ISO 19115

Geographic information — Metadata

Workbook

Guide to Implementing ISO 19115:2003(E),
the North American Profile (NAP), and
ISO 19110 Feature Catalogue

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This workbook is not intended to replace the ISO standards but is meant to act as an educational and implementational guide to be used in conjunction with ISO 19115 Geographic information — Metadata ISO 19115:2003(E).

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Table of Contents

INTRODUCTION

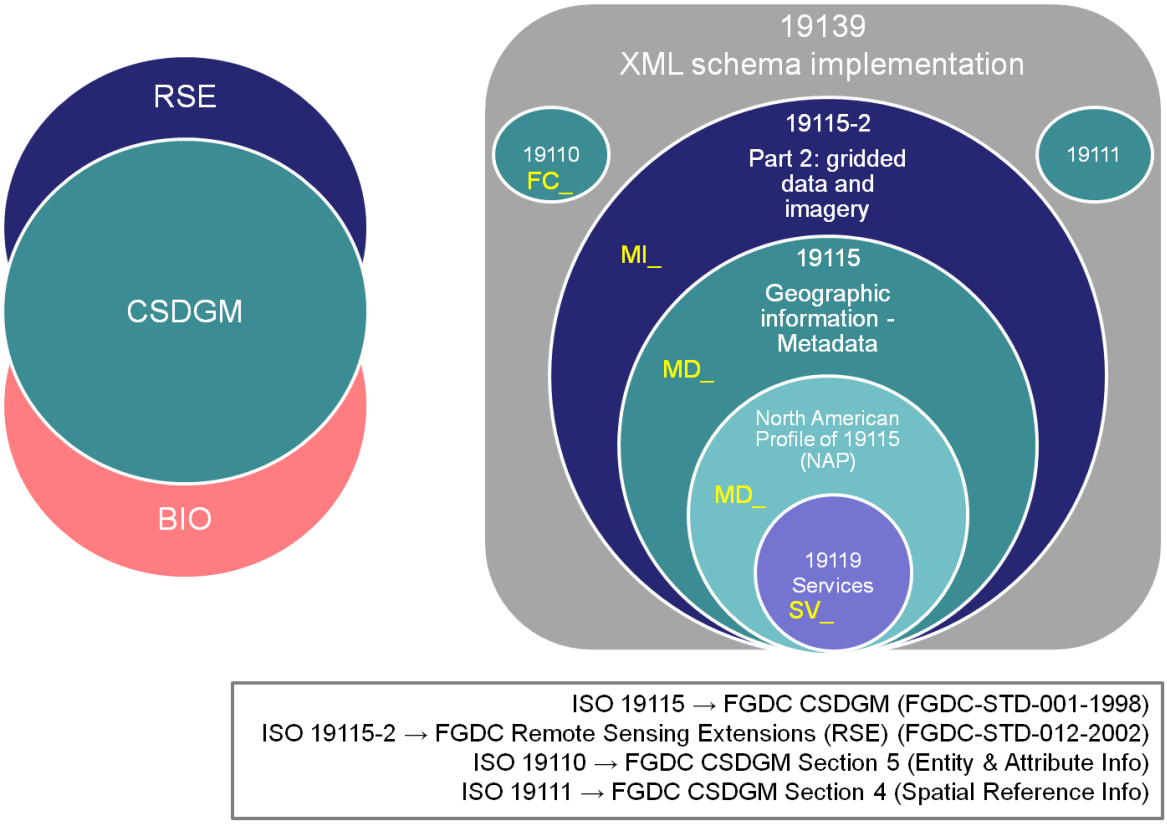
ISO 19115:2003(E)
Geographic information — Metadata

Main Sections of ISO Metadata	
Metadata (MD_Metadata)	Root element that contains information about the metadata itself.
Spatial Representation Information (gmd:spatialRepresentationInfo)	Information about the geospatial representation of a resource.
Reference System Information (gmd:referenceSystemInfo)	Information about the spatial and temporal reference systems used in the resource.
Metadata Extension Information (gmd:metadataExtensionInfo)	Information about user specified extensions to the metadata standard used to describe the resource.
Identification Information (gmd:identificationInfo)	Information required to uniquely identify a resource or resources.
Content Information (gmd:contentInfo)	Information about the physical parameters and other attributes contained in a resource
Distribution Information (gmd:distributionInfo)	Information about who makes a resource available and how to get it
Data Quality Information (gmd:dataQualityInfo)	Information about the quality and lineage (including processing steps and sources) of a resource
Portrayal Catalogue Information (gmd:portrayalCatalogueInfo)	Information identifying portrayal catalogues used for the resource
Metadata Constraint Information (gmd:metadataConstraints)	Information about constraints on the use of the metadata and the resource it describes
Application Schema Information (gmd:applicationSchemaInfo)	Information about the application schema used to build a dataset
Metadata Maintenance Information (gmd:metadataMaintenanceInfo)	Information about maintenance of the metadata and the resource it describes

Comparing FGDC and ISO Standards

The content of ISO 19115 strongly resembles the sections of the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata (CSDGM). The following information is **new** with ISO/NAP:

- Is far more flexible.
- Depicts relationships between datasets and collection level (parent/child relationships).
- Standardizes descriptors through the use of codelists.
- Accommodates new technologies (such as the ability to document services).
- Accommodates international scope.



ISO 19115 → FGDC CSDGM (FGDC-STD-001-1998)
ISO 19115-2 → FGDC Remote Sensing Extensions (RSE) (FGDC-STD-012-2002)
ISO 19110 → FGDC CSDGM Section 5 (Entity & Attribute Info)
ISO 19111 → FGDC CSDGM Section 4 (Spatial Reference Info)

The CSDGM is the core, or base, of the FGDC standards for documenting geospatial data. Profiles and extensions to the core standard can shorten or extend the main standard and can change conditionality. The Biological Profile (BIO) extends the CSDGM in order to properly document biological information. The Remote Sensing Extensions (RSE) extends the CSDGM in order to document information about imagery and other remotely sensed data.

The core ISO standard for documenting geospatial data is ISO 19115 Geographic information – Metadata. ISO 19115-2 Geographic information – Metadata – Part 2: Extensions for imagery and gridded data extend ISO 19115 in order to properly document information about imagery, gridded data, and remotely sensed data. The North American Profile (NAP) is a profile of ISO 19115. The NAP shortened the core and changed conditionality and multiplicity on several elements. ISO 19110 Geographic information – Methodology for feature cataloguing is a separate standard and separate document that ISO 19115 will reference if it exists. ISO 19110 is similar to

Section 5, Entity and Attribute Information, of the CSDGM. The ISO 19111 Geographic information – Spatial referencing by coordinates is also a separate standard and separate document that may be referenced from ISO 19115. ISO 19111 is much like Section 4, Spatial Reference Information, of the CSDGM. ISO 19139 defines the XML encoding of the ISO metadata standards. ISO 19139 provides the structure and rules to which the validation should be set.

How ISO is Organized

The ISO workbook is organized in sections and packages. A section is a grouping of similar information (similar to FGDC sections). The main sections are listed in the Main Sections of ISO Metadata table above. A section may contain several packages. A package is a logical grouping of elements that can be found in multiple locations within the main sections (similar to the "supporting sections" of the FGDC CSDGM). You might notice that some XML elements have a two-letter code followed by an underscore. These are packages.

Ex:
CI_ResponsibleParty

The package abbreviations are identified in the following table.

Package Abbreviations	
CI	Citation
DQ	Data Quality
DS	Dataset
EX	Extent
FC	Feature Catalogue
GM	Geometry
LE	Lineage Extended (added in ISO 19115-2)
LI	Lineage
MD	Metadata
MI	Metadata for Imagery (added in ISO 19115-2 and replace the root MD)
RS	Reference System
SV	Services
QE	Data Quality Extended

XML Basics

Note: All elements, punctuation, and attributes preserve the European spellings. Do not change (Americanize) them.
Example: 'organisation' is correct in these instances; 'organization' is not.

Various views of metadata standards are text, HyperText Markup Language (HTML), and eXtensible Markup Language (XML).

The FGDC metadata that many are accustomed to seeing are the HTML or Text views. Text views are simple and easy to read, but are more of a legacy type of view. Text documents can often be easily corrupted. HTML views can be customized for web viewing and other applications. Text and HTML views can be derived from the XML by applying a stylesheet, XSL or XSLT, over the base XML to display as you want.

XML is a set of rules for encoding documents in machine-readable form. XML's use emphasizes simplicity, interoperability, and usability over the Internet. XML consists of three main parts, tags, elements, and attributes.

Tag
A markup construct that begins with '<' and ends with '>'.

start-tags **<**section**>**
end-tags **</**section**>** or **/>**

Element
An element is a logical component of a document that either begins with a start-tag and ends with a matching end-tag, or consists only of an empty-element tag. The characters between the start- and end-tags, if any, are the element's *content*, and may contain markup, including other elements, which are called child elements.

<**Greeting**>*Hello, world.*</**Greeting**>

Attribute
An attribute is a markup construct consisting of a name/value pair that exists within a start-tag or empty-element tag. In the example (below), the element img has two attributes, *src* and *alt*:

.

Another example would be <step *number*="3">Connect A to B.</step> where the name of the attribute is 'number' and the value is '3'. For more information about attributes, see *Using Attributes.*

Namespaces
You may notice in the XML that the element names have a three-letter code followed by a colon.

Ex:

gco:CharacterString

These codes are called namespaces. The namespace is a container providing context and rules for elements. A definition of a term may change, depending on what namespace is applied. The namespace abbreviation table identifies namespaces that may be found in the XML.

Namespace Abbreviations	
gco	Geographic Common extensible markup language
gfc	Geographic Feature Catalogue extensible markup language
gmd	Geographic Metadata extensible markup language
gmx	Geographic Metadata XML schema
gss	Geographic Spatial Schema extensible markup language
gsr	Geographic Spatial Referencing extensible markup language
gts	Geographic Temporal Schema extensible markup language
gml	Geography Markup Language
xlink	XML Linking Language
xs	W3C XML base schemas

Using Attributes

XML elements can have attributes, as previously discussed. These attributes provide additional information about an element. Often, the additional information is not part of the data. Attribute values must contain either single or double quotes. Attributes tend to be "grouped" by certain types. Elements that are ISO roles (xml tags that start with lower case) will often allow XLinks, uuidref, and nilReason attributes. Elements that are ISO objects (xml tags that start with two upper case package abbreviations) will often allow ids and uuids. The frame, calendarEraName, and indeterminatePosition are gml attributes and found within time positions.

Ex:
<MD_Keywords> will allow the id and uuid attributes
<gmd:thsaurusName> will allow the XLink attributes type, href, role, arcole, title, show, and actuate as well as the uuidref and nilReason attributes.
<gml:beginPosition> will allow the gml attribues of frame, calendarEraName, and indeterminatePosition.

id
An identifier for the element, if specified, must be unique within the XML document. The value of the identifier must always start with a letter, an underline (_), or a colon (:). An XML element can have only one attribute of type ID. The identifiers used in the id attribute are XML Names that have significant restrictions. They must begin with a letter, an underline (_), or a colon (:), and, after the first character, be composed only of letters, digits, underlines, and hyphens (-). This attribute is often mandatory for such items as units and extents.

Ex:
```
<gml:BaseUnit gml:id="lengthUnit">
<gml:identifier codeSpace="SI">meters</gml:identifer>
<gml:unitsSystem xlink:href="http://www.bipm.org/en/si/"/>
</gml:BaseUnit>
```

idref
A reference to an XML element in the XML document. The value must correspond to an attribute value of type ID in an existing XML element. The idref attribute allows an XML element to refer to another XML element within the same document that has a corresponding id attribute.

idrefs
A reference to one or more XML elements. The values must be separated by spaces and must correspond to existing XML element ID's.

uuid
Note: The uuid of any deleted object cannot be used again.
The uuids are Universally Unique Identifiers which also have special characteristics. A uuid is assigned to an object when it is created and is stable over the entire life span of the objects. uuids are required for long-term distributed data management and for realizing update mechanisms. These identifiers are also called persistent identifiers. A uuid is a 16-byte number that consists of 32 hexadecimal (0-9 and a-f) values. The values are split into five groups, separated by hyphens in the form 8-4-4-4-12 or 8-4-4-16 for a total of 36 characters (32 values and 4 hyphens).

Ex:
uuid="594D435F-954C-1022-78E7-D62F30CD0592"

uuidref
The uuidref attribute is used to refer to an XML element that has a corresponding uuid attribute.

Ex:
uuidref="594D435F-954C-1022-78E7-D62F30CD0592"

uom

The uom attribute provides an identifier of the unit of measure used. The uom attribute is often mandatory for the element that uses it.

Ex:

```
<gmi:groundResolution>
        <gco:Distance uom=”meters”>10.0</gco:Distance>
</gmi:groundResolution>
```

frame

The frame attribute is optional and allows the user to specify the temporal reference system to be used for interpretation of the value of the time position.

Ex:

```
<gml:timePosition frame=”tcs.xml#geologyMA”>-2500</gml:timePosition>
```

calendarEraName

The calendarEraName attribute is optional and provides the name of the calendar era to which the date is referenced (e.g. the Meiji era of the Japanese calendar).

Ex:

```
<gml:beginPosition calendarEraName="Seireki">1965</gml:beginPosition>
<gml:endPosition calendarEraName="Seireki">1990</gml:endPosition>
```

indeterminatePosition

The indeterminatePosition attribute is optional and is used in time posistions and can be used alone or it can quality a specific calue for a temporal position. This attribute is often used to document unknown and present dates. The valid values for indeterminatePosition are *“unknown”, “after”, “before”*, and *“now”*. If indeterminatePosition = “now” the best practice is to put the date and time of the instance of metadata creation.

Ex:

```
<gml:TimePeriod gml:id="boundingTemporalExtent">
        <gml:description>ground condition</gml:description>
        <gml:beginPosition>1990-11-03T00:00:00</gml:beginPosition>
        <gml:endPosition indeterminatePosition="now"/>
</gml:TimePeriod>
```

XLinks

The XML Linking Language (XLink) allows elements to be inserted into XML documents for creating and describing links between resources, similar to HTML hyperlinks. Linking elements are recognized based on the use of a designated attribute named xml:link and a set of accompanying global attributes. The global attributes are *type*, *href*, *role*, *arcrole*, *title*, *show*, and *actuate*. If an XLink is used, the following ISO component is not used.

type

The type attribute indicates the XLink element type, such as simple, extended, locator, arc, resource or title.

href

The value of the href attribute in linking elements contains a locator that identifies a resource, e.g., by a URI reference or by an XPointer specification. The xlink href attribute is used to reference a component, and the xlink title attribute is used to apply a human understandable name to the component. Components are snippets of XML describing a specific piece of metadata content, such as information about people, websites, documents, archives,

instruments, etc. A component is the finest level (atomic level) of granularity in a metadata record. Components are stored once and used as often as required within a metadata collection. Components provide significant storage and editing advantages over the traditional metadata management method of storing each record as a whole. XLinks can be used to reference a component from an unresolved metadata record (unresolved meaning that the metadata record contains xlinks). The xlink references a specific component by its unique identifier (UUID). During the resolve process, a component referenced via XLink is retrieved and embedded in the record (resolved metadata record).

Ex:
<gmd:contact xlink:href="http://www.ngdc.noaa.gov/docucomp/iso/8294BEE08AD7359FE040AC8C5AB460D1"/>

role
The role attribute specifies a part of the link's semantics. The value of this attribute indicates a property that the entire link has and identifies to the application software the meaning of the link. This allows the application to show different symbols for the different kinds of links.

arcrole
The arcrole attribute corresponds to the Resource Description Framework (RDF) notion of a property, where the role can be interpreted as stating that *starting-resource* HAS *arc-role ending-resource*. This contextual role can differ from the meaning of an ending resource when taken outside the context of this particular arc. For example, a resource might generically represent a 'person', but in the context of a particular arc it might have the role of 'mother' and in the context of a different arc it might have the role of 'daughter'.

title
The title attribute indicates a human-readable description of the entire link.

Ex:
<gmd:contact xlink:href="http://www.ngdc.noaa.gov/docucomp/iso/8294BEE08AD7359FE040AC8C5AB460D1" xlink:title="Anna Milan"/>

Note: Often, the best practice that has emerged is to add the role in parenthesis to the xlink:title if the component is a contact. This aids in providing more "human readable" content.

Ex:
<gmd:contact xlink:href="http://www.ngdc.noaa.gov/docucomp/component/7c7d17a0-4d66-11df-9879-0800200c9a66" xlink:title="DOC/NOAA/NESDIS/NODC/NCDDC> National Coastal Data Development Center (pointOfContact)"/>

show
This attribute indicates the behavior policies to use when the link is traversed for the purpose of display or processing. The embed value indicates that the designated resource should be embedded in the body of the resource and at the location where the traversal started. The replace value indicates that the designated resource should replace the resource where the traversal started. The new value indicates that the designated resource should be displayed or processed in a new context.

actuate
The actuate attribute is used to express a policy as to when the traversal of a link should occur. The auto value indicates that the resource is automatically traversed. The user value indicates that the link is traversed only on the request of the user. The valid values for actuate are *"onLoad", "onRequest", "other"*, and *"none"*.

nilReason
The nilReason attribute is used to explain why an element is not included in the XML. This attribute allows a reason (explaining why the actual value cannot be provided) to exist in place of an actual value. It can have the values

'inapplicable,' 'missing,' 'template', 'unknown', and 'withheld'. The example below shows how to use the nilReason to document and unknown date value.

Ex:

```
<gmd:date>
    <gmd:CI_Date>
        <gmd:date gco:nilReason="unknown"/>
        <gmd:dateType>
            <gmd:CI_DateTypeCode
          codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_DateTypeCode"
        codeListValue="publication" codeSpace="002">publication</gmd:CI_DateTypeCode>
        </gmd:dateType>
    </gmd:CI_Date>
</gmd:date>
```

Using CodeLists

To standardize values for certain metadata elements, ISO metadata uses codelists. A codelist is an enumeration of values. It is a flexible mechanism allowing the extension of code lists as needed.

Use attributes to refer to a specific codelist value in a register. Codelists contain the attributes *codeList*, *codeListValue*, and *codeSpace*. The *codeList* attribute is mandatory and contains a URL that references a codeList definition within a registry or a codeList catalogue. The *codeListValue* attribute is also mandatory and contains the name of the selected value. The *codeSpace* attribute is optional and refers to the alternative expression of the codeListValue. See Annex C for more information about specific ISO codelists.

CI_DateTypeCode - identification of when a given event occurred

Name	Domain code	Definition
creation	001	date identifies when the resource was brought into existence
publication	002	date identifies when the resource was issued
revision	003	date identifies when the resource was examined or re-examined and improved or amended

Ex:

```
<gmd:dateType>
        <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_DateTypeCode"
codeListValue="publication" codeSpace="002">publication</gmd:CI_DateTypeCode>
</gmd:dateType>
```

Date and Time Formats

The proper date formats correspond to ISO 8601, Data elements and interchange formats – Information interchange – Representation of dates and times. See Annex A for more information and examples. Calendar date is the most common date representation and is expressed as—

YYYY-MM-DD

where *YYYY* is the year in the Gregorian calendar, *MM* is the month of the year between 01 (January) and 12 (December), and *DD* is the day of the month between 01 and 31.

Ex:
2010-08-11 represents August 11, 2010.

Time of day, the time representation, uses the 24-hour timekeeping system and is expressed as—

hh:mm:ss

where *hh* is the number of complete hours that have passed since midnight, *mm* is the number of complete minutes since the start of the hour, and *ss* is the number of complete seconds since the start of the minute.

Ex:
23:59:59 represents the time one second before midnight.

Date and time represents a specified time of a specified day. When using the calendar date, the representation is—

YYYY-MM-DDThh:mm:ss,

where *T* is used to separate the date and time components.

Ex:
2010-08-11T13:31:01 represents 31 minutes and 1 second after 1 o'clock in the afternoon of August 11, 2010.

Using the Workbook

The workbook is a resource for applying the ISO metadata standard and its profiles. It provides names and definitions, describes domain values (valid values that can be assigned to the data element), and uses a graphic representation of the production rules.

The workbook is organized by main sections and supporting packages. The main sections are documented in the order in which they appear in the standard. The packages are referred to from various points within the main sections and other packages. The packages are documented in alphabetical order.

The workbook includes the selected geographic information metadata standard implementation guide as well as the feature catalogue standard implementation guide. The workbook also documents differences between the ISO standard and the NAP. NAP compliancy is documented at 'Multiplicity'. The workbook is structured as follows; the fileIdentifier is an example of that structure.

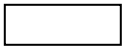
Tag: XML tag
Definition: Definition of the tag
Type: Type or package
Domain: Format of the content
Multiplicity: If something is repeatable and if it is required
Attributes: XML attributes
Best Practices: Recommended implementation

fileIdentifier – A unique phrase or string that uniquely identifies the metadata file

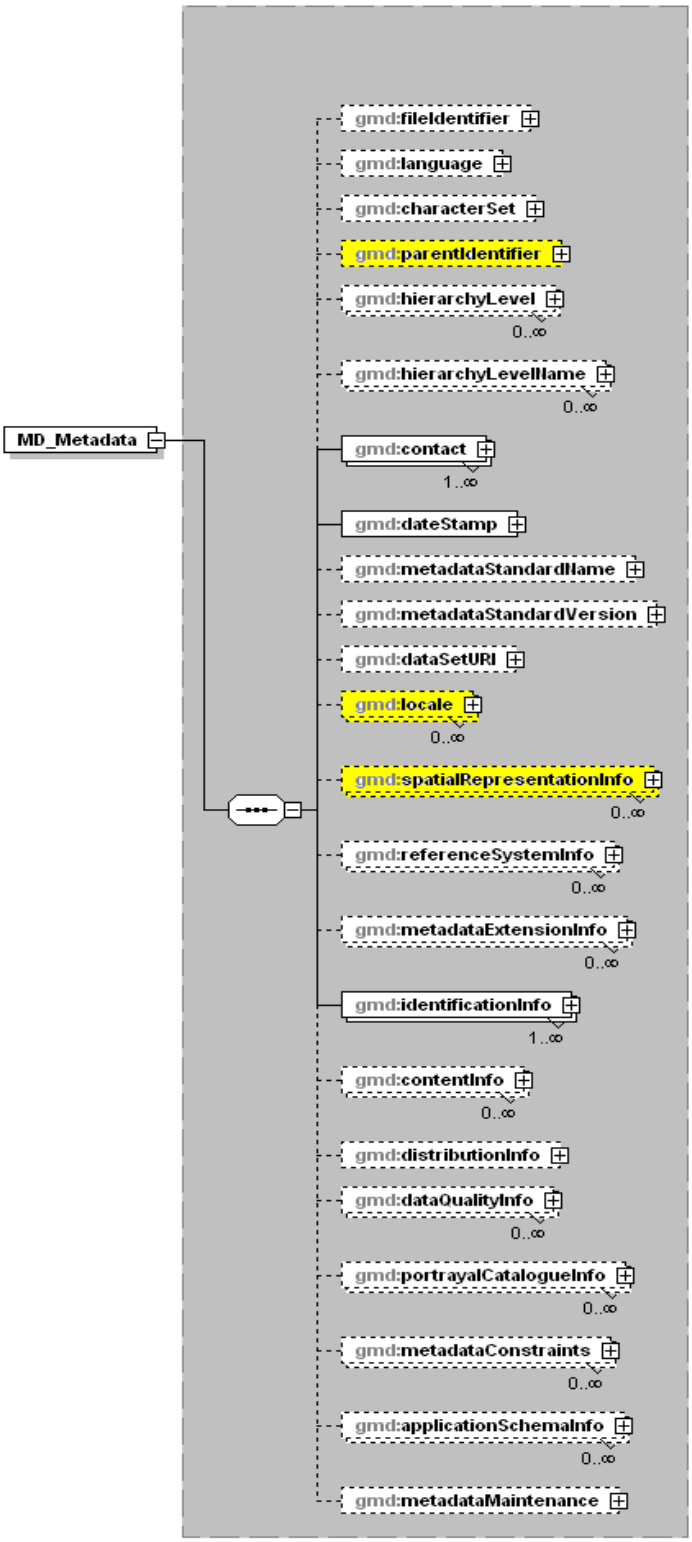
Type: gco:characterString
Domain: free text
Multiplicity: optional *This is NAP requirement*
Attributes: nilReason
Best Practices: Each metadata record shall have a universal unique identifier (UUID) to distinguish it from others.

Reading the Graphics

The graphics were generated automatically from the actual ISO schemas using Altova's XMLSpy software. The graphics were then cleaned up to provide easier to read graphical representations of the standard. The legend of symbols required to read the graphics is provided below. Additional symbols are the result of the automating software and are not considered necessary to the understanding of the standard. The actual Unified Modeling Language (UML) diagrams can be found in Annex E.

Graphic Legend	
	sequence
	choice
 Or	mandatory
 Or	optional
	conditional
0..∞	repeatability
	closed but expands further
	opened to show expansion

ISO 19115


MD_Metadata
gmd:fileIdentifier
gmd:language
gmd:characterSet
gmd:parentIdentifier
gmd:hierarchyLevel
0..∞
gmd:hierarchyLevelName
0..∞
gmd:contact
1..∞
gmd:dateStamp
gmd:metadataStandardName
gmd:metadataStandardVersion
gmd:dataSetURI
gmd:locale
0..∞
gmd:spatialRepresentationInfo
0..∞
gmd:referenceSystemInfo
0..∞
gmd:metadataExtensionInfo
0..∞
gmd:identificationInfo
1..∞
gmd:contentInfo
0..∞
gmd:distributionInfo
gmd:dataQualityInfo
0..∞
gmd:portrayalCatalogueInfo
0..∞
gmd:metadataConstraints
0..∞
gmd:applicationSchemaInfo
0..∞
gmd:metadataMaintenance

Metadata

0 MD_Metadata – Root entity that defines information about metadata.
Type: compound
Multiplicity: optional
Attributes: id, uuid
Best Practices: MD_Metadata refers to ISO19115, MI_Metadata refers to ISO19115-2.

0.1 fileIdentifier – A unique phrase or string which uniquely identifies the metadata file.
Type: gco:characterString
Domain: free text
Multiplicity: optional *this is a NAP requirement*
Attributes: nilReason
Best Practices: Each metadata record shall have a universal unique identifier (UUID) to distinguish it from others.

0.2 language – Language of the metadata composed of an ISO639-2/T three-letter language code and an ISO3166-1 three-letter country code.
Type: gco:characterString
Domain: free text
Multiplicity: optional *this is a NAP requirement*
Attributes: nilReason
Best Practices: The language code and country code are documented in the following manner: <ISO639-2/T three letter language code><;><blank space><ISO3166-1 three letter country code> Country code is given in uppercase. See Annex B.

FAQ: How would you populate the element 'language' for a dataset composed in English from the United States?

eng; USA

0.3 characterSet – Character coding standard in the metadata.
Type: MD_CharacterSetCode
Domain: ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2, 8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10, 8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii, ebcdic, eucKR, big5, GB2312
Multiplicity: optional *this is a NAP requirement*
Attributes: nilReason
Best Practices: The character set for the metadata is set to 'utf8' by default.

0.4 parentIdentifier – The unique name of the file or associated fileIdentifier, related in higher hierarchy to the file.
Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: parentIdentifier is documented when the hierarchy of a higher level exists. If

there is more than one parent, see Aggregation Information.

0.5 hierarchyLevel – Level to which the metadata applies.
Type: MD_ScopeCode
Domain: attribute, attributeType, collectionHardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile
Multiplicity: optional, repeatable *this is a NAP requirement*
Attributes: nilReason
Best Practices: Default repeatability is 1. If hierarchy is unknown, default value is 'dataset'.

0.6 hierarchyLevelName – Name of the hierarchy levels for which the metadata is provided
Type: gco:CharacterString
Domain: free text
Multiplicity: optional, repeatable *this is not in NAP*
Attributes: nilReason

0.7 contact – The responsible party for the metadata content.
Type: CI_ResponsibleParty
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: The organisation directly responsible for the metadata maintenance. Contact information shall be provided.

FAQ: Where are the data elements for 'contact'?

Because the 'contact' elements are required by another section, the elements were grouped in the citation package (CI) at CI_ResponsibleParty.

0.8 dateStamp – Metadata creation date.
Type: choice of gco:Date or gco:DateTime
Domain: date
Multiplicity: mandatory
Attributes: nilReason
Best Practices: Date of the metadata creation or the last metadata update. Refer to date format information.

0.9 metadataStandardName – Name of the metadata standard/profile used.
Type: gco:characterString
Domain: free text
Multiplicity: optional *this is a NAP requirement*
Attributes: nilReason
Best Practices: ISO 19115 Geographic information – Metadata *reference NAP if NAP is used*

0.10 metadataStandardVersion – Version of the metadata standard/profile used.
Type: gco:characterString
Domain: free text
Multiplicity: optional

Attributes: nilReason
Best Practices: ISO 19115:2003(E) *reference NAP if NAP is used*

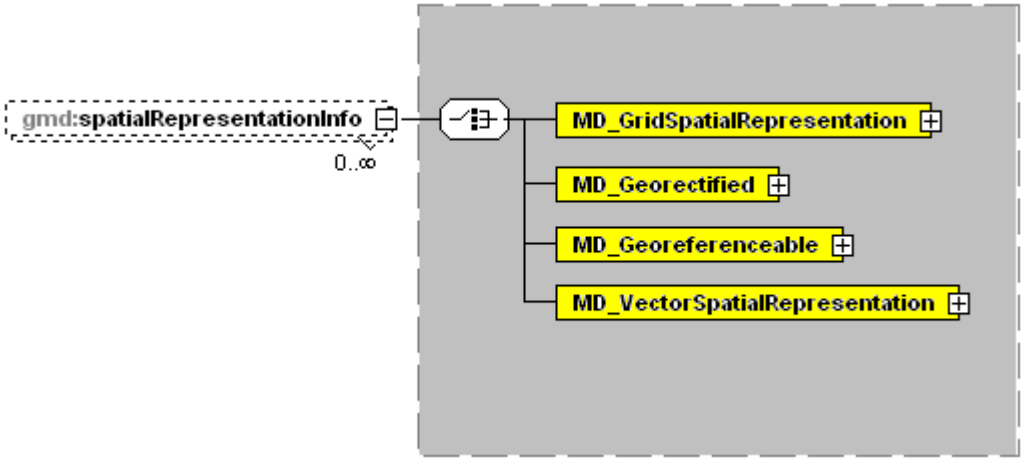
0.11 dataSetURI – Uniform Resource Identifier (URI) of the dataset to which the metadata applies.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason
Best Practices: This is NOT the place to link to the dataset. This should be the link to the metadata.

FAQ: Why is the dataSetURI a link to the metadata vs. the data?

The dataSetURI is found within MD_Metadata, defining information about the metadata. Because of where this element is contextually, it should describe the location of the metadata record, not the data set. This is similar to the way in which the CSDGM is used. Online Linkage gets you the URL for a Citation, for the publication of which the data may be a part, because it is part of the Citation Information. A link to the dataset should be found within the Distribution Information. For ISO, to document the URL to the data, document so in the Distribution OnlineResource. Similarly, within the CSDGM, Network Resource Name is for the URL that gets you the data package, because it is part of the Standard Order Process.

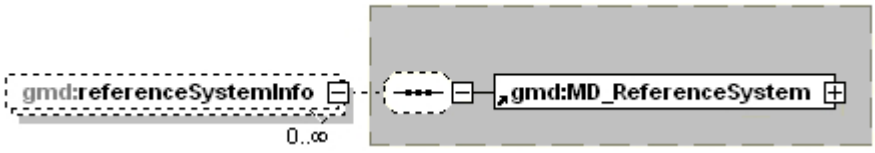
0.12 locale - Other languages used in metadata free text descriptions.
Type: PT_Locale
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: locale is mandatory when more than one language is used in free text descriptions

Spatial Representation Information



1 spatialRepresentationInfo – Digital representation of spatial information in the dataset.
Type: MD_VectorSpatialRepresentation or MD_GridSpatialRepresentation or MD_Georectified or MD_Georeferenceable
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

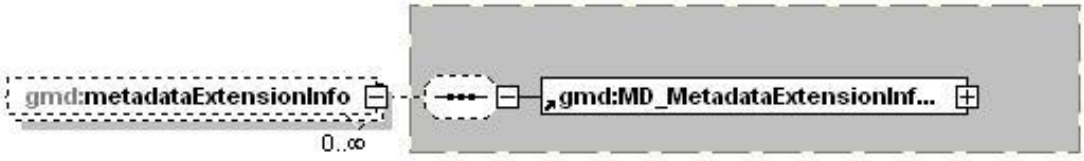
Reference System Information



2 referenceSystemInfo – Identification of the spatial and temporal reference systems used.

Type: MD_ReferenceSystem
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Mandatory if spatialRepresentationType in dataIdentification is vector, grid, or tin.

Metadata Extension Information



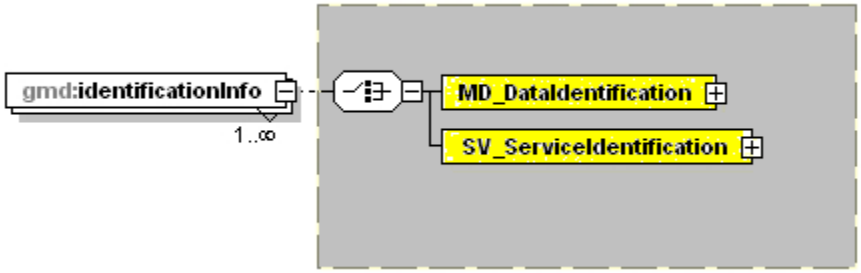
3 metadataExtensionInfo – Information describing metadata extensions

Type: MD_MetadataExtensionInformation

Multiplicity: optional, repeatable *this is not in NAP*

Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

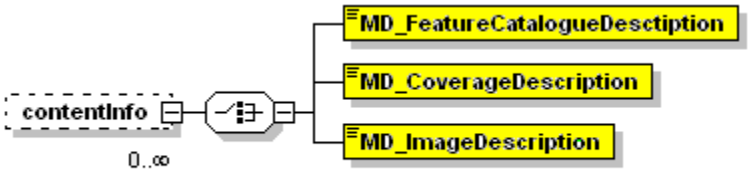
Identification Information



4 identificationInfo – Basic information about the dataset.

