssociatedRxN* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction: **Nautical Information, Recommendations, Restrictions**

7.7 Authority

IHO Definition: **AUTHORITY**. A person or organization that has the legally delegated or invested authority, capacity, or power to perform a designated function or exert administrative control.

S-127 Information Feature: Authority

Supertype: Information Type

Primitives: None

Real World

Paper Chart Symbol

ECDIS Symbol

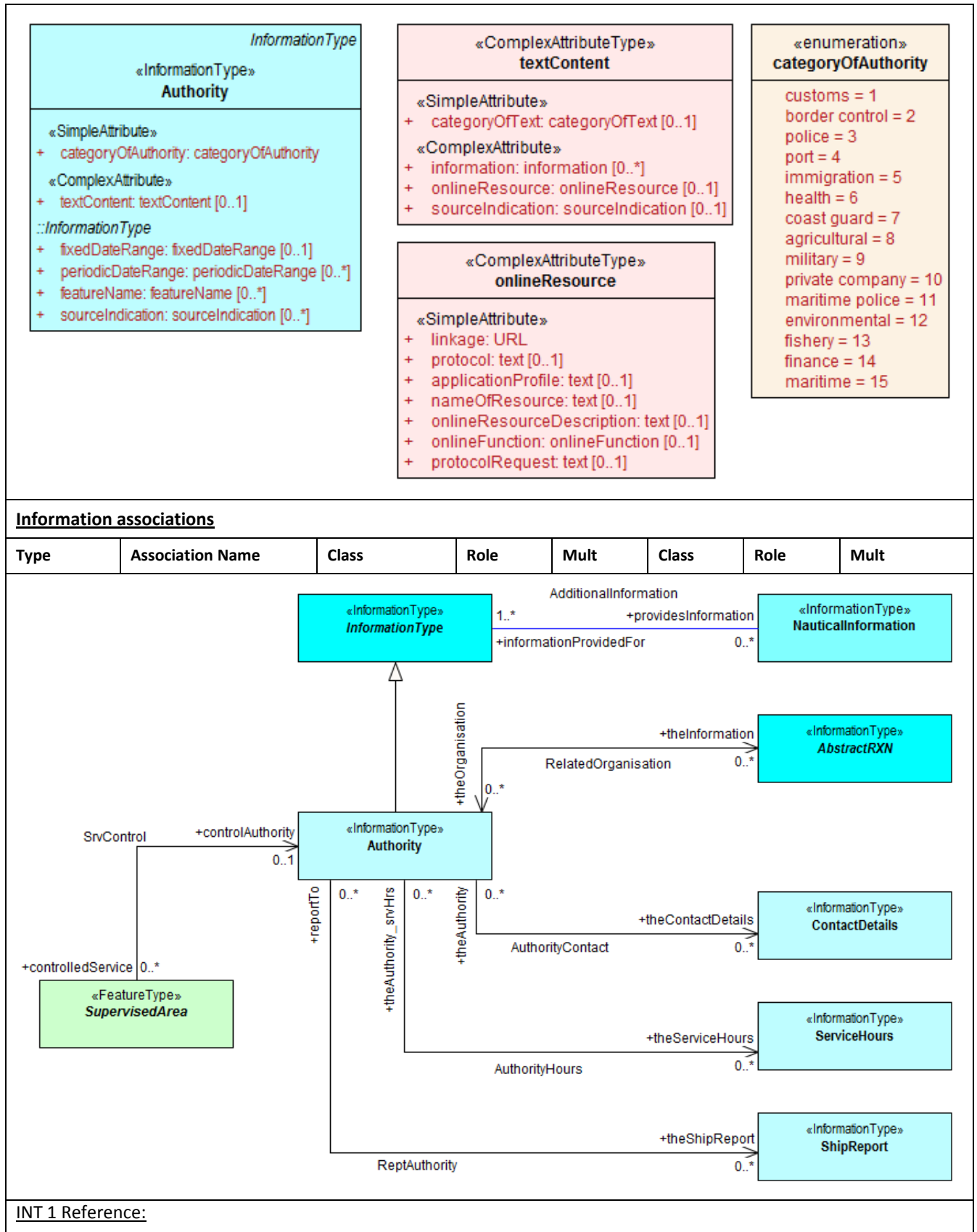
S-127 Attribute

S-57 Acronym

Allowable Encoding Value

Type

Multiplicity



Remarks:

- No remarks.

Distinction:

7.8 Contact Details

IHO Definition: **CONTACT DETAILS.** Information on how to reach a person or organisation by postal, internet, telephone, telex and radio systems.

