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Explaining Feature Catalogues

DQWG15-04.1C

Informative

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CLASSES

- A class is a description of a set of objects that share the same attributes, operations, methods, relationships, behaviour and constraints
- A class represents a concept being modelled
- Depending on the kind of model, the concept may be based on:
  - the real world (for a conceptual model);
  - implementation between platform independent system concepts (for specification models);
  - platform specific system concepts (for implementation models)

- A UML class has a name, a set of attributes, a set of operations and constraints. In S-100 operations are not used. A class may participate in associations

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SIMPLE ATTRIBUTES -> VALUE TYPES

- The following primitive types are supported in the S-100 UML Diagrams:
  - **integer**: a signed integer number
  - **PositiveInteger**: an unsigned integer number > 0
  - **NonNegativeInteger**: an unsigned integer ≥ 0
  - **Real**: a signed real (floating point) number consisting of a mantissa and an exponent
  - **Boolean**: a value representing binary logic
  - **Characterstring**: a CharacterString is an arbitrary-length sequence of characters including accents and special characters from repertoire of one of the adapted character sets
  - **Date**: a date gives values for year, month and day according to the Gregorian calendar
  - **Time**: a time given by an hour, minute and second in the 24-hour clock system.
  - **DateTime**: a DateTime is a combination of a date and a time type (follow ISO 8601)
  - **TruncatedDate**: a TruncatedDate allows a partial date to be given (YYYMMDD)
  - **Enumeration**

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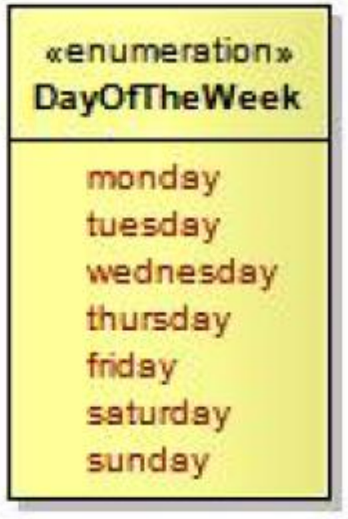
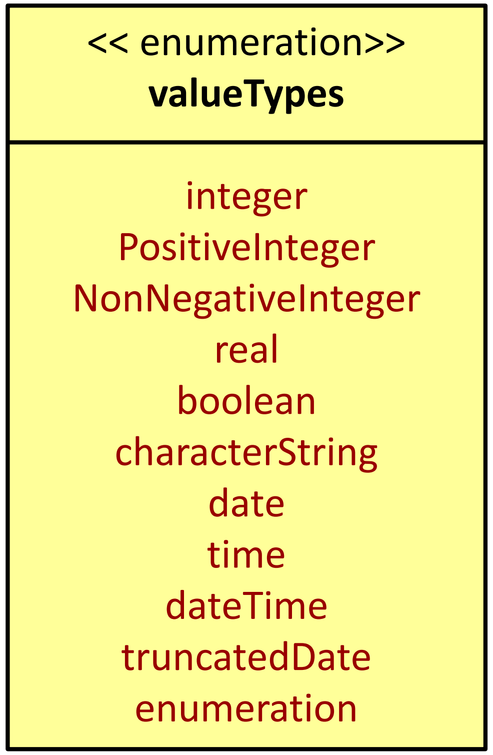
ENUMERATIONS

- An enumerated type declaration defines a list of valid identifiers of mnemonic words
- Attributes of an enumerated type can only take values from this list





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CODELIST TYPES

- Codelist types may be used for open enumerations whose membership cannot be known at the level of the product specification, for reuse of information model fragments, or for more efficient catalogue management. Specifically, they may be used:

a) for enumerations whose members are not all knowable at the level of the application schema;
b) for lists defined or controlled by external authorities;
c) for lists common to multiple S-100 domains;
d) if the set of allowed values needs to be extended without a major revision of the date specification;
e) long lists of potential values which would clutter or bloat feature catalogues

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CODELIST TYPES [2]

- A codelist type declaration must be one of the following 3 types:

1) an **open enumeration**, which is a list of valid key-value combinations (that is codevalue mappings) with a provision for allowing user communities to provide allowed values in a specified format
2) a **closed dictionary**, which is a dictionary (vocabulary) of key-value combinations in a known format, identifiable by a Uniform Resource Identifier and which can be located by the application of standard modern techniques for locating resources. Additional values cannot be provided
3) an **open dictionary**, which is a dictionary (vocabulary) of key-value combinations in a known format, identifiable by a Uniform Resource Identifier, as defined above, with the additional proviso that additional values conforming to a specified format may be provided

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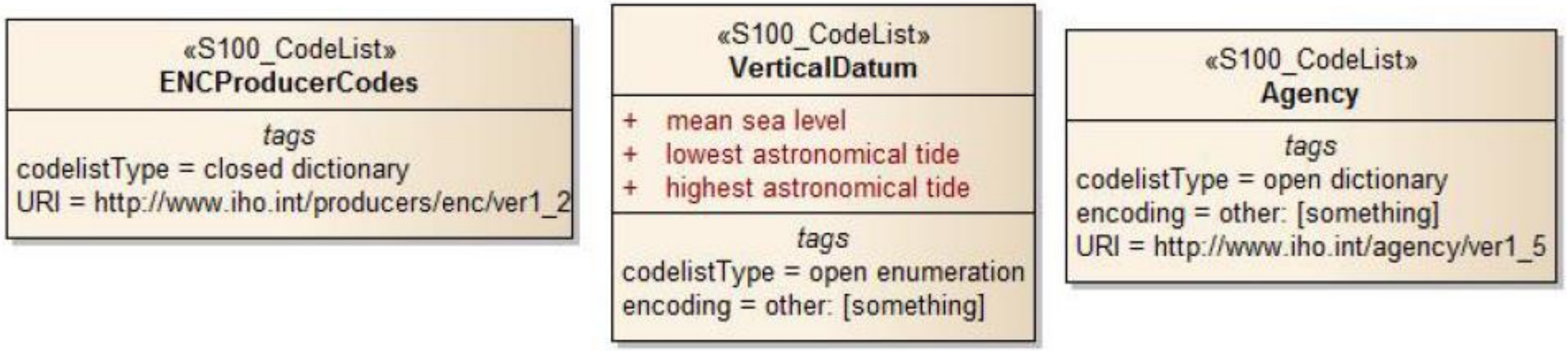
CODELIST EXAMPLES


«S100_CodeList»
ENCProducerCodes
tags
codelistType = closed dictionary
URI = http://www.iho.int/producers/enc/ver1_2
«S100_CodeList»
VerticalDatum
+ mean sea level
+ lowest astronomical tide
+ highest astronomical tide
tags
codelistType = open enumeration
encoding = other: [something]
«S100_CodeList»
Agency
tags
codelistType = open dictionary
encoding = other: [something]
URI = http://www.iho.int/agency/ver1_5

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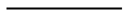
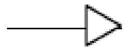
RELATIONSHIPS AND ASSOCIATIONS



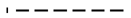
Association

A semantic connection between two instances



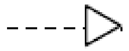
Generalization

A relationship between an element
and the subelements that may be substituted for it



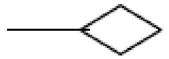
Dependency

The use of one element by another



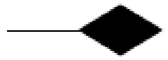
Refinement

A shift in levels of abstraction



Aggregation

A part-of relationship



Composition

Strong Aggregation, children are deleted if parent is deleted

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ASSOCIATIONS

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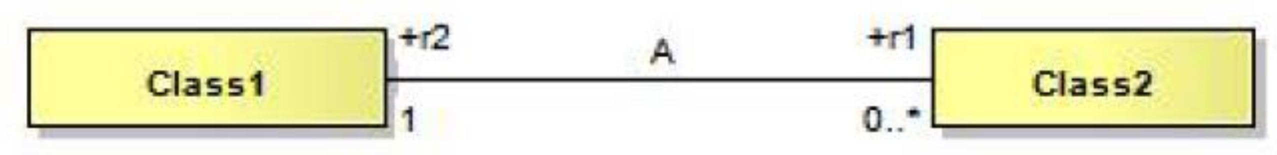

Figure above shows an association named "A" with its two respective association-ends. The role name r1 identifies the association-end which is connected to the class named Class2