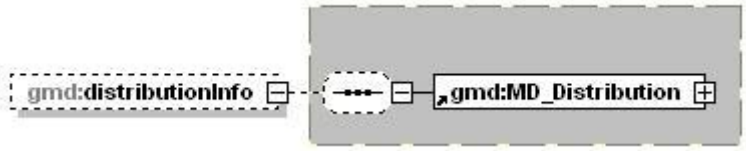
Type: MD_DataIdentification or SV_ServiceIdentification
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: There must be one occurrence of MD_DataIndentification or SV_ServiceIdentification

Content Information



5 contentInfo – Characteristics describing the feature catalogue, the coverage, and the image data.
Type: MD_FeatureCatalogueDescription or MD_CoverageDescription or MD_ImageDescription
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Must have MD_FeatureCatalogueDescription or MD_CoverageDescription or MD_ImageDescription

Distribution Information



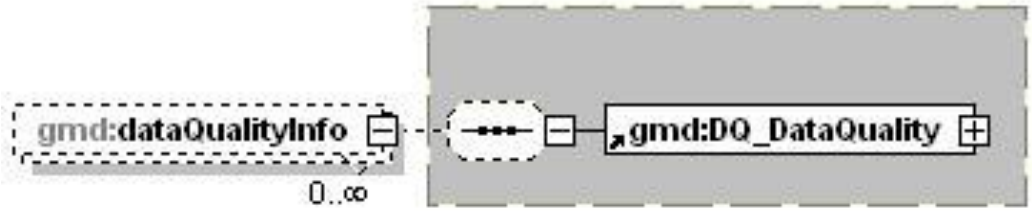
6 distributionInfo – Information about acquiring the dataset.
Type: MD_Distribution
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

---

FAQ: When do you use Distribution Information vs. Service Information?

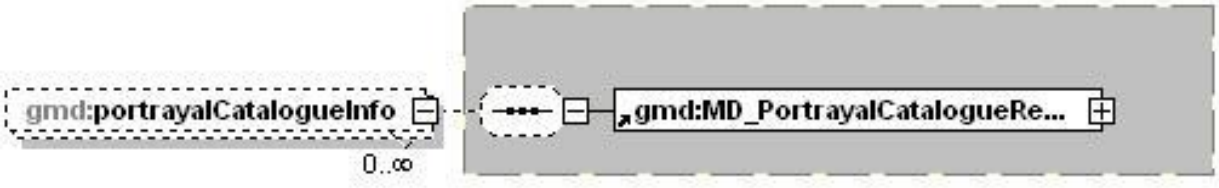
If computers read it, the information goes in Services. If humans read it, the information goes in Distribution.

Data Quality Information



7 dataQualityInfo – Information on the quality of the data that is specified by a data quality scope.
Type: DQ_DataQuality
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

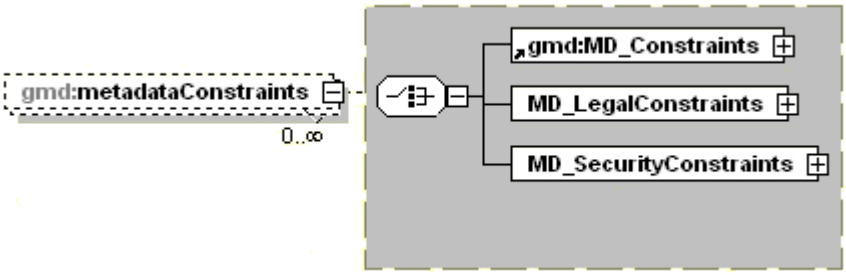
Portrayal Catalogue Information



8 portrayalCatalogueInfo – A portrayal catalogue is a collection of defined symbols used to depict, to humans, features on a map.

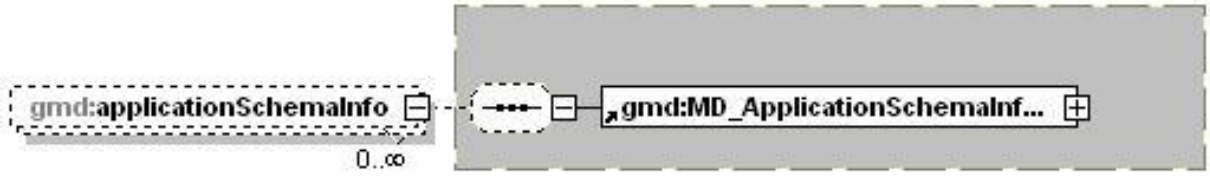
Type: MD_PortrayalCatalogueReference
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

Metadata Constraint Information



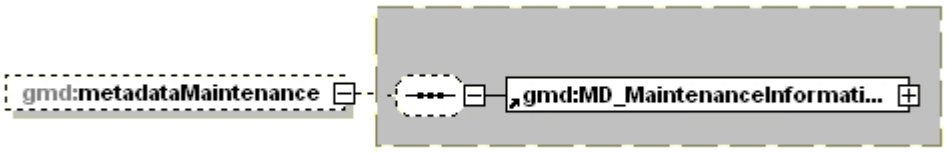
9 metadataConstraints – The limitations or constraints on the use of or access of the metadata.
Type: MD_Constraints or MD_LegalConstraints or MD_SecurityConstraints
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

Application Schema Information



10 applicationSchemaInfo – Information about the conceptual schema of the dataset.
Type: MD_ApplicationSchemaInformation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

Metadata Maintenance Information



11 metadataMaintenance – Information about metadata updates.

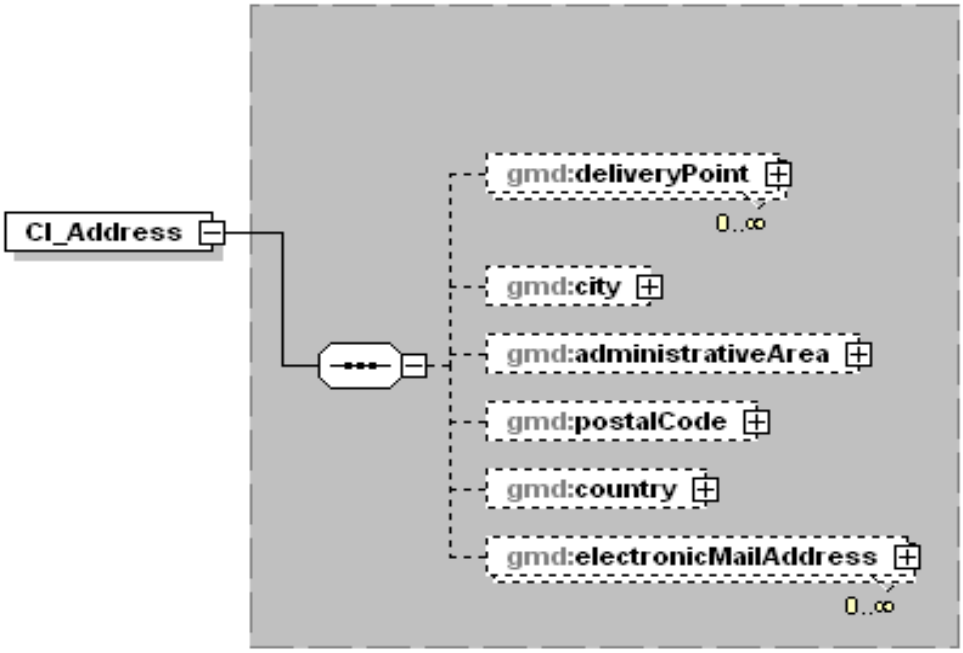
Type: MD_MaintenanceInformation

Multiplicity: optional

Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

CI PACKAGE

CI_Address



CI_Address – Physical and email address at which the organisation or individual may be contacted.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

deliveryPoint – Address line for the location.
Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable *this is not repeatable in NAP*
Attributes: nilReason

city – City of the address
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

administrativeArea – State or province of the address.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

postalCode – Administrative spatial code which assists mail and parcel delivery.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

country – Country of the physical address.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason
Best Practices: Refer to ISO3166. See Annex B.

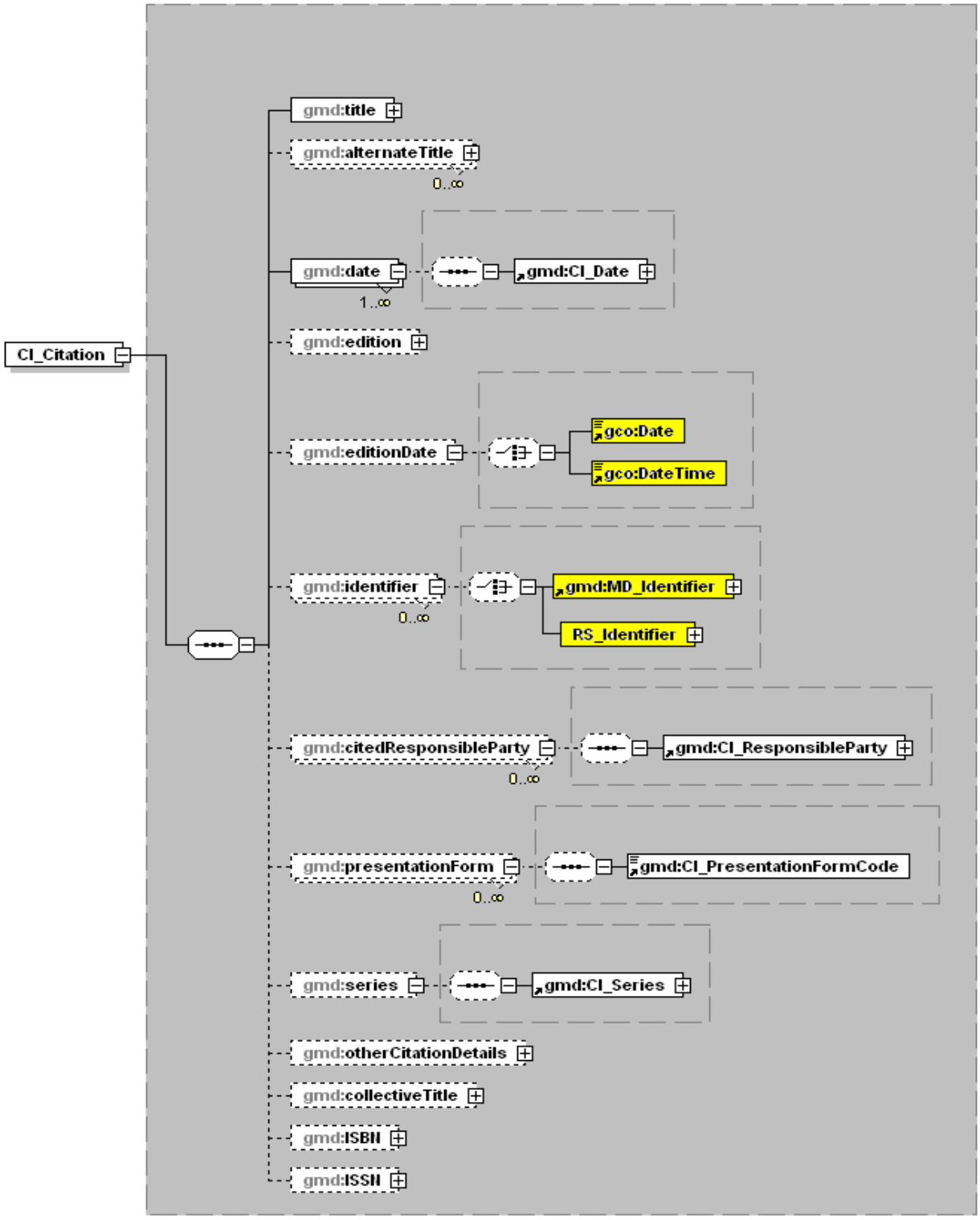
electronicMailAddress – The electronic mailbox address of the responsible organisation or individual.

Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

Ex:

```
<gmd:CI_Address>
        <gmd:deliveryPoint>
                <gco:CharacterString>Building 1100; Rm 101</gco:CharacterString>
        </gmd:deliveryPoint>
        <gmd:city>
                <gco:CharacterString>Stennis Space Center</gco:CharacterString>
        </gmd:city>
        <gmd:administrativeArea>
                <gco:CharacterString>MS</gco:CharacterString>
        </gmd:administrativeArea>
        <gmd:postalCode>
                <gco:CharacterString>39529</gco:CharacterString>
        </gmd:postalCode>
        <gmd:country>
                <gco:CharacterString>USA</gco:CharacterString>
        </gmd:country>
        <gmd:electronicMailAddress>
                <gco:CharacterString>ncddcmetadata@noaa.gov</gco:CharacterString>
        </gmd:electronicMailAddress>
</gmd:CI_Address>
```

CI_Citation


CI_Citation
gmd:title
gmd:alternateTitle
0..∞
gmd:date
1..∞
gmd:CI_Date
gmd:edition
gmd:editionDate
gco:Date
gco:DateTime
gmd:identifier
0..∞
gmd:MD_Identifier
RS_Identifier
gmd:citedResponsibleParty
0..∞
gmd:CI_ResponsibleParty
gmd:presentationForm
0..∞
gmd:CI_PresentationFormCode
gmd:series
gmd:CI_Series
gmd:otherCitationDetails
gmd:collectiveTitle
gmd:ISBN
gmd:ISSN

CI_Citation – Bibliographic information to reference the resource.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

title – Name by which the cited resource is known.
Type: gco:characterString
Domain: free text
Multiplicity: mandatory

alternateTitle – Short name or other language name by which the cited information is known.
Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable

FAQ: Where is an example of 'alternateTitle'?

If the dataset titled 'Digital Chart of the World' was also known as 'DCW', then 'DCW' would be the alternateTitle.

---

date – Reference date for the cited resource; reference date and event used to describe it.
Type: CI_Date
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Whenever possible, include both creation date and revision date.

edition – Version of the cited resource.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

editionDate – Reference date for the cited resource.
Type: choice of gco:Date or gco:DateTime
Domain: date
Multiplicity: optional
Attributes: nilReason

identifier – A unique value that identifies an object in a given namespace.
Type: MD_Identifier or RS_Identifier
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

citedResponsibleParty – Identification of the contact for the resource.
Type: CI_ResponsibleParty
Multiplicity: optional, repeatable *this is a NAP requirement*
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

presentationForm – The form in which the resource is available.

Type: CI_PresentationFormCode
Domain: documentDigital, documentHardcopy, imageDigital, imageHardcopy, mapDigital, mapHardcopy, modelDigital, modelHardcopy, profileDigital, profileHardcopy, tableDigital, tableHardcopy, videoDigital, videoHardcopy
Multiplicity: optional, repeatable
Attributes: nilReason
Best Practices: See Annex C.

series – Information about the series or collection of which the resource is a part.

Type: CI_Series
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

otherCitationDetails – Other information to complete a citation.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

collectiveTitle – Information about the combined resource of which the dataset is a part. The description may include information on other volumes which are also available.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

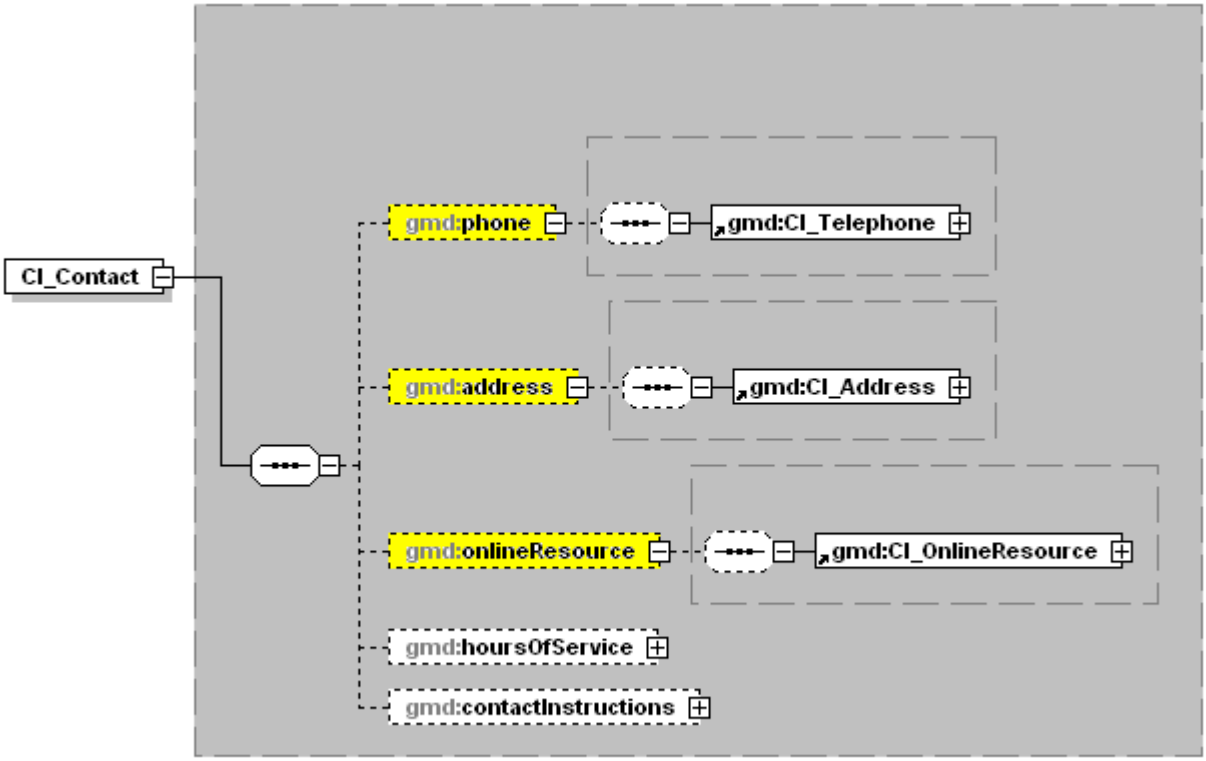
ISBN – The international standard book number (ISBN) assigned by an ISBN authority to a publication such as a book, a pamphlet, an educational kit, a microform, a CD-ROM or another digital or electronic publication.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

ISSN – The international standard serial number (ISSN) assigned by an ISSN authority to a serial publication, such as a periodical, a newspaper, an annual, a journal, or a monographic series.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

CI_Contact



CI_Contact – Information which assists one to contact an individual or organisation.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: one of phone, address, or onlineResource shall be provided.

phone – Telephone numbers to contact the organisation or individual.

Type: CI_Telephone
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: one of phone, address, or onlineResource shall be provided.

address – Physical and email address to contact the organisation or individual.

Type: CI_Address
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: one of phone, address, or onlineResource shall be provided.

onlineResource – Information about Internet hosted resources: availability; URL; protocol used; resource name; resource description, and resource function.

Type: CI_OnlineResource
Multiplicity: conditional

Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: one of phone, address, or onlineResource shall be provided.

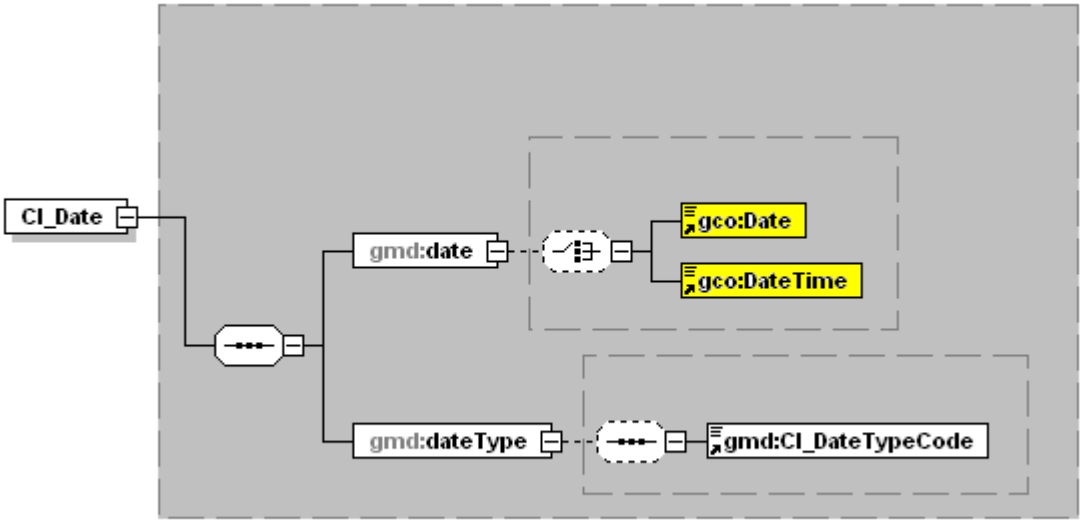
hoursOfService – Time period (including time zone) when individuals can contact the organisation or individual.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason
Best Practices: Refer to ISO 8601 for the representation of time.

contactInstructions – Supplemental instructions on how or when to contact the individual or organisation.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

CI_Date



CI_Date – The date in which the event or action occurred.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

date – The date in which the event or action occurred.
Type: choice of gco:Date or gco:DateTime
Domain: date
Multiplicity: mandatory
Attributes: nilReason
Best Practices: Date is represented minimally as a four digit representation for year- YYYY. Refer to FAQ for further format information.

dateType – Identification of the event used for the temporal aspects in the resource.
Type: CI_DateTypeCode
Domain: creation, publication, revision
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

FAQ: What is the proper date format for gco:Date and gco:DateTime?

The proper date formats correspond to ISO 8601, Data elements and interchange formats – Information interchange – Representation of dates and times.

Calendar date is the most common date representation. It is—

YYYY-MM-DD

where *YYYY* is the year in the Gregorian calendar, *MM* is the month of the year between 01 (January) and 12 (December), and *DD* is the day of the month between 01 and 31.

Ex:

2010-08-11 represents August 11, 2010.

Time of the day is the time representation, using the 24-hour timekeeping system. It is—

hh:mm:ss

where *hh* is the number of complete hours that have passed since midnight, mm is the number of complete minutes since the start of the hour, and *ss* is the number of complete seconds since the start of the minute.

Ex:

23:59:59 represents the time one second before midnight.

Date and time represents a specified time of a specified day. When use is made of the calendar date the representation is—

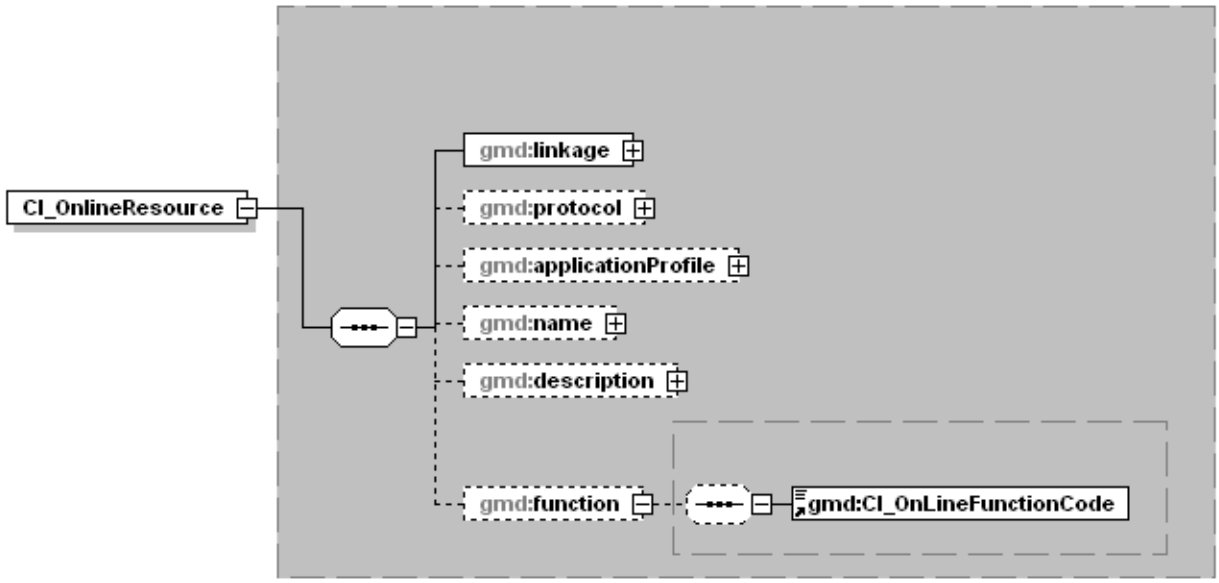
YYYY-MM-DDThh:mm:ss

where *T* is used to separate the date and time components.

Ex:

2010-08-11T13:31:01 represents 31 minutes and 1 second after 1 o'clock in the afternoon of August 11, 2010.

CI_OnlineResource



CI_OnlineResource – Information on the Internet available resource.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid

linkage – Internet location (address) for on-line access which uses a Uniform Resource Locator address or similar addressing scheme.

Type: URL
Domain: any valid URL
Multiplicity: mandatory
Attributes: nilReason

protocol – The connection protocol to be used, such as http, ftp, etc.

Type: gco:characterString
Domain: free text
Multiplicity: optional *this is a NAP requirement*
Attributes: nilReason
Best Practices: The protocol should be taken from an official controlled list, such as the Official Internet Protocol Standards or the Internet Assigned Numbers Authority (IANA).

applicationProfile – Name of an application profile that can be used with the online resource.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

name – Name of the online resource .

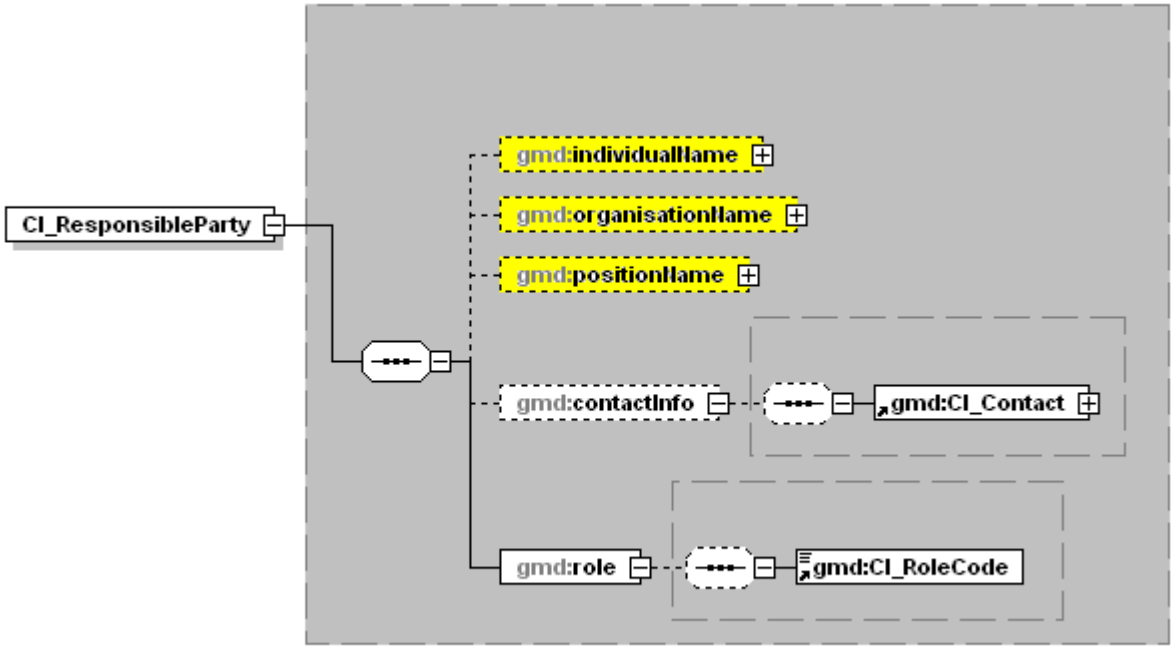
Type: gco:characterString

Domain: free text
Multiplicity: mandatory
Attributes: nilReason

description – Description of the online resource that provides the resource sought.
Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

function – Code for function performed by the online resource.
Type: CI_OnlineFunctionCode
Domain: download, information, offlineAccess, order, search
Multiplicity: optional
Best Practices: See Annex C.

CI_ResponsibleParty



CI_ResponsibleParty – The identification of those responsible for the resource and the party's role in the resource.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: Must have one occurrence of either individualName, organisationName, and/or positionName.

individualName – The name of the responsible individual.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: individualName shall be provided if organisationName and/or positionName are not provided.

organisationName – Name of the responsible organisation.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: organisationName shall be provided if individualName and/or positionName are not provided.

positionName – Position of the responsible person.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: positionName shall be provided if individualName and/or organisationName are not provided.

FAQ: What should I do if I have information about a responsible party, such as contact information but I do not know the name of the individual, organisation, or position?

Document the information that you do know. To have a valid CI_ResponsibleParty, there must be one occurrence of either individualName, organisationName, and/or positionName. In this case, use the nilReason attribute.

Ex:

```
<gmd:CI_ResponsibleParty>
  <gmd:organisationName gco:nilReason="unknown"/>
  <gmd:contactInfo>
    <gmd:CI_Contact>
      <gmd:phone>
        <gmd:CI_Telephone>
          <gmd:voice>
            <gco:CharacterString>111-222-3333</gco:CharacterString>
          </gmd:voice>
        </gmd:CI_Telephone>
      </gmd:phone>
      <gmd:address>
        <gmd:CI_Address>
          <gmd:deliveryPoint>
            <gco:CharacterString>123 ABC Road</gco:CharacterString>
          </gmd:deliveryPoint>
          <gmd:city>
            <gco:CharacterString>City</gco:CharacterString>
          </gmd:city>
          <gmd:administrativeArea>
            <gco:CharacterString>State</gco:CharacterString>
          </gmd:administrativeArea>
          <gmd:postalCode>
            <gco:CharacterString>90210</gco:CharacterString>
          </gmd:postalCode>
          <gmd:country>
            <gco:CharacterString>United States</gco:CharacterString>
          </gmd:country>
          <gmd:electronicMailAddress>
            <gco:CharacterString>email@address.com</gco:CharacterString>
          </gmd:electronicMailAddress>
        </gmd:CI_Address>
      </gmd:address>
    </gmd:CI_Contact>
  </gmd:contactInfo>
  <gmd:role>
```

```
    <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="pointOfContact" codeSpace="007">pointOfContact</gmd:CI_RoleCode>
  </gmd:role>
</gmd:CI_ResponsibleParty>
```

---

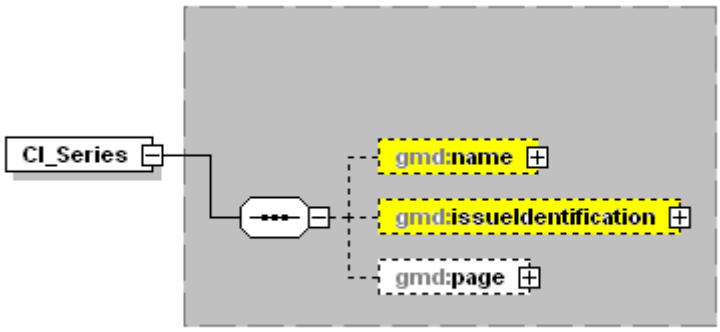
contactInfo – Information required enabling contact with the responsible person and/or organisation.

Type: CI_Contact
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

role – Function performed by the responsible party.

Type: CI_RoleCode
Domain: resourceProvider, custodian, owner, user, distributor, originator, pointOfContact, principalInvestigator, processor, publisher, author
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

CI_Series



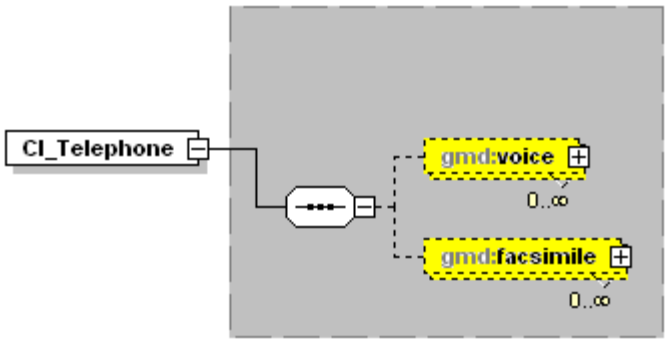
CI_Series – Information about a Series publication or dataset aggregation.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

name – Name of the publication series or aggregate dataset of which the referenced dataset is a part.
Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: name will be provided if issueIdentification is not provided.

issueIdentification – Identification of the series' issue information.
Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: issueIdentification will be provided if name is not provided.

page – Identification of the articles' page number(s).
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

CI_Telephone



CI_Telephone – Information on the telephone numbers used to contact the responsible individual or organisation.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: At least one occurrence of voice or facsimile is required.

voice – Telephone number of an organisation or individual.
Type: gco:characterString
Domain: free text
Multiplicity: conditional, repeatable
Attributes: nilReason
Best Practices: voice is mandatory if facsimile is not documented.

facsimile – Facsimile telephone number of an organisation or individual.
Type: gco:characterString
Domain: free text
Multiplicity: conditional, repeatable
Attributes: nilReason
Best Practices: facsimile is mandatory if voice is not documented.

DQ PACKAGE

DQ _ConformanceResult

DQ_ConformanceResult – Information which describes the outcome from evaluating the value(s) against a set acceptable quality level.

Type: compound
Multiplicity: conditional
Attributes: id, uuid

specification – citation for the specification or user requirement used to evaluate the data.

Type: CI_Citation
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

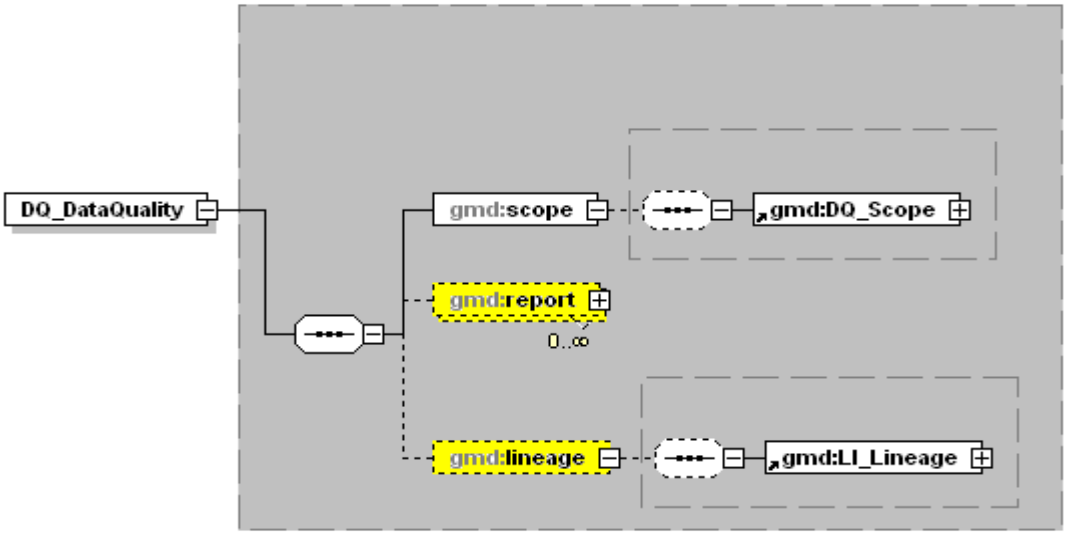
explanation – An explanation of the conformance result.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

pass – Notification of whether the data passed or failed the conformance test.