S-127 Information Feature: Contact Details

Supertype: Information Type

Primitives: None

Real World

Paper Chart Symbol

ECDIS Symbol

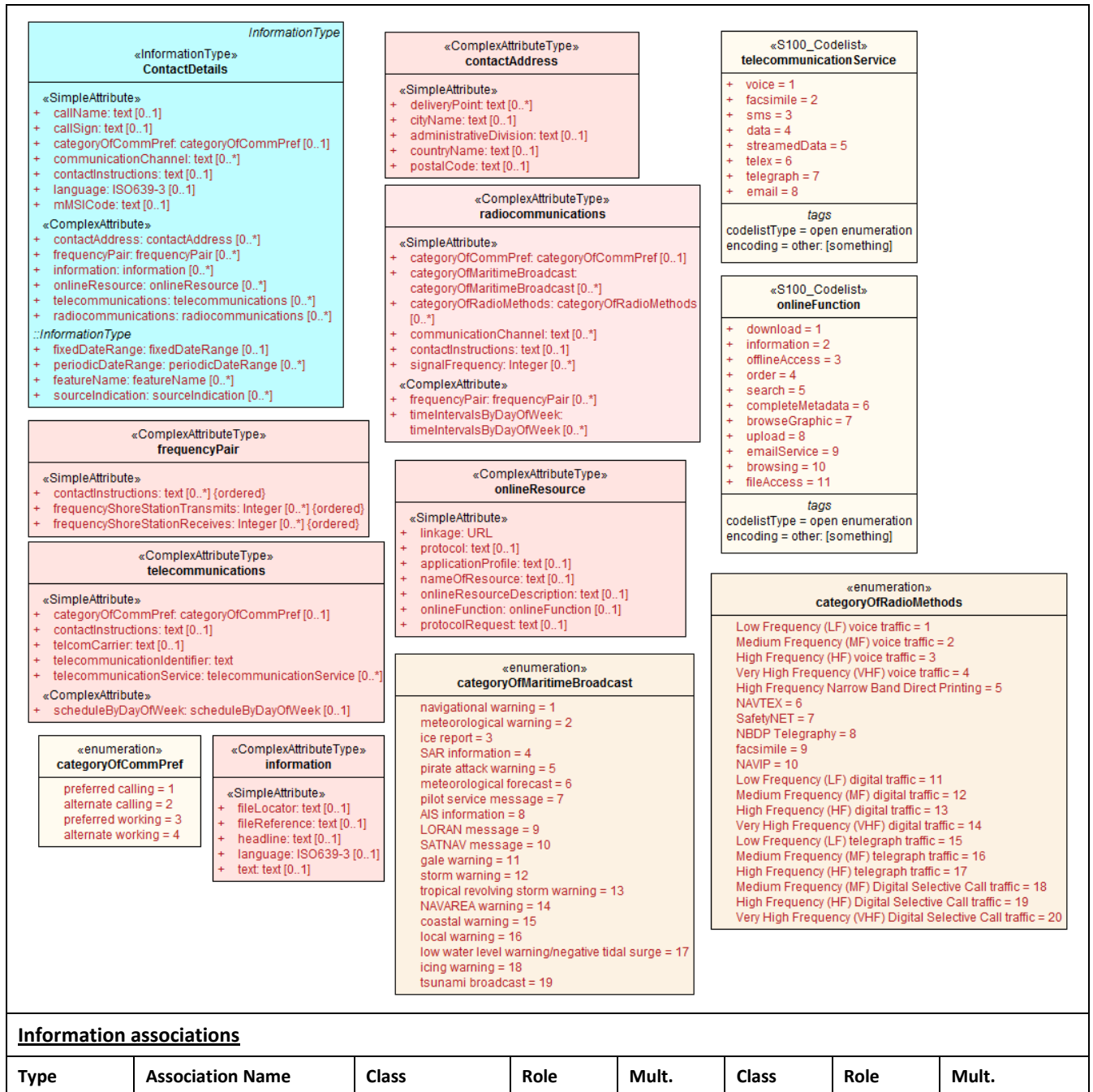
S-127 Attribute

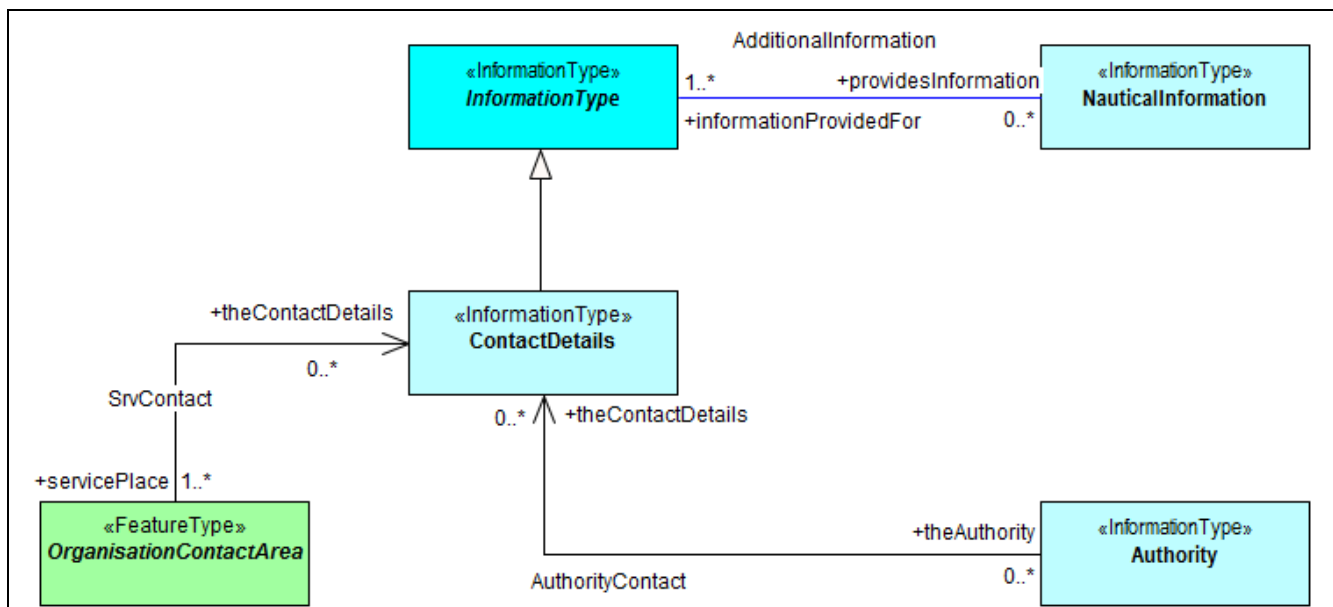
S-57 Acronym

Allowable Encoding Value

Type

Multiplicity





INT 1 Reference:

When the complex attribute **radioCommunications** is used in **Contact Details**, it can have only the sub-attributes indicated in this table.

Remarks:

- If it is required to encode call name in different languages, this must be done by associating an instance of **Contact Details** per language, with the originating instance. The **Language** attribute must be used to designate the language of the instance.

Distinction:

7.9 Ship Report

IHO Definition: **SHIP REPORT**. This describes how a ship should report to a maritime authority, including when to report, what to report and whether the format conforms to the IMO standard.

S-127 Information Feature: Ship Report

Supertype: Information Type

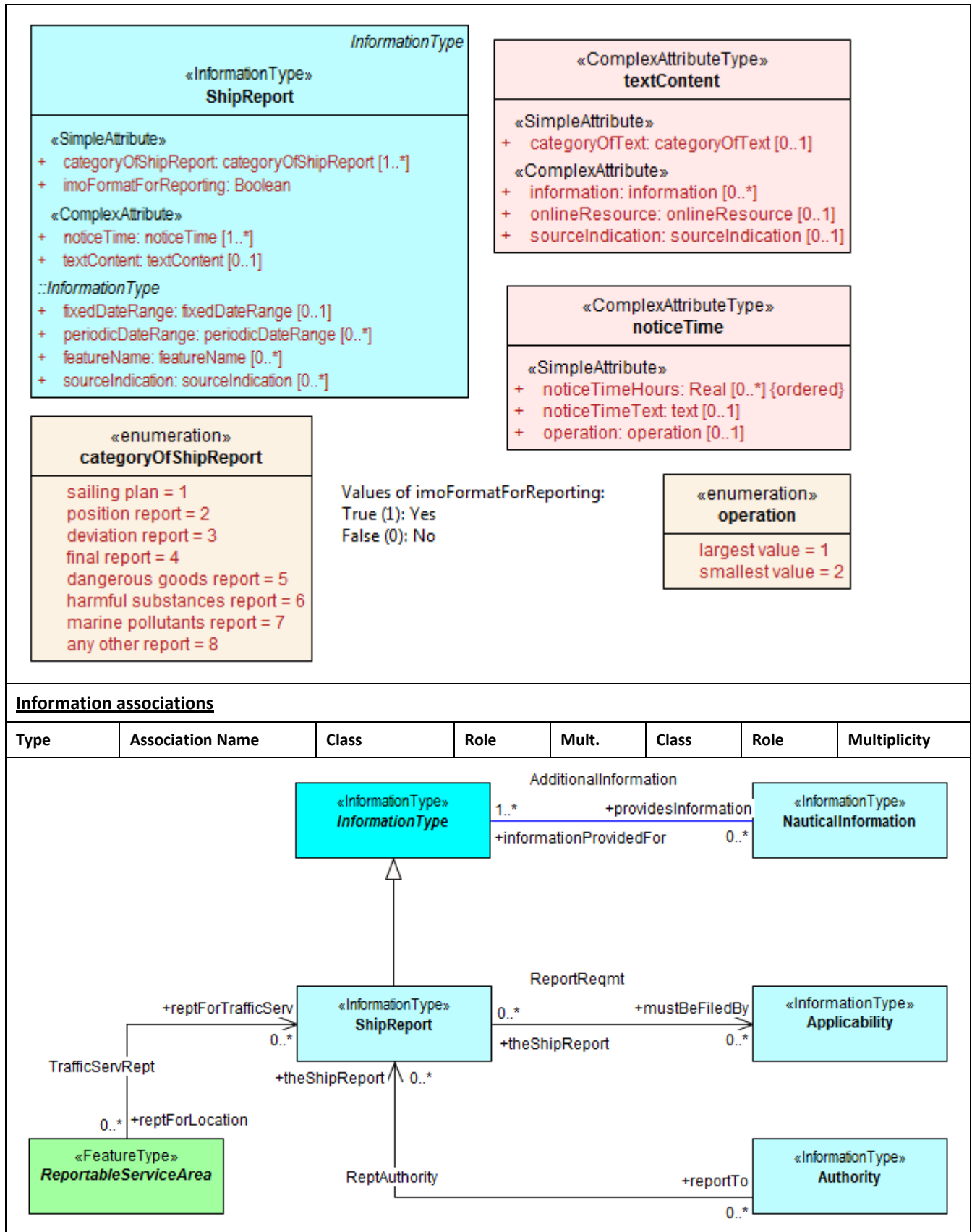
Primitives: None

Real World

Paper Chart Symbol

ECDIS Symbol

S-127 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
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INT 1 Reference:

Remarks:

- **textContent** is used to describe non-standard ship reports. The associated information object **Applicability** indicates characteristics of vessels which use this report.
- Association *TrafficServRept* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.
- If it is required to encode one or more pre-arrival reporting times, it must be done using the complex attribute **noticeTime**, and the required time in hours before arrival in the attribute **noticeTimeHours**. Further explanations for the reporting time can be added in the **noticeTimeText** attribute.
- Distinction:

7.10 Non Standard Working Day

IHO Definition: **NON STANDARD WORKING DAY**. Days when many services are not available. Often days of festivity or recreation or public holidays when normal working hours are limited, especially a national or religious festival, etc.