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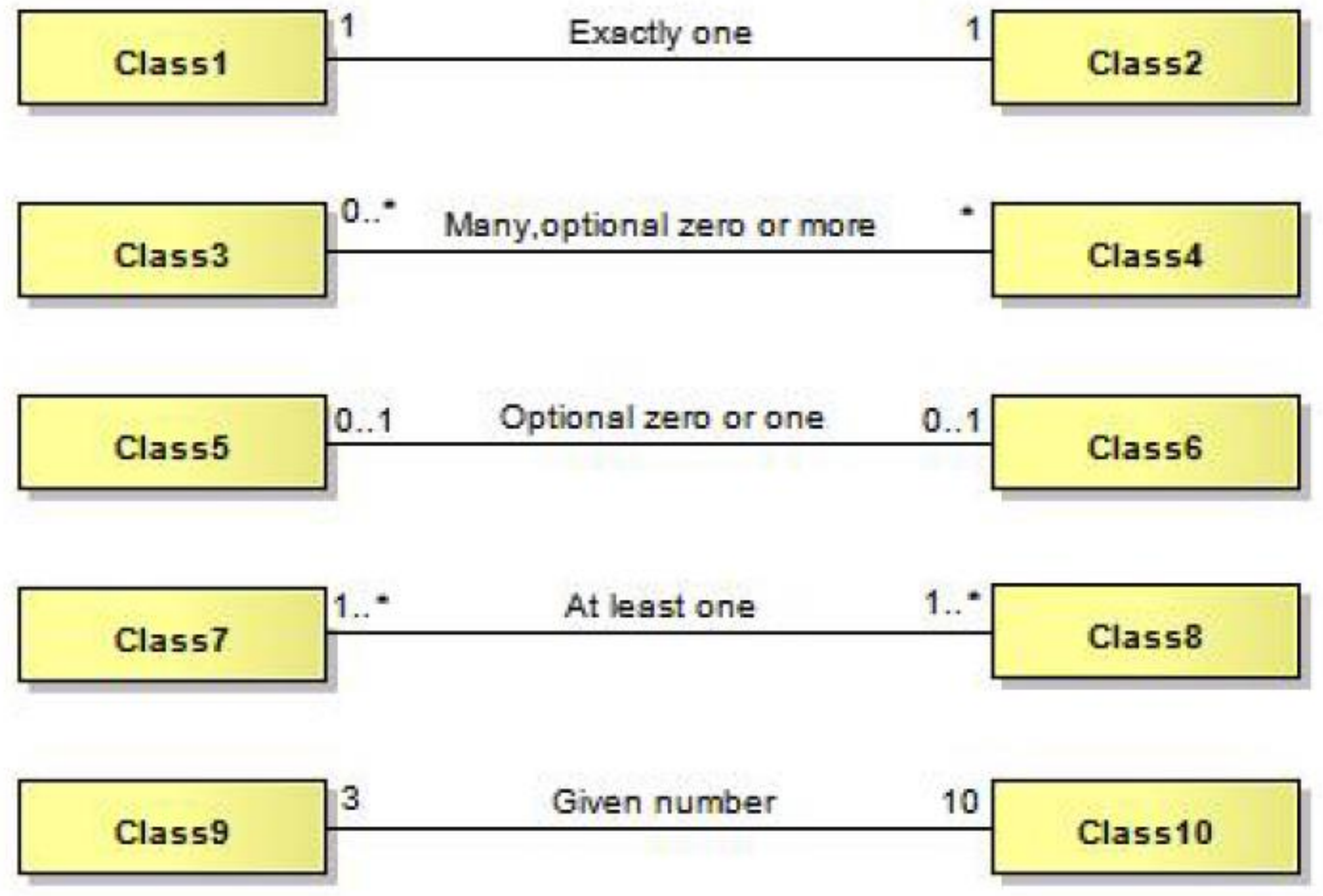
SPECIFICATION OF MULTIPLICITY