Type: Boolean
Domain: 0, 1 (0 = failed, 1 = passed)
Multiplicity: mandatory
Attributes: nilReason

DQ_DataQuality



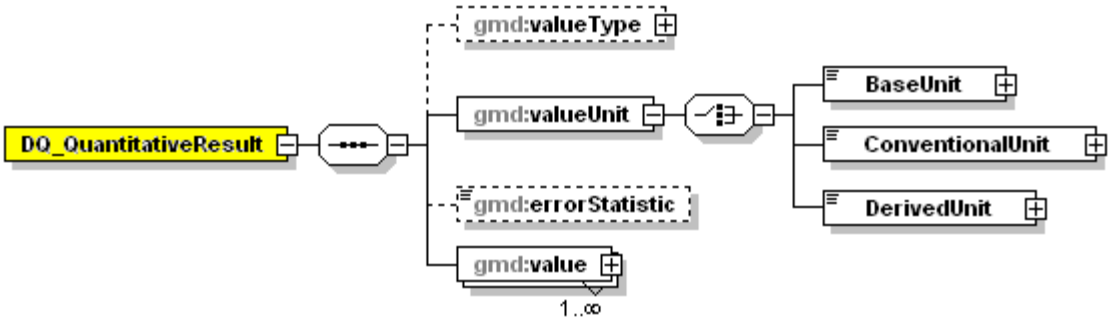
DQ_DataQuality – Information on the quality of the data that is specified by a data quality scope.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: The must be one occurrence of either report or lineage.

scope – The extent of characteristics for which data quality information is reported.
Type: DQ_Scope
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: When the attribute level of scope is set to 'dataset', *Report* OR *Lineage* is mandatory. Both may be reported.

report – A statement of the quality of the resource specified by the scope.
Type: DQ_CompletenessCommission or DQ_CompletenessOmission or DQ_ConceptualConsistency or DQ_DomainConsistency or DQ_FormatConsistency or DQ_TopologicalConsistency or DQ_AbsoluteExternalPositionalAccuracy or DQ_GriddedDataPositionalAccuracy or DQ_RelativeInternalPositionalAccuracy or DQ_ThematicClassificationCorrectness or DQ_NonQuantitativeAttributeAccuracy or DQ_QuantitativeAttributeAccuracy or DQ_AccuracyOfATimeMeasurement or DQ_TemporalConsistency
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: report is mandatory if lineage is missing.

lineage – Information or lack of information on the events and source data used to construct the dataset within the specified Scope
Type: LI_Lineage
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Lineage shall be provided when Report is not reported.

DQ_QuantitativeResult



DQ_QuantitativeResult – Information on the value(s) resulting from applying a data quality measure.

Type: compound
Multiplicity: conditional
Attributes: id, uuid

valueType – The class or classes used for the value type(s).

Type: gco:RecordType
Multiplicity: optional
Attributes: nilReason

valueUnit – Any system devised to quantify a value, such as length, time, angle, area, volume, velocity, or scale.

Type: BaseUnit or ConventionalUnit or DerivedUnit
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: See Annex D.

errorStatistic – The statistical method used to estimate error in the value.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

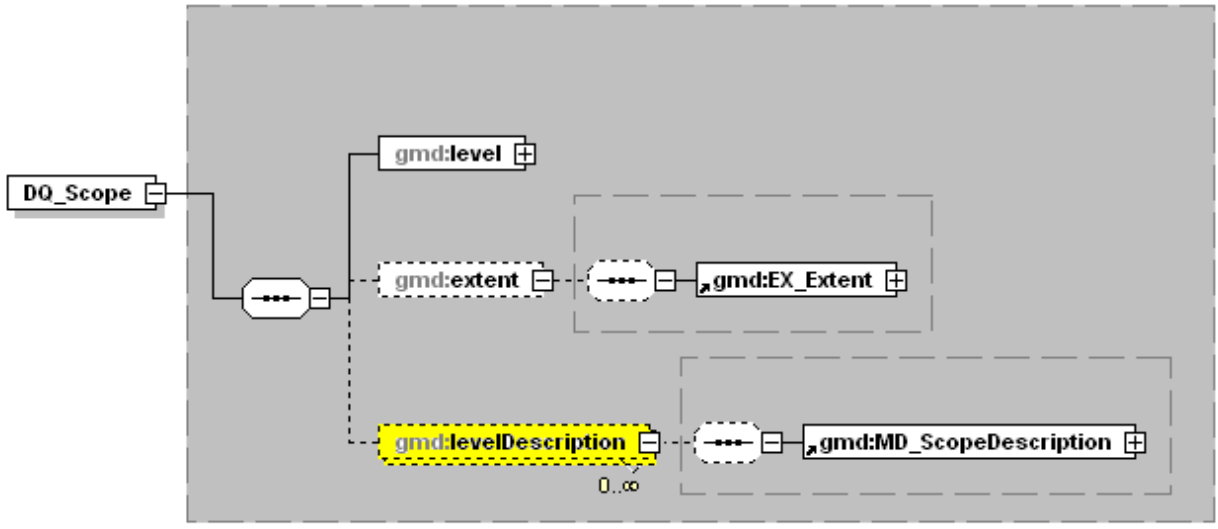
value – The quantitative value(s) for the object measured.

Type: gco:Record
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

Ex:

```
<gmd:DQ_QuantitativeResult>
        <gmd:valueUnit>
                <gml:BaseUnit gml:id="meters">
                <gml:identifier codeSpace="SI">meters</gml:identifer>
                        <gml:unitsSystem xlink:href="http://www.bipm.org/en/si/"/>
                </gml:BaseUnit>
        </gmd:valueUnit>
        <gmd:value>
                <gco:Record>2</gco:Record>
        </gmd:value>
</gmd:DQ_QuantitativeResult>
```

DQ_Scope



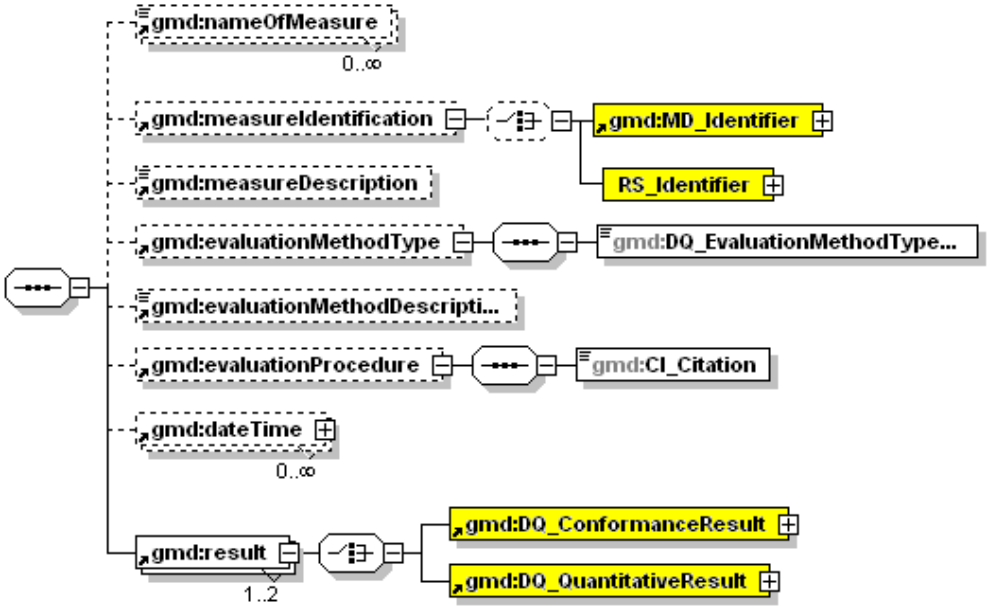
DQ_Scope – The extent of characteristics for which data quality information is reported.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

level – The data or application level for which data quality is described.
Type: MD_ScopeCode
Domain: attribute, attributeType, collectionHardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C. When 'dataset' is selected, report or lineage is mandatory.

extent – The spatial (horizontal and/or vertical) and the temporal delineation of the resource.
Type: EX_Extent
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

levelDescription – Description of the level of the dataset.
Type: MD_ScopeDescription
Multiplicity: conditional, repeatable
Attributes: nilReason
Best Practices: When level is not 'dataset' or 'series', then levelDescription is mandatory.

DQ_CompletenessCommission
DQ_CompletenessOmission
DQ_ConceptualConsistency
DQ_DomainConsistency
DQ_FormatConsistency
DQ_TopologicalConsistency
DQ_AbsoluteExternalPositionalAccuracy
DQ_GriddedDataPositionalAccuracy
DQ_RelativeInternalPositionalAccuracy
DQ_ThematicClassificationCorrectness
DQ_NonQuantitativeAttributeAccuracy
DQ_QuantitativeAttributeAccuracy
DQ_AccuracyOfATimeMeasurement
DQ_TemporalConsistency



**NOTE* Each of the compounds below share the same elements pictured above and detailed below.*

DQ_CompletenessCommission **–** Notification of excess data present in the dataset beyond the extent defined in Scope.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_CompletenessOmission – Notification of data absent from the dataset as defined by Scope.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_ConceptualConsistency – The level to which the dataset adheres to the conceptual schema. For example, conceptual consistency might describe to which level the resource complies with the data structure and attributing of the conceptual schema – i.e., feature types, feature attributes, relationships between features, etc.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_DomainConsistency – The adherence of resource attribute values to conceptual schema specified values.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_FormatConsistency – The level of data storage agreement with the dataset physical structure as described by the attribute Scope.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_TopologicalConsistency – The testing for topological correctness of encoded characteristics in the dataset as delimited by Scope.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_AbsoluteExternalPositionalAccuracy– Description of the methods, procedures, conformance results or quantitative results and date stamp of the positional measurement in the dataset.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_GriddedDataPositionalAccuracy – The degree to which gridded data positions compare to values accepted as being true.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_RelativeInternalPositionalAccuracy – The degree to which all features in a given set meet a defined proximity threshold.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_ThematicClassificationCorrectness – Comparison of classes or attributes assigned to features or feature attributes respectively with respect to a recognized repository of features that pertain in a particular context.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_NonQuantitativeAttributeAccuracy – Degree to which qualitative attributes reflect the stated requirements.

Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_QuantitativeAttributeAccuracy – Degree to which quantitative attributes reflect the stated requirements.
Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_AccuracyOfATimeMeasurement - Report on the accuracy or error in time measurement.
Type: compound
Multiplicity: optional
Attributes: id, uuid

DQ_TemporalConsistency – The correctness of reported ordered events or sequences.
Type: compound
Multiplicity: optional
Attributes: id, uuid

nameOfMeasure – Name of the test applied to the data to assure data quality.
Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

measureIdentification – Code which identifies a registered standard data quality procedure.
Type: MD_Identifier or RS_Identifier
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

measureDescription – Description of the measure applied to the dataset to assure quality.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

evaluationMethodType – Method type used to evaluate data quality in the dataset.
Type: DQ_EvaluationMethodTypeCode
Domain: directInternal, directExternal, indirect
Multiplicity: optional
Attributes: nilReason
Best Practices: See Annex C.

evaluationMethodDescription – Description of the evaluation method applied to the dataset.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

evaluationProcedure – Citation for the evaluation procedure.
Type: CI_Citation
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

dateTime – Date and Time at which the test was completed.

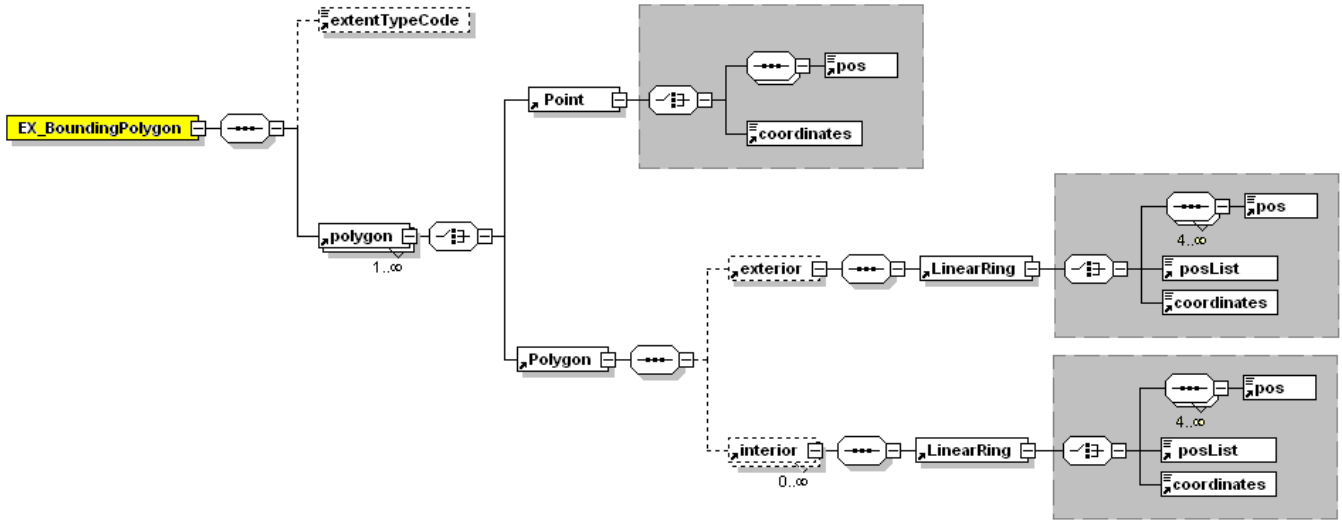
Type: gco:DateTime
Domain: date
Multiplicity: optional, repeatable
Attributes: nilReason

result – Value(s) obtained from data quality test or outcome from applying data quality measure against a specified/acceptable quality conformance level.

Type: DQ_QuantitativeResult or DQ_ConformanceResult
Multiplicity: mandatory, repeatable twice
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

EX PACKAGE

EX _BoundingPolygon



EX_BoundingPolygon – Boundary enclosing the dataset, expressed as the closed set of (x,y) coordinates of the polygon (last point replicates the first point).

Type: compound
Multiplicity: conditional
Attributes: id, uuid
Best Practices: EX_BoundingPolygon is mandatory if EX_GeographicExtent or EX_GeographicBoundingBox or EX_GeographicDescription are not documented. The first point must equal the last point.

extentTypeCode – Indication of whether the bounding polygon encompasses an area covered by the data or an area where data is not present.

Type: gco:Boolean
Domain: 0, 1 (0 – exclusion, 1 – inclusion)
Multiplicity: optional
Attributes: nilReason

polygon – Coordinates defining the outline of an area covered by a dataset.

Type: Point or Polygon
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

Point – A point is defined by a single coordinate tuple. The direct position of a point is specified by the pos element.

Type: pos or coordinates
Multiplicity: mandatory
Attributes: id, srsName, srsDimension, axisLabels, uomLabels
Best Practices: The id attribute is mandatory.

Polygon – A special surface that is defined by a single surface patch. The elements exterior and interior describe the surface boundary of the polygon.

Type: exterior and/or interior
Multiplicity: mandatory
Attributes: id, srsName, srsDimension, axisLabels, uomLabels

exterior – The exterior boundary of a ring.

Type: LinearRing
Multiplicity: optional

LinearRing – A LinearRing is defined by four or more coordinate tuples, with linear interpolation between them; the first and last coordinates shall be coincident.

Type: coordinates or pos or posList
Domain: coordinate tuple
Multiplicity: mandatory

interior – The interior area enclosed by the rings.

Type: LinearRing
Multiplicity: optional, repeatable

LinearRing – A LinearRing is defined by four or more coordinate tuples, with linear interpolation between them; the first and last coordinates shall be coincident.

Type: coordinates or pos or posList
Domain: coordinate tuple
Multiplicity: mandatory

Ex:

```
<gmd:EX_BoundingPolygon id="boundingPolygon">
    <gmd:polygon>
        <gml:Polygon>
            <gml:interior>
                <gml:LinearRing>
                    <gml:coordinates decimal=" 156.86274,71.34815 -156.87389,71.33893 -
                    156.88004,71.33883 -156.89144,71.33259 -156.89982,71.33182
                    156.86274,71.34815 "/>
                </gml:LinearRing>
            </gml:interior>
        </gml:Polygon>
    </gmd:polygon>
</gmd:EX_BoundingPolygon>
```

Ex:

```
<gmd:EX_BoundingPolygon>
    <gmd:polygon>
        <gml:LineString gml:id="leg1" srsName="EPSG:4326">
            <gml:posList>1.0 1.0 2.0 2.0 3.0 3.0</gml:posList>
        </gml:LineString>
    </gmd:polygon>
</gmd:EX_BoundingPolygon>
```

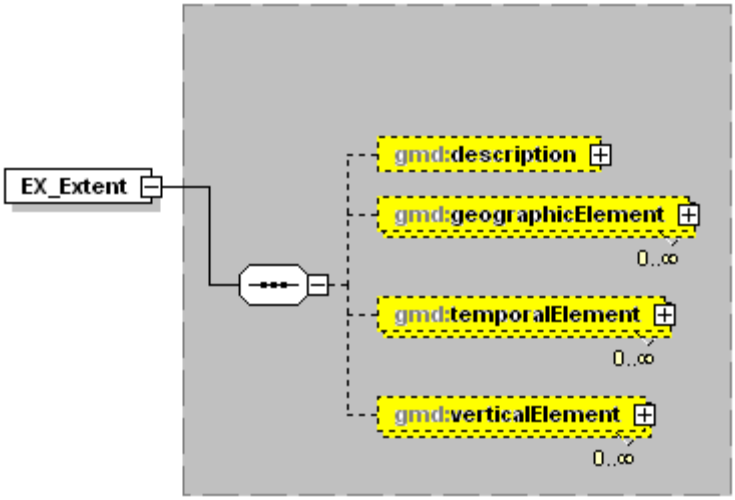
FAQ: What is the srsName attribute and how is it used?

A srsName attribute attached to a geometry object specifies the object's coordinate reference system (CRS). The value of the srsName attribute is a Uniform Resource Identifier (URI). It refers to a definition of the CRS that is used to interpret the coordinates in the geometry. The CRS definition may be in a document or in an online web service. Values of EPSG codes can be resolved by using the CRS Registry Service operated by the Oil and Gas Producers Association available at http://www.epsg-registry.org. The srsName URI may also be a Uniform Resource Name (URN) for referencing a common CRS definition.

Ex:
An object is located at the point 45.67 and 88.56 on a map and is referenced to WGS 84.

```
<gmd:geographicElement>
        <gmd:EX_BoundingPolygon>
                <gmd:polygon
                        <gml:Point gml:id="boundingPoint">
                                <gml:pos srsName="http://www.opengis.net/def/crs/EPSG/0/4326">45.67
88.56</gml:pos>
                        </gml:Point>
                </gmd:polygon>
        </gmd:EX_BoundingPolygon>
</gmd:geographicElement>
```

EX_Extent



EX_Extent – Information about horizontal, vertical, and temporal extent

Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: If EX_Extent exists, there must be one occurrence of gmd:description or gmd:geographicElement or gmd:temporalElement or gmd:verticalElement.

description – Spatial and temporal extent for the referring object.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: gmd:description is mandatory if gmd:geographicElement or gmd:temporalElement or gmd:verticalElement are not present.

geographicElement – Provides geographic component of the extent of the referring object.

Type: EX_GeographicExtent or EX_BoundingPolygon or EX_GeographicBoundingBox or EX_GeographicDescription
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: gmd:geographicElement is mandatory if gmd:description or gmd:temporalElement or gmd:verticalElement are not present.

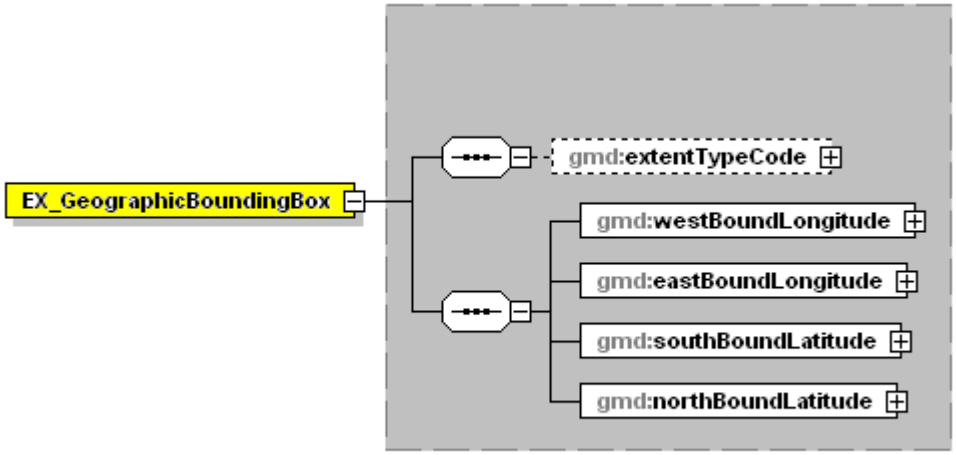
temporalElement – Provides temporal component of the extent of the referring object.

Type: EX_TemporalExtent
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: gmd:temporalElement is mandatory if gmd:description or gmd:geographicElement or gmd:verticalElement are not present.

verticalElement – Provides vertical component of the extent of the referring object.

Type: EX_VerticalExtent
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: gmd:verticalElement is mandatory if gmd:description or gmd:geographicElement or gmd:temporalElement are not present.

EX_GeographicBoundingBox



EX_GeographicBoundingBox – Geographic position of the dataset.

Type: compound

Multiplicity: conditional

Attributes: id, uuid

Best Practices: EX_GeographicBoundingBox is mandatory if EX_GeographicExtent or EX_BoundingPolygon or EX_GeographicDescription are not documented.

extentTypeCode – Indication of whether the bounding polygon encompasses an area covered by the data or an area where data is not present.

Type: gco:Boolean

Domain: 0, 1 (0 – exclusion, 1 – inclusion)

Multiplicity: optional

Attributes: nilReason

westBoundingLongitude – Westernmost coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees.

Type: gco:Decimal

Domain: any decimal number

Multiplicity: mandatory

Attributes: nilReason

eastBoundingLongitude – Easternmost coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees.

Type: gco:Decimal

Domain: any decimal number

Multiplicity: mandatory

Attributes: nilReason

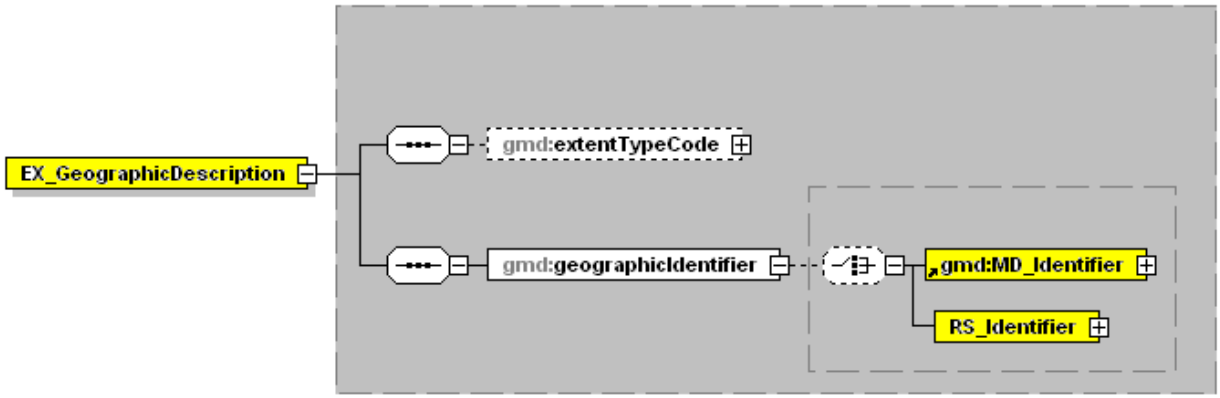
southBoundingLatitude – Southernmost coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees.

Type: gco:Decimal
Domain: any decimal number
Multiplicity: mandatory
Attributes: nilReason

northBoundingLatitude – Northernmost coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees.

Type: gco:Decimal
Domain: any decimal number
Multiplicity: mandatory
Attributes: nilReason

EX_GeographicDescription



EX_GeographicDescription – Description of the geographic area using identifiers.

Type: compound
Multiplicity: conditional
Attributes: id, uuid
Best Practices: EX_GeographicDescription is mandatory if EX_GeographicExtent or EX_BoundingPolygon or EX_GeographicBoundingBox are not documented.

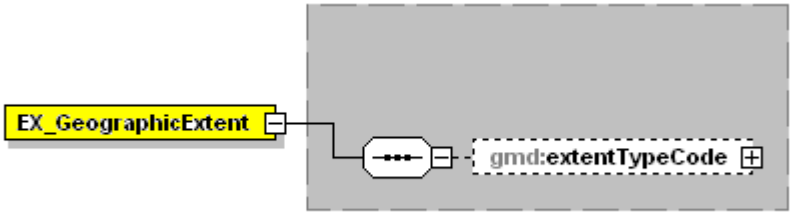
extentTypeCode – Indication of whether the bounding polygon encompasses an area covered by the data or an area where data is not present.

Type: gco:Boolean
Domain: 0, 1 (0 – exclusion, 1 – inclusion)
Multiplicity: optional
Attributes: nilReason

geographicIdentifier – Identifier used to represent a geographic area.

Type: MD_Identifier or RS_Identifier
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

EX_GeographicExtent



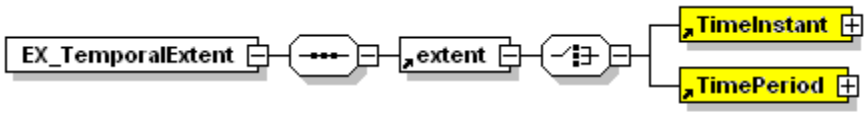
EX_GeographicExtent – Geographic area of the dataset.

Type: compound
Multiplicity: conditional
Attributes: id, uuid
Best Practices: EX_GeographicExtent is mandatory if EX_BoundingPolygon or EX_GeographicBoundingBox or EX_GeographicDescription are not documented.

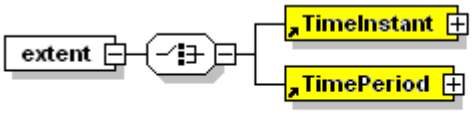
extentTypeCode – Indication of whether the bounding polygon encompasses an area covered by the data or an area where data is not present.

Type: gco:Boolean
Domain: 0, 1 (0 – exclusion, 1 – inclusion)
Multiplicity: optional
Attributes: nilReason

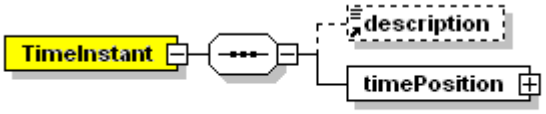
EX_TemporalExtent



EX_TemporalExtent – Time period covered by the content of the dataset
Type: Compound
Multiplicity: mandatory
Attributes: id, uuid



extent – Date and time for the content of the dataset
Type: choice of TimeInstant or TimePeriod
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason



TimeInstant – Single date and Time
Type: compound
Multiplicity: conditional
Attributes: id, frame
Best Practices: TimeInstant is mandatory if TimePeriod is not documented. The TimeInstant attribute id is mandatory. Each TimeInstant id attribute must be unique within a record.

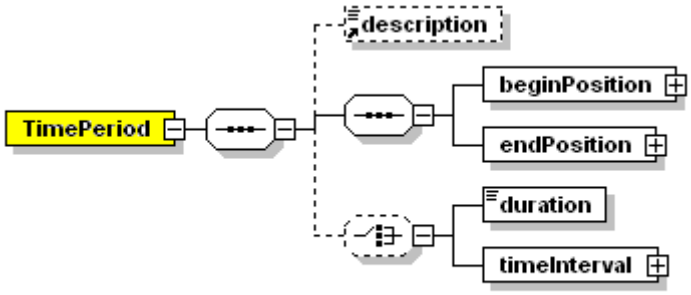
description – description of the date and time documented.
Domain: free text
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: The currentness reference (the basis on which the time period of content information is determined) is often documented here.

timePosition- single date and time
Domain: date
Multiplicity: mandatory

Attributes: frame, calendarEraName, indeterminatePosition
Best Practices: Use indeterminatePosition to document unknown dates and present dates. The valid values for indeterminatePosition are 'unknown', 'after', 'before', and 'now'.

Ex:

```
<gmd:EX_TemporalExtent id="boundingTemporalExtent">
        <gmd:extent>
                <gml:TimeInstant gml:id="tp_114854">
                        <gml:description>ground condition</gml:description>
                        <gml:timePosition>1990-11-03T00:00:00</gml:timePosition>
                </gml:TimeInstant>
        </gmd:extent>
</gmd:EX_TemporalExtent>
```



TimePeriod – Represents an identifiable extent in time.

Type: compound
Multiplicity: conditional
Attributes: id, frame
Best Practices: TimePeriod is mandatory if TimeInstant is not documented. The TimePeriod attribute id is mandatory. Each TimeInstant id attribute must be unique within a record.

description – description of the date and time documented.

Domain: free text
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: The currentness reference (the basis on which the time period of content information is determined) is often documented here.

beginPosition – The beginning date and time of the dataset's content.

Domain: date
Multiplicity: mandatory
Attributes: frame, calendarEraName, indeterminatePosition
Best Practices: Use indeterminatePosition to document unknown dates and present dates. The valid values for indeterminatePosition are 'unknown', 'after', 'before', and 'now'.

endPosition – The ending date and time of the content of the dataset.

Domain: date

Multiplicity: mandatory

Attributes: frame, calendarEraName, indeterminatePosition

Best Practices: Use indeterminatePosition to document unknown dates and present dates. The valid values for indeterminatePosition are ‘unknown’, ‘after’, ‘before’, and ‘now’.

duration – Length of time.

Domain: date
Multiplicity: optional
Best Practices: Cannot document both duration and timeInterval.

timeInterval – Frequency between time events based on floating point values for temporal length.

Type: float
Domain: 32-bit floating point
Multiplicity: optional
Attributes: unit, radix, factor
Best Practices: Cannot document both timeInterval and duration. The attribute unit is mandatory to document units of time.

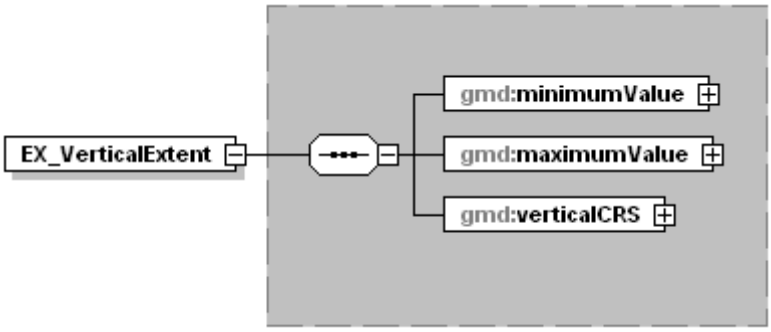
Ex:

```
<gmd:temporalElement>
        <gmd:EX_TemporalExtent id="boundingTemporalExtent">
                <gmd:extent>
                        <gml:TimePeriod gml:id="tp_1234">
                                <gml:description>ground condition</gml:description>
                                <gml:beginPosition>1990-11-03T00:00:00</gml:beginPosition>
                                <gml:endPosition indeterminatePosition="now"/>
                        </gml:TimePeriod>
                </gmd:extent>
        </gmd:EX_TemporalExtent>
</gmd:temporalElement>
```

FAQ: How do I document multiple dates?

You must repeat at gmd:temporalElement

EX_VerticalExtent



EX_VerticalExtent – Vertical domain of a dataset.
Type: compound
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

minimumValue – lowest vertical extent contained in the dataset.
Type: gco:Real
Domain: any number
Multiplicity: mandatory
Attributes: nilReason

maximumValue – Highest vertical extent containd in the dataset.
Type: gco:Real
Domain: any number
Multiplicity: mandatory
Attributes: nilReason

verticalCRS – Vertical coordinate reference system.
Type: compound
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: A coordinate reference system (CRS) should be taken from a publicly available register or document such as the EPSG Geodetic Parameter Dataset (http://www.epsg-registry.org/) or Spatial Reference (http://spatialreference.org). An identifier or well known name with an authority is defined and referenced here. If a coordinate reference system (CRS) is not available from a publicly available register or document and as such has no identifier or well known name, then that CRS shall be described according to ISO 19111.

FAQ: How do I document water depths and units? For example, water column samples taken between 3100 and 3600 meters?