S-127 Information Feature: Non Standard Working Day

Supertype: Information Type

Primitives: None

Real World

Paper Chart Symbol

ECDIS Symbol

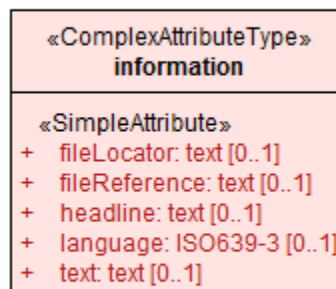
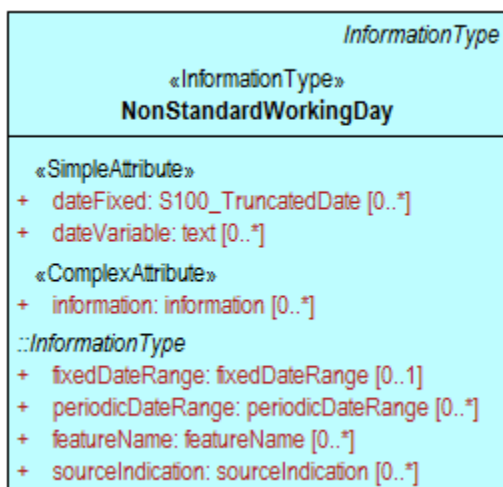
S-127 Attribute

S-57 Acronym

Allowable Encoding Value

Type

Multiplicity

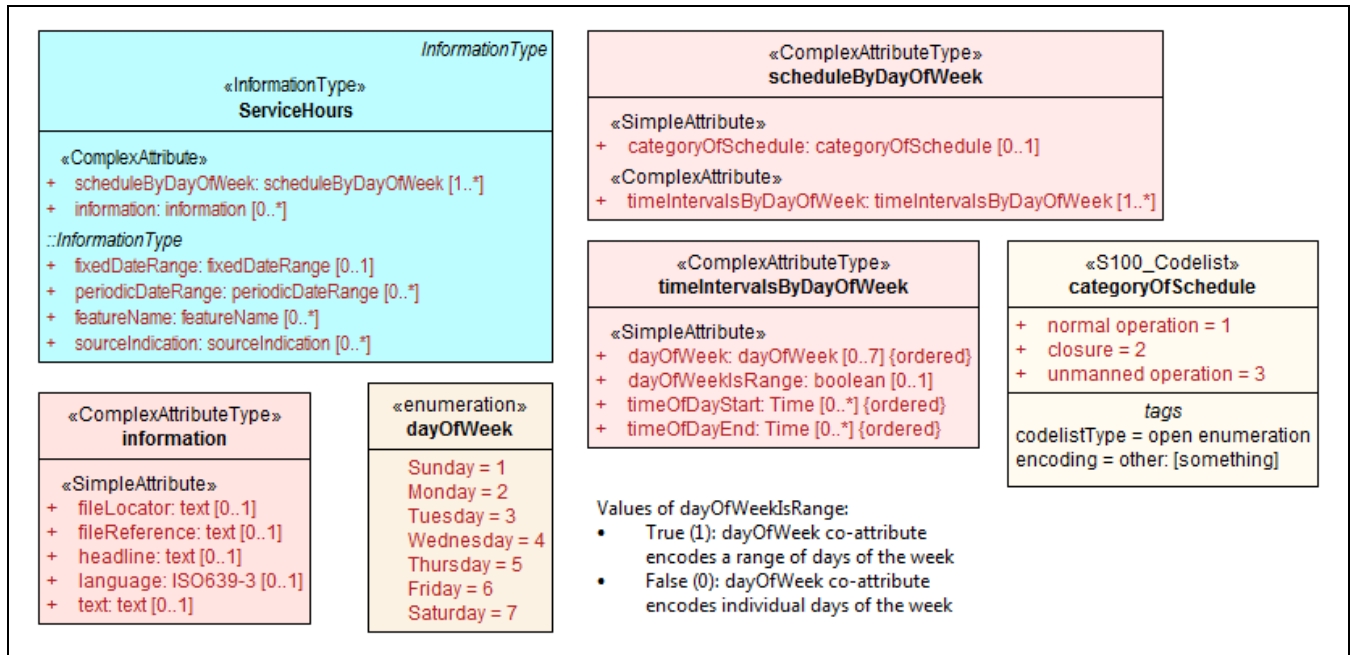


Information associations

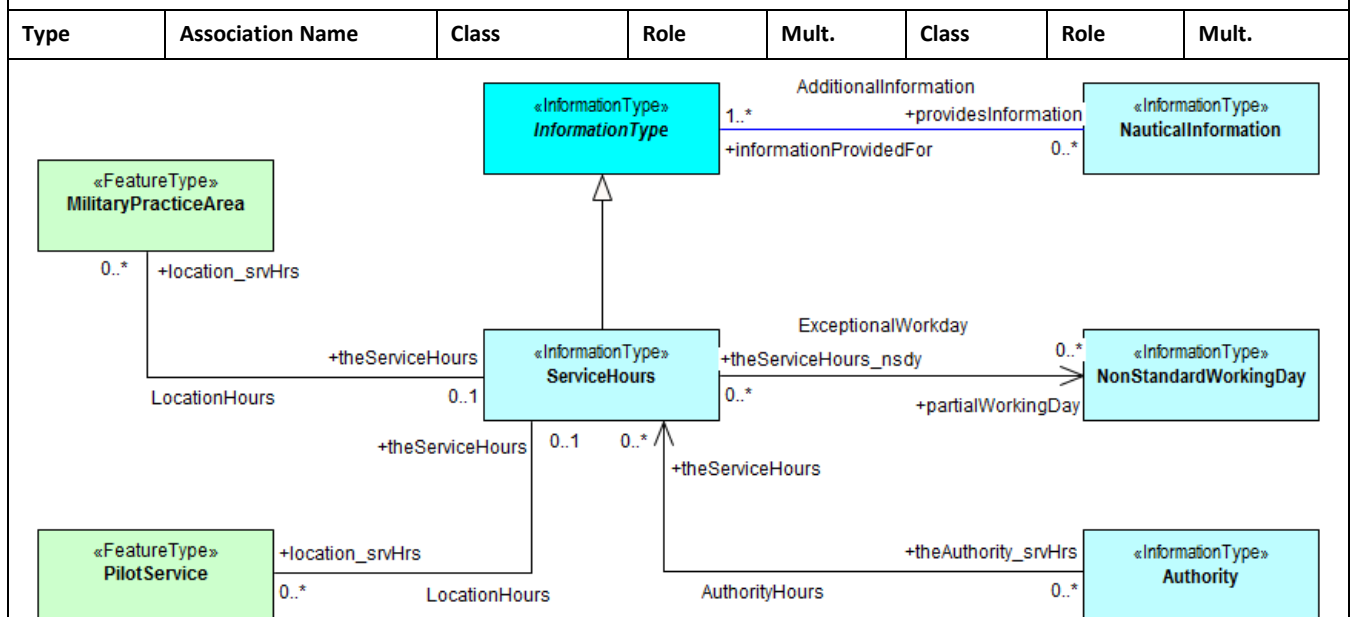
Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
<pre> classDiagram class InformationType { <<InformationType>> } class NauticalInformation { <<InformationType>> } class NonStandardWorkingDay { <<InformationType>> } class ServiceHours { <<InformationType>> } InformationType "1..*" -- "0..*" NauticalInformation : +providesInformation InformationType "1..*" -- "0..*" NauticalInformation : +informationProvidedFor NonStandardWorkingDay < -- InformationType NonStandardWorkingDay "0..*" -- "0..*" ServiceHours : +theServiceHours_nsd NonStandardWorkingDay "0..*" -- "0..*" ServiceHours : +partialWorkingDay </pre> <p>The diagram illustrates the relationships between four classes: InformationType, NauticalInformation, NonStandardWorkingDay, and ServiceHours. InformationType is a base class for NonStandardWorkingDay, indicated by a generalization arrow. InformationType has two associations with NauticalInformation: one labeled AdditionalInformation with role +providesInformation and multiplicity 1..* on InformationType and 0..* on NauticalInformation; the other is unlabeled with role +informationProvidedFor and multiplicity 1..* on InformationType and 0..* on NauticalInformation. NonStandardWorkingDay has two associations with ServiceHours: one labeled ExceptionalWorkday with role +theServiceHours_nsd and multiplicity 0..* on NonStandardWorkingDay and 0..* on ServiceHours; the other is unlabeled with role +partialWorkingDay and multiplicity 0..* on NonStandardWorkingDay and 0..* on ServiceHours.</p>							
<p><u>INT 1 Reference:</u></p> <p><u>Remarks:</u></p> <ul style="list-style-type: none"> Non-standard workdays which cannot be represented using fixed or variable dates should be encoded using the information complex attribute, preferably as a short description in the text sub-attribute of information. The information attribute can also be used for encoding any additional explanatory information if the explanation is essential knowledge for specifying the day. The two date range attributes (fixed and periodic date range) should be used if the non-standard day applies only in specific years or periods (e.g., seasonally). <p><u>Distinction:</u></p>							

7.11 Service Hours

IHO Definition: SERVICE HOURS The time when a service is available and known exceptions.				
S-127 Information Feature: Service Hours				
Supertype: Information Type				
Primitives: None				
<i>Real World</i>	<i>Paper Chart Symbol</i>	<i>ECDIS Symbol</i>		
S-127 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity



Information associations



INT 1 Reference:

Seasonal variations in service hours can be encoded using multiple **Service Hours** instances with appropriate **periodicDateRange** values.

Remarks:

- The two *LocationHours* associations are with geographic features. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction:

7.12 Applicability

IHO Definition: **APPLICABILITY** Describes the relationship between vessel characteristics and: (i) the applicability of an associated information object or feature to the vessel; or, (ii) the use of a facility, place, or service by the vessel; or, (iii) passage of the vessel through an area.