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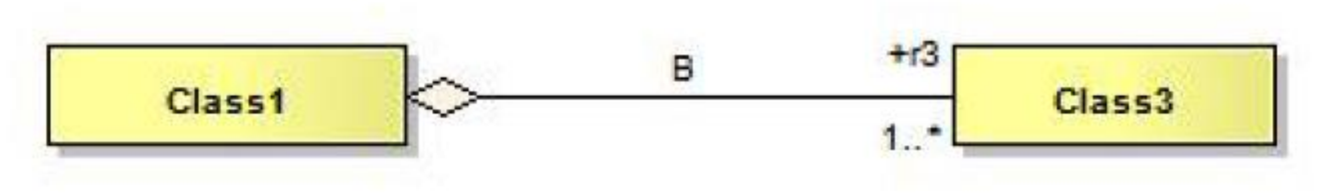
AGGREGATION



An aggregation association is a relationship between two classes, in which one of the classes plays the role of container and the other plays the role of a containee. The diamond-shaped aggregation symbol at the association-end close to class1 indicates that class1 is an aggregation consisting of class3. The meaning of this is that class3 is a part of class1

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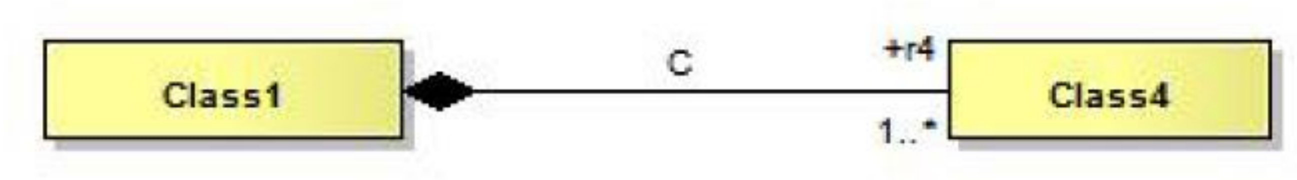
COMPOSITION (STRONG AGGREGATION)



A composition association is a strong aggregation. In a composition association, if a container object is deleted then all of its containee objects are deleted as well. The composition association shall be used when the objects representing the parts of a container object, cannot exist without the container object

The diamond-shaped composition symbol has a solid fill. Here class1 objects consist of one-or-more class4 objects, and the class4 objects cannot exist unless the class1 object also exists. The required (implied) multiplicity for the owner class is always one. The containees, or parts, cannot be shared among multiple owners

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STEREOTYPES

In S-100 the following stereotypes are used:

a) Interface
b) Type
c) Enumeration
d) MetaClass
e) DataType
f) Codelist

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STEREOTYPES - Interface

<<Interface>>

a definition of a set of operations that is supported by objects having this interface

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STEREOTYPES - Type

<<Type>>

a stereotyped class used for specification of a domain of instances (objects), together with the operations applicable to the objects. A type may have attributes and associations

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STEREOTYPES - Enumeration

<<Enumeration>>

A data type whose instances form a list of named literal values. Both the enumeration name and its literal values are declared. Enumeration means a short list of well-understood potential values within a class. Classic examples are Boolean that has only 2 (or 3) potential values TRUE, FALSE (and NULL). Most enumerations will be encoded as a sequential set of Integers, unless specified otherwise. The actual encoding is normally only of use to the programming language compilers. In S-100 Codelists taken from the ISO 19100 standards are classified as enumerations

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STEREOTYPES - MetaClass

<<MetaClass>>

A class whose instances are classes. Metaclasses are typically used in the construction of metamodels. The meaning of metaclass is an object class whose primary purpose is to hold metadata about another class

For example, “FeatureType” and “AttributeType” are metaclasses for “Feature” and “Attribute”

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STEREOTYPES - DataType

<<DataType>>

A descriptor of a set of values that lack identity (independent existence and the possibility of side effects). Data types include primitive predefined types and user-definable types. A DataType is thus a class with few or no operations whose primary purpose is to hold the abstract state of another class for transmittal, storage, encoding or persistent storage

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STEREOTYPES - Codelist

<<Codelist>>
A data type whose instances form a list of named literals, some or all of whose members may not be known. The Codelist name is declared in the application schema. The list members may be described by either (i) a list of codes and corresponding literals augmented with a pattern allowing additional values conforming to a certain format, or (ii) a pointer to a resource consisting of a list of code/literal mappings. The resource is called a vocabulary or dictionary. Tagged values attached to the Codelist declaration indicate which form is used and the location of the resource (generally as a URI). Codelists should be used only when an enumeration is either unusable or inefficient (for example, if the full list of values is not known to the specification authors or the list of allowed values is long, volatile, controlled by another authority, and/or shared by multiple domains)