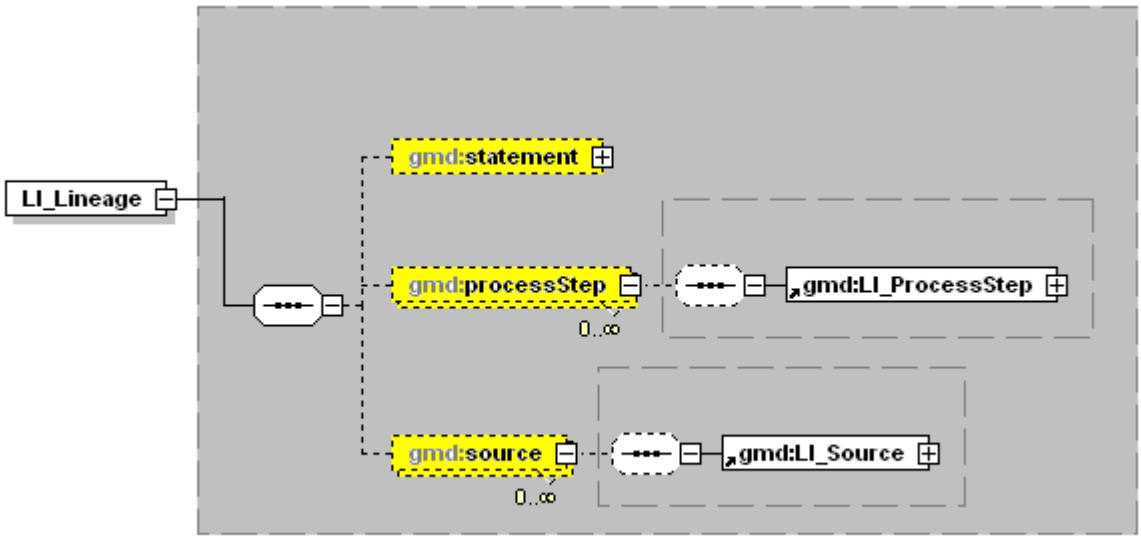
```
<gmd:EX_VerticalExtent>
        <gmd:minimumValue>
                <gco:Real>3600</gco:Real>
        </gmd:minimumValue>
        <gmd:maximumValue>
                <gco:Real>3100</gco:Real>
        </gmd:maximumValue>
        <gmd:verticalCRS>
                <gml:VerticalCRS gml:id="verticalCRSforSamples">
                        <gml:description>Definition of water depth in meters for marine geosamples.</gml:description>
                        <gml:identifier codeSpace="NGDC">verticalCRSforSamples</gml:identifier>
                        <gml:remarks>Minimum and maximum values represent the start and end time of sample
collection.</gml:remarks>
                        <gml:scope>water</gml:scope>
                        <gml:usesVerticalCS>
                                <gml:VerticalCS gml:id="verticalCSforSamples">
                                        <gml:identifier codeSpace="NGDC">verticalCSforSamples</gml:identifier>
                                        <gml:axis>
                                                <gml:CoordinateSystemAxis uom="#meters"
gml:id="coordinateSystemAxisforSamples">
                                                        <gml:identifier
codeSpace="NGDC">coordinateSystemAxisforSamples</gml:identifier>
                                                        <gml:axisAbbrev>Water Depth</gml:axisAbbrev>
                                                        <gml:axisDirection
codeSpace="NGDC">down</gml:axisDirection>
                                                        <gml:minimumValue>0.0</gml:minimumValue>
                                                </gml:CoordinateSystemAxis>
                                        </gml:axis>
                                </gml:VerticalCS>
                        </gml:usesVerticalCS>
                        <gml:verticalDatum>
                                <gml:VerticalDatum gml:id="verticalDatumforSamples">
                                        <gml:identifier codeSpace="NGDC">verticalDatumforSamples</gml:identifier>
                                        <gml:scope>water</gml:scope>
                                        <gml:anchorPoint>water surface</gml:anchorPoint>
                                </gml:VerticalDatum>
                        </gml:verticalDatum>
                </gml:VerticalCRS>
        </gmd:verticalCRS>
</gmd:EX_VerticalExtent>
```

Or when there is something to reference in EPSG:

```
<gmd:verticalElement>
 <gmd:EX_VerticalExtent>
  <gmd:minimumValue>
   <gco:Real> 3600 </gco:Real>
  </gmd:minimumValue>
  <gmd:maximumValue>
   <gco:Real> 3100 </gco:Real>
  </gmd:maximumValue>
  <gmd:verticalCRS xlink:href="http://www.epsg-registry.org/export.htm?gml=urn:ogc:def:crs:EPSG::5715" xlink:title="msl depth in meters"
xlink:actuate="onRequest"/>
 </gmd:EX_VerticalExtent>
</gmd:verticalElement>
```

LI PACKAGE

LI_Lineage



LI_Lineage – Information or lack of information on the events and source data use to construct the dataset within the specified Scope.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: There must be at least one occurrence of statement or source or processStep.

statement – General explanation of the data producer's knowledge of the dataset lineage.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason

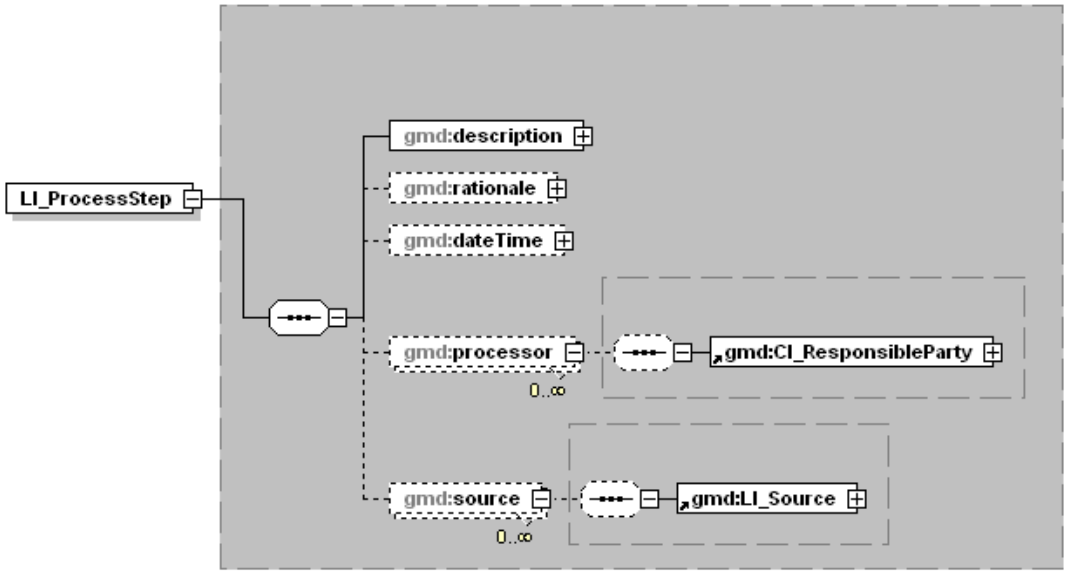
processStep – The events in the development of the dataset.

Type: LI_ProcessStep
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

source – Information on the sources used in the development of the dataset.

Type: LI_Source
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practice: source is provided when statement or processStep is not reported.

LI_ProcessStep



LI_ProcessStep – The events in the development of the dataset.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

description – Description of the processes performed on the data.
Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

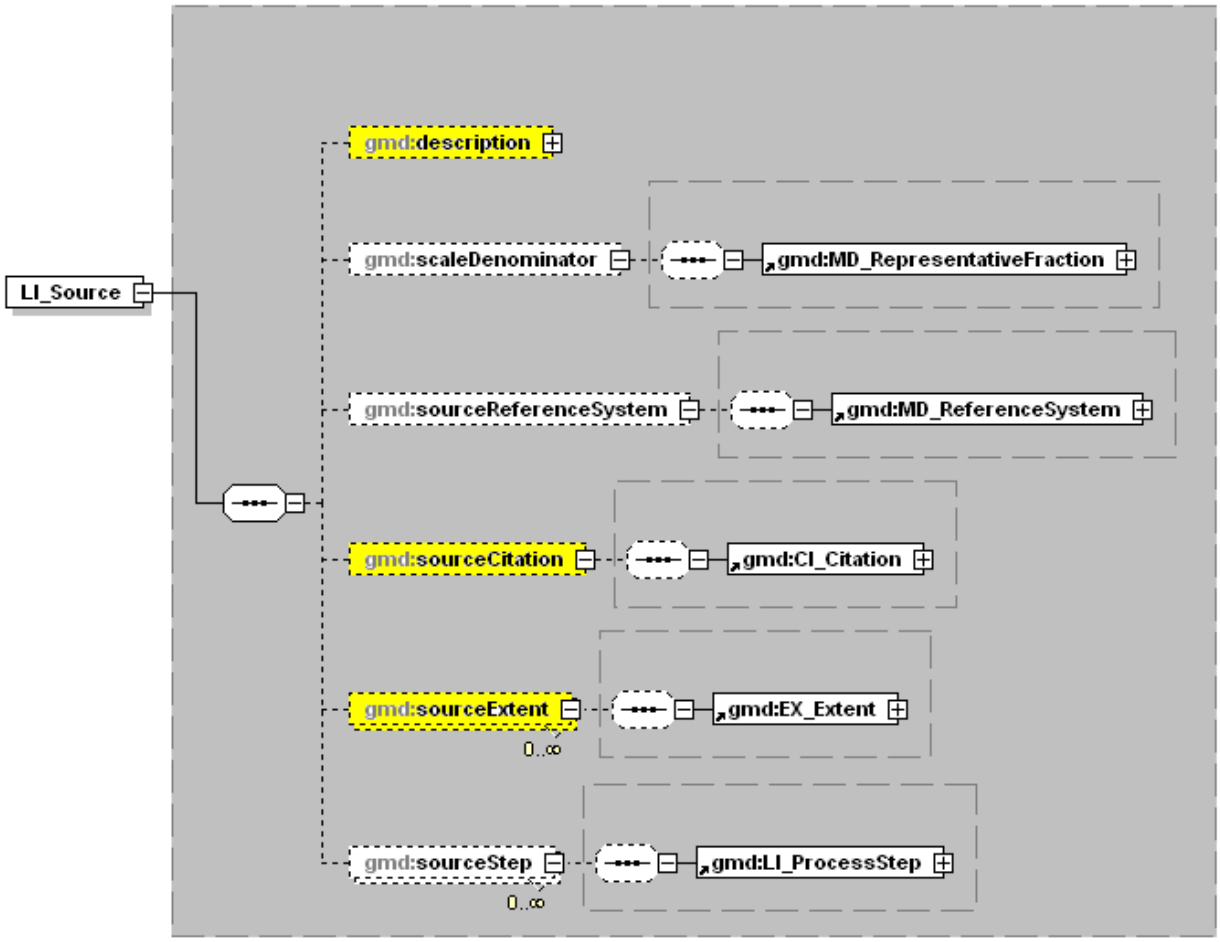
rationale – Purpose for performing the process on the data.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

dateTime – The date and time when the process was completed.
Type: gco:DateTime
Domain: date
Multiplicity: optional
Attributes: nilReason

processor – Identification and means to contact the person or party that performed the process.
Type: CI_ResponsibleParty
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

source – Information about the source data related to the creation of the data within the scope.
Type: LI_Source
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

LI_Source



LI_Source – Information about the source data used in creating the data within the specified Scope.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

description – Statement that describes the source data.
Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: description is mandatory if sourceCitation and sourceExtent are not provided.
description format is <MD_MediumNameCode codeList><;><blank space><free text>

FAQ: **How would you populate the description for a satellite image source that is on a DVD??**

dvd; source satellite image

---

scaleDenominator – The number below the line in a proper faction that the numerator is equal to 1.

Type: MD_RepresentativeFraction
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

sourceReferenceSystem – Information about the reference system.

Type: MD_ReferenceSystem
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

sourceCitation – Citation for the sources for the dataset.

Type: CI_Citation
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: sourceCitation is mandatory if description is not provided. This is NOT a citation to a document about the source data, bit it is a dataset citation of the dataset.

sourceExtent – Describes the spatial, horizontal and/or vertical, and the temporal coverage in the source dataset.

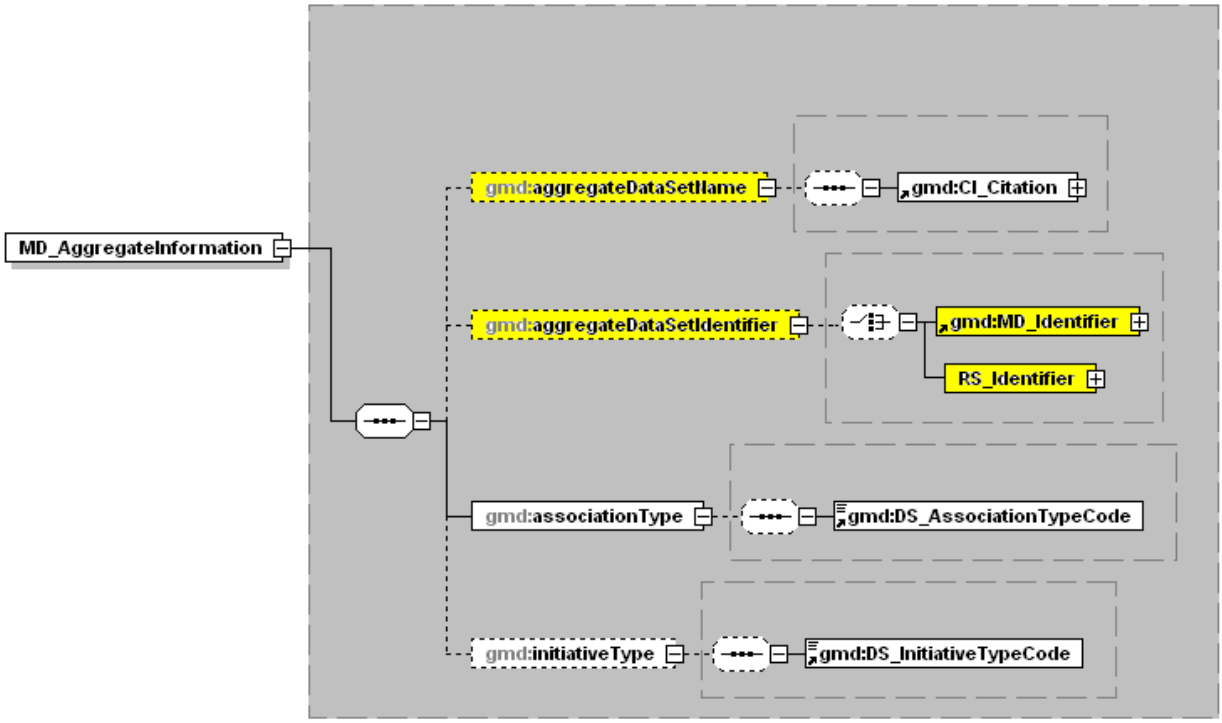
Type: EX_Extent
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: sourceExtent is mandatory if description is not provided

sourceStep – Information about an event related to the creation process for the source data.

Type: LI_ProcessStep
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD PACKAGE

MD_AggregateInformation



MD_AggregateInformation – The citation for or name of an aggregate dataset, the type of aggregate dataset, and optionally the activity which produced the dataset.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: Either aggregateDateSetName or aggregateDataSetIdentifier shall be provided.

aggregateDataSetName – Citation information for the aggregate resource or initiative.

Type: CI_Citation
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Strongly recommended to provide contact information under cited responsible party.

aggregateDataSetIdentifier – Identification of the aggregate dataset.

Type: MD_Identifier or RS_Identifier
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

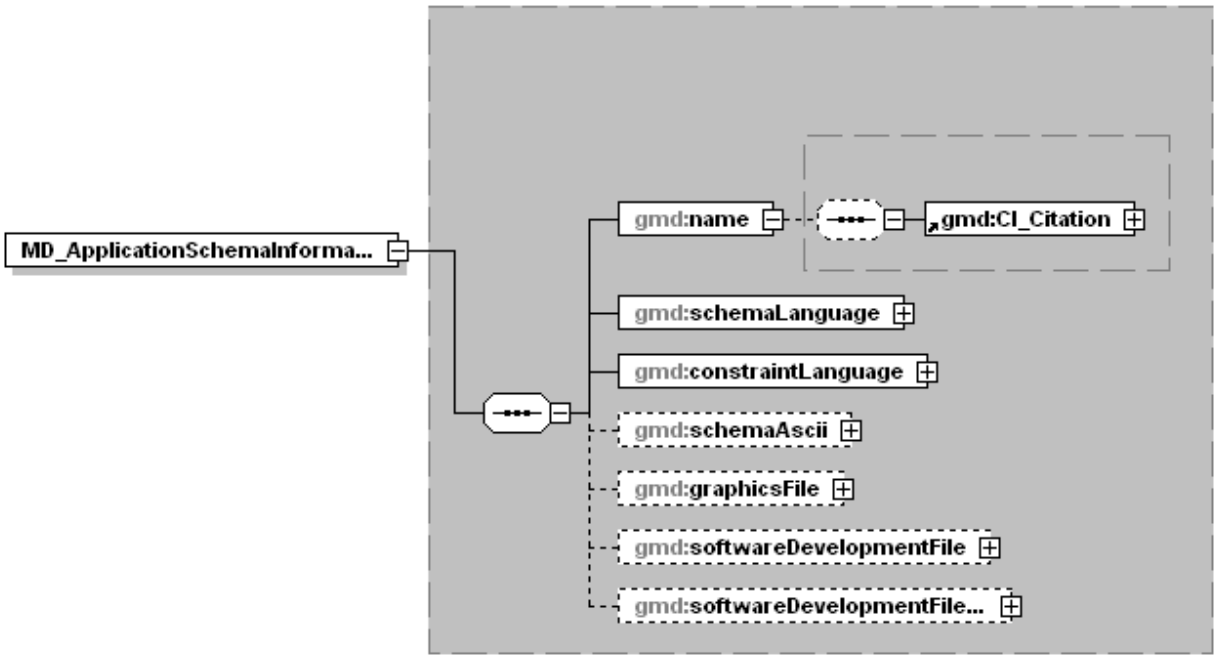
associationType – Association type of the aggregate dataset.

Type: DS_AssociationTypeCode
Domain: crossReference, largerWorkCitation, partOfSeamlessDatabase, source, stereoMate
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

initiativeType – Type of initiative for which the dataset was developed.

Type: DS_InitiativeTypeCode
Domain: campaign, collection, exercise, experiment, investigation, mission, sensor, operation, platform, process, program, project, study, task, trial
Multiplicity: optional
Attributes: nilReason
Best Practices: See Annex C.

MD_ApplicationSchemaInformation



MD_ApplicationSchemaInformation – Information about the application schema used to develop the dataset.

Type: compound
Multiplicity: mandatory
Attributes: id ,uuid

name – Citation for the application schema.

Type: CI_Citation
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

schemaLanguage – Identification of the schema language.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

constraintLanguage – Identification of the formal language used to describe constraints in the application schema.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

schemaAscii – Full application schema given as an ASCII file.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

graphicsFile – Full application schema given as a graphics file.

Type: gco:Binary
Multiplicity: optional
Attributes: nilReason

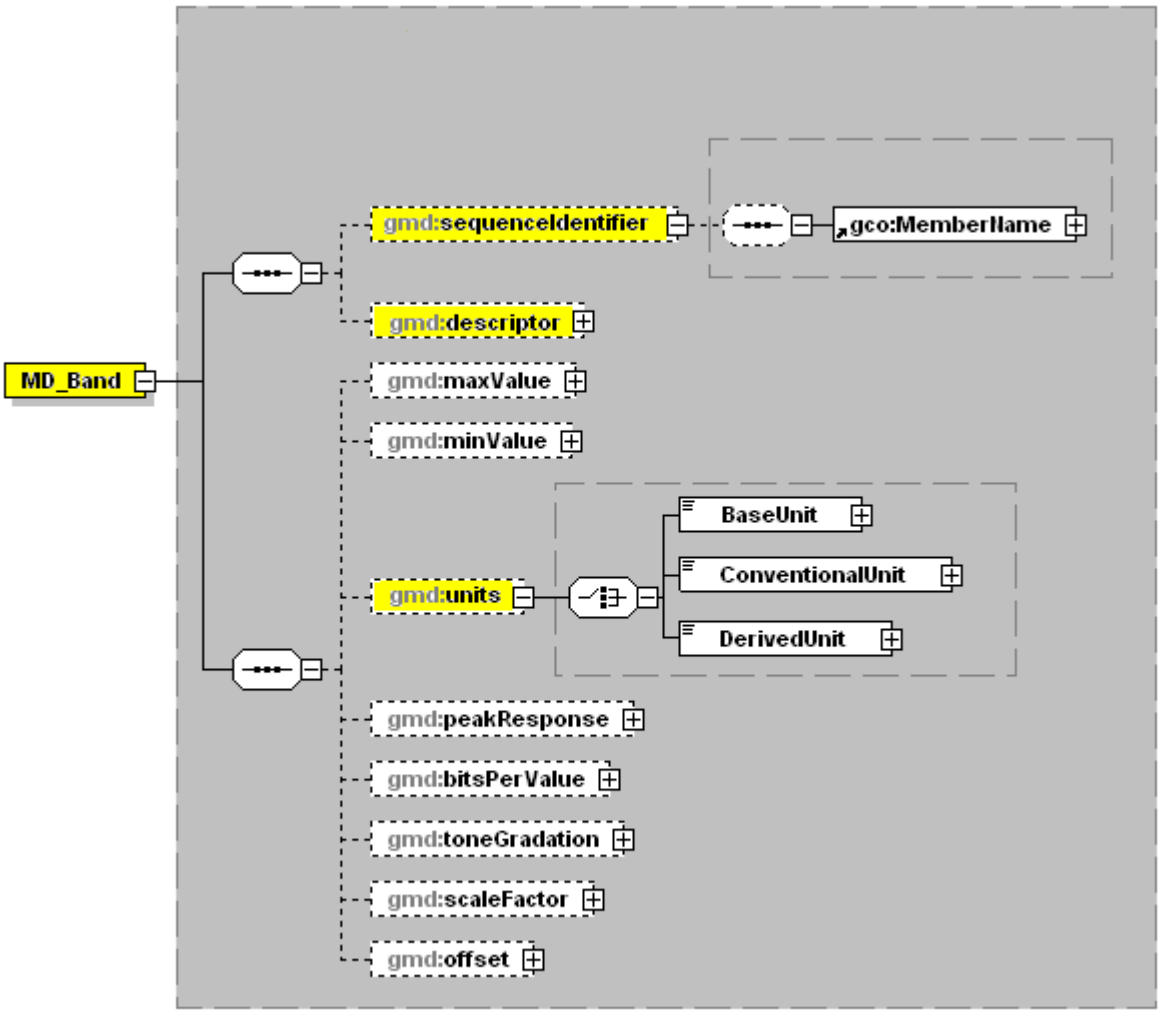
softwareDevelopmentFile – Full application schema given as a software development file.

Type: gco:Binary
Multiplicity: optional
Attributes: nilReason

softwareDevelopmentFileFormat – Software dependent format used for the application schema software dependent file.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

MD_Band



MD_Band – Range of wavelengths in the electromagnetic spectrum.

Type: compound
Multiplicity: conditional
Attributes: id, uuid

sequenceIdentifier – Sensor band wavelengths.

Type: gco:MemberName
Multiplicity: conditional
Attributes: id, uuid
Best Practices: Either sequenceIdentifier or descriptor will be provided, or both.

descriptor – Description of cell value range.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: Either descriptor or sequenceIdentifier will be provided, or both.

maxValue – Longest wavelength the sensor is capable of collecting within the designated band.
Type: gco:Real
Domain: any number
Multiplicity: optional
Attributes: nilReason

minValue - Shortest wavelength the sensor is capable of collecting within the designated band.
Type: gco:Real
Domain: any number
Multiplicity: optional
Attributes: nilReason

units – Sensor wavelength units.
Type: BaseUnit or ConventionalUnit or DerivedUnit
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Mandatory if maxValue or minValue is reported. See Annex D.

peakResponse – Highest wavelength response.
Type: gco:Real
Domain: any number
Multiplicity: optional
Attributes: nilReason

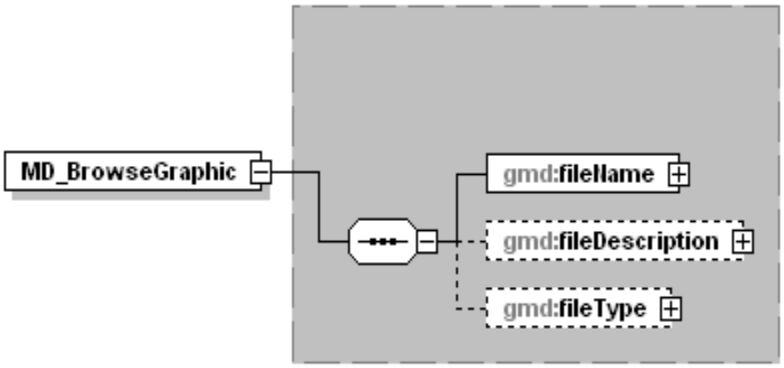
bitsPerValue - Maximum number of significant bits in the uncompressed representation for the value in each band of each pixel.
Type: gco:Integer
Domain: any whole number
Multiplicity: optional
Attributes: nilReason

toneGradation – Number of discrete numerical values in the grid data.
Type: gco:Integer
Domain: any whole number
Multiplicity: optional
Attributes: nilReason

scaleFactor – Scale factor applied to each cell value.
Type: gco:Real
Domain: any number
Multiplicity: optional
Attributes: nilReason

offset – The physical value corresponding to a cell value of zero.
Type: gco:Real
Domain: any number
Multiplicity: optional
Attributes: nilReason

MD_BrowseGraphic



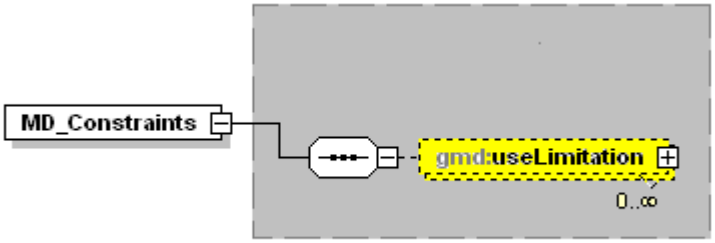
MD_BrowseGraphic – The name, description, and file type of an illustration of the resource.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

filename – Name of the graphic file provided to illustrate the resource.
Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason
Best Practices: The filename shall include the path or URL to access the graphic file and the file type extension.

fileDescription – Text description of the graphic file's content.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

fileType – Description of the graphic file format.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason
Best Practices: If the file type requires a non common viewer, also provide instructions on acquiring that viewer.

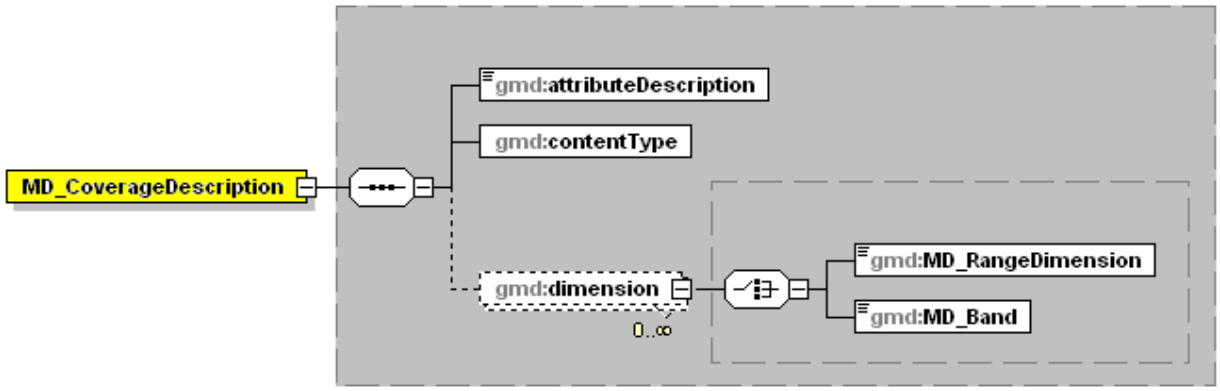
MD_Constraints



MD_Constraints – The limitations, restrictions, or statements on the resource fitness for use.
Type: compound
Multiplicity: conditional
Attributes: id, uuid

useLimitation – Statement on the fitness of use or limitations on the use of the resource or metadata.
Type: gco:characterString
Domain: free text
Multiplicity: conditional, repeatable
Attributes: nilReason
Best Practices: useLimitation is mandatory unless MD_LegalConstraints or MD_SecurityConstraints is used.

MD_CoverageDescription



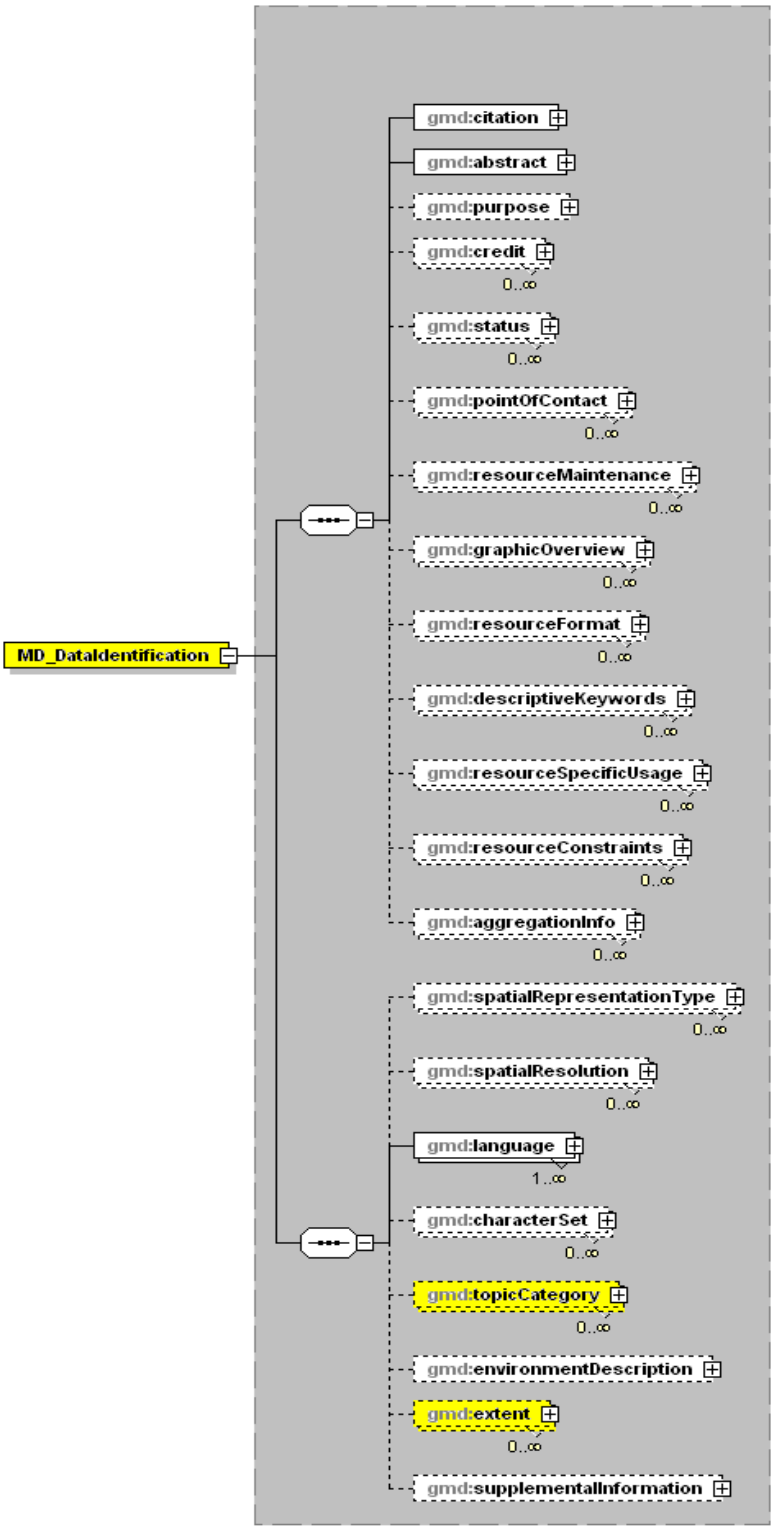
MD_CoverageDescription – Information about the content of grid data cells.
Type: compound
Multiplicity: conditional
Attributes: id, uuid

attributeDescription – Description of the cell measurement.
Type: gco:RecordType
Multiplicity: mandatory
Attributes: nilReason

contentType – Information represented by the cell.
Type: MD_CoverageContentTypeCode
Domain: image, thematicClassification, physicalMeasurement
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

dimension – Information on the dimension of the cell measurement value.
Type: MD_RangeDimension or MD_Band
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD_DataIdentification



MD_DataIdentification – Information which describes a dataset.

Type: compound
Multiplicity: conditional
Attributes: id, uuid
Best Practices: identificationInfo must have at least one occurrence of Data Identification or Service Identification.

citation – Citation for the dataset.

Type: CI_Citation
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

abstract – Brief narrative summary of the dataset's contents.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

purpose – Summary of the intentions for which the dataset was developed.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

credit – Recognition of those who contributed to the dataset.

Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

status – The development phase of the dataset.

Type: MD_ProgressCode
Domain: completed, historicalArchive, obsolete, ongoing, planned, required, underdevelopment
Multiplicity: optional, repeatable *this is a NAP requirement*
Attributes: nilReason

pointOfContact – Identification and means to contact people/organisations associated with the dataset.

Type: CI_ResponsibleParty
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

resourceMaintenance – Describes the frequency, scope, and responsible party for the updating of the dataset.

Type: MD_MaintenanceInformation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

graphicOverview – The name of, description of, and file type of an illustration of the dataset.

Type: MD_BrowseGraphic
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

resourceFormat – Provides a description of the format of the resource(s).

Type: MD_Format
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

descriptiveKeywords – Commonly used words or phrases which describe the dataset. Optionally, the keyword type and a citation for the authoritative or registered resource of the keywords are also provided.

Type: MD_Keywords
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

resourceSpecificUsage – Provides basic information about specific application(s) for which the resource(s) has been or is being used by different users.

Type: MD_Usage
Multiplicity: optional, repeatable *this is not in NAP*
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

resourceConstraints – The limitations or constraints on the use of or access to the resource.

Type: MD_Constraints or MD_LegalConstraints or MD_SecurityConstraints
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

aggregationInfo – The citation for the aggregate dataset or the name of the aggregate dataset, the type of aggregate dataset, and optionally the activity which produced the dataset.

Type: MD_AggregateInformation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

spatialRepresentationType – Object(s) used to represent the geographic information.

Type: MD_SpatialRepresentationTypeCode
Domain: vector, grid, textTable, tin, stereoModel, video
Multiplicity: optional, repeatable
Attributes: nilReason

spatialResolution – The level of detail of the dataset expressed as equivalent scale or ground distance.

Type: MD_Resolution
Multiplicity: optional, repeatable
Attributes: nilReason

language – Languages of the dataset using standard ISO three-letter codes. See Annex B.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory, repeatable
Attributes: nilReason

characterSet – Character coding standard in the dataset.

Type: MD_CharacterSetCode
Domain: ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2, 8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10, 8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii, ebcdic, eucKR, big5, GB2312

Multiplicity: optional, repeatable
Attributes: nilReason
Best Practices: The character set for the metadata is set to ‘utf8’ by default.