S-127 Information Feature: Applicability

Supertype: InformationType

Primitives: None

Real World

Paper Chart Symbol

ECDIS Symbol

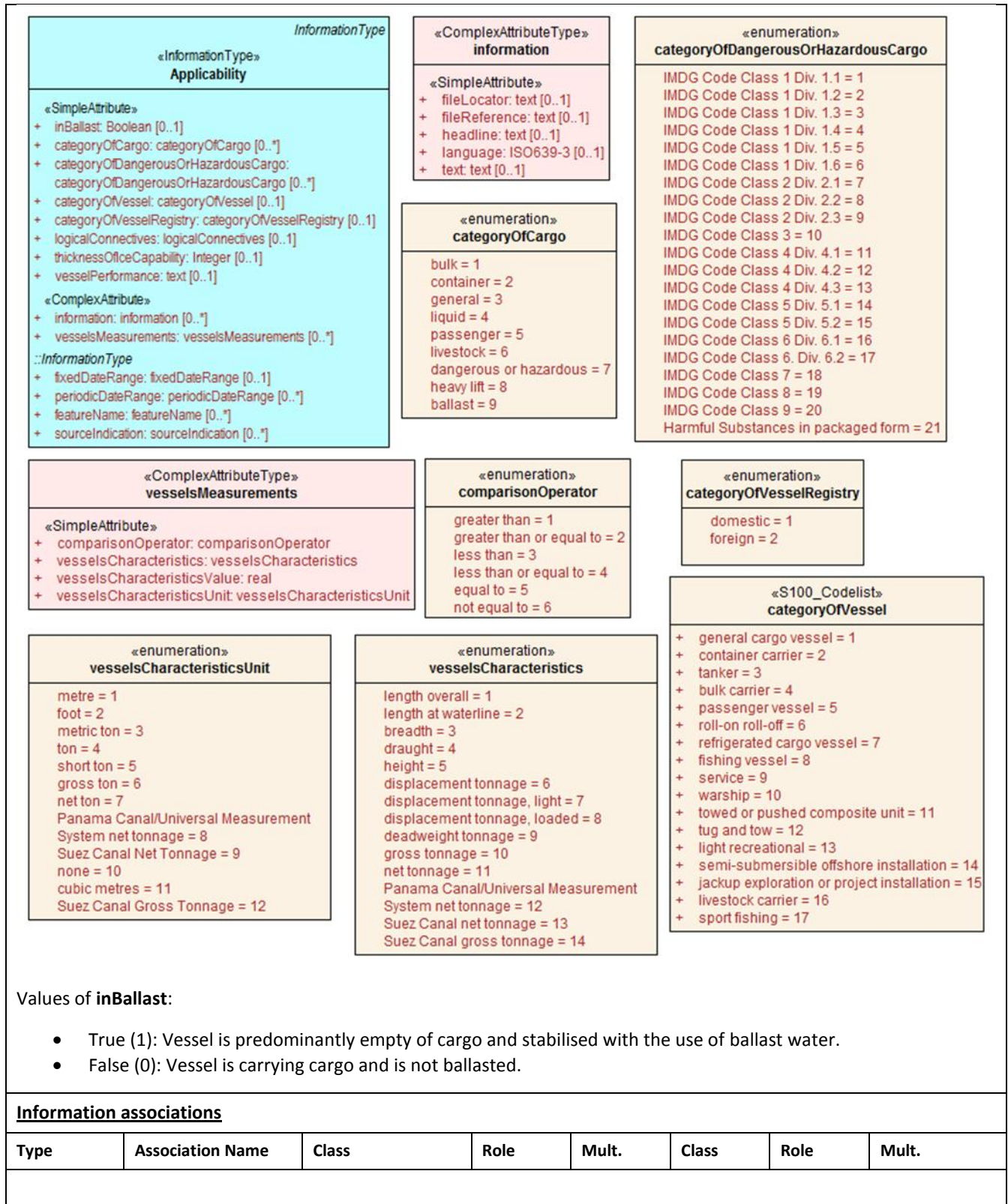
S-127 Attribute

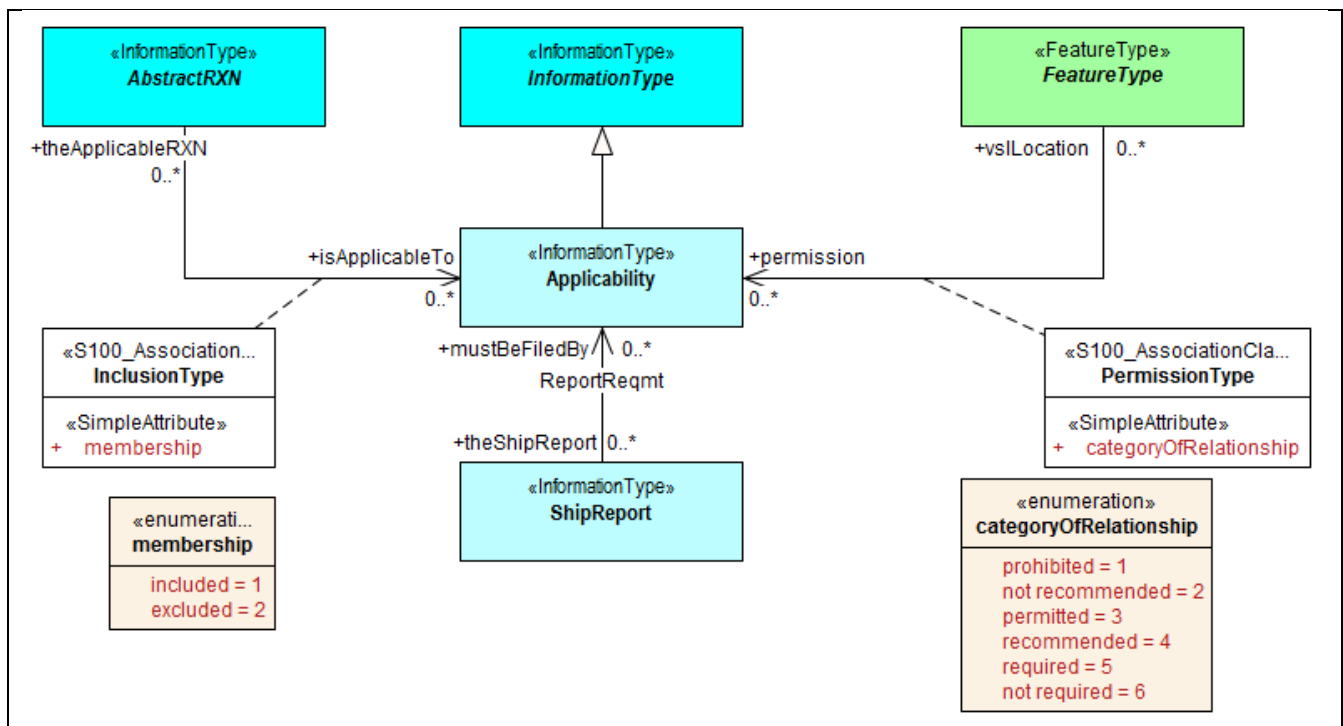
S-57 Acronym

Allowable Encoding Value

Type

Multiplicity





INT 1 Reference:

Remarks:

- Vessel characteristics are specified as follows:

BALAST: The vessel is ballasted as described by this attribute.

VSLMSM: The vessel or cargo matches the attribute value (for multi-valued attributes, matches at least one of the values).

ICECAP, UKCLRN, PRFMNC attributes: The vessel matches the specified requirement. Absent attributes or null values are ignored.

LOGCON states whether “all” or “at least one” of the specifications must be met.

CATREL indicates the relationship between matching vessels and the associated information object or feature.

Example:

With one instance of APPLIC:

VSLMSM [VSLCAR=length, VSLUNT=metre, COMPOP=greater than, VSLVAL=50], CATVSL=3 (tanker), LOGCON=1 (and), CATREL=5 (required); associated to a PILBOP object: tankers with LOA > 50.0 m must use the PILBOP

PRFMNC="Vessels with thrusters", MBRSHP=2; associated to a REGLTS object: Vessels with thrusters are exempted from the regulation.

If VSLMSM becomes repeatable:

VSLMSM [VSLCAR=length, VSLUNT=metre, COMPOP=(>), VSLVAL=50], VSLMSM [VSLCAR=length, VSLUNT=metre, COMPOP=(<), VSLVAL=90], CATDHC=19, LOGCON=1 (and), MBRSHP=1 (included);

associated with **Regulations**: the regulation applies to vessels with LOA greater than 50.0 and less than 90.0 m. carrying MARPOL Class 8 corrosive substances.

Same situation as above with one instance of VSLMSM:

VSLMSM [[VSLCAR=length; VSLUNT=metre, VSLVAL=50; COMPOP=(>)], [VSLCAR=length; VSLUNT=metre, VSLVAL=90; COMPOP=(<)]], CATVSL=3 (tanker), LOGCON=1 (and), MBRSHP=1 (included);

associated with a REGLTS: the regulation applies to vessels with LOA greater than 50.0 and less than 90.0 m. carrying MARPOL Class 8 corrosive substances.