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Optional, conditional and mandatory – attributes and associations

- In UML all attributes are per default mandatory. The possibility to show multiplicity for attributes and association role names provide a way of describing optional and conditional attributes
- The default is mandatory which thus do not need to be specified. Where a multiplicity of 0..1 or 0..* is specified it means that this attribute may be present or may be omitted
- An attribute may be defined as conditional, meaning that it is optional depending on other attributes. The dependencies may be by existence-dependence of other (optional) attributes or by the values of other attributes
- If unspecified, the default multiplicity for associations is 0..*, and the default multiplicity for attributes is 1

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NAMING AND NAME SPACES - CLASSES

- All classes shall have unique names
- All classes shall be defined within a package
- Class names shall start with an upper case letter
- A class shall not have a name that is based on its external usage, since this may limit reuse
- A class name shall not contain spaces
- Separate words in a class name shall be concatenated
- Each subword in a name shall begin with a capital letter, such as “XnnnYmmm”
- The name of an association must be unique within the context of a class and its supertypes or else it must be derived

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NAMING AND NAME SPACES - ATTRIBUTES

- Attribute names shall start with a lower-case letter.
  (example: firstName, lastName)
- Precise technical names should be used for attributes and operations to avoid confusion
  (example: alphaCodeIdentifier, dateOfLastChange)

- Documentation fields should be used extensively to describe element

- Don't reiterate class names inside the attribute names. Keep names short if possible
  (example: class S-100_WorkingGroup, attribute workingGroupName)

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NAMING CONVENTIONS

- Use precise and understandable technical names for classes, attributes
- For attributes and association roles capitalize only the first letter of each word after the first word that is combined in a name
- For each name of a class, package, type-specification and association names capitalize the first letter of the first word
- Examples: index not i, computePartialDerivatives, CoordinateTransformation
- Keep names as short as practical. Use standard abbreviations if understandable, skip prepositions, and drop verbs when they do not significantly add to meaning of the name

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RESTRICTIVE NAMING CONVENTION

- All class names should be unique in a case insensitive manner
- Class name should be unique across the entire model (so as not to create a problem with many UML tools)
- Package names should be unique across the entire model. (for the same reason)
- Every effort should be applied to eliminate multiple classes instantiating the same concept