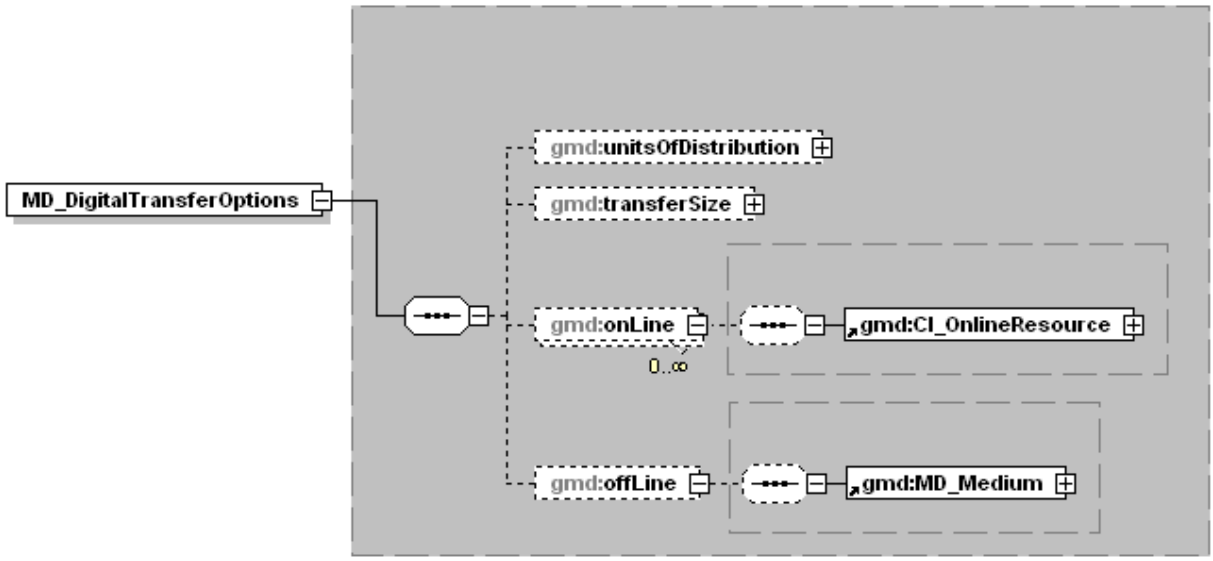
topicCategory – The main theme(s) of the dataset.
Type: MD_TopicCategoryCode
Domain: farming, biota, boundaries, climatologyMeteorolgyAtmosphere, economy, elevation, environment, geoscientificInformation, health, imageryBaseMapsEarchCover, intelligenceMilitary, inlandWaters, location, oceans, planningCadastre, society, structure, transportation, utilitiesCommunication
Multiplicity: conditional, repeatable
Attributes: nilReason
Best Practices: A topicCategory code shall be provided when hierarchyLevel is set to ‘dataset’.

environmentDescription – Describes the dataset’s processing environment. Includes information, such as software, computer operating system, filename, and dataset size.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

extent – Describes the spatial, horizontal and/or vertical, and the temporal coverage in the resource.
Type: EX_Extent
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Either Geographic Bounding Box or Geographic Description is required when hierarchyLevel is set to ‘dataset’.

supplementalInformation – Other descriptive information about the dataset.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

MD_DigitalTransferOptions



MD_DigitalTransferOptions – Technical means and media by which a resource is obtained from the distributor.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

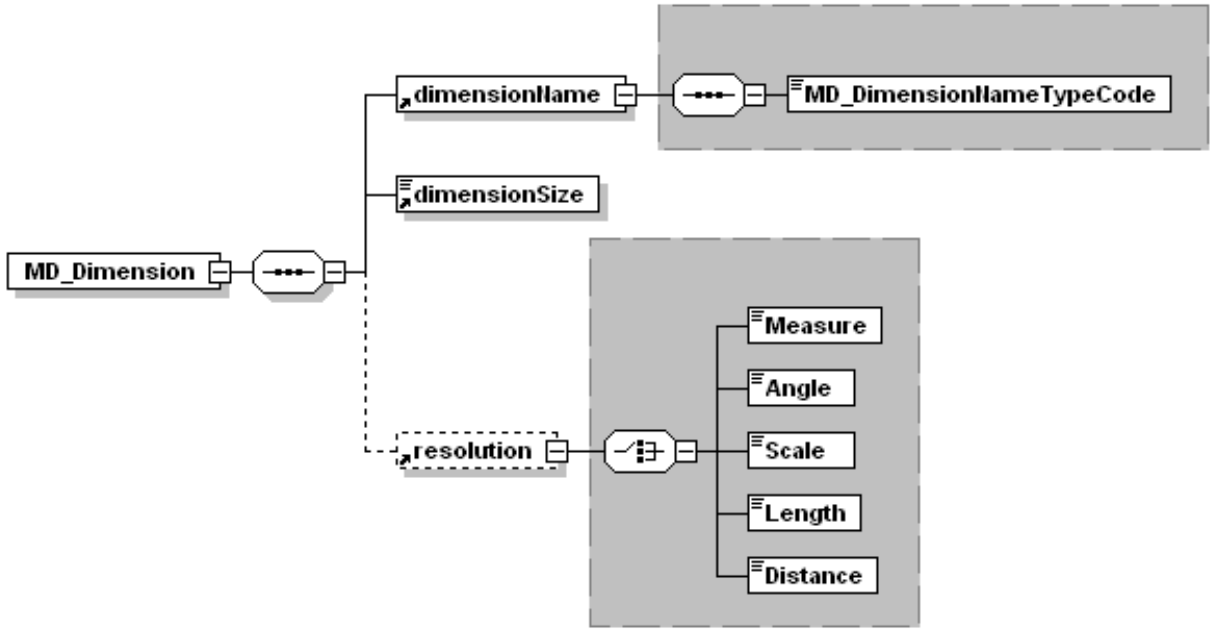
unitsOfDistribution – Tiles, layers, geographic areas, etc. in which the data is available.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

transferSize – Estimated size of the transfer unit in the specified format, expressed in megabytes.
Type: gco:Real
Domain: any number
Multiplicity: optional
Attributes: nilReason
Best Practices: Value greater that '0.0'.

onLine – Information about the online sources where the data/dataset may be obtained.
Type: CI_OnlineResource
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

offLine – Information about the offline distribution media.
Type: MD_Medium
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Not sure why onLine is repeatable and offLine is not. This will be discussed at the next ISO review.

MD_Dimension



MD_Dimension – Information on the dimension name, size, and resolution used.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

dimensionName – Axis name.
Type: MD_DimensionNameTypeCode
Domain: row, column, vertical, track, crossTrack, line, sample, time
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

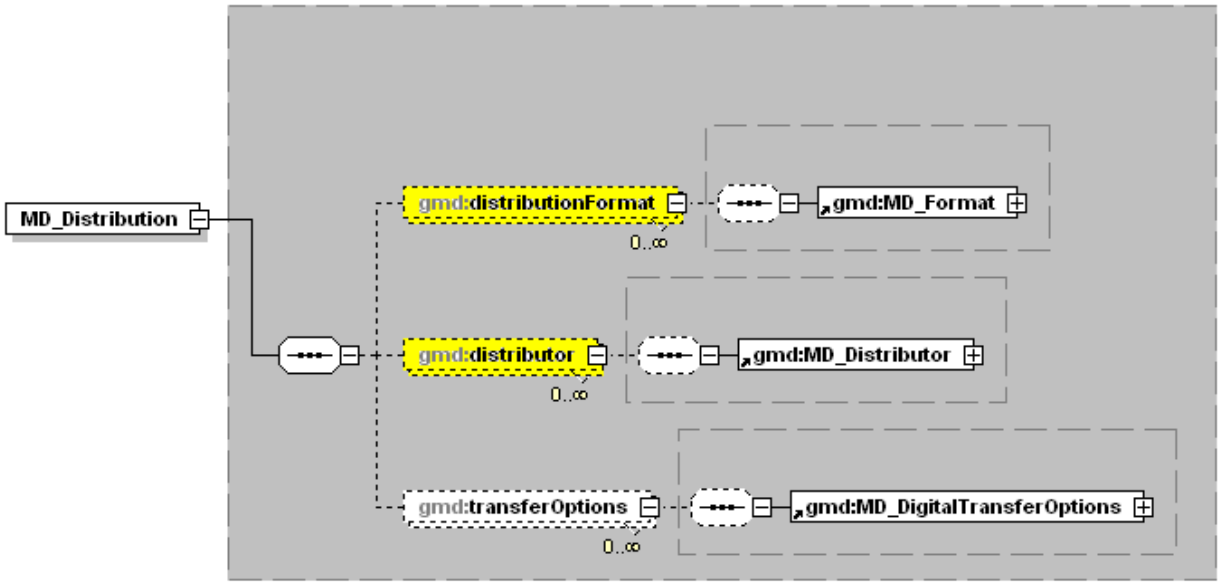
dimensionSize – Number of elements along the axes.
Type: gco:Integer
Domain: any whole number
Multiplicity: mandatory
Attributes: nilReason

resolution – Degree of detail in the grid dataset.
Type: gco:Measure or Angle or Scale or Length or Distance
Multiplicity: optional
Attributes: nilReason
Best Practices: Document the type attribute uom (unit of measure).

Ex:

```
<gmd:MD_Dimension>
        <gmd:dimensionName>
                <gmd:MD_DimensionNameTypeCode
codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD_DimensionNameTypeCode" codeListValue="row"
></gmd:MD_DimensionNameTypeCode>
        </gmd:dimensionName>
        <gmd:dimensionSize>
                <gco:Integer>1354</gco:Integer>
        </gmd:dimensionSize>
        <gmd:resolution>
                <gco:Measure uom="kilometer">2</gco:Measure>
        </gmd:resolution>
</gmd:MD_Dimension>
```

MD_Distribution



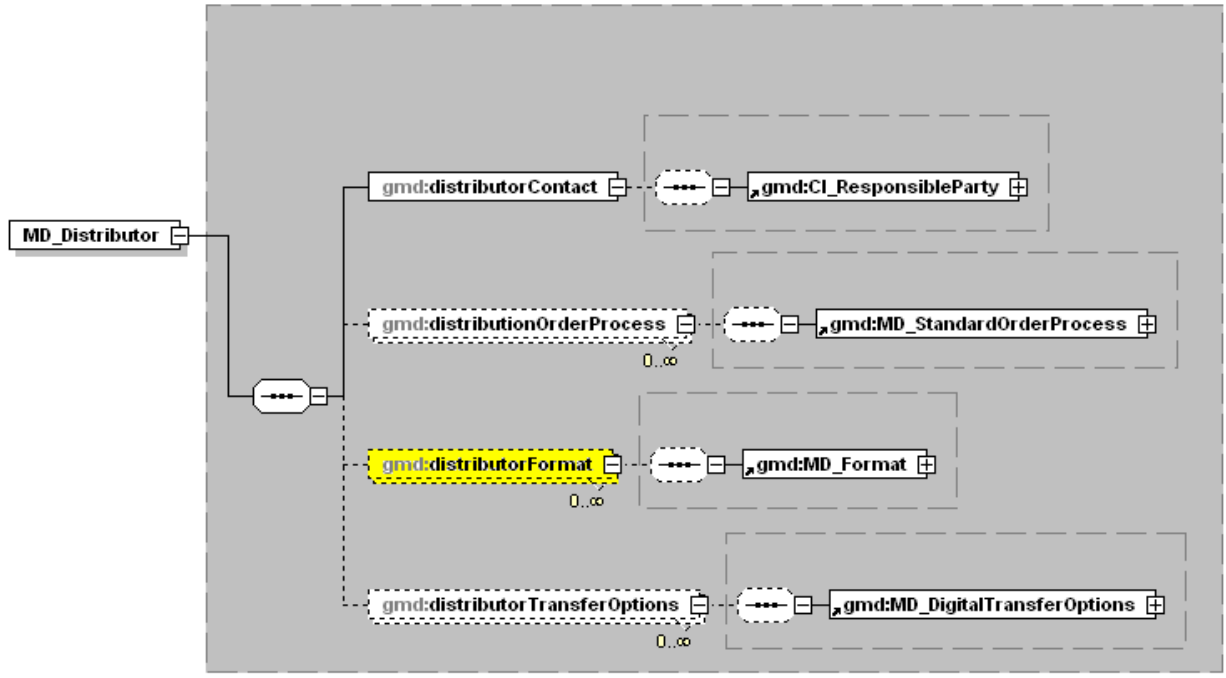
MD_Distribution – Information about the data distributor and options to obtain the dataset.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

distributionFormat – Description of distribution format.
Type: MD_Format
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: distributionFormat is mandatory if distributor information is not provided.

distributor – Information about the data distributor.
Type: MD_Distributor
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: distributor is mandatory if distributionFormat information is not provided.

transferOptions – The means and media by which the data/dataset is obtained from the distributor.
Type: MD_DigitalTransferOptions
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD_Distributor



MD_Distributor – Information about the distributor.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

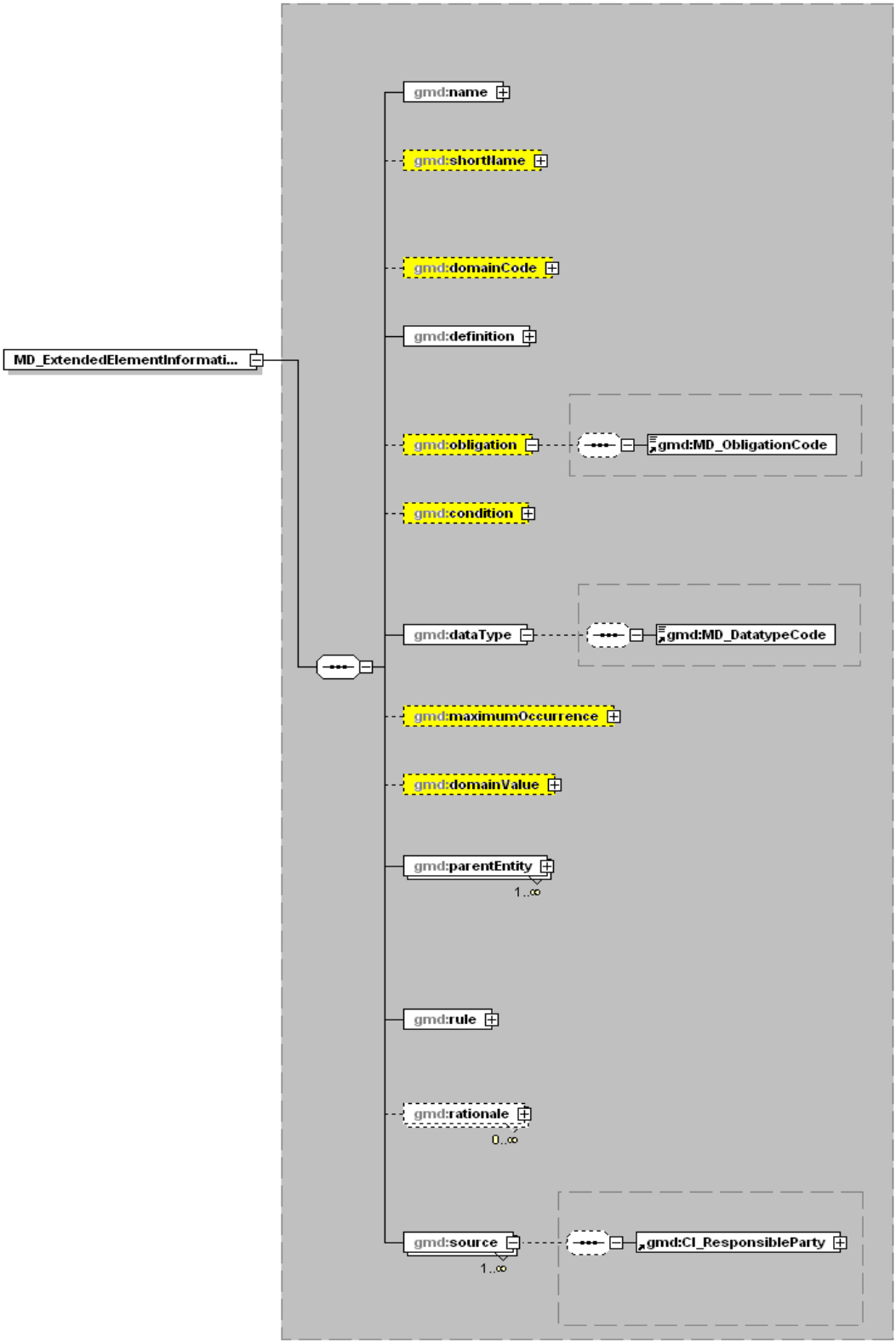
distributorContact – Information on the party responsible for distribution.
Type: CI_ResponsibleParty
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

distributionOrderProcess – The process to follow when obtaining the data/dataset.
Type: MD_StandardOrderProcess
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

distributorFormat – Provides information about the format used by the distributor.
Type: MD_Format
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Use if the distributionFormat is not documented.

distributorTransferOptions – Provides information about the technical means and media used by the distributor.
Type: MD_DigitalTransferOptions
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD_ExtendedElementInformation



MD_ExtendedElementInformation – New metadata element, not found in ISO 19115 or ISO 19115-2.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

name – Name of the extended metadata element.
Type: gco:CharacterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

shortName – Short form suitable for use in an implementation method such a XML.
Type: gco:CharacterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: shortName is mandatory if dataType is not equal to codeListElement.

domainCode – Three-digit code assigned to the extended element.
Type: gco:Integer
Domain: any whole number
Multiplicity: conditional
Attributes: nilReason
Best Practices: domainCode is mandatory if dataType equals codelistElement

definition – Definition of the extended element.
Type: gco:CharacterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

obligation – Obligation of the extended element.
Type: MD_ObligationCode
Multiplicity: conditional
Attributes: nilReason
Best Practices: obligation is mandatory if dataType is not codelist, enumeration, or codelistElement.

condition – Condition under which the extended element is mandatory.

Type: gco:CharacterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: condition is mandatory if obligation equals conditional

dataType – Code which identifies the kind of value provided in the extended element.
Type: MD_DatatypeCode
Domain: class, codelist, enumeration, codelistElement, abstractClass, aggregateClass, specifiedClass, datatypeClass, interfaceClass, unionClass, metaClass, typeClass, characterString, integer, association
Multiplicity: mandatory
Attributes: nilReason

maximumOccurrence – Maximum occurrence of the extended element.

Type: gco:CharacterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: maximumOccurrence is mandatory if dataType is not codelist, enumeration, or codelistElement.

domainValue – Valid values that can be assigned to the extended element.

Type: gco:CharacterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: domainValue is mandatory if dataType is codelist, enumeration, or codelistElement.

parentEntity – Name of the metadata entity(s) under which this extended metadata element may appear. The name(s) may be standard metadata elements or other extended metadata elements.

Type: gco:CharacterString
Domain: free text
Multiplicity: mandatory, repeatable
Attributes: nilReason

rule – Specifies how the extended element relates to other existing elements and entities.

Type: gco:CharacterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

rationale – Reason for creating the extended element.

Type: gco:CharacterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

source – Name of the person or organisation creating the extended element.

Type: CI_ResponsibleParty
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

---

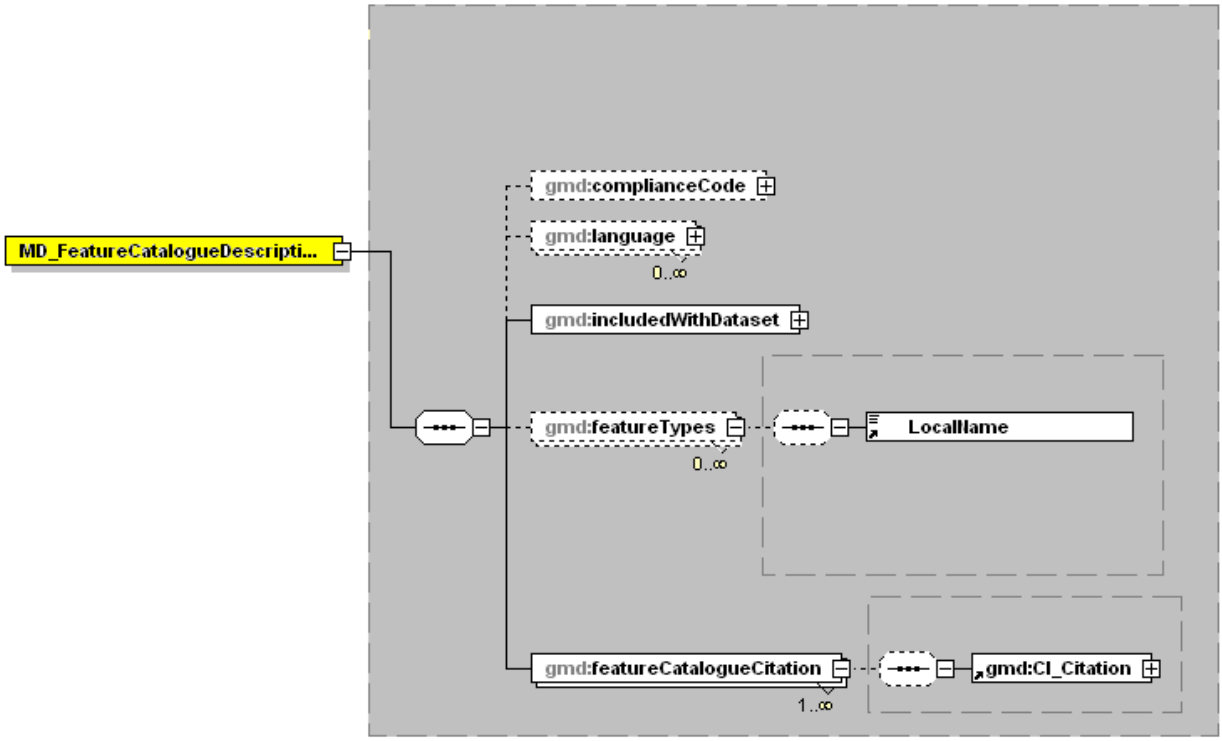
FAQ: How would I document extended element information for biological information?

Ex:

```
<gmd:MD_MetadataExtensionInformation>
<gmd:extendedElementInformation>
<gmd:MD_ExtendedElementInformation>
<gmd:name>
<gco:CharacterString>Taxonomy System</gco:CharacterString>
</gmd:name>
<gmd:shortName>
<gco:CharacterString>taxonomy</gco:CharacterString>
</gmd:shortName>
```

```
<gmd:definition>
<gco:CharacterString>Documentation of taxonomic sources, procedures, and treatments.</gco:CharacterString>
</gmd:definition>
<gmd:obligation>
<gmd:MD_ObligationCode>optional</gmd:MD_ObligationCode>
</gmd:obligation>
<gmd:dataType>
<gmd:MD_DatatypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_DatatypeCode" codeListValue="class"
codeSpace="001"> class</gmd:MD_DatatypeCode>
</gmd:dataType>
<gmd:maximumOccurrence>
<gco:CharacterString>1</gco:CharacterString>
</gmd:maximumOccurrence>
<gmd:parentEntity>
<gco:CharacterString>MD_Identification</gco:CharacterString>
</gmd:parentEntity>
<gmd:rule>
<gco:CharacterString>New Metadata section as a class to MD_Identification</gco:CharacterString>
</gmd:rule>
<gmd:rationale>
<gco:CharacterString>The set of data elements contained within this class element represents an attempt to provide
better documentation of taxonomic sources, procedures, and treatments.</gco:CharacterString>
</gmd:rationale>
<gmd:source>
<gmd:CI_ResponsibleParty>
<gmd:organisationName>
<gco:CharacterString>National Biological Information Infrastructure (NBII)</gco:CharacterString>
</gmd:organisationName>
<gmd:role>
<gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="resourceProvider" codeSpace="001"/>
</gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:source>
</gmd:MD_ExtendedElementInformation>
</gmd:extendedElementInformation>
</gmd:MD_MetadataExtensionInformation>
```

MD_FeatureCatalogueDescription



MD_FeatureCatalogueDescription – Identification of the feature catalogue or the conceptual schema.

Type: compound
Multiplicity: conditional
Attributes: id, uuid
Best Practices: Although features (attributes of the dataset) are normally documented in a Feature Catalogue (ISO 19110), they should be a part of this metadata record.

complianceCode – Indication of whether the cited feature catalogue complies with ISO 19110.

Type: gco:Boolean
Domain: 0, 1 (0 = not compliant and 1 = compliant)
Multiplicity: optional
Attributes: nilReason

language – Language and character coding standards of the feature catalogue. See Annex B.

Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

includedWithDataset – Is the feature catalogue included with the dataset?

Type: gco:Boolean
Domain: 0, 1 (0 = not included and 1 = included)
Multiplicity: mandatory
Attributes: nilReason

featureTypes – Feature type identifier and/or generic name of feature as listed in the feature catalogue.

Type: LocalName
Domain: free text
Multiplicity: optional, repeatable * this is NAP requirement*
Attributes: nilReason
Best Practices: LocalName has an optional attribute 'codeSpace'.

FAQ: How would the feature type 'building' be documented?

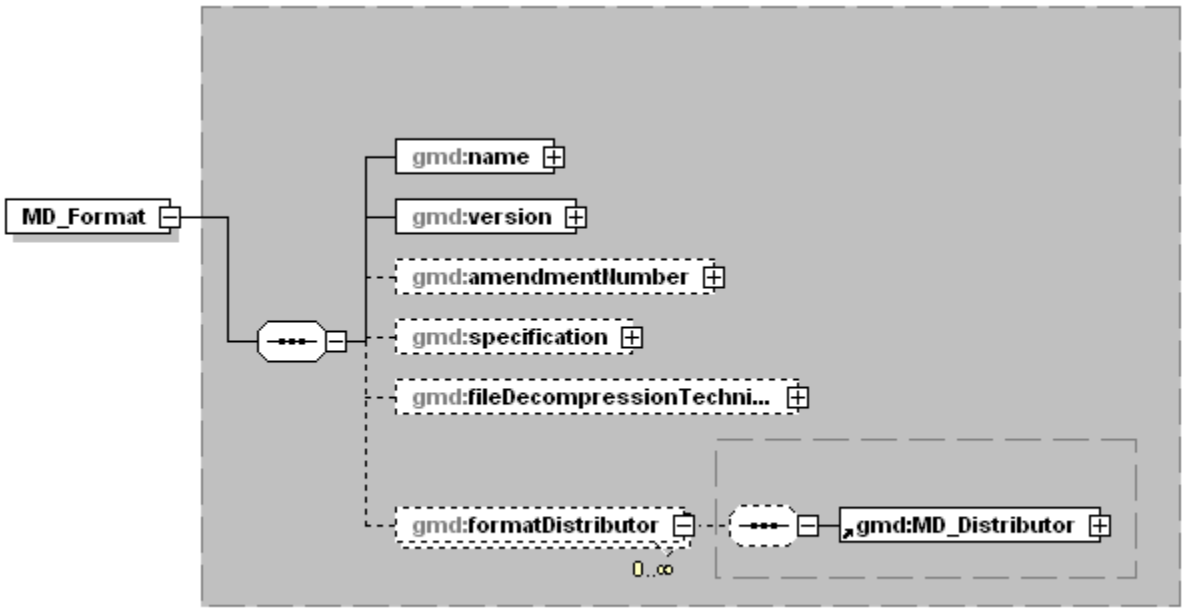
Ex:
<featureTypes>
<LocalName codeSpace="http://www...">building</LocalName>
</featureTypes>

---

featureCatalogueCitation – Citation to reference the feature catalogue.

Type: CI_Citation
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: This citation should provide a link to the feature catalogue.

MD_Format



MD_Format – Description of the computer language construct that specifies the representation of data objects in a record, file, message, storage device, or transmission channel.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid

name – Name of the data transfer format.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

version – Version of the format (date, number, etc).

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

amendmentNumber – Format version amendment number.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

specification – The subset name, profile, or product specification of the format.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

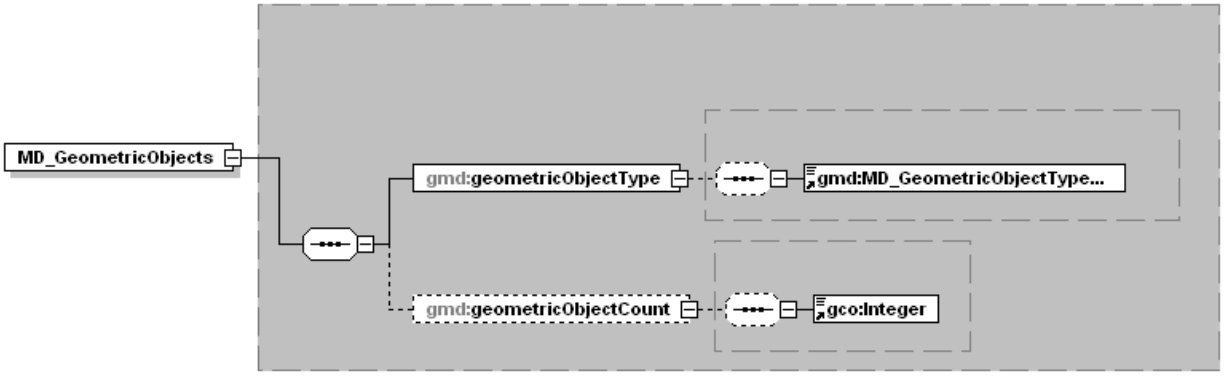
fileDecompressionTechnique – Description of recommended processes or algorithms to apply to the compressed resource.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

formatDistributor – Provides information about the distributor's format.

Type: MD_Distributor
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD_GeometricObjects



MD_GeometricObjects – Number of objects, listed by geometric object type, used in the dataset.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid

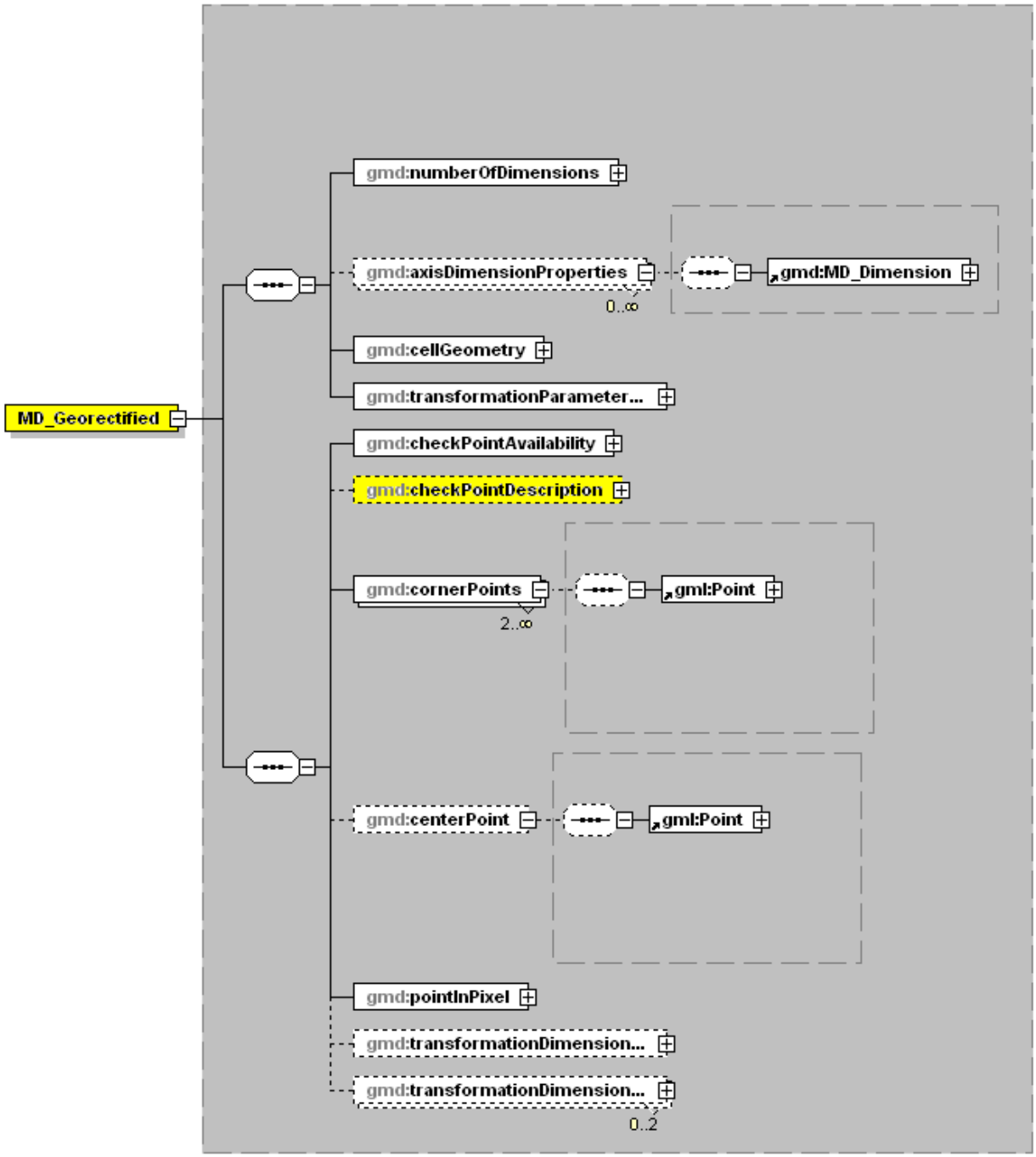
geometricObjectType – Name of point or vector objects used to locate zero, one-, two-, or three-dimensional spatial locations in the dataset.

Type: MD_GeometricObjectTypeCode
Domain:
Multiplicity: mandatory
Attributes: nilReason

geometricObjectCount – Total number of the point or vector object type occurring in the dataset.

Type: gco:Integer
Domain: any whole number
Multiplicity: optional
Attributes: nilReason

MD_Georectified



MD_Georectified – Information on the grid used to georectify the data.
Type: compound
Multiplicity: conditional
Attributes: id, uuid

numberOfDimensions – Number of independent spatial-temporal axes (x, y, or z).
Type: gco:Integer
Domain: any whole number
Multiplicity: mandatory
Attributes: nilReason

axisDimensionProperties – Information on the dimension name, size, and resolution used.
Type: MD_Dimension
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

cellGeometry – Identification of grid data as point or cell.
Type: MD_CellGeometryCode
Domain: point, area
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

transformationParameterAvailability – Indication of image coordinates and geographic or map coordinates availability.
Type: gco:Boolean
Domain: 0, 1 (1 = Yes, 0 = No)
Multiplicity: mandatory
Attributes: nilReason

checkPointAvailability – Indication of availability of geographic position points in order to test the accuracy of the georeferenced grid data.
Type: gco:Boolean
Domain: 0, 1 (1 = Yes, 0 = No)
Multiplicity: mandatory
Attributes: nilReason

checkPointDescription – Description of geographic position points in order to test the accuracy of the georeferenced grid data.
Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: checkPointDescription is mandatory if checkPointAvailability = '1' (yes).

cornerPoints – Location in coordinate system defined by Spatial Reference System and grid coordinates of the cells at opposite ends of the grid coverage along two diagonals in the grid spatial dimension.
Type: gml:Point
Domain: single coordinate tuple
Multiplicity: mandatory, repeatable twice
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

Best Practices: At a minimum, two corner points shall be provided along a diagonal. When providing more than two corner points, they shall be in the clockwise order.

centerPoint – Earth location, represented as a point, in the coordinate system defined by the Spatial Reference System and the grid coordinate of the cell halfway between opposite ends of the grid.

Type: gml:Point
Domain: single coordinate tuple
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

pointInPixel – Point in a pixel corresponding to the Earth location of the pixel.

Type: MD_PixelOrientationCode
Domain: center, lowerLeft, lowerRight, upperLeft, upperRight
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

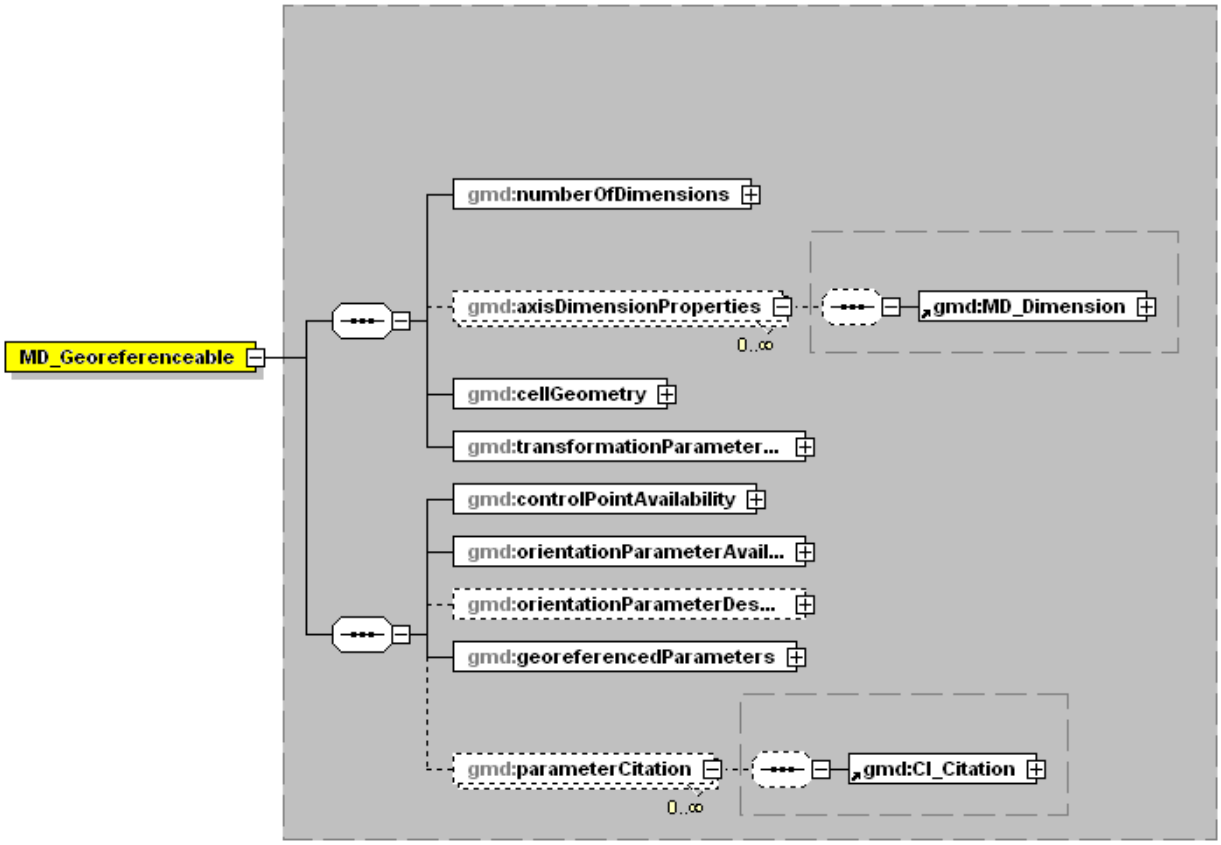
transformationDimensionDescription – General description of the transformation.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

transformationDimensionMapping – Information about which grid axes are spatial axes.

Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable twice
Attributes: nilReason

MD_Georeferenceable



MD_Georeferenceable – Grid with cells irregularly spaced in any given geographic/map projection coordinate system, whose individual cells can be geolocated using geolocation information supplied with the data but cannot be geolocated from the grid properties alone.

Type: compound
Multiplicity: conditional
Attributes: id, uuid

numberOfDimensions – Number of independent spatial-temporal axes (x, y, or z).

Type: gco:Integer
Domain: any whole number
Multiplicity: mandatory
Attributes: nilReason

axisDimensionProperties – Information on the dimension name, size, and resolution used.

Type: MD_Dimension
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

cellGeometry – Identification of grid data as point or cell.

Type: MD_CellGeometryCode
Domain: point, area
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

transformationParameterAvailability – Indication of image coordinates and availability of geographic or map coordinates.

Type: gco:Boolean
Domain: 0, 1 (1 = Yes, 0 = No)
Multiplicity: mandatory
Attributes: nilReason

controlPointAvailability – Indication of control point existence.

Type: gco:Boolean
Domain: 0, 1 (1 = Yes, 0 = No)
Multiplicity: mandatory
Attributes: nilReason

orientationParameterAvailability – Indication of orientation parameters availability.

Type: gco:Boolean
Domain: 0, 1 (1 = Yes, 0 = No)
Multiplicity: mandatory
Attributes: nilReason

orientationParameterDescription – Description of parameters used to describe sensor orientation.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

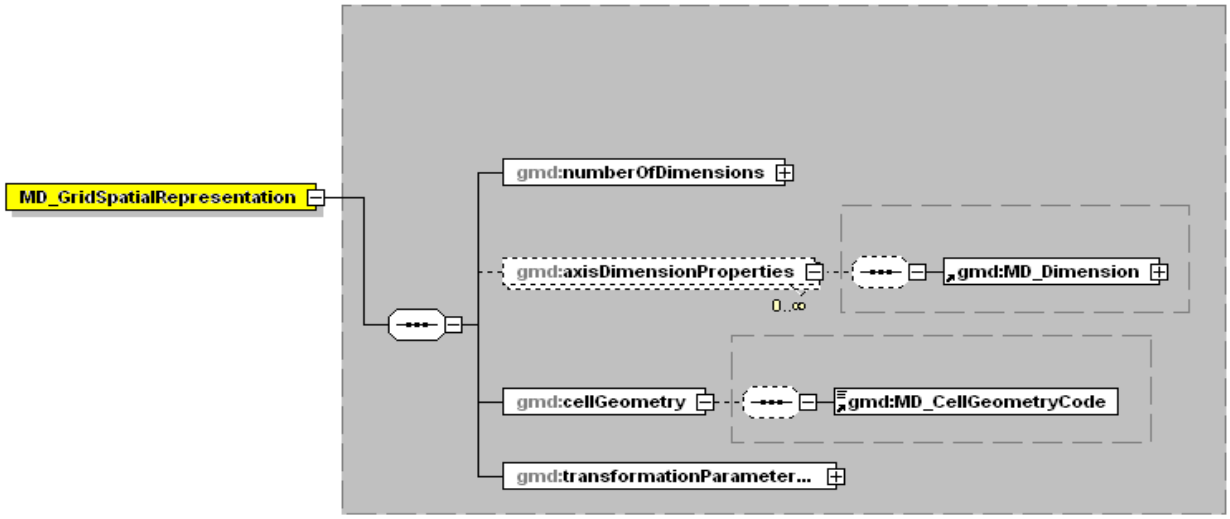
georeferencedParameters – Terms which support grid data georeferencing.

Type: gco:Record
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

parameterCitation – Citation for the parameter reference.

Type: CI_Citation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD_GridSpatialRepresentation



MD_GridSpatialRepresentation – Information about grid spatial objects in the dataset.

Type: compound
Multiplicity: conditional
Attributes: id, uuid
Best Practices: MD_GridSpatialRepresentation is mandatory if dataset objects are gridded and MD_Georectified or MD_Georeferenceable are not used.

numberOfDimensions – Number of independent spatial-temporal axes (x, y, or z).

Type: gco:Integer
Domain: any whole number
Multiplicity: mandatory
Attributes: nilReason

axisDimensionProperties – Information on the dimension name, size, and resolution used.

Type: MD_Dimension
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

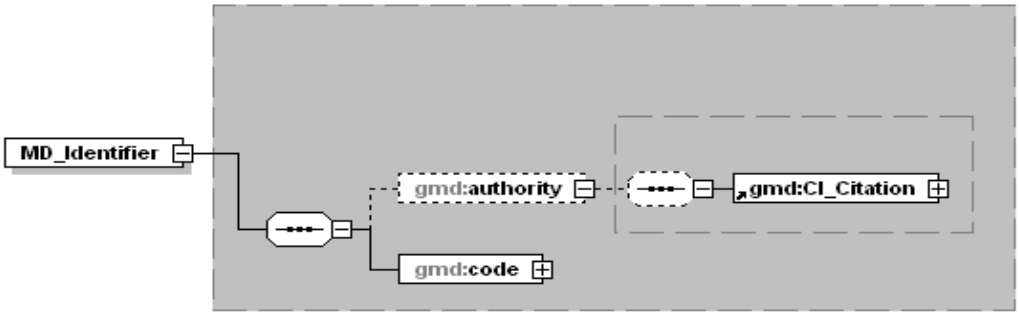
cellGeometry – Identification of grid data as point or cell.

Type: MD_CellGeometryCode
Domain: point, area
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

transformationParameterAvailability – Indication of image coordinates and availability of geographic or map coordinates.

Type: gco:Boolean
Domain: 0, 1 (1 = Yes, 0 = No)
Multiplicity: mandatory
Attributes: nilReason

MD_Identifier



MD_Identifier – Information about the unique identification of an object.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: The namespace is stored in the attribute authority and the ID is stored in the attribute code.

authority – Recognized responsible party or organisation for a reference.
Type: CI_Citation
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

code – The alphanumeric value that identifies a resource.
Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

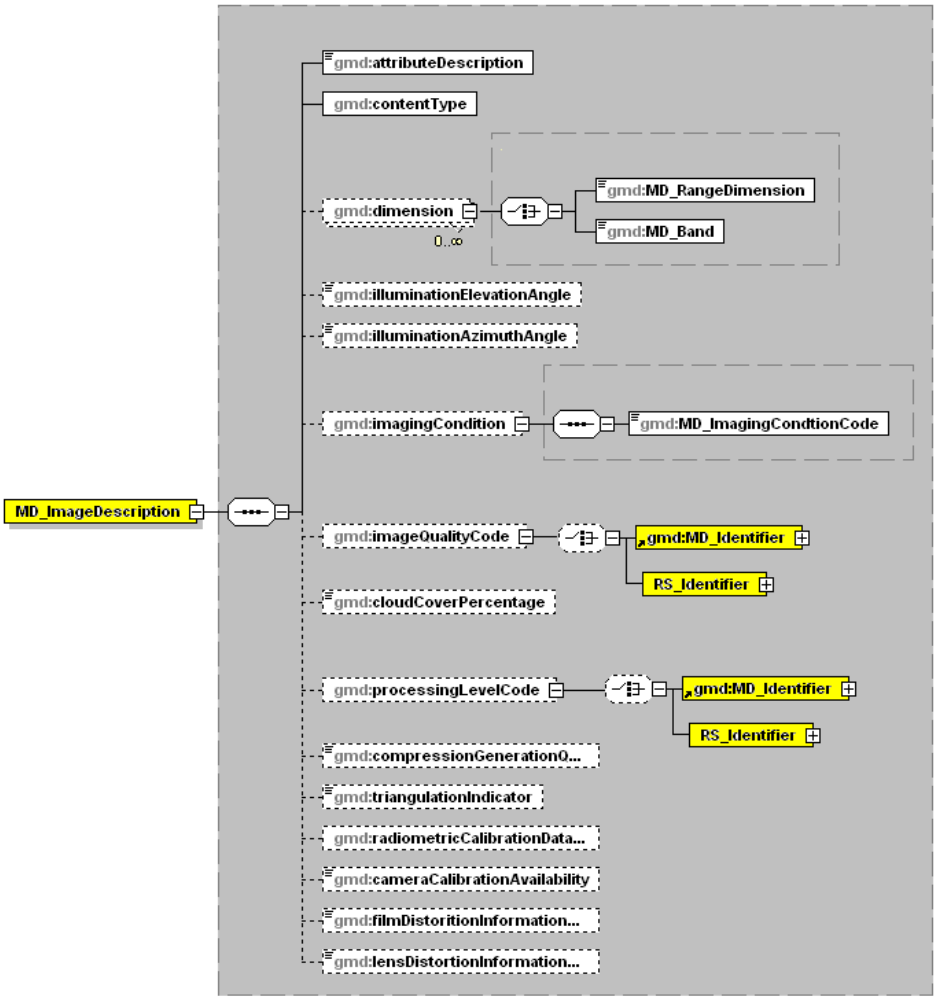
FAQ: What would MD_Identifier look like for the 1:50,000 map sheet of Sherbrooke in Canada that is identified by the code '21E05' under the authority of 'National Topographic System'?

Ex:

```
<gmd:MD_Identifier>
        <gmd:authority>
                <gmd:CI_Citation>
                        <gmd:title>
                                <gco:CharacterString>1:50,000 Topographic Map of
Sherbrooke, Canada</gco:CharacterString>
                        </gmd:title>
                        <gmd:date gco:nilReason="unknown"/>
                        <gmd:citedResponsibleParty>
                                <gmd:CI_ResponsibleParty>
                                        <gmd:organisationName>
                                                <gco:CharacterString>National Topographic
System (NTS)</gco:CharacterString>
```

```
                                                </gmd:organisationName>
                                                <gmd:role>
                                                        <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="resourceProvider" codeSpace="001">resourceProvider</gmd:CI_RoleCode>
                                                </gmd:role>
                                        </gmd:CI_ResponsibleParty>
                                </gmd:citedResponsibleParty>
                        </gmd:CI_Citation>
                </gmd:authority>
                <gmd:code>
                        <gco:CharacterString>21E05</gco:CharacterString>
                </gmd:code>
        </gmd:MD_Identifier>
```

MD_ImageDescription



MD_ImageDescription – Information about image characteristics.

Type: compound
Multiplicity: conditional
Attributes: id, uuid

attributeDescription – Description of the cell measurement.

Type: gco:RecordType
Multiplicity: mandatory
Attributes: nilReason

contentType – Information represented by the cell.

Type: MD_CoverageContentTypeCode
Domain: image, thematicClassification, physicalMeasurement
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

dimension – Information on the dimension of the cell measurement value.

Type: MD_RangeDimension or MD_Band
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

illuminationElevationAngle – Illumination elevation measure in degrees clockwise for the target plane at intersection of the optical line of sight with the Earth's surface.

Type: gco:Real
Domain: any number [-90, 90]
Multiplicity: optional
Attributes: nilReason

illuminationAzimuthAngle – Illumination azimuth measured in degrees clockwise from true north at the time the image is taken.

Type: gco:Real
Domain: any number [0, 360]
Multiplicity: optional
Attributes: nilReason

imagingCondition – Conditions affecting the image.

Type: MD_ImagingConditionCode
Domain: blurredImage, cloud, degradingObliquity, fog, heavySmokeOrDust, night, rain, semidarkness, shadow, snow, terrainMasking
Multiplicity: optional
Attributes: nilReason
Best Practices: See Annex C.

imageQualityCode – Specifies the image quality.

Type: MD_Identifier or RS_Identifier
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

cloudCoverPercentage – Percentage of dataset area obscured by clouds.

Type: gco:Real
Domain: any number [0.0, 100.0]
Multiplicity: optional
Attributes: nilReason

processingLevelCode – Identification of the image processing level.

Type: MD_Identifier or RS_Identifier
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

compressionGenerationQuantity – The number of compression cycles performed on the image.

Type: gco:Integer
Domain: any whole number
Multiplicity: optional
Attributes: nilReason

triangulationIndicator – Indication if triangulation was performed on the image.

Type: gco:Boolean
Domain: 0,1 (0 = no and 1 = yes)
Multiplicity: optional
Attributes: nilReason

radiometricCalibrationDataAvailability – Indication if radiometric calibration information to generate radiometrically calibrated standard data product is available.

Type: gco:Boolean
Domain: 0,1 (0 = no and 1 = yes)
Multiplicity: optional
Attributes: nilReason

cameraCalibrationInformationAvailability – Indication of camera calibration constants availability.

Type: gco:Boolean
Domain: 0,1 (0 = no and 1 = yes)
Multiplicity: optional
Attributes: nilReason

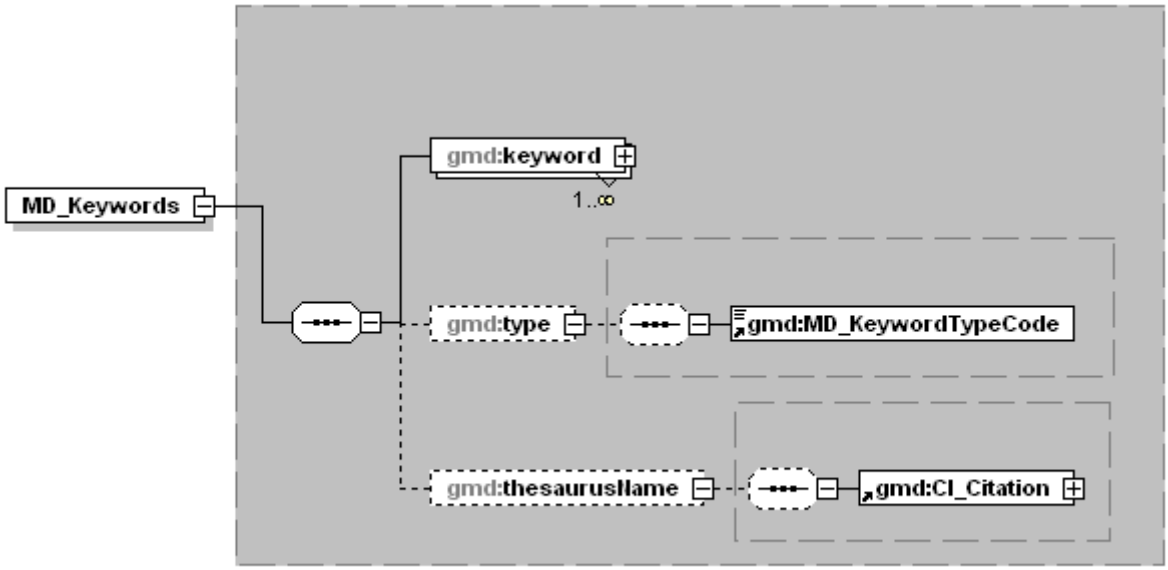
filmDistortionInformationAvailability – Indication of Calibration Reseau information availability.

Type: gco:Boolean
Domain: 0,1 (0 = no and 1 = yes)
Multiplicity: optional
Attributes: nilReason

lensDistortionInformationAvailability – Indication of lens aberration correction information availability.

Type: gco:Boolean
Domain: 0,1 (0 = no and 1 = yes)
Multiplicity: optional
Attributes: nilReason

MD_Keywords



MD_Keywords – Commonly used words or phrases that describe the resource. Optionally, the keyword type and a citation for the authoritative or registered resource of the keywords are also provided.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: It is highly recommended that keywords from the authoritative source be used instead of using user defined keywords.

keyword – Commonly used words or phrases which describe the resource.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory, repeatable
Attributes: nilReason

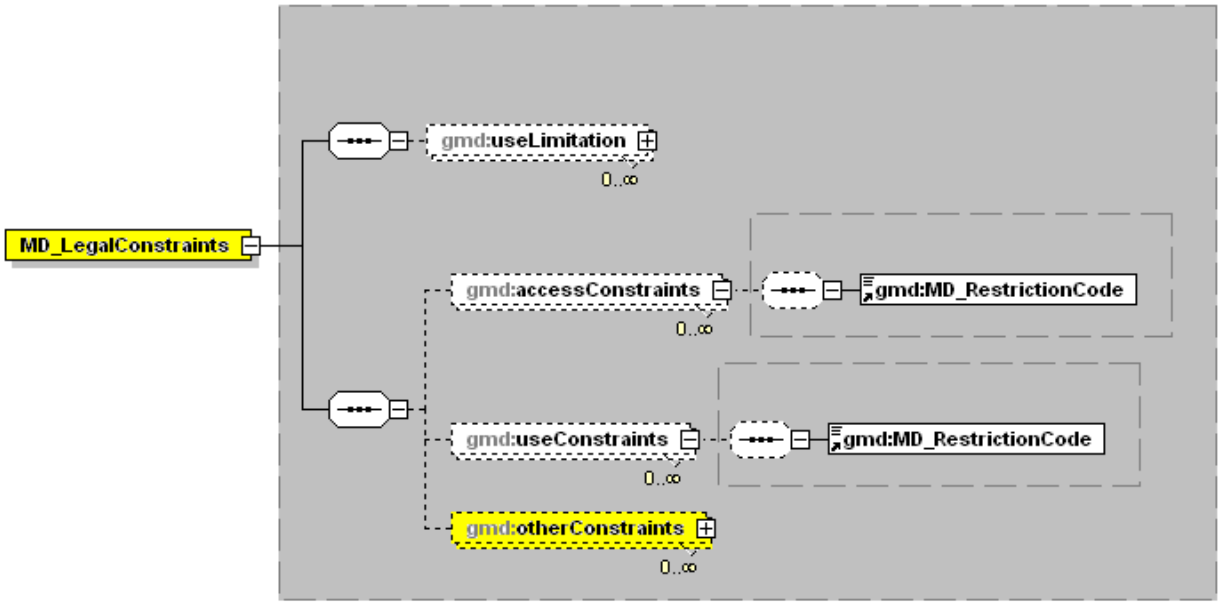
type – Terms or type used to group keywords.

Type: MD_KeywordTypeCode
Domain: discipline, place, stratum, temporal, theme
Multiplicity: optional
Attributes: nilReason
Best Practices: See Annex C.

thesaurusName – The name of a registered authoritative keyword resource.

Type: CI_Citation
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: It is strongly recommended to provide contact information.

MD_LegalConstraints



MD_LegalConstraints – The legal restrictions or prerequisites to using the resource or accessing the metadata.

Type: compound
Multiplicity: conditional
Attributes: id, uuid

useLimitation – Statement on the fitness of use or limitations on the use of the resource or metadata.

Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

accessConstraints – Limitations on access to the resource or metadata to protect privacy, intellectual property, or any special limitations.

Type: MD_RestrictionCode
Domain: copyright, patent, patentPending, trademark, license, intellectualPropertyRights, restricted, otherRestrictions
Multiplicity: optional, repeatable
Attributes: nilReason
Best Practices: See Annex C.

useConstraints – Restrictions or limitations or warnings to protect privacy, intellectual property, or other special restrictions on the resource or the metadata.

Type: MD_RestrictionCode
Domain: copyright, patent, patentPending, trademark, license, intellectualPropertyRights, restricted, otherRestrictions
Multiplicity: optional, repeatable
Attributes: nilReason
Best Practices: See Annex C.

otherConstraints – Other restrictions or legal prerequisites for accessing the resource or metadata.

Type: gco:characterString
Domain: free text
Multiplicity: conditional, repeatable
Attributes: nilReason
Best Practices: otherConstraints becomes mandatory when accessConstraints or useConstraints are set to 'otherRestrictions'.

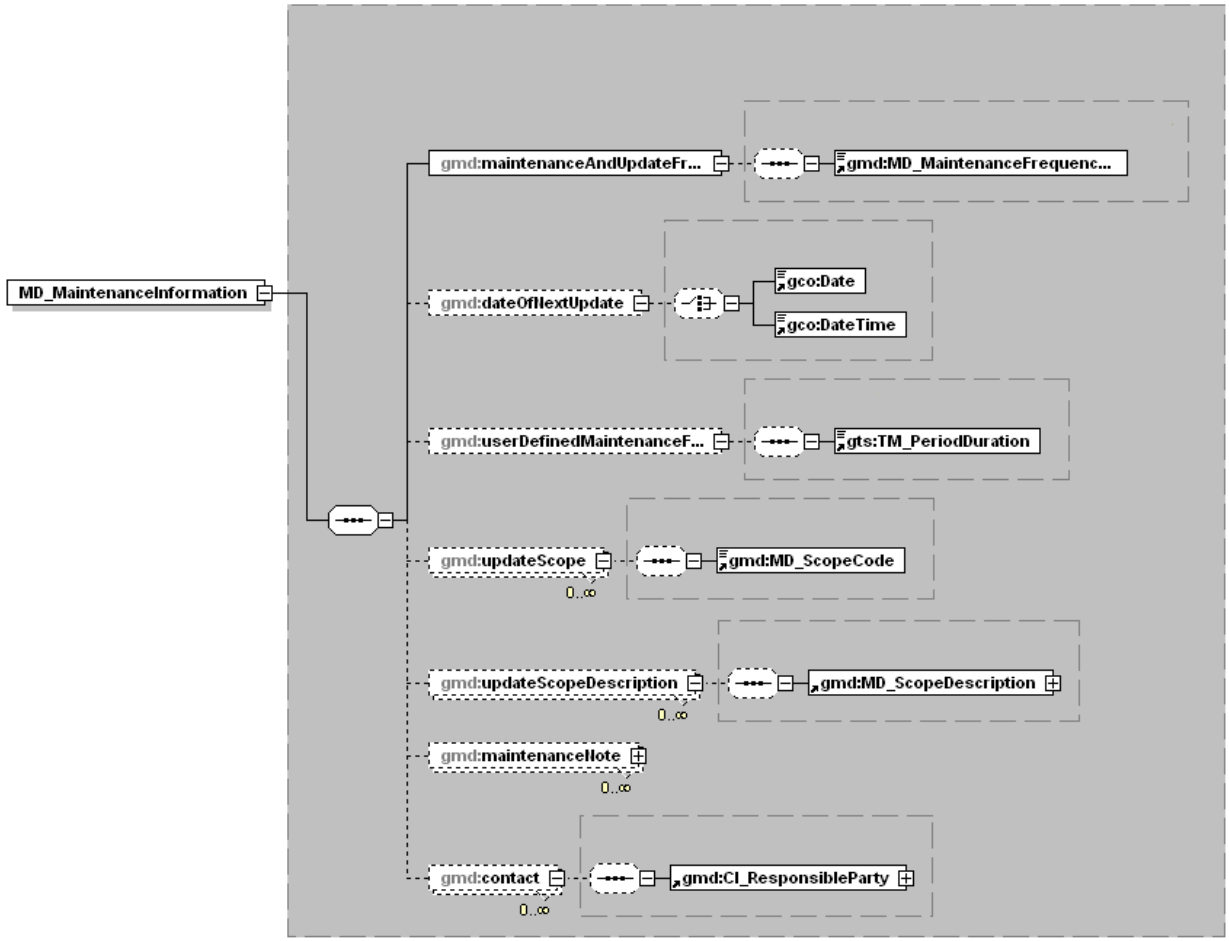
FAQ: Why are some use and access constraints found in 'otherConstraints'?

useConstraints and accessConstraints are restricted to only allow use of the codelist values. If none of the values can accurately describe the constraints, other constraints allows free text. Often, when translating from legacy metadata, it is difficult to translate to the codelist values with accuracy. To preserve the integrity of the content, the entire content, verbatim is mapped to 'otherConstraints'.

Ex:

```
<gmd:resourceConstraints>
        <gmd:MD_LegalConstraints>
          <gmd:accessConstraints>
            <gmd:MD_RestrictionCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_RestrictionCode"
                                codeListValue="otherRestrictions"
                                codeSpace="008">otherRestrictions</gmd:MD_RestrictionCode>
          </gmd:accessConstraints>
          <gmd:useConstraints>
            <gmd:MD_RestrictionCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_RestrictionCode"
                                codeListValue="otherRestrictions"
                                codeSpace="008">otherRestrictions</gmd:MD_RestrictionCode>
          </gmd:useConstraints>
          <gmd:otherConstraints>
            <gco:CharacterString>Access Constraints: None    Use Constraints: The user is responsible for the results of
any application of this data for other than its intended purpose.     Distribution Liability: NOAA makes no warranty
regarding these data, expressed or implied, nor does the fact of distribution constitute such a warranty. NOAA,
NESDIS, NODC and NCDDC cannot assume liability for any damages caused by any errors or omissions in these data,
nor as a result of the failure of these data to function on a particular system.</gco:CharacterString>
          </gmd:otherConstraints>
        </gmd:MD_LegalConstraints>
      </gmd:resourceConstraints>
```

MD_MaintenanceInformation



MD_MaintenanceInformation – Provides information about how the resources or metadata records are updated.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid

maintenanceAndUpdateFrequency – Frequency of changes and additions made to the resource after the initial completion.

Type: MD_MaintenanceFrequencyCode
Domain: continual, daily, weekly, fortnightly, monthly, quarterly, biannually, annually, asNeeded, irregular, notPlanned, unknown
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

dateOfNextUpdate – The scheduled revision date for the resource.

Type: choice of gco:Date or gco:DateTime
Domain: date
Multiplicity: optional
Attributes: nilReason

userDefinedMaintenanceFrequency – The maintenance period other than those defined.

Type: gts:TM_PeriodDuration
Multiplicity: optional
Attributes: nilReason

updateScope – Scope of data to which maintenance is applied.

Type: MD_ScopeCode
Domain: attribute, attributeType, collectionHardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile
Multiplicity: optional, repeatable
Attributes: nilReason
Best Practices: See Annex C.

updateScopeDescription – Additional information about the range or extent of the resource.

Type: MD_ScopeDescription
Multiplicity: optional, repeatable
Attributes: nilReason

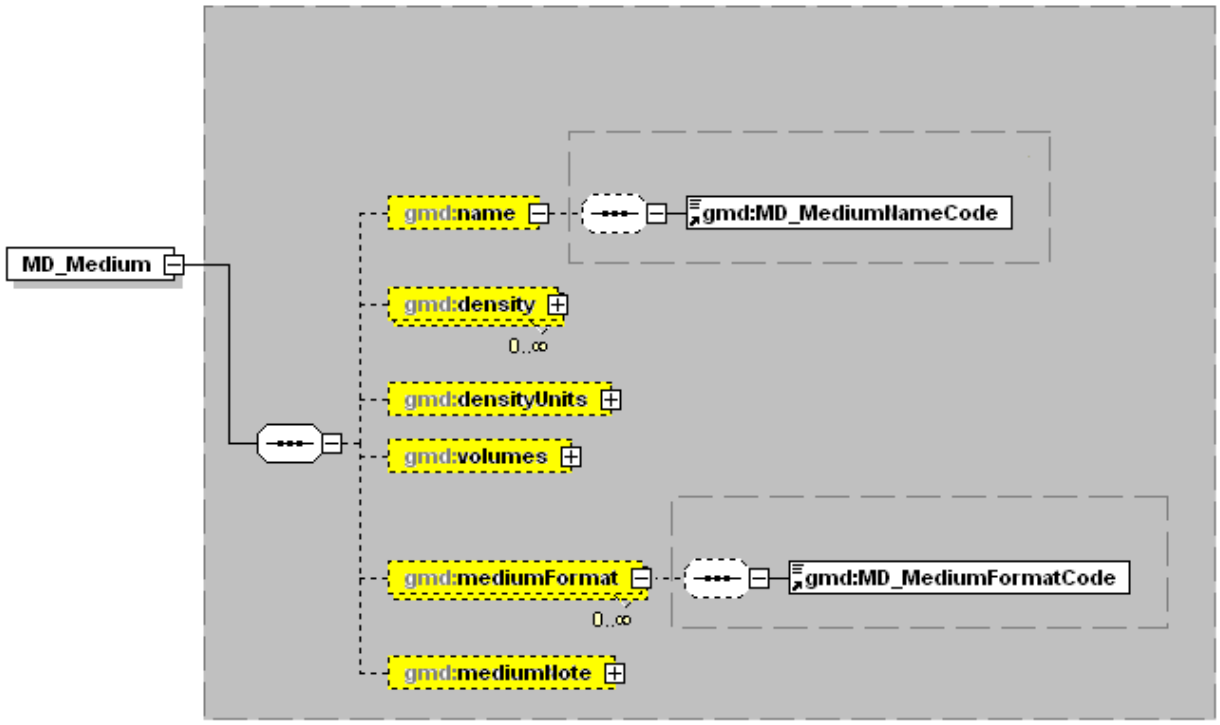
maintenanceNote – Information regarding specific requirements for maintaining the resource.

Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

contact – Identification of and means of communicating with the person or organisation with responsibility for maintaining the resource.

Type: CI_ResponsibleParty
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD_Medium



MD_Medium – Information on the name, density units, volumes, medium format, and medium note used to describe the transfer of data to a medium.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: At least one of name, density, volumes, mediumFormat, or mediumNote shall be provided. densityUnits is mandatory if density is provided.

name – Medium name code.

Type: MD_MediumNameCode
Domain: cdRom, dvd, dvdRom, 3halfInchFloppy, 5quarterInchFloppy, 7trackTape, 9trackTape, 3480Cartridge, 3490Catridge, 3580Cartridge, 4mmCartridgeTape, 8mmCartridgeTape, 1quarterInchCartridgeTape, digitalLinearTape, onLine, satellite, telephoneLink, hardcopy
Multiplicity: conditional
Attributes: nilReason
Best Practices: See Annex C.

density – The recording density on the specified media.

Type: gco:Real
Domain: any number
Multiplicity: conditional, repeatable
Attributes: nilReason
Best Practices: Value greater than '0.0'.

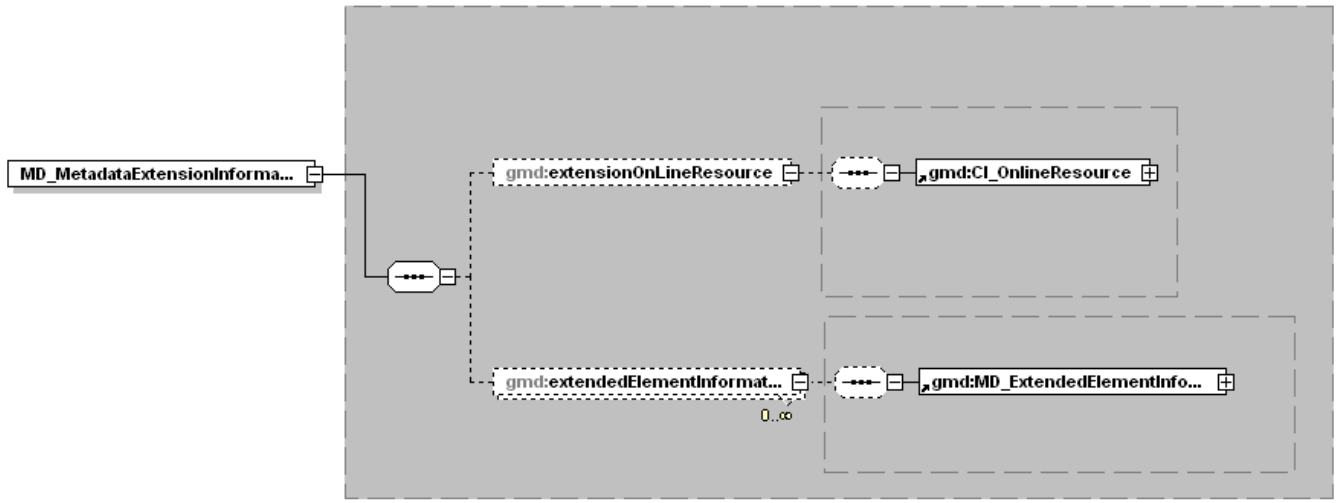
densityUnits – The recording density units.
Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: densityUnits is mandatory when density is documented.

volumes – Identification of the number of recorded items on the media.
Type: gco:Integer
Domain: any whole number
Multiplicity: conditional
Attributes: nilReason
Best Practices: Value greater than '0'.

mediumFormat – Method used to write to the medium.
Type: MD_MediumFormatCode
Domain: cpio, tar, highSierra, iso9660, iso9660RockRidge, iso9660AppleHFS
Multiplicity: conditional, repeatable
Attributes: nilReason
Best Practices: See Annex C.

mediumNote – Description of limitations or requirements for using the medium.
Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason

MD_MetadataExtensionInformation



MD_MetadataExtensionInformation – Information describing metadata extensions.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid

extensionOnlineResource – Information about on-line sources containing the community profile name and the extended metadata elements. Information for all new metadata elements.

Type: CI_OnlineResource
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

extendedElementInformation – Provides information about a new metadata element.

Type: MD_ExtendedElementInformation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD_PortrayalCatalogueReference

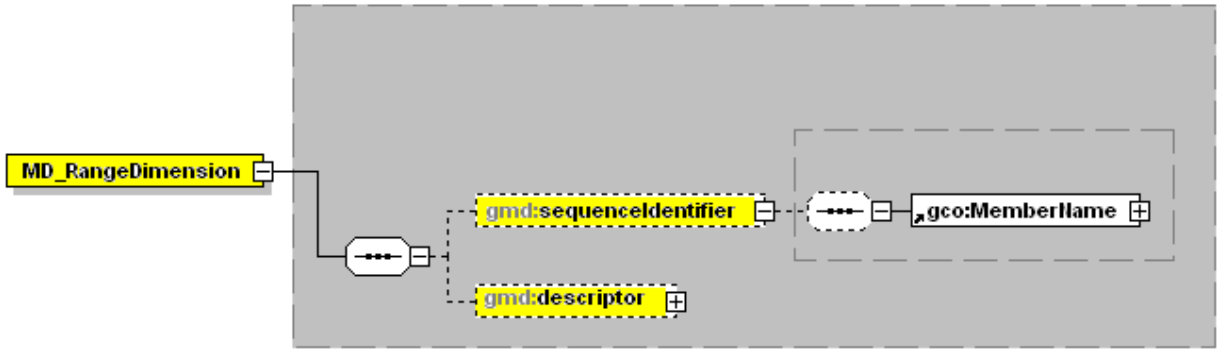
MD_PortrayalCatalogueReference – Information used to identify and located the portrayal catalogue.