- Multiple values of **Category of Cargo** and of **Category of Dangerous Or Hazardous Cargo** should be treated as “inclusive OR” (i.e., if **Category of Cargo**=1 and 2, then it means vessels with either bulk or container cargo or both).

Distinction:

8 Complex attributes

This DCEG describes complex attributes similarly to features and information types, specifying the name, definition, etc., then providing a picture depicting the sub-attributes and their types, then encoding remarks describing any constraints, etc., that apply to the complex attribute in general. Constraints and usage notes pertaining to their use in specific features or information types are provided in the respective table describing the feature or information type. Complex sub-attributes are not shown in the figures since they are depicted in their own sub-clauses elsewhere in this clause.

8.1 Bearing information

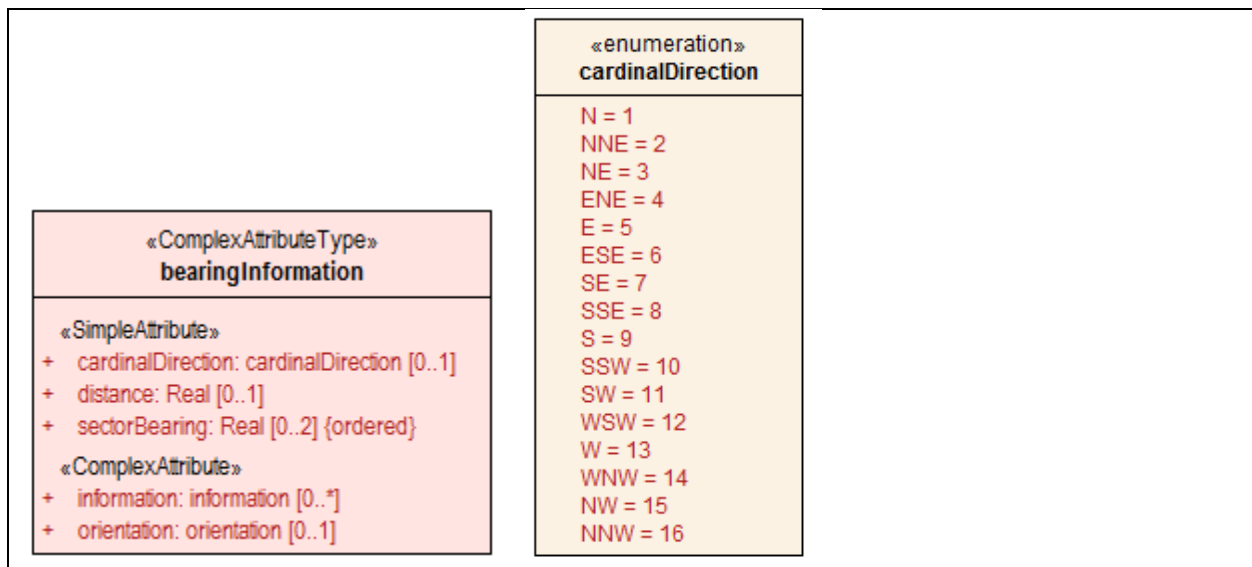
Name: Bearing information

Definition: A bearing is the direction one object is from another object.

Code: 'bearingInformation'

Remarks:

Aliases: BRGINF



Remarks:
At least one of the sub-attributes must be populated.

8.2 Contact address

Name: Contact address

Definition: Direction or superscription of a letter, package, etc., specifying the name of the place to which it is directed, and optionally a contact person or organisation who should receive it.

Code: 'contactAddress'

Remarks:

Aliases: (none)

«ComplexAttributeType» contactAddress
«SimpleAttribute» + deliveryPoint: text [0..*] + cityName: text [0..1] + administrativeDivision: text [0..1] + countryName: text [0..1] + postalCode: text [0..1]

Remarks:
At least one of the sub-attributes must be populated.

8.3 Feature name

Name: Feature name

Definition: The complex attribute provides the name of an entity, defines the national language of the name, and provides the option to display the name at various system display settings.

Code: 'featureName'

Remarks:

Aliases: (none)

«ComplexAttributeType» featureName
«SimpleAttribute» + displayName: Boolean [0..1] + language: ISO639-3 [0..1] + name: text

8.4 Fixed date range

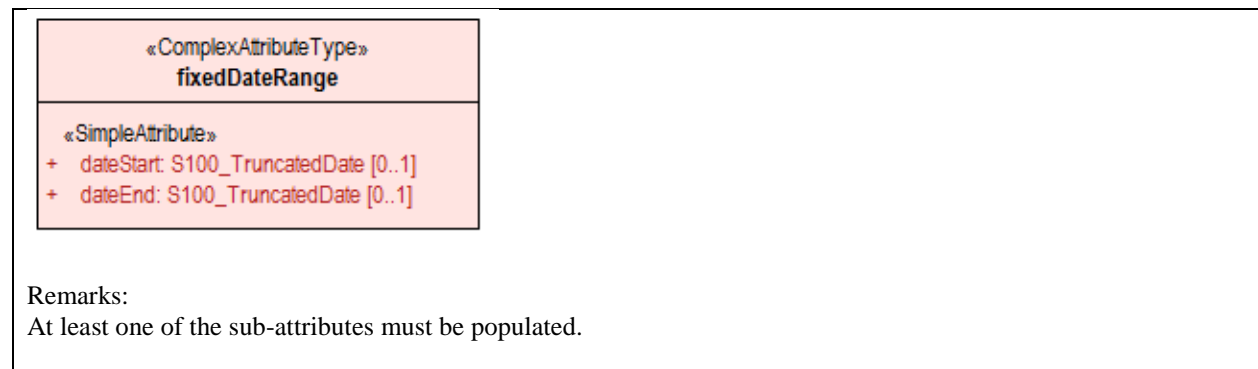
Name: Fixed date range

Definition: The complex attribute describes single fixed period, as the date range between its sub-attributes.

Code: 'fixedDateRange'

Remarks: the sub-attributes date start and date end must be encoded using 4 digits for the calendar year (YYYY) and, optionally, 2 digits for the month (MM) (e.g. April = 04) and 2 digits for the day (DD). When no specific month and/or day is required/known, the values are replaced with dashes (-).

Aliases: (none)



8.5 Frequency pair

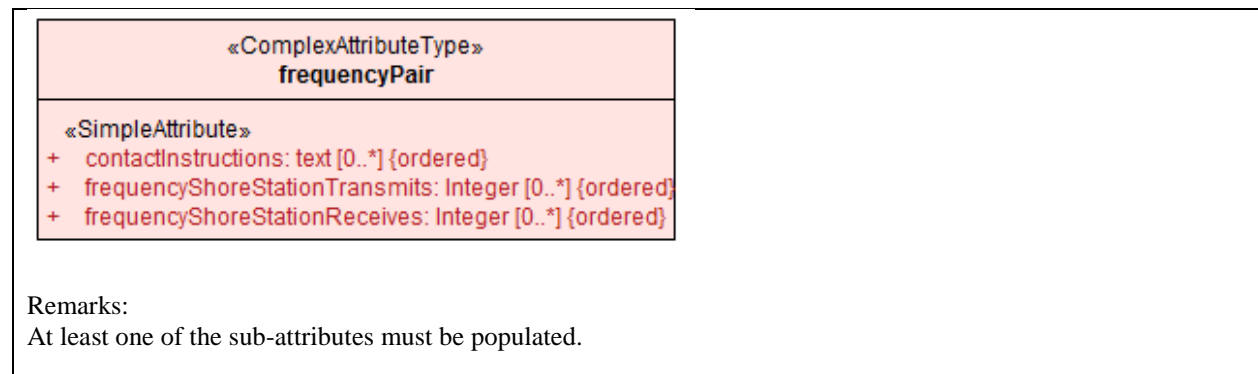
Name: Frequency pair

Definition: A pair of frequencies for transmitting and receiving radio signals. The shore station transmits and receives on the frequencies indicated.