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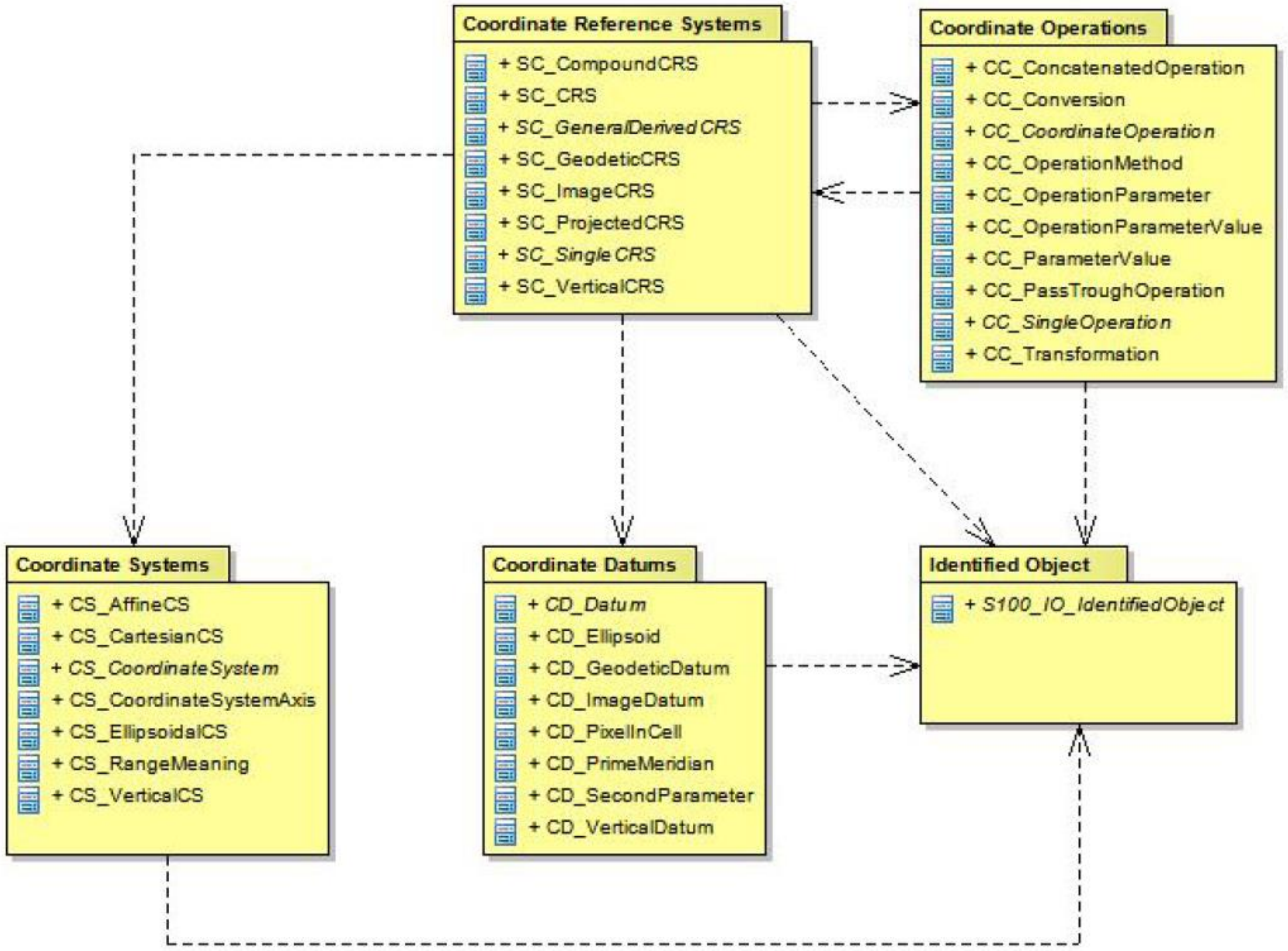
PACKAGE STRUCTURE



A UML package is a container that is used to group declarations of subpackages, classes and their associations. The package structure in UML enables a hierarchical structure of subpackages, class declarations, and associations. A package shall be used to represent a schema

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DOCUMENTATION OF MODELS IN S-100

In addition to the diagrams, it is necessary to document the semantics of the model. The meaning of attributes, associations, operations and constraints needs to be explained. This is done by means of context tables. A context table is defined for each class; it has the following columns:

- Role Name
- Name
- Description
- Multiplicity
- Data Type
- Remarks

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ROLE NAME

The Role Name column specifies what property of the class is described in this row. Possible values are:

- **Class** – The class itself
- **Attribute** – An attribute of that class
- **Association** – An association to another class
- **Enumeration** – An enumerated data type
- **Literal** – A value of an enumerated data type