Type: portrayalCatalogueCitation
Multiplicity: mandatory
Attributes: id, uuid

portrayalCatalogueCitation – Bibliographic citation for the portrayal catalogue.

Type: CI_Citation
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD_RangeDimension



MD_RangeDimension – Information on the dimensions of the cell measurement value.
Type: compound
Multiplicity: conditional
Attributes: id, uuid

sequenceIdentifier – Sensor band wavelengths.
Type: gco:MemberName
Multiplicity: conditional
Attributes: id, uuid
Best Practices: Either sequenceIdentifier or descriptor shall be provided, or both.

descriptor – Description of cell value range.
Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: Either descriptor or sequenceIdentifier shall be provided, or both.

MD_ReferenceSystem

MD_ReferenceSystem – Describes the attributes that provide information about reference system information.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid

referenceSystemIdentifier – Identifier of the Reference System.

Type: RS_Identifier
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: A coordinate reference system (CRS) should be taken from a publicly available register or document, such as the EPSG Geodetic Parameter Dataset (http://www.epsg-registry.org/) or Spatial Reference (http://spatialreference.org). An identifier or well known name with an authority is defined and referenced here. If a coordinate reference system (CRS) is not available from a publicly available register or document and as such has no identifier or well known name, then that CRS shall be described according to ISO 19111.

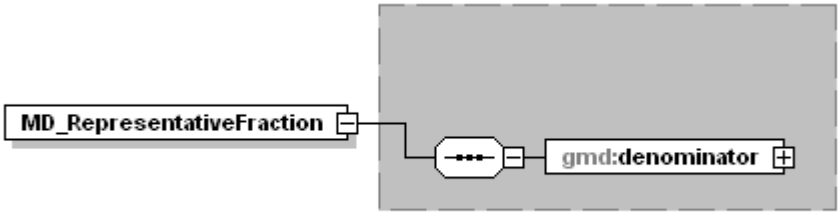
FAQ: How would you document a map with a Mercator projection ?

Ex:

```
<gmd:referenceSystemInfo>
<gmd:MD_ReferenceSystem>
<gmd:referenceSystemIdentifier>
<gmd:RS_Identifier>
<gmd:authority>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>WGS 84 / World Mercator</gco:CharacterString>
</gmd:title>
<gmd:date>
<gmd:CI_Date>
<gmd:date>
<gco:Date>2006-06-02</gco:Date>
</gmd:date>
<gmd:dateType>
<gmd:CI_DateTypeCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_DateTypeCode"
codeListValue="revision">revision</gmd:CI_DateTypeCode>
</gmd:dateType>
</gmd:CI_Date>
</gmd:date>
<gmd:citedResponsibleParty>
<gmd:CI_ResponsibleParty>
```

<gmd:contactInfo>
<gmd:CI_Contact>
<gmd:onlineResource>
<gmd:CI_OnlineResource>
<gmd:linkage>
<gmd:URL>http://www.epsg-registry.org/indicio/query?request=getRepositoryitem&id=urn:ogc:def:crs:EPSG::3395</gmd:URL>
</gmd:linkage>
</gmd:CI_OnlineResource>
</gmd:onlineResource>
</gmd:CI_Contact>
</gmd:contactInfo>
<gmd:role>
<gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="resourceProvider" codeSpace="001">resourceProvider</gmd:CI_RoleCode>
</gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:citedResponsibleParty>
</gmd:CI_Citation>
</gmd:authority>
<gmd:code>urn:ogc:def:crs:EPSG::3395</gmd:code>
</gmd:RS_Identifier>
</gmd:referenceSystemIdentifier>
</gmd:MD_ReferenceSystem>
</gmd:referenceSystemInfo>

MD_RepresentativeFraction



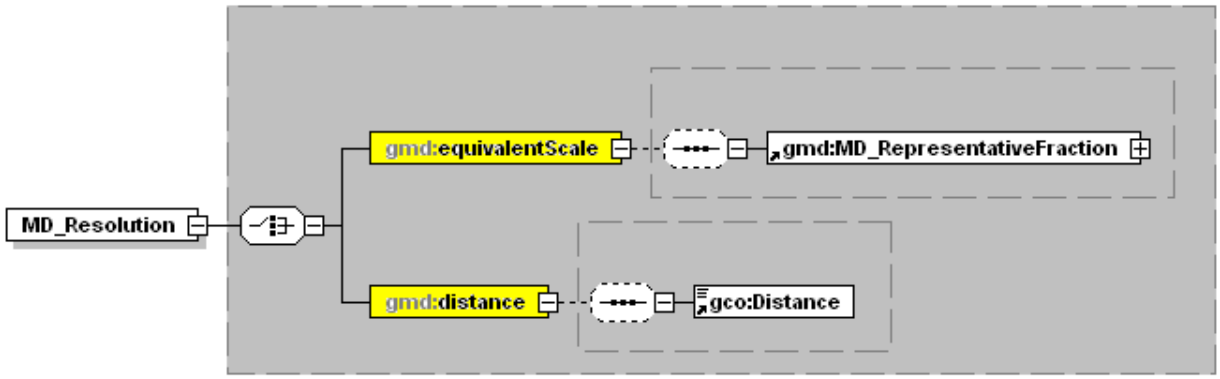
MD_RepresentativeFraction – The scale of a map or other cartographic object expressed as a fraction or ratio which relates unit distance on the map or other cartographic object to distance, measured in the same units, on the ground.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid

denominator – The number below the line in a proper fraction that the numerator is equal to 1.

Type: gco:Integer
Domain: any whole number
Multiplicity: mandatory
Attributes: nilReason
Best Practices: Value is greater than 0.

MD_Resolution



MD_Resolution – The level of detail in a dataset expressed as equivalent scale or ground distance.
Type: compound
Multiplicity: mandatory
Best Practices: One and only one of the following must be entered: equivalentScale or distance.

equivalentScale – Detail expressed as the numerical scale of a comparable hardcopy map or chart.
Type: MD_RepresentativeFraction
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

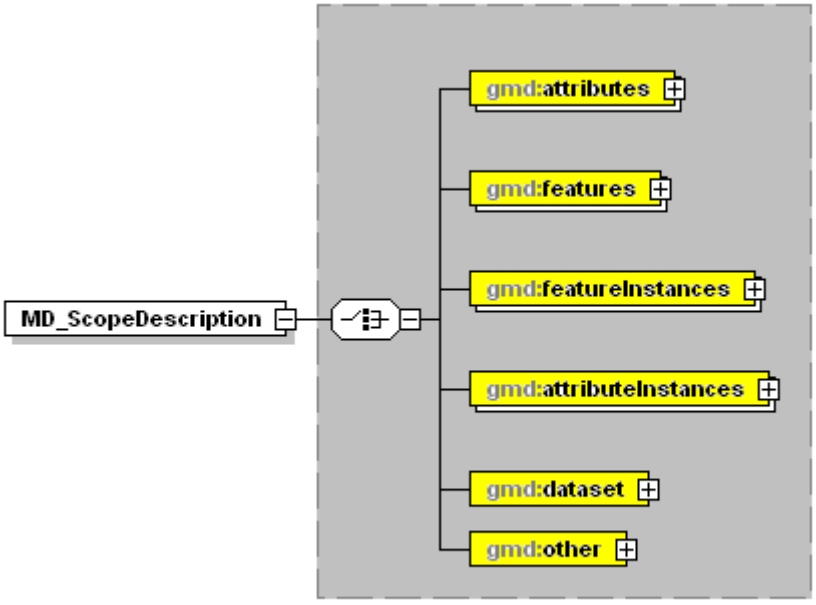
distance – Ground sample distance.
Type: gco:Distance
Multiplicity: conditional
Attributes: nilReason
Best Practice: Distance is a measure of length between two points. A distance is made of a value and a unit of measure (uom), which is an attribute of distance and is mandatory.

FAQ: How would you populate the element 'distance' for a distance of 5 meters?

Ex:

```
<MD_Resolution>
  <distance>
    <gco:Distance uom="meters">5</gco:Distance>
  </distance>
</MD_Resolution>
```

MD_ScopeDescription



MD_ScopeDescription – Description of the class of information covered by the information.
Type: compound
Multiplicity: mandatory
Best Practices: A choice must be made between attributes or features or featureInstances or attributeInstances or dataset or other.

attributes – Attributes to which the information applies.
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

features – Features to which the information applies.
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

featureInstances – Feature instances to which the information applies.
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

attributeInstances – Attribute instances to which the information applies.
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

dataset – Dataset to which the information applies.
Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason

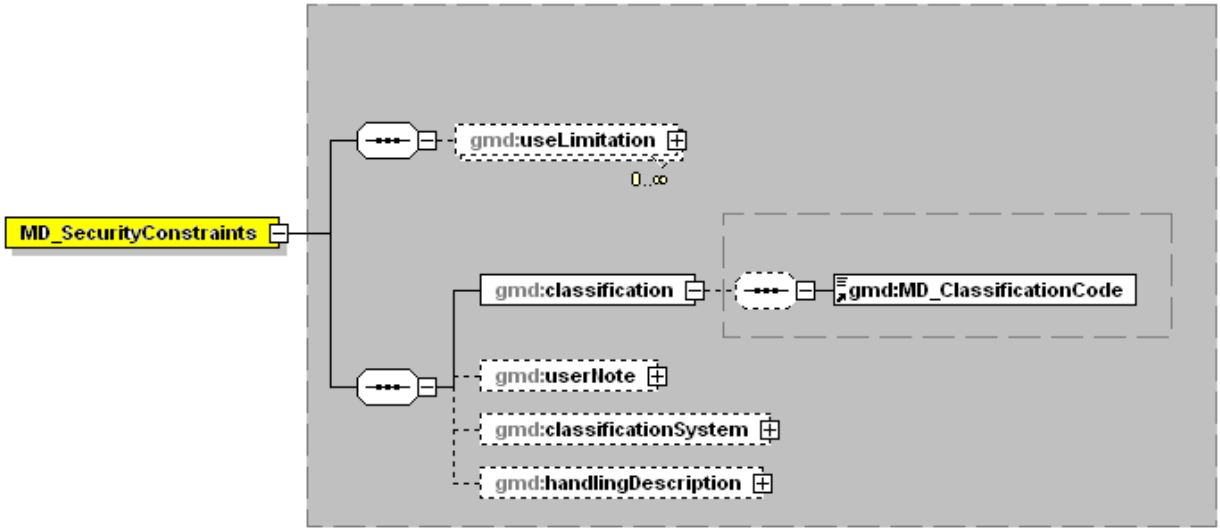
other – Class of information that does not fall into the other categories to which the information applies.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason

Ex:

```
<gmd:MD_ScopeDescription>
   <gmd:dataset>
                <gco:CharacterString>Name of the Parameter goes here</gco:CharacterString>
   </gmd:dataset>
</gmd:MD_ScopeDescription>
```

MD_SecurityConstraints



MD_SecurityConstraints – Restrictions applied to the resource or metadata to protect security concerns.
Type: compound
Multiplicity: conditional
Attributes: id, uuid

useLimitation – Statement on the fitness of use or limitations on the use of the resource or metadata.
Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

classification – Name of the handling restrictions on the resource or the metadata.
Type: MD_ClassificationCode
Domain: unclassified, restricted, confidential, secret, topSecret
Multiplicity: mandatory
Attributes: nilReason
Best Practices: See Annex C.

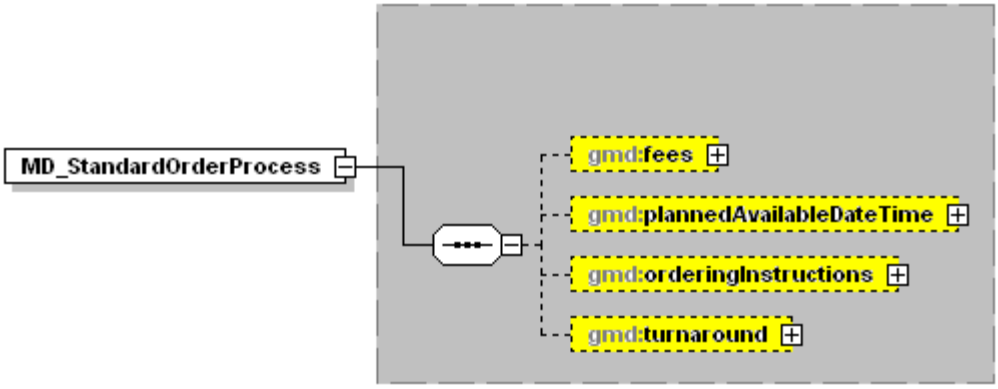
userNote – An explanation of the classification level applied to the resource or metadata.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

classificationSystem – Name of the security classification system.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

handlingDescription – Additional information regarding security restrictions on handling the resource or metadata.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

MD_StandardOrderProcess



MD_StandardOrderProcess – The process in which the resource is obtained or received and other related instructions or fee information.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid
Best Practices: At least one of fees, plannedAvailableDateTime, orderingInstructions, or turnaround shall be provided.

fees- Fees and terms for obtaining the data/dataset.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: Include at the end the monetary unit alphabetic code as specified in ISO 4217. (see http://www.iso.org/iso/support/faqs/faqs_widely_used_standards/widely_used_standards_other/currency_codes/currency_codes_list-1.htm) Common codes: United States = USD, Canada = CAD, Mexico = MXN or MXV

FAQ: **How would you show that a dataset costs $45.00 ?**

<gmd:fees>45.00USD</gmd:fees>

---

plannedAvailableDateTime – Date and time the resource will be available.

Type: gco:DateTime
Domain: date
Multiplicity: conditional
Attributes: nilReason

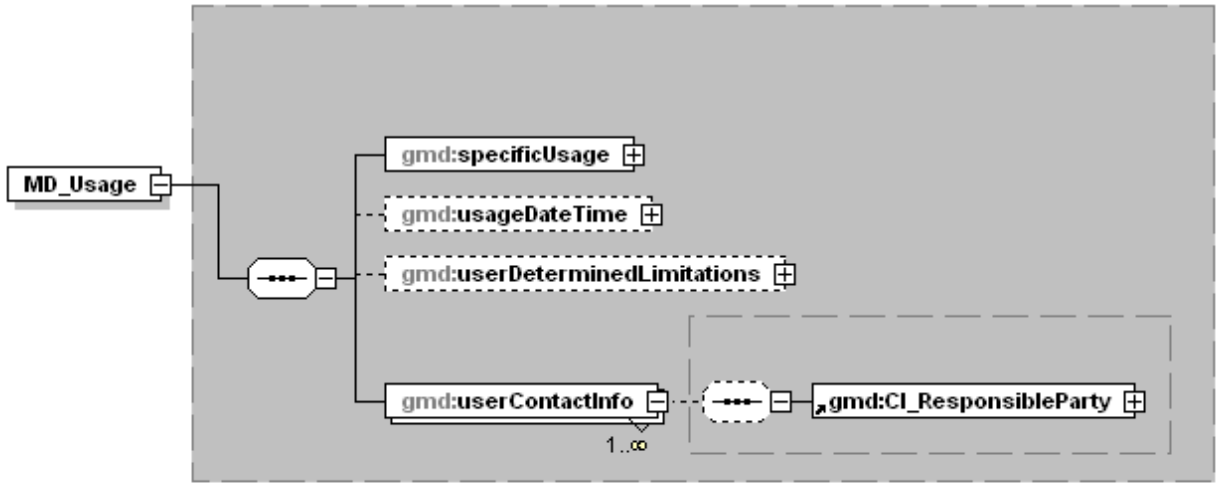
orderingInstructions – General instructions, terms, and services provided by the data distributor.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason

turnaround – Typical time required for filing a data request.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason

MD_Usage



MD_Usage – Brief description of ways in which the resource(s) is/are currently or has been used

Type: compound
Multiplicity: mandatory
Attributes: id, uuid

specificUsage – Brief description of the resource and/or resource series usage.

Type: gco:CharacterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

usageDateTime – Data and time of the first use or range of uses of the resource and/or resource series.

Type: gco:DateTime
Domain: date
Multiplicity: optional

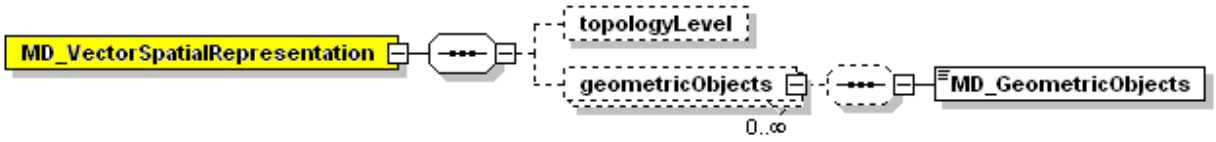
userDeterminedLimitiations – Applications determined by the user for which the resource and/or resource series is not suitable.

Type: gco:CharacterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

userContactInfo – Identification of and means of communicating with the person(s) and organisation(s) using the resource(s).

Type: CI_ResponsibleParty
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

MD_VectorSpatialRepresentation



MD_VectorSpatialRepresentation – Information about the vector spatial objects in the dataset.

Type: compound
Multiplicity: conditional
Attributes: id, uuid
Best Practices: MD_VectorSpatialRepresentation is mandatory if the dataset objects are vectors.

toplogyLevel – Code which identifies the degree of complexity of the spatial relationships.

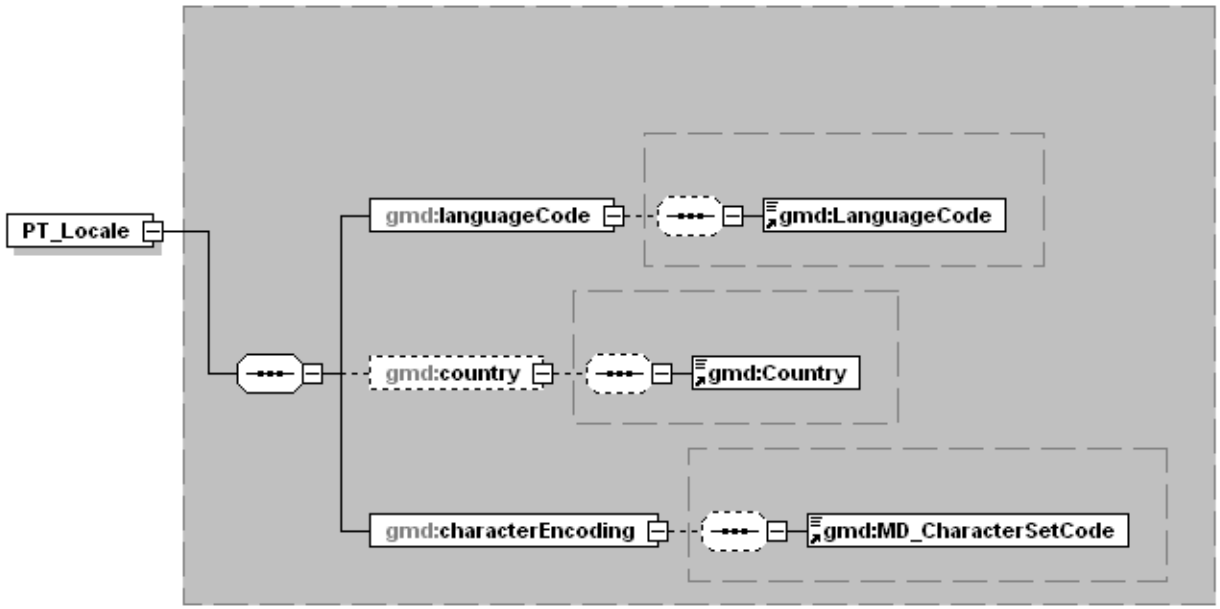
Type: MD_TopologyLevelCode
Domain: geometryOnly, topology1D, planarGraph, fullPlanarGraph, surfaceGraph, fullSurfaceGraph, topology3D, fullTopology3D, abstract
Multiplicity: optional
Attributes: nilReason
Best Practices: See Annex C.

geometricObjects – Information about the geometric objects used in the dataset.

Type: MD_GeometricObjects
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

PT PACKAGE

PT_Locale



PT_Locale – Declared language properties.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

languageCode – Language codelist
Type: gmd:LanguageCode
Multiplicity: mandatory
Attributes: nilReason

LanguageCode – ISO 639-2/T three-letter terminology code
Type: LanguageCodeList
Multiplicity: mandatory
Best Practices: Use the three-letter code in lowercase. See Annex B.

country – Country codelist
Type: gmd:Country
Multiplicity: optional
Attributes: nilReason

Country – ISO 3166-1 two-letter code
Type: CountryCodeList
Multiplicity: mandatory
Best Practices: Use the two-letter code in uppercase. See Annex B.

characterEncoding – Character coding standard.
Type: MD_CharacterSetCode

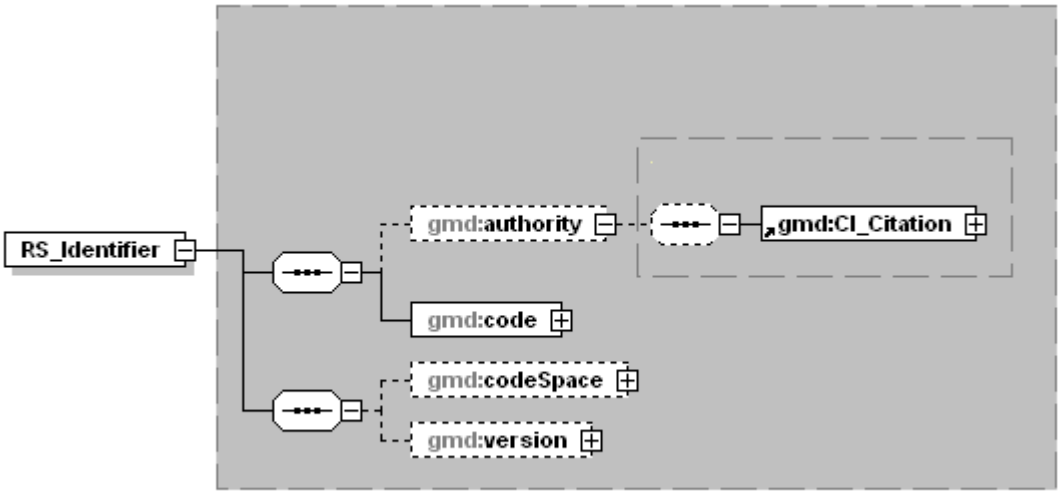
Domain: ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2, 8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10, 8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii, ebcdic, eucKR, big5, GB2312
Multiplicity: mandatory
Attributes: nilReason
Best Practices: Encoding shall be set to the recommended default value ‘utf8’.

Ex:

```
<gmd:locale>
        <gmd:PT_Locale>
                <gmd:languageCode>
                        <gmd:LanguageCode codeList="../Codelist/ML_gmxCodelists.xml#LanguageCode"
codeListValue="eng">English</gmd:LanguageCode>
                </gmd:languageCode>
                <gmd:country>
                        <gmd:Country codeList="../Codelist/ML_gmxCodelists.xml#Country" codeListValue="US">US</gmd:Country>
                </gmd:country>
                <gmd:characterEncoding>
                        <gmd:MD_CharacterSetCode  codeList="../Codelist/ML_gmxCodelists.xml#MD_CharacterSetCode"
codeListValue="utf8">utf8</gmd:MD_CharacterSetCode>
                </gmd:characterEncoding>
        </gmd:PT_Locale>
</gmd:locale>
```

RS PACKAGE

RS_Identifier



RS_Identifier – Information about the unique identification of an object.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

authority – Recognized responsible party or organisation for a reference.
Type: CI_Citation
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

code – The alphanumeric value that identifies a resource.
Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

codeSpace – Identifier/namespace of the system in which the code is valid, e.g., 'http://www.epsg.org/databases/Discv7_5.html'
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

version – The cited version, e.g., '7.5.'
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

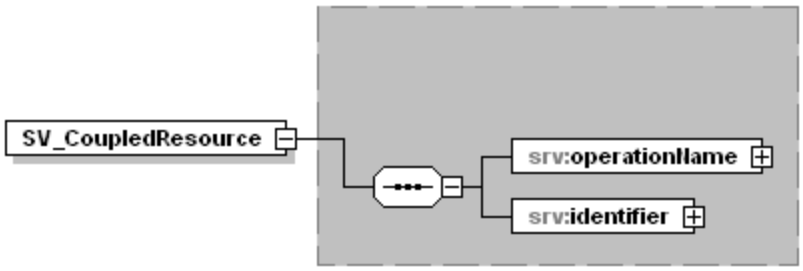
FAQ: **What would the RS_Identifier look like for the 1:50,000 map sheet of Sherbrooke in Canada that is identified by the code '21E05' under the authority of 'National Topographic System'?**

Ex:

```
<gmd:RS_Identifier>
        <gmd:authority>
                <gmd:CI_Citation>
                        <gmd:title>
                                <gco:CharacterString>1:50,000 Topographic Map of
Sherbrooke, Canada</gco:CharacterString>
                        </gmd:title>
                        <gmd:date gco:nilReason="unknown"/>
                        <gmd:citedResponsibleParty>
                                <gmd:CI_ResponsibleParty>
                                        <gmd:organisationName>
                                                <gco:CharacterString>National Topographic
System (NTS)</gco:CharacterString>
                                        </gmd:organisationName>
                                        <gmd:role>
                                                <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="resourceProvider" codeSpace="001">resourceProvider</gmd:CI_RoleCode>
                                        </gmd:role>
                                </gmd:CI_ResponsibleParty>
                        </gmd:citedResponsibleParty>
                </gmd:CI_Citation>
        </gmd:authority>
        <gmd:code>
                <gco:CharacterString>21E05</gco:CharacterString>
        </gmd:code>
</gmd:RS_Identifier>
```

SV PACKAGE

SV_CoupledResource



SV_CoupledResource – Information describing the linkage between a service operation and a tightly coupled dataset.

Type: Compound
Multiplicity: mandatory
Attributes: id, uuid

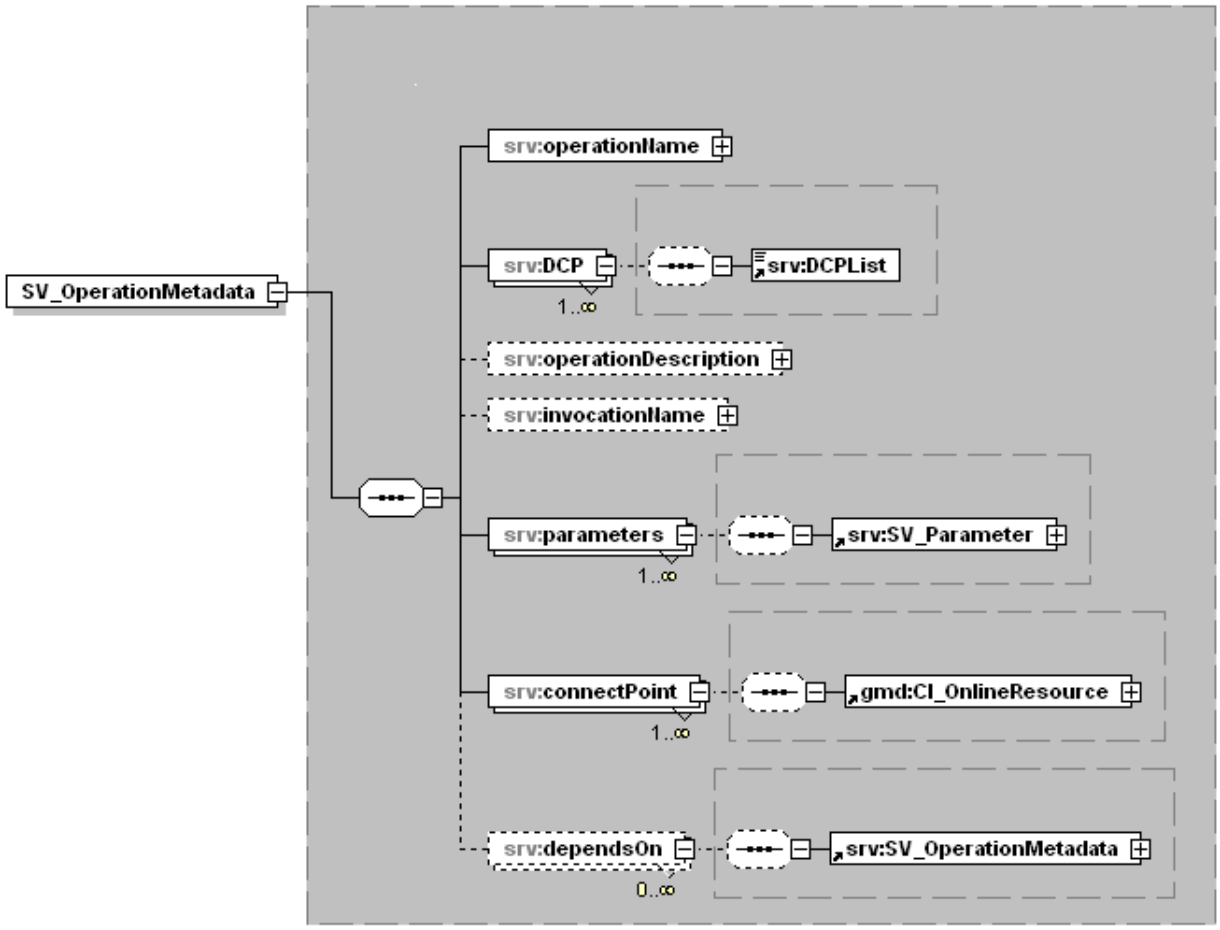
operationName – Designation of the operation

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

identifier – The dataset name or identifier of the associated dataset.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

SV_OperationMetadata



SV_OperationMetadata – Description of one's service operation to provide the signature of the operation.

Type: compound
Multiplicity: mandatory
Attributes: id, uuid

operationName – An identifier that uniquely designates the operation.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

DCP – Distributed Computing Platforms that have been used to implement the operation.

Type: srv:DCPList
Domain: XML, CORBA, JAVA, COM, SQL, WebServices
Multiplicity: mandatory, repeatable
Attributes: nilReason
Best Practices: See Annex C.

operationDescription – Description of the purpose of the operation and results obtained from the operation.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

invocationName – The name used to invoke the operation on all Distributed Computing Platforms.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

parameters – Values required for the interface invocation.

Type: SV_Parameter
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

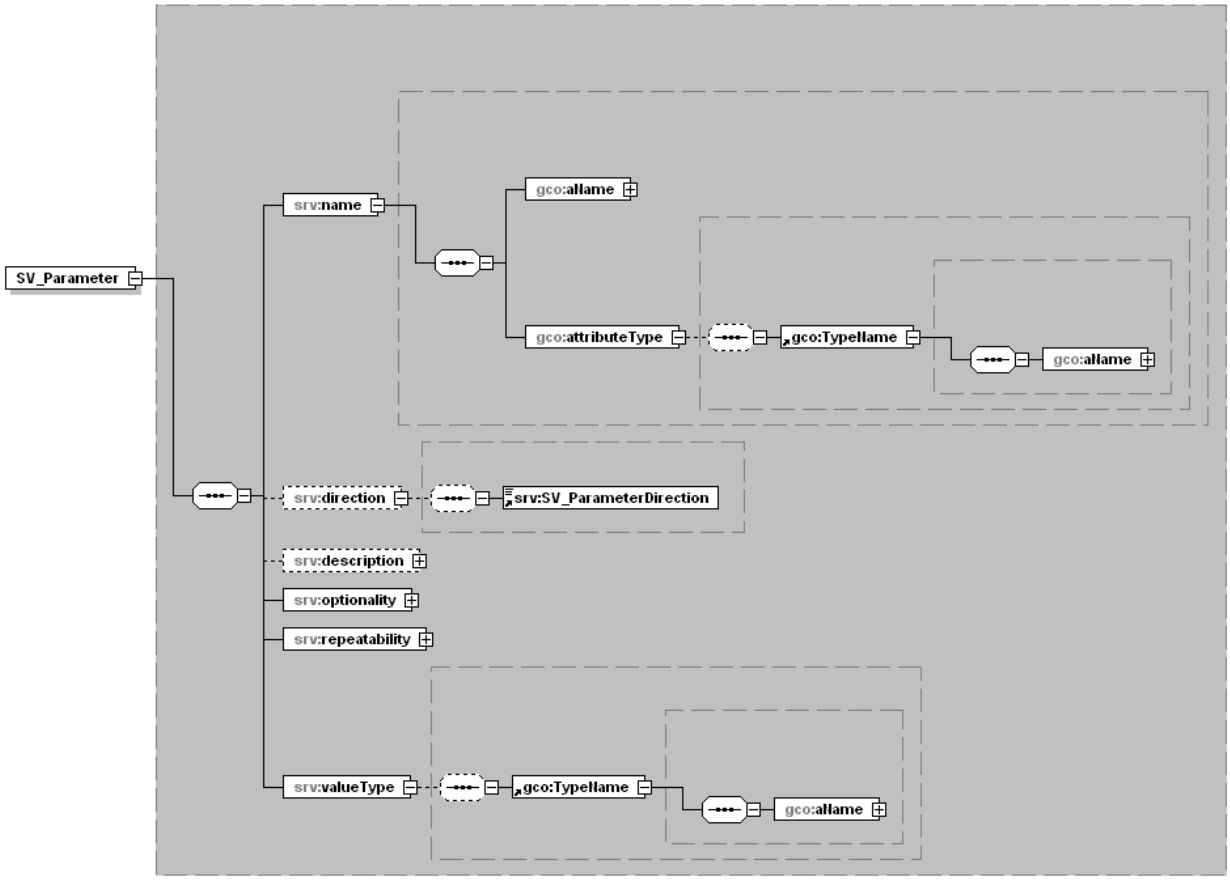
connectPoint – Reference to access the service interface.

Type: CI_OnlineResource
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

dependsOn – The list of operations required prior to invoking the service; Structured as a list for capturing alternate or parallel predecessor paths.

Type: SV_OperationMetadata
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

SV_Parameter



SV_Parameter – Information describing parameters of an operation.
Type: compound
Multiplicity: mandatory
Attributes: id, uuid

name – The name that the service uses for the parameter.
Type: gco:MemberName
Multiplicity: mandatory
Attributes: id, uuid

direction – Indication if the parameter serves as input, output, or both.
Type: SV_ParameterDirection
Domain: in, out, in/out
Multiplicity: optional
Attributes: nilReason

description – Explanation of the purpose and function of the parameter.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

optionality – Indicates the necessity of the parameter.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason
Best Practices: The default value is ‘Mandatory’.