Code: 'frequencyPair'

Remarks:

Aliases: FRQPAR



8.6 Graphic

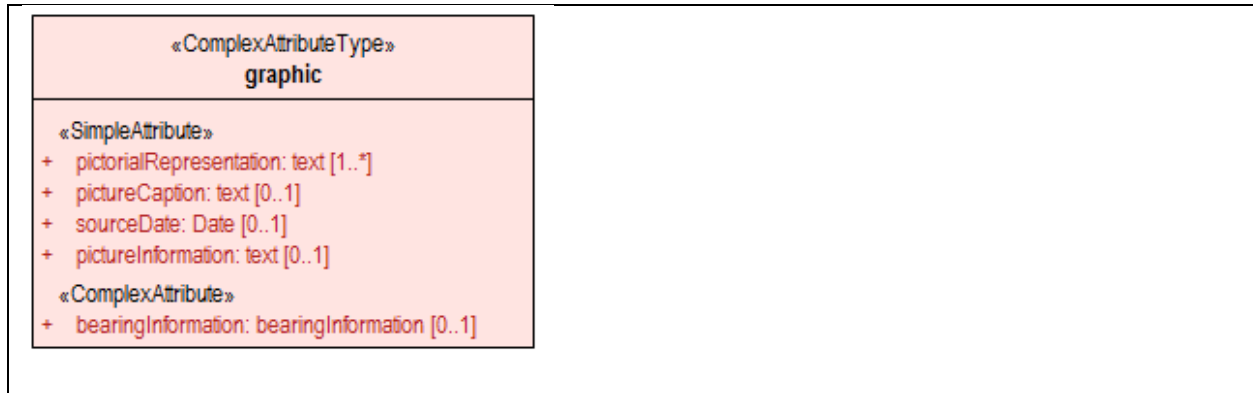
Name: Graphic

Definition: Pictorial information such as a photograph, sketch, or other graphic, optionally accompanied by descriptive information about the graphic and the location relative to its subject from which it was made.

Code: 'graphic'

Remarks:

Aliases: (none)



8.7 Horizontal position uncertainty

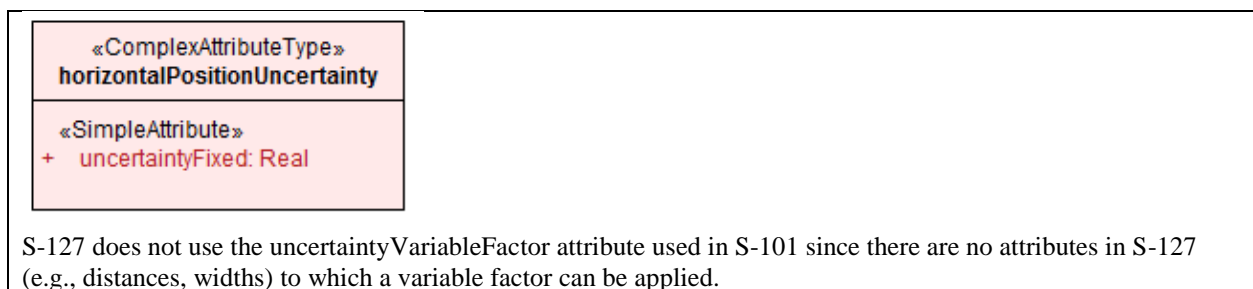
Name: Horizontal position uncertainty

Definition: The best estimate of the accuracy of a position.

Code: 'horizontalPositionUncertainty'

Remarks: The expected input is the maximum of the two-dimensional error. The error is assumed to be positive and negative.

Aliases: (none)



8.8 Information

Name: Information

Definition: Textual information about the feature. The information may be provided as a string of text or as a file name of a single external text file that contains the text.

Code: 'information'

Remarks: this complex attribute should be used, for example, to hold the information that is shown on paper charts by cautionary and explanatory notes.

Aliases: (none)

<div> <div>«ComplexAttributeType» information</div> <div> <div>«SimpleAttribute»</div> <div> + fileLocator: text [0..1] + fileReference: text [0..1] + headline: text [0..1] + language: ISO639-3 [0..1] + text: text [0..1] </div> </div> </div>	
<p>Remarks:</p> <ul style="list-style-type: none"> At least one of the sub-attributes fileReference or text must be populated. If fileLocator is populated, fileReference must be populated. 	

8.9 Notice time

Name: Notice time

Definition: Span of time, prior to the time the service is needed, for preparations to be made to fulfil the requirement.

Code: 'noticeTime'

Remarks:

Aliases: NTCTIM

<div> <div>«ComplexAttributeType» noticeTime</div> <div> <div>«SimpleAttribute»</div> <div> + noticeTimeHours: Real [0..*] {ordered} + noticeTimeText: text [0..1] + operation: operation [0..1] </div> </div> </div>	<div> <div>«enumeration» operation</div> <div> largest value = 1 smallest value = 2 </div> </div>
<p>Remarks:</p> <ul style="list-style-type: none"> At least one of the sub-attributes noticeTimeHours and noticeTimeText must be encoded. If there is more than one noticeTimeHours sub-attribute encoded, then the sub-attribute operation must be encoded. 	

8.10 Online resource

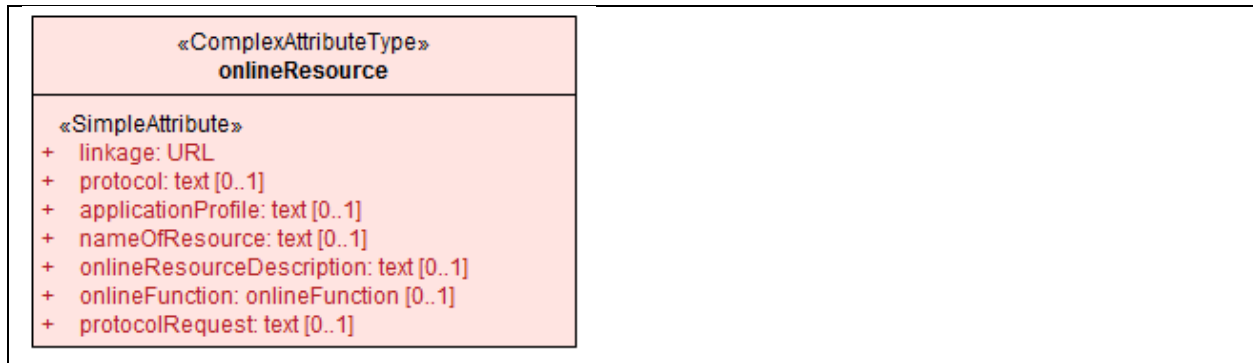
Name: Online resource

Definition: Information about online sources from which a resource or data can be obtained.

Code: 'onlineResource'

Remarks: The complex attribute describes the access to online resources according to ISO 19115.

Aliases: ONLRES



8.11 Orientation

Name: Orientation

Definition: The angular distance measured from true north to the major axis of the feature.

Code: 'orientation'

Remarks:

Aliases: (none)



8.12 Periodic date range

Name: Periodic date range

Definition: The complex attribute describes the active period for a seasonal feature (e.g. a buoy), as the dates between its sub-attributes

Code: 'periodicDateRange'

Remarks: The sub-attributes date start and date end should be encoded using 4 digits for the calendar year (YYYY), 2 digits for the month (MM) (for example April = 04) and 2 digits for the day (DD). When no specific year is required (that is, the feature is removed at the same time each year) the following two cases may be considered: - same day each year: ----MMDD - same month each year: ----MM-- This conforms to ISO 8601:2004.

Aliases: (none)

«ComplexAttributeType» periodicDateRange
«SimpleAttribute» + dateStart: S100_TruncatedDate + dateEnd: S100_TruncatedDate

8.13 Radiocommunications

Name: Radiocommunications

Definition: Detailed radiocommunications description with channels, frequencies, preferences and time schedules

Code: 'radiocommunications'

Remarks:

Aliases: RDOCOM

«ComplexAttributeType» radiocommunications	«enumeration» categoryOfMaritimeBroadcast
«SimpleAttribute» + categoryOfCommPref: categoryOfCommPref [0..1] + categoryOfMaritimeBroadcast: categoryOfMaritimeBroadcast [0..*] + categoryOfRadioMethods: categoryOfRadioMethods [0..*] + communicationChannel: text [0..*] + contactInstructions: text [0..1] + signalFrequency: Integer [0..*] «ComplexAttribute» + frequencyPair: frequencyPair [0..*] + timeIntervalsByDayOfWeek: timeIntervalsByDayOfWeek [0..*]	navigational warning = 1 meteorological warning = 2 ice report = 3 SAR information = 4 pirate attack warning = 5 meteorological forecast = 6 pilot service message = 7 AIS information = 8 LORAN message = 9 SATNAV message = 10 gale warning = 11 storm warning = 12 tropical revolving storm warning = 13 NAVAREA warning = 14 coastal warning = 15 local warning = 16 low water level warning/negative tidal surge = 17 icing warning = 18 tsunami broadcast = 19

<div> <div> <div>«enumeration»</div> <div>categoryOfRadioMethods</div> </div> <div> Low Frequency (LF) voice traffic = 1 Medium Frequency (MF) voice traffic = 2 High Frequency (HF) voice traffic = 3 Very High Frequency (VHF) voice traffic = 4 High Frequency Narrow Band Direct Printing = 5 NAVTEX = 6 SafetyNET = 7 NBDP Telegraphy = 8 facsimile = 9 NAVIP = 10 Low Frequency (LF) digital traffic = 11 Medium Frequency (MF) digital traffic = 12 High Frequency (HF) digital traffic = 13 Very High Frequency (VHF) digital traffic = 14 Low Frequency (LF) telegraph traffic = 15 Medium Frequency (MF) telegraph traffic = 16 High Frequency (HF) telegraph traffic = 17 Medium Frequency (MF) Digital Selective Call traffic = 18 High Frequency (HF) Digital Selective Call traffic = 19 Very High Frequency (VHF) Digital Selective Call traffic = 20 </div> </div>	
	<div> <div> <div>«enumeration»</div> <div>categoryOfCommPref</div> </div> <div> preferred calling = 1 alternate calling = 2 preferred working = 3 alternate working = 4 </div> </div>
Remarks: At least one of the sub-attributes must be populated.	