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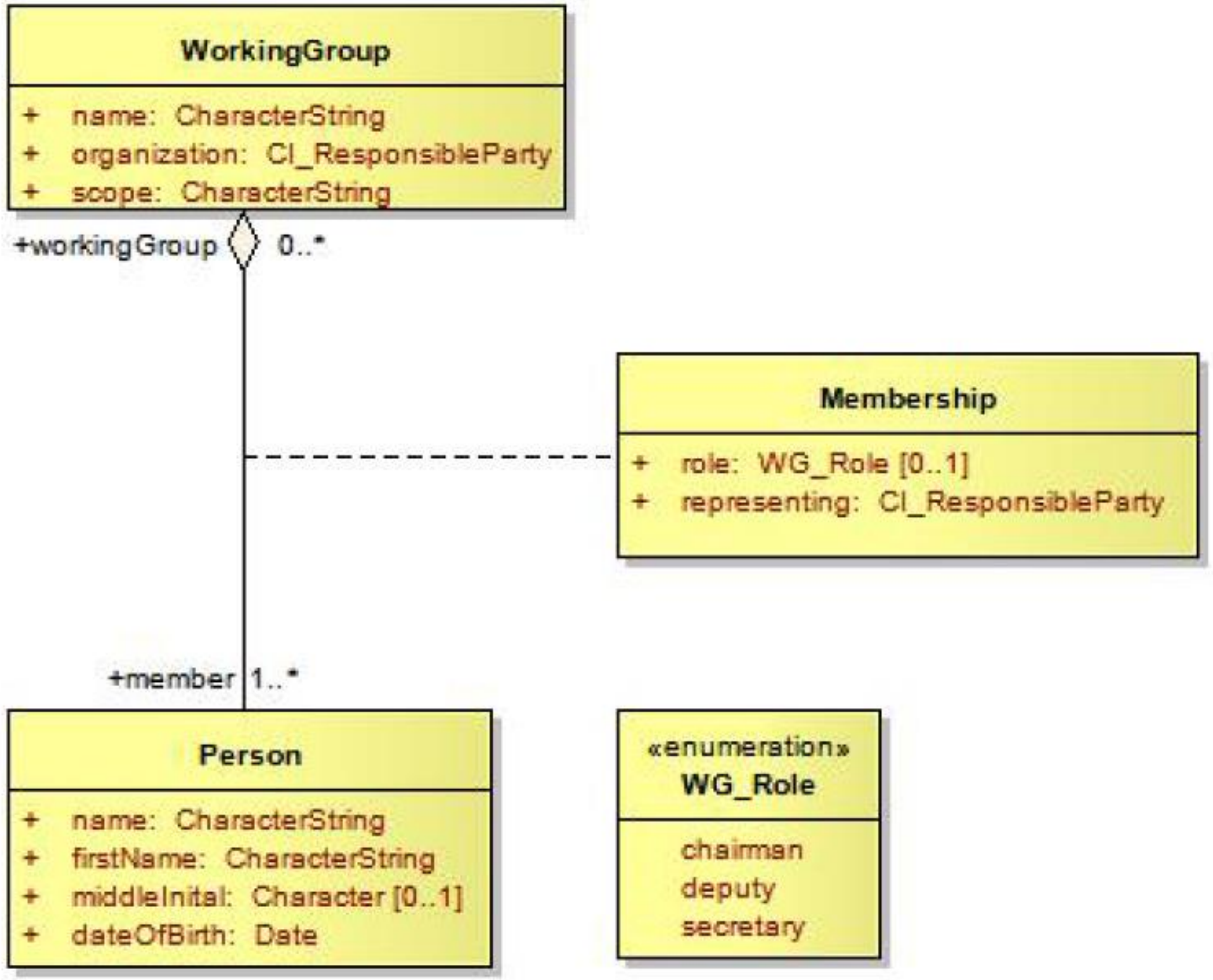
EXAMPLE OF THE USE OF CONTEXT TABLES [1]



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EXAMPLE OF THE USE OF CONTEXT TABLES [2]

Role Name	Name	Description	Multiplicity	Data Type	Remarks
Class	WorkingGroup	A group of experts doing some useful work	-	-	
Attribute	name	The name of the working group	1	CharacterString	
Attribute	organization	The organization responsible for the working group	1	CI_ResponsibleParty	
Attribute	scope	The reason why so many people travel around the world	1	CharacterString	
Association	member	A person that is designated to contribute to the group	1..*	Person	

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EXAMPLE OF THE USE OF CONTEXT TABLES [3]

Role Name	Name	Description	Multiplicity	Data Type	Remarks
Class	Person	A human being	-	-	
Attribute	name	The name of that person	1	CharacterString	
Attribute	firstName	The first name of the person	1	CharacterString	
Attribute	middleInitial	The middle initial of the person	0..1	Character	
Attribute	dateOfBirth	The date when the person was born	1	Date	
Association	workingGroup	A working group the person contributes to	0..*	WorkingGroup	

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EXAMPLE OF THE USE OF CONTEXT TABLES [4]

Role Name	Name	Description	Multiplicity	Data Type	Remarks
Class	Membership	A class describing the membership of a person in a working group	-	-	
Attribute	role	The role that the person has in the working group	0..1	WG_Role	
Attribute	representing	The organization which is represented by the person in the working group	1	CI_ResponsibleParty	

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EXAMPLE OF THE USE OF CONTEXT TABLES [5]