8.14 RxN Code

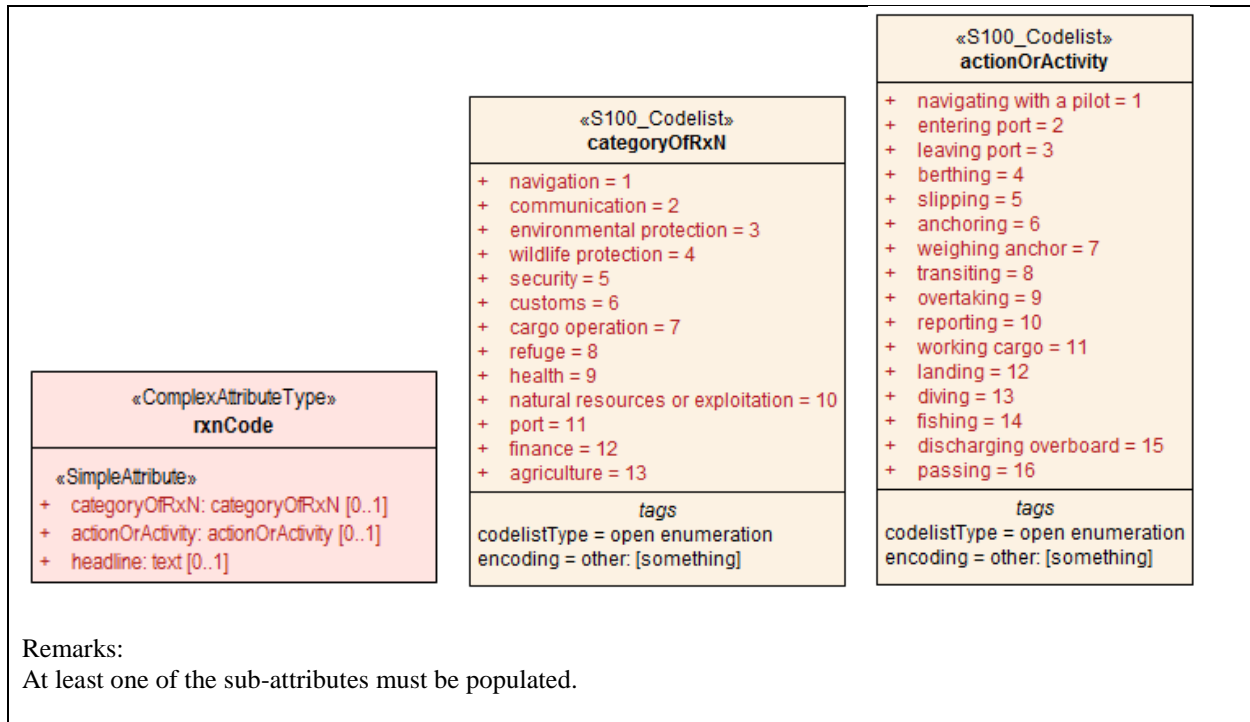
Name: RxN Code

Definition: A summary of the impact of the most common types of regulation, restriction, recommendation and nautical information on a vessel.

Code: 'rxnCode'

Remarks: This attribute converts the subject, topic, and effects of regulations, etc., from plain text or natural language into a set of categories.

Aliases: (none)



8.15 Schedule by day of week

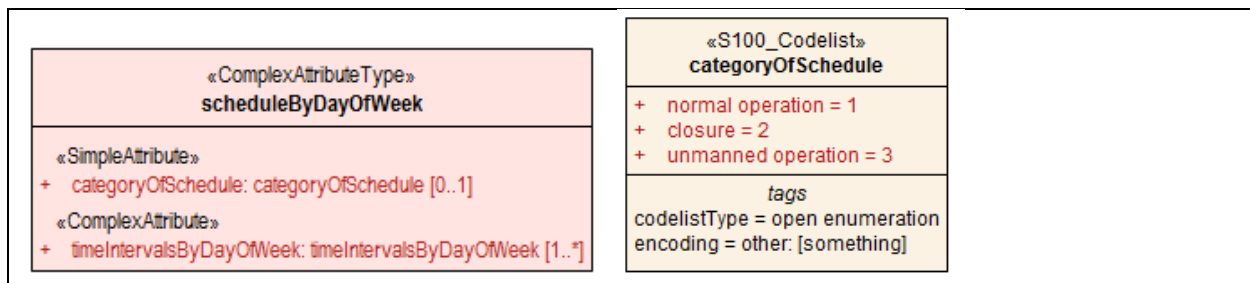
Name: Schedule by day of week

Definition: The nature and timings of a daily schedule by days of the week.

Code: 'scheduleByDayOfWeek'

Remarks:

Aliases: (none)



8.16 Source indication

Name: Source indication

Definition: Information about the source document, publication, or reference from which object data or textual material included or referenced in a dataset are derived

Code: 'sourceIndication'

Remarks:

Aliases: SORIND

<div> <div>«ComplexAttributeType» sourceIndication</div> <div> <div>«SimpleAttribute»</div> <div>+ categoryOfAuthority: categoryOfAuthority [0..1]</div> <div>+ countryName: text [0..1]</div> <div>+ reportedDate: S100_TruncatedDate [0..1]</div> <div>+ source: text [0..1]</div> <div>+ sourceType: sourceType [0..1]</div> <div>«ComplexAttribute»</div> <div>+ featureName: featureName [0..*]</div> </div> </div>	<div> <div>«enumeration» categoryOfAuthority</div> <div> <div>customs = 1</div> <div>border control = 2</div> <div>police = 3</div> <div>port = 4</div> <div>immigration = 5</div> <div>health = 6</div> <div>coast guard = 7</div> <div>agricultural = 8</div> <div>military = 9</div> <div>private company = 10</div> <div>maritime police = 11</div> <div>environmental = 12</div> <div>fishery = 13</div> <div>finance = 14</div> <div>maritime = 15</div> </div> </div>	<div> <div>«enumeration» sourceType</div> <div> <div>law or regulation = 1</div> <div>official publication = 2</div> <div>mariner report, confirmed = 7</div> <div>mariner report, not confirmed = 8</div> <div>industry publications and reports = 9</div> <div>remotely sensed images = 10</div> <div>photographs = 11</div> <div>products issued by HO services = 12</div> <div>news media = 13</div> <div>traffic data = 14</div> </div> </div>
<p>Remarks:</p> <p>At least one of the sub-attributes must be populated.</p>		

8.17 Survey date range

Name: Survey date range

Definition: The complex attribute describes the period of the hydrographic survey, as the time between its sub-attributes.

Code: 'surveyDateRange'

Remarks:

Aliases: (none)

<div> <div>«ComplexAttributeType» surveyDateRange</div> <div> <div>«SimpleAttribute»</div> <div>+ dateStart: S100_TruncatedDate [0..1]</div> <div>+ dateEnd: S100_TruncatedDate</div> </div> </div>

8.18 Telecommunications

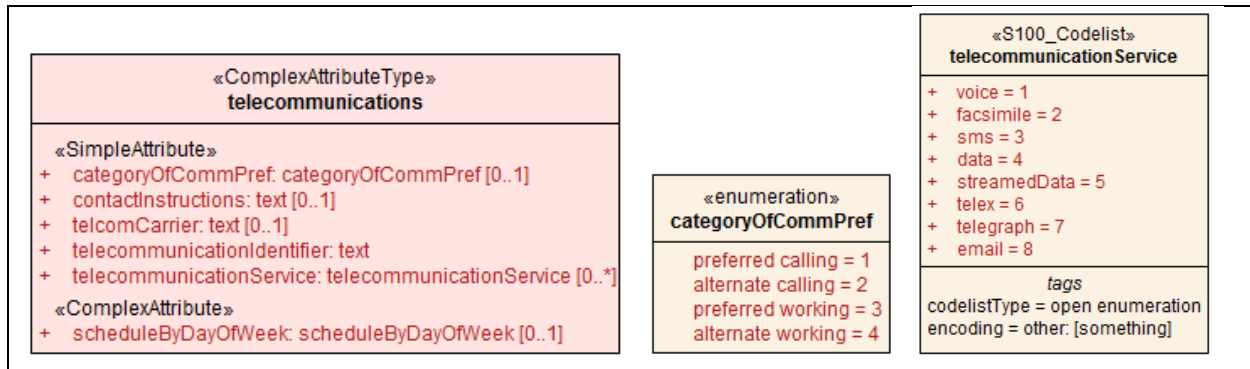
Name: Telecommunications

Definition: A means or channel of communicating at a distance by electrical or electromagnetic means such as telegraphy, telephony, or broadcasting.

Code: 'telecommunications'

Remarks:

Aliases: TELCOM



8.19 Text content

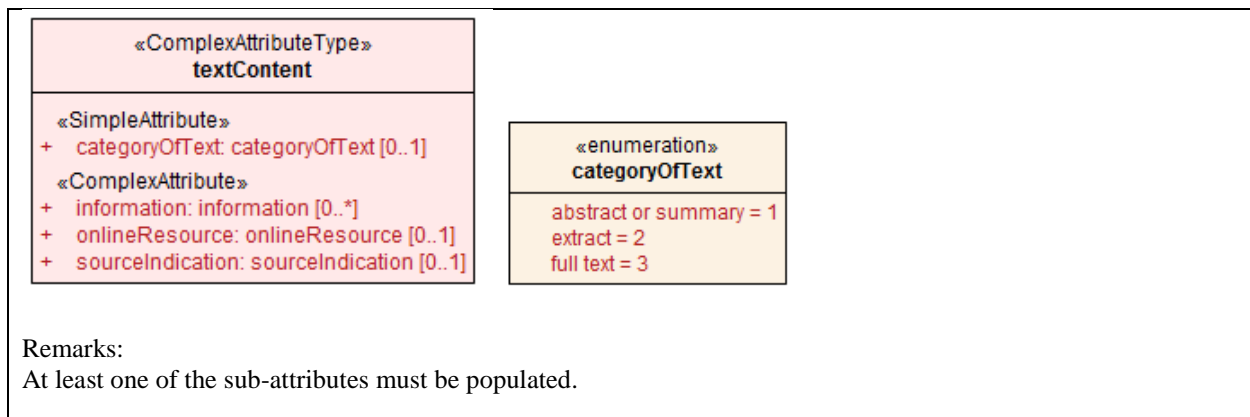
Name: Text content

Definition: Textual material, or a pointer to a resource providing textual material. May be accompanied by basic information about its source and relationship to the source.

Code: 'textContent'

Remarks: textContent is intended to allow text passages from other publications to be included in, or referenced by, instances of feature or information types. Exactly one of sub-attributes onlineResource or information must be completed in one instance of textContent. Product specifications may restrict the use or content of onlineResource for security. For example, a product specification may forbid populating onlineResource. Product specification authors must consider whether applications using the data product may be prevented from accessing off-system resources by security policies.

Aliases: TXTCON



8.20 Time intervals by day of week

Name: Time intervals by day of week

Definition: Time intervals by days of the week.

Code: 'timeIntervalsByDayOfWeek'

Remarks:

Aliases: (none)

<p>«ComplexAttributeType» timeIntervalsByDayOfWeek</p> <p>«SimpleAttribute»</p> <ul style="list-style-type: none"> + dayOfWeek: dayOfWeek [0..7] {ordered} + dayOfWeekIsRange: boolean [0..1] + timeOfDayStart: Time [0..*] {ordered} + timeOfDayEnd: Time [0..*] {ordered} 	<p>«enumeration» dayOfWeek</p> <p>Sunday = 1 Monday = 2 Tuesday = 3 Wednesday = 4 Thursday = 5 Friday = 6 Saturday = 7</p>
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Values of dayOfWeekIsRange:

- True (1): dayOfWeek co-attribute encodes a range of days of the week
- False (0): dayOfWeek co-attribute encodes individual days of the week

Remarks:

- At least one of (dayOfWeek, timeOfDayStart, timeOfDayEnd) must be encoded
- The number of timeOfDayStart and timeOfDayEnd attributes must be equal
- If more than one dayOfWeek is encoded, then dayOfWeekIsRange must be encoded.

8.21 Underkeel allowance

Name: Underkeel allowance

Definition: A fixed figure, or a figure derived by calculation, which is added to draught in order to maintain the minimum underkeel clearance taking into account the vessel's static and dynamic characteristics, sea state, information from real time sensors and weather forecast, the reliability of the chart and variance from predicted height of tide or water level.

Code: 'underkeelAllowance'

Remarks:

Aliases: UKALNS

<p>«ComplexAttributeType» underkeelAllowance</p> <p>«SimpleAttribute»</p> <ul style="list-style-type: none"> + underkeelAllowanceFixed: Real [0..1] + underkeelAllowanceVariableBeamBased: Real [0..1] + underkeelAllowanceVariableDraughtBased: Real [0..1] + operation: operation [0..1] 	<p>«enumeration» operation</p> <p>largest value = 1 smallest value = 2</p>
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Remarks:

At least one of the sub-attributes underkeelAllowance Fixed/BeamBased/DraughtBased must be encoded.

8.22 Vessels measurements

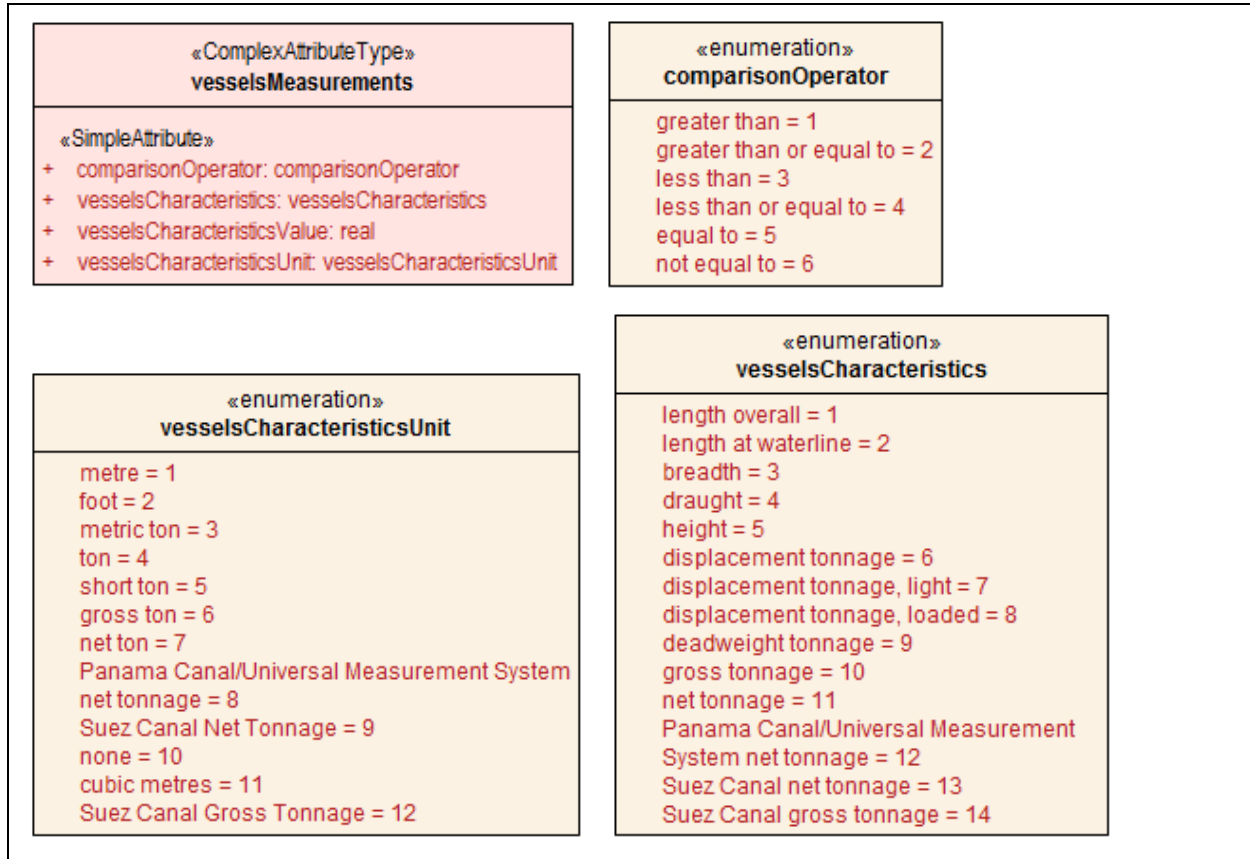
Name: Vessels measurements

Definition: Terms and definitions specifically related to vessels

Code: 'vesselsMeasurements'

Remarks:

Aliases: VSLMSM



9 Other elements

Roles, associations, and simple attributes are described in the printable Feature Catalogue (Appendix C-1) and are not described in this DCEG.