Role Name	Name	Description	Remarks
Enumeration	WG_Role	The roles people can have in a working group	
Literal	chairman	The gov’nor	
Literal	deputy	His best friend	
Literal	secretary	Poor man (or woman) has to have his (or her) fingers always on the keyboard	
Literal	IHO member	Working group member respresenting a member state with voting rights	
Literal	Expert Contributor	Working group member, usually from the industry or end user community	
Literal	Other	Working group member who likes to travel around the world	

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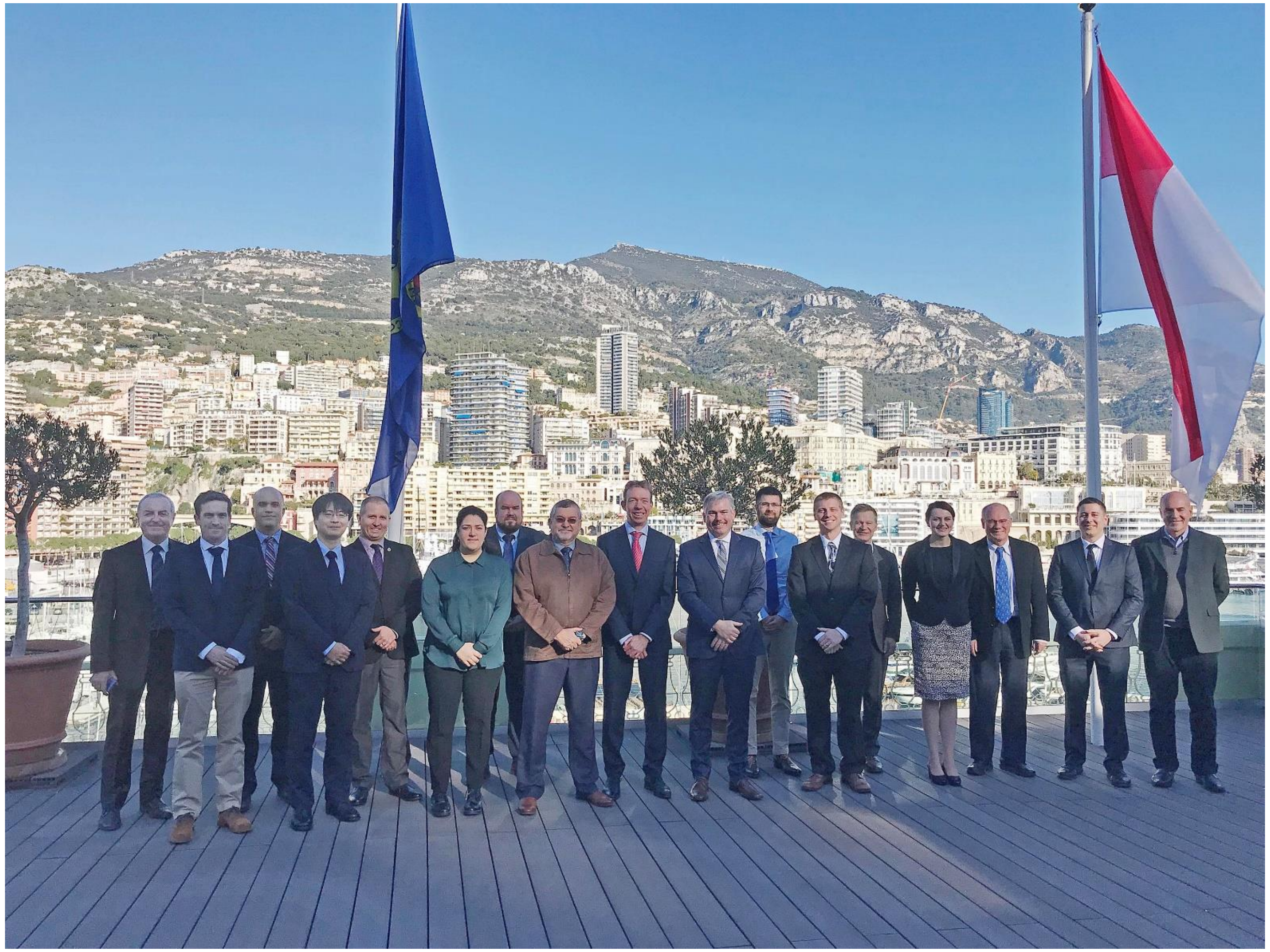
IHO HSSC Data Quality Working Group



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