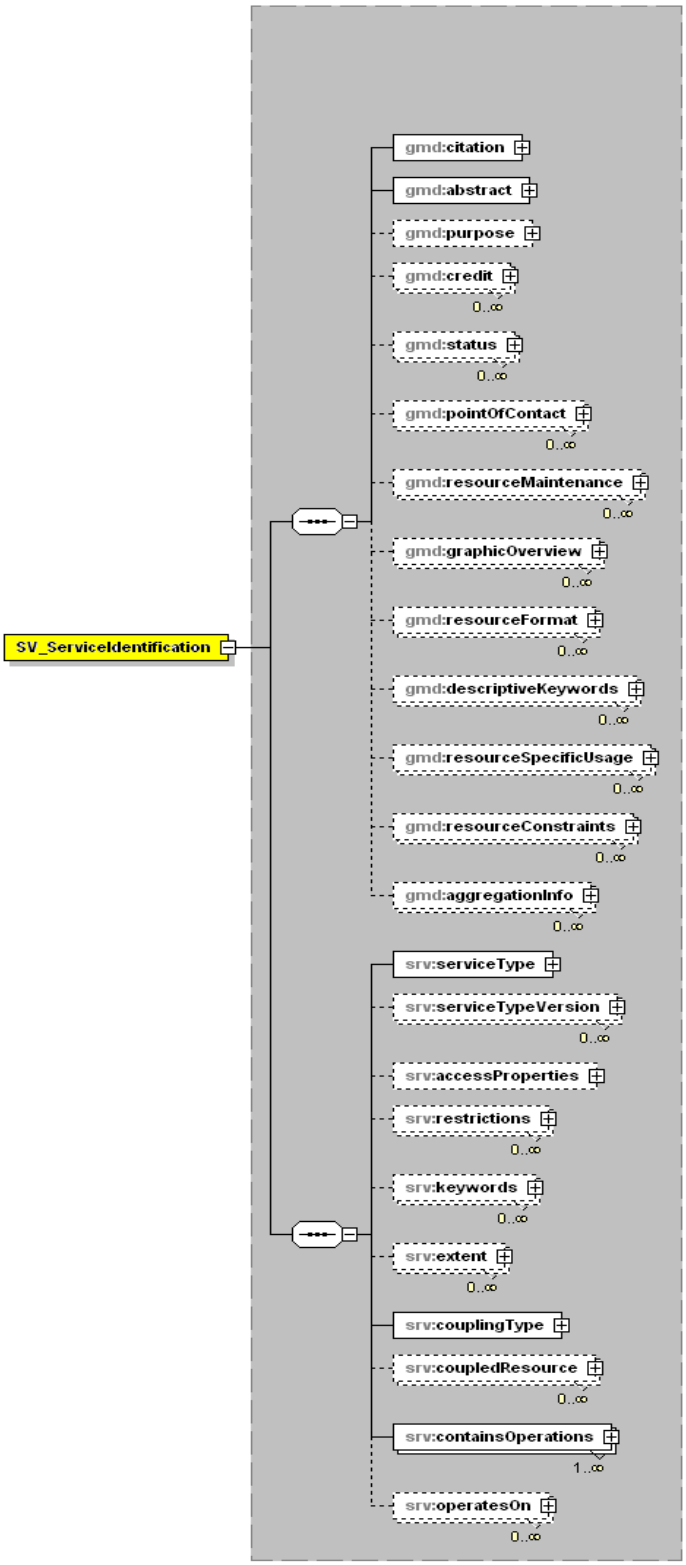
repeatability – Indication if one or more values for the parameter may be provided.

Type: gco:Boolean
Domain: 0,1 (0 = not repeatable, 1 = repeatable)
Multiplicity: mandatory
Attributes: nilReason

valueType – The class used for the value type.

Type: gco:TypeName
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

SV_ServiceIdentification



SV_ServiceIdentification – Service metadata describes the operation and address of an electronic geographic delivery system. This identifies capabilities which a service provider makes available to a service user through a set of interfaces.

Type: compound
Multiplicity: conditional
Attributes: id, uuid
Best Practices: identificationInfo must have at least one occurrence of Data Identification or Service Identification.

citation – Citation for the dataset.
Type: CI_Citation
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

abstract – Brief narrative summary of the dataset's contents.
Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

purpose – Summary of the intentions for which the dataset was developed.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

credit – Recognition of those who contributed to the dataset.
Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

status – The development phase of the dataset.
Type: MD_ProgressCode
Domain: completed, historicalArchive, obsolete, ongoing, planned, required, underdevelopment
Multiplicity: optional, repeatable *this is a NAP requirement*
Attributes: nilReason

pointOfContact – Identification and means to contact people/organisations associated with the dataset.
Type: CI_ResponsibleParty
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

resourceMaintenance – Describes the frequency, scope, and responsible party for the updating of the dataset.
Type: MD_MaintenanceInformation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

graphicOverview – The name of, description of, and file type of an illustration of the dataset.
Type: MD_BrowseGraphic
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

resourceFormat – Provides a description of the format of the resource(s).
Type: MD_Format
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

descriptiveKeywords – Commonly used words or phrases which describe the dataset. Optionally, the keyword type and a citation for the authoritative or registered resource of the keywords are also provided.
Type: MD_Keywords
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

resourceSpecificUsage – Provides basic information about specific application(s) for which the resource(s) has been or is being used by different users.
Type: MD_Usage
Multiplicity: optional, repeatable *this is not in NAP*
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

resourceConstraints – The limitations or constraints on the use of or access to the resource.
Type: MD_Constraints or MD_LegalConstraints or MD_SecurityConstraints
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

aggregationInfo – The citation for the aggregate dataset or the name of the aggregate dataset, the type of aggregate dataset, and optionally the activity which produced the dataset.
Type: MD_AggregateInformation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

serviceType – The service type name from a service registry.
Type: gco:LocalName
Multiplicity: mandatory
Attributes: nilReason
Best Practices: serviceType should follow the format of <urn><:><domain-name><:><serviceType><:><unique name assigned by the vendor><:>version number>

FAQ: If I had an OGC map service, how would I document it?

The registry namespace would be 'ogc' and the service type would be 'WebMapService'.

EX:
<srv:serviceType>
<gco:LocalName>urn:ogc:serviceType:WebMapService:1.1</gco:LocalName>
</srv:serviceType>

---

serviceTypeVersion – The version of the service type.

Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

accessProperties – Information on the availability of the service which includes attributes from Standard Order Process.

Type: MD_StandardOrderProcess
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

restrictions – The limitations or constraints on the use of or access to the service.

Type: MD_Constraints or MD_LegalConstraints or MD_SecurityConstriants
Multiplicity: optional, repeatable *this is not in NAP*
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

keywords – Commonly used words or phrases which describe the service.

Type: MD_Keywords
Multiplicity: optional, repeatable *this is not in NAP*
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

extent – Describes the spatial, horizontal and/or vertical, and the temporal coverage in the resource.

Type: EX_Extent
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

couplingType – Qualitative information on the tightness with which the service and the associated data are coupled.

Type: SV_CouplingType
Domain: loose, mixed, tight
Multiplicity: mandatory
Attributes: nilReason

coupledResource – Further description of the coupling between the service and the data when they are tightly coupled.

Type: SV_CoupledResource
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

containsOperations – Operations performed by the service.

Type: SV_OperationMetadata
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

operatesOn – Information describing datasets on which the service operates.

Type: MD_DataIdentification
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

ISO 19115 METADATA EXAMPLES

XML View


```
<gmd:MD_Metadata xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:srv="http://www.isotc211.org/2005/srv" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gsr="http://www.isotc211.org/2005/gsr" xmlns:gss="http://www.isotc211.org/2005/gss"
xmlns:gts="http://www.isotc211.org/2005/gts" xmlns:gmi="http://www.isotc211.org/2005/gmi"
xmlns:gmx="http://www.isotc211.org/2005/gmx" xsi:schemaLocation="http://www.isotc211.org/2005/gmd ..\..\..\gmd\gmd.xsd">
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  <gco:CharacterString>EX1003</gco:CharacterString>
 </gmd:fileIdentifier>
 <gmd:language>
  <gco:CharacterString>eng; USA</gco:CharacterString>
 </gmd:language>
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  <gmd:MD_CharacterSetCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_CharacterSetCode" codeListValue="utf8"
codeSpace="004">utf8</gmd:MD_CharacterSetCode>
 </gmd:characterSet>
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  <gmd:CI_ResponsibleParty uuid="08D95C427FB1284799458932 56DADE37">
   <gmd:organisationName>
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```

```
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          <gmd:facsimile>
           <gco:CharacterString>301-713-4252</gco:CharacterString>
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```

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Wind), Oceanographic Sensor Data (XBT, ASVP); Multibeam Bathymetric Data.</gco:CharacterString>
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</gmd:description>
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     <gmd:CI_Citation>
      <gmd:title>
       <gco:CharacterString>None</gco:CharacterString>
      </gmd:title>
      <gmd:date gco:nilReason="Unknown"/>
     </gmd:CI_Citation>
    </gmd:thesaurusName>
   </gmd:MD_Keywords>
  </gmd:descriptiveKeywords>
  <gmd:resourceConstraints>
   <gmd:MD_LegalConstraints>
    <gmd:accessConstraints>
     <gmd:MD_RestrictionCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_RestrictionCode"
codeListValue="otherRestrictions" codeSpace="008">otherRestrictions</gmd:MD_RestrictionCode>
    </gmd:accessConstraints>
    <gmd:useConstraints>
     <gmd:MD_RestrictionCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_RestrictionCode"
codeListValue="otherRestrictions" codeSpace="008">otherRestrictions</gmd:MD_RestrictionCode>
    </gmd:useConstraints>
    <gmd:otherConstraints>
     <gco:CharacterString>Access Constraints: No Access Constraints. Use Constraints: No Use Constraints.</gco:CharacterString>
    </gmd:otherConstraints>
   </gmd:MD_LegalConstraints>
  </gmd:resourceConstraints>
  <gmd:aggregationInfo>
   <gmd:MD_AggregateInformation>
    <gmd:aggregateDataSetIdentifier>
     <gmd:MD_Identifier>
      <gmd:code>
       <gco:CharacterString>NOAA Office of Ocean Exploration and Research (OER)</gco:CharacterString>
      </gmd:code>
     </gmd:MD_Identifier>
    </gmd:aggregateDataSetIdentifier>
    <gmd:associationType>
     <gmd:DS_AssociationTypeCode
codeList="http://www.ngdc.noaa.gov/metadata/published/xsd/schema/resources/Codelist/gmxCodelists.xml#DS_AssociationTypeC
ode" codeListValue="largerWorkCitation">largerWorkCitation</gmd:DS_AssociationTypeCode>
    </gmd:associationType>
    <gmd:initiativeType>
```

<gmd:DS_InitiativeTypeCode codeList="http://www.ngdc.noaa.gov/metadata/published/xsd/schema/resources/Codelist/gmxCodelists.xml#DS_InitiativeTypeCode" codeListValue="program">program</gmd:DS_InitiativeTypeCode>
</gmd:initiativeType>
</gmd:MD_AggregateInformation>
</gmd:aggregationInfo>
<gmd:language>
<gco:CharacterString>eng; USA</gco:CharacterString>
</gmd:language>
<gmd:topicCategory>
<gmd:MD_TopicCategoryCode>oceans</gmd:MD_TopicCategoryCode>
</gmd:topicCategory>
<gmd:extent>
<gmd:EX_Extent id="boundingExtent">
<gmd:geographicElement>
<gmd:EX_GeographicBoundingBox id="boundingGeographicBoundingBox">
<gmd:westBoundLongitude>
<gco:Decimal>-150</gco:Decimal>
</gmd:westBoundLongitude>
<gmd:eastBoundLongitude>
<gco:Decimal>140</gco:Decimal>
</gmd:eastBoundLongitude>
<gmd:southBoundLatitude>
<gco:Decimal>10</gco:Decimal>
</gmd:southBoundLatitude>
<gmd:northBoundLatitude>
<gco:Decimal>25</gco:Decimal>
</gmd:northBoundLatitude>
</gmd:EX_GeographicBoundingBox>
</gmd:geographicElement>
<gmd:geographicElement>
<gmd:EX_GeographicDescription id="startPort">
<gmd:geographicIdentifier>
<gmd:MD_Identifier>
<gmd:authority>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>University-National Oceanographic Laboratory System (UNOLS) Port Table</gco:CharacterString>
</gmd:title>
<gmd:date gco:nilReason="missing"/>
</gmd:CI_Citation>
</gmd:authority>
<gmd:code>
<gco:CharacterString>Pearl Harbor, HI</gco:CharacterString>
</gmd:code>
</gmd:MD_Identifier>
</gmd:geographicIdentifier>
</gmd:EX_GeographicDescription>
</gmd:geographicElement>
<gmd:geographicElement>
<gmd:EX_GeographicDescription id="endPort">
<gmd:geographicIdentifier>
<gmd:MD_Identifier>
<gmd:authority>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>University-National Oceanographic Laboratory System (UNOLS) Port Table</gco:CharacterString>
</gmd:title>
<gmd:date gco:nilReason="missing"/>
</gmd:CI_Citation>
</gmd:authority>
<gmd:code>
<gco:CharacterString>Apra, GU</gco:CharacterString>
</gmd:code>
</gmd:MD_Identifier>
</gmd:geographicIdentifier>
</gmd:EX_GeographicDescription>

```
    </gmd:geographicElement>
    <gmd:temporalElement>
     <gmd:EX_TemporalExtent>
      <gmd:extent>
       <gml:TimePeriod gml:id="boundingTemporalExtent">
        <gml:description>ground condition</gml:description>
        <gml:beginPosition>2010-05-19</gml:beginPosition>
        <gml:endPosition>2010-06-03</gml:endPosition>
       </gml:TimePeriod>
      </gmd:extent>
     </gmd:EX_TemporalExtent>
    </gmd:temporalElement>
   </gmd:EX_Extent>
  </gmd:extent>
  <gmd:supplementalInformation>
   <gco:CharacterString>Data Inventory Report:</gco:CharacterString>
  </gmd:supplementalInformation>
 </gmd:MD_DataIdentification>
</gmd:identificationInfo>
<gmd:contentInfo>
 <gmd:MD_FeatureCatalogueDescription>
  <gmd:includedWithDataset>
   <gco:Boolean>false</gco:Boolean>
  </gmd:includedWithDataset>
  <gmd:featureCatalogueCitation gco:nilReason="unknown"/>
 </gmd:MD_FeatureCatalogueDescription>
</gmd:contentInfo>
<gmd:metadataMaintenance>
 <gmd:MD_MaintenanceInformation>
  <gmd:maintenanceAndUpdateFrequency gco:nilReason="Unknown"/>
  <gmd:maintenanceNote>
   <gco:CharacterString>This metadata was automatically generated from the FGDC Content Standard for Digital Geospatial
Metadata standard version FGDC-STD-001-1998.</gco:CharacterString>
  </gmd:maintenanceNote>
  <gmd:contact xlink:title="NOAA/OAR/OER - Ocean Exploration and Research">
   <gmd:CI_ResponsibleParty uuid="99fd1600-e1fd-11df-85ca-0800200c9a66">
    <gmd:organisationName>
     <gco:CharacterString>NOAA/OAR/OER - Ocean Exploration and Research</gco:CharacterString>
    </gmd:organisationName>
    <gmd:contactInfo>
     <gmd:CI_Contact>
      <gmd:phone>
       <gmd:CI_Telephone>
        <gmd:voice>
         <gco:CharacterString>301-713-9444</gco:CharacterString>
        </gmd:voice>
        <gmd:facsimile>
         <gco:CharacterString>301-713-4252</gco:CharacterString>
        </gmd:facsimile>
       </gmd:CI_Telephone>
      </gmd:phone>
      <gmd:address>
       <gmd:CI_Address>
        <gmd:deliveryPoint>
         <gco:CharacterString>SSMC3, 1315 East-West Highway, 10th Floor</gco:CharacterString>
        </gmd:deliveryPoint>
        <gmd:city>
         <gco:CharacterString>Silver Spring</gco:CharacterString>
        </gmd:city>
        <gmd:administrativeArea>
         <gco:CharacterString>MD</gco:CharacterString>
        </gmd:administrativeArea>
        <gmd:postalCode>
         <gco:CharacterString>20910</gco:CharacterString>
        </gmd:postalCode>
        <gmd:country>
         <gco:CharacterString>USA</gco:CharacterString>
```

```
        </gmd:country>
        <gmd:electronicMailAddress>
         <gco:CharacterString>ncddcmetadata@noaa.gov</gco:CharacterString>
        </gmd:electronicMailAddress>
       </gmd:CI_Address>
      </gmd:address>
      <gmd:hoursOfService>
       <gco:CharacterString>8am-5pm, Monday through Friday</gco:CharacterString>
      </gmd:hoursOfService>
      <gmd:contactInstructions/>
     </gmd:CI_Contact>
    </gmd:contactInfo>
    <gmd:role>
     <gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="custodian" codeSpace="002">custodian</gmd:CI_RoleCode>
    </gmd:role>
   </gmd:CI_ResponsibleParty>
  </gmd:contact>
 </gmd:MD_MaintenanceInformation>
</gmd:metadataMaintenance>
</gmd:MD_Metadata>
```

```
MD_Metadata:  (schema: http://www.isotc211.org/2005/gmd
..\..\..\ISO\gmd\gmd.xsd)
  File identifier:
    Character string:
      EX1003
  Language:
    Character string:
      eng; USA
  Character set:
    MD_CharacterSetCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_Character
SetCode)
      utf8
  Hierarchy level:
    MD_ScopeCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_ScopeCode
)
      fieldSession
  Hierarchy level name:
    Character string:
      cruise-level metadata
  Metadata author:  (title: NOAA/OAR/OER - Ocean Exploration and Research)
    CI_ResponsibleParty:  (uuid: 08D95C427FB128479945893256DADE37)
      Organisation name:
        Character string:
          NOAA/OAR/OER - Ocean Exploration and Research
      Contact information:
        CI_Contact:
          Phone:
            CI_Telephone:
              Voice:
                Character string:
                  301-713-9444
              Facsimile:
                Character string:
                  301-713-4252
          Address:
            CI_Address:
              Delivery point:
                Character string:
                  SSMC3, 1315 East-West Highway, 10th Floor
              City:
                Character string:
                  Silver Spring
              Administrative area:
                Character string:
                  MD
              Postal code:
                Character string:
                  20910
              Country:
                Character string:
```

```
                USA
            Electronic mail address:
              Character string:
                ncddcmetadata@noaa.gov
          Hours of service:
            Character string:
              8am-5pm, Monday through Friday
      Role:
        CI_RoleCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode)
          pointOfContact
  Date stamp:
    Date:
      2010-10-07
  Metadata standard name:
    Character string:
      ISO 19115 Geographic information - Metadata
  Metadata standard version:
    Character string:
      ISO 19115:2003(E)
  Identification information:
    MD_DataIdentification:
      Citation:
        CI_Citation:
          Title:
            Character string:
              EX1003 Transit from Hawaii to Guam (EX1003) on NOAA Ship
Okeanos Explorer in Hawaii to Guam between 20100519 and 20100603
          Date:
            CI_Date:
              Date:
                Date:
                  2010
              Date type:
                CI_DateTypeCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_DateTypeC
ode)
                  publication
          Identifier:
            MD_Identifier:
              Code:
                Character string:
                  EX1003
          Cited responsible party:  (title: NOAA/OAR/OER - Ocean Exploration
and Research)
            CI_ResponsibleParty:  (uuid: 0ca7cab0-e1fe-11df-85ca-
0800200c9a66)
              Organisation name:
                Character string:
                  NOAA/OAR/OER - Ocean Exploration and Research
              Contact information:
                CI_Contact:
                  Phone:
                    CI_Telephone:
                      Voice:
```

Character string:
301-713-9444
Facsimile:
Character string:
301-713-4252
Address:
CI_Address:
Delivery point:
Character string:
SSMC3, 1315 East-West Highway, 10th Floor
City:
Character string:
Silver Spring
Administrative area:
Character string:
MD
Postal code:
Character string:
20910
Country:
Character string:
USA
Electronic mail address:
Character string:
ncddcmetadata@noaa.gov
Hours of service:
Character string:
8am-5pm, Monday through Friday
Role:
CI_RoleCode: (codeList: http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode)
originator
Cited responsible party:
CI_ResponsibleParty:
Organisation name:
Character string:
Elizabeth Lobecker, OER/UNH
Role:
CI_RoleCode: (codeList: http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode)
scienceParty
Abstract:
Character string:
EX1003 Transit from Hawaii to Guam produced the following data: Ship Navigation Data (CNAV ,Gyro, POSMV), Ship Sensor Data (Depth, DGPS, Doppler, EventData, Met, Router, SAMOS, SciSwSys, TWind, Webship, Winches, Wind), Oceanographic Sensor Data (XBT, ASVP); Multibeam Bathymetric Data.
Purpose:
Character string:
Ocean Exploration and Research
Credit:
Character string:
OER/UNH
Status:

```
        MD_ProgressCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_ProgressC
ode)
          completed
      Point of contact:
        CI_ResponsibleParty:
          Organisation name:
            Character string:
              OER/UNH
          Contact information:
            CI_Contact:
              Phone:
                CI_Telephone:
                  Voice:
                    Character string:
                      401-662-9297
              Address:
                CI_Address:
                  Delivery point:
                    Character string:
                      24 Colovos Road
                  City:
                    Character string:
                      Durham
                  Administrative area:
                    Character string:
                      NH
                  Postal code:
                    Character string:
                      03824
                  Country:
                    Character string:
                      US
                  Electronic mail address:
                    Character string:
                      elizabeth.lobecker@noaa.gov
          Role:
            CI_RoleCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode)
              pointOfContact
      Resource maintenance:
        MD_MaintenanceInformation:
          Maintenance and update frequency:
            MD_MaintenanceFrequencyCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_Maintenan
ceFrequencyCode)
                unknown
      Descriptive keywords:
        MD_Keywords:
          Keyword:
            Character string:
              EARTH SCIENCE > Oceans
          Type:
```

```
            MD_KeywordTypeCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_KeywordTy
peCode)
              theme
          Thesaurus name:  (title: GCMD)
            CI_Citation:  (uuid: 9f0de6e6-428b-11df-9879-0800200c9a66)
              Title:
                Character string:
                  NASA/GCMD Data Center Keywords
              Date:  (nilReason: unknown)
              Cited responsible party:  (title: GCMD User Support Office)
                CI_ResponsibleParty:  (uuid:
8294BEE08B11359FE040AC8C5AB460D1)
                  Organisation name:
                    Character string:
                      NASA Global Change Master Directory (GCMD) User Support
Office
                  Contact information:
                    CI_Contact:
                      Phone:  (nilReason: missing)
                      Address:
                        CI_Address:
                          Delivery point:
                            Character string:
                              NASA Global Change Master Directory, Goddard
        Space
                                Flight Center
                          City:
                            Character string:
                              Greenbelt
                          Administrative area:
                            Character string:
                              MD
                          Postal code:
                            Character string:
                              20771
                          Country:
                            Character string:
                              USA
                          Electronic mail address:
                            Character string:
                              gcmduso@gcmd.gsfc.nasa.gov
                      Online resource:
                        CI_OnlineResource:  (uuid: 5e4e9d00-4288-11df-9879-
0800200c9a66)
                          Linkage:
                            URL:
                              http://gcmd.nasa.gov/index.html
                          Protocol:
                            Character string:
                              http
                          Application profile:
                            Character string:
                              web browser
                          Name:
```

Character string:
NASA Global Change Master Directory
Description:
Character string:
Home Page
Function:
CI_OnLineFunctionCode: (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_OnLineFun
ctionCode)
information
Contact instructions:
Character string:

http://gcmd.nasa.gov/MailComments/MailComments.jsf?rcpt=gcmduso
Role:
CI_RoleCode: (codeList:
http://www.ngdc.noaa.gov/metadata/published/xsd/schema/resources/Codelist/gmx
Codelists.xml#CI_RoleCode)
custodian
Cited responsible party: (title: GCMD Valids)
CI_ResponsibleParty: (uuid: 1edb41d0-428a-11df-9879-
0800200c9a66)
Organisation name:
Character string:
NASA Global Change Master Directory (GCMD)
Contact information:
CI_Contact:
Phone: (nilReason: missing)
Address:
CI_Address:
Delivery point:
Character string:
NASA Global Change Master Directory, Goddard
Space Flight
Center
City:
Character string:
Greenbelt
Administrative area:
Character string:
MD
Postal code:
Character string:
20771
Country:
Character string:
USA
Electronic mail address:
Character string:
gcmduso@gcmd.gsfc.nasa.gov
Online resource:
CI_OnlineResource: (uuid: 18ec3410-4289-11df-9879-
0800200c9a66)
Linkage:
URL:

http://gcmd.nasa.gov/Resources/valids/
Protocol:
Character string:
http
Application profile:
Character string:
web browser
Name:
Character string:
NASA Global Change Master Directory (GCMD)Keyword Page
Description:
Character string:
This page describes the NASA GCMD Keywords, how to reference those keywords and provides download instructions.
Function:
CI_OnLineFunctionCode: (codeList: http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_OnLineFunctionCode)
download
Contact instructions:
Character string:
http://gcmd.nasa.gov/MailComments/MailComments.jsf?rcpt=gcmduso
Role:
CI_RoleCode: (codeList: http://www.ngdc.noaa.gov/metadata/published/xsd/schema/resources/Codelist/gmxCodelists.xml#CI_RoleCode)
custodian
Descriptive keywords:
MD_Keywords:
Keyword:
Character string:
Ocean Exploration
Type:
MD_KeywordTypeCode: (codeList: http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_KeywordTypeCode)
theme
Thesaurus name:
CI_Citation:
Title:
Character string:
None
Date: (nilReason: Unknown)
Descriptive keywords:
MD_Keywords:
Keyword:
Character string:
South Pacific Ocean
Keyword:
Character string:
Hawaii to Guam
Type:

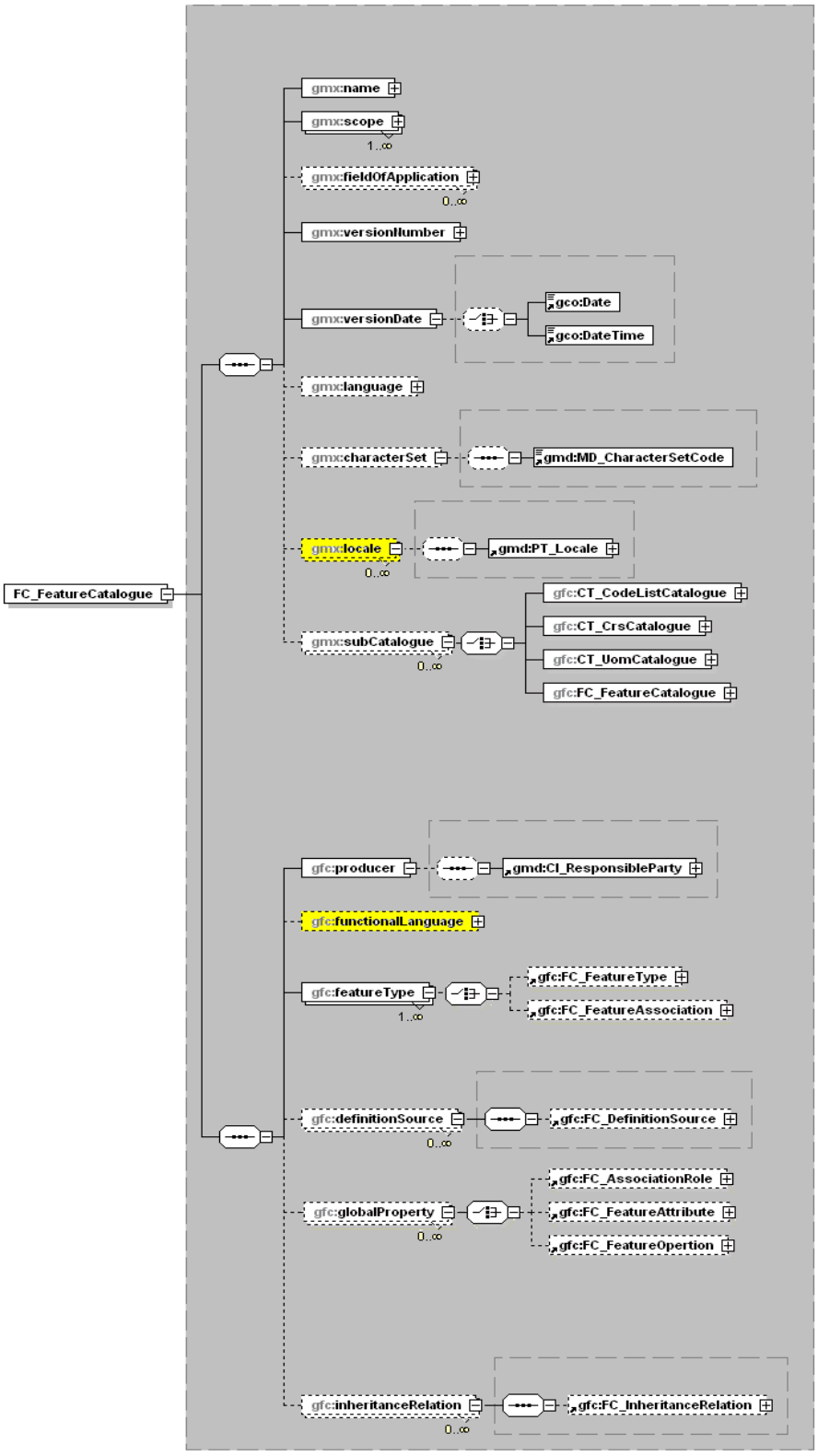
```
            MD_KeywordTypeCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_KeywordTy
peCode)
              place
          Thesaurus name:
            CI_Citation:
              Title:
                Character string:
                  None
              Date:  (nilReason: Unknown)
      Resource constraints:
        MD_LegalConstraints:
          Access constraints:
            MD_RestrictionCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_Restricti
onCode)
              otherRestrictions
          Use constraints:
            MD_RestrictionCode:  (codeList:
http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_Restricti
onCode)
              otherRestrictions
          Other constraints:
            Character string:
              Access Constraints: No Access Constraints. Use Constraints: No
Use Constraints.
      Aggregation information:
        MD_AggregateInformation:
          Aggregate dataset identifier:
            MD_Identifier:
              Code:
                Character string:
                  NOAA Office of Ocean Exploration and Research (OER)
          Association type:
            Association type code:  (codeList:
http://www.ngdc.noaa.gov/metadata/published/xsd/schema/resources/Codelist/gmx
Codelists.xml#DS_AssociationTypeCode)
              largerWorkCitation
          Initiative type:
            DS_InitiativeTypeCode:  (codeList:
http://www.ngdc.noaa.gov/metadata/published/xsd/schema/resources/Codelist/gmx
Codelists.xml#DS_InitiativeTypeCode)
              program
      Language:
        Character string:
          eng; USA
      Topic category:
        MD_TopicCategoryCode:
          oceans
      Extent:
        EX_Extent: (id: boundingExtent)
          Geographic element:
            EX_GeographicBoundingBox: (id: boundingGeographicBoundingBox)
              West bound longitude:
                Decimal:
```

```
                -150
            East bound longitude:
              Decimal:
                140
            South bound latitude:
              Decimal:
                10
            North bound latitude:
              Decimal:
                25
        Geographic element:
          EX_GeographicDescription: (id: startPort)
            Geographic identifier:
              MD_Identifier:
                Authority:
                  CI_Citation:
                    Title:
                      Character string:
                        University-National Oceanographic Laboratory System
(UNOLS) Port Table
                    Date:  (nilReason: missing)
                Code:
                  Character string:
                    Pearl Harbor, HI
        Geographic element:
          EX_GeographicDescription: (id: endPort)
            Geographic identifier:
              MD_Identifier:
                Authority:
                  CI_Citation:
                    Title:
                      Character string:
                        University-National Oceanographic Laboratory System
(UNOLS) Port Table
                    Date:  (nilReason: missing)
                Code:
                  Character string:
                    Apra, GU
        Temporal element:
          EX_TemporalExtent:
            Extent:
              Time period:
                gml:description:
                  ground condition
                Begin date:
                  2010-05-19
                End date:
                  2010-06-03
    Supplemental information:
      Character string:
        Data Inventory Report:
  Content information:
    MD_FeatureCatalogueDescription:
      Included with dataset:
        Boolean:
```

false
Feature catalogue citation: (nilReason: unknown)
Metadata maintenance:
MD_MaintenanceInformation:
Maintenance and update frequency: (nilReason: Unknown)
Maintenance note:
Character string:
This metadata was automatically generated from the FGDC Content Standard for Digital Geospatial Metadata
standard version FGDC-STD-001-1998.
Metadata author: (title: NOAA/OAR/OER - Ocean Exploration and Research)
CI_ResponsibleParty: (uuid: 99fd1600-e1fd-11df-85ca-0800200c9a66)
Organisation name:
Character string:
NOAA/OAR/OER - Ocean Exploration and Research
Contact information:
CI_Contact:
Phone:
CI_Telephone:
Voice:
Character string:
301-713-9444
Facsimile:
Character string:
301-713-4252
Address:
CI_Address:
Delivery point:
Character string:
SSMC3, 1315 East-West Highway, 10th Floor
City:
Character string:
Silver Spring
Administrative area:
Character string:
MD
Postal code:
Character string:
20910
Country:
Character string:
USA
Electronic mail address:
Character string:
ncddcmetadata@noaa.gov
Hours of service:
Character string:
8am-5pm, Monday through Friday
Contact instructions:
Role:
CI_RoleCode: (codeList: http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode)
custodian

FC PACKAGE

FC_FeatureCatalogue



FC_FeatureCatalogue – A catalogue containing definitions and descriptions of the feature types, feature attributes, and feature associations occurring in one or more sets of geographic data, together with any feature operations that may be applied.

Type: compound
Multiplicity:
Attributes: id, uuid

name – Name of the feature catalogue.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

scope – Subject domain(s) of feature types defined in the feature catalogue.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory, repeatable
Attributes: nilReason

fieldOfApplication – Description of kind(s) of use to which the feature catalogue may be put.

Type: gco:characterString
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

versionNumber – Version number of the feature catalogue.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason
Bets Practices: versionNumber may include a major version number or letter and a sequence of minor release numbers or letters, such as '3.2.4a'. Format may differ between cataloguing authorities.

versionDate – Effective date of the feature catalogue.

Type: gco:Date or gco:DateTime
Domain: date
Multiplicity: mandatory
Attributes: nilReason

language – Language of the metadata composed of an ISO639-2/T three-letter language code and an ISO3166-1 three-letter country code.

Type: gco:characterString
Domain: free text
Multiplicity: optional *this is a NAP requirement*
Attributes: nilReason
Best Practices: The language code and country code are documented in the following manner: <ISO639-2/T three-letter language code><;><blank space><ISO3166-1 three-letter country code> Country code is given in uppercase. See Annex B.

characterSet – Character coding standard in the metadata.

Type: MD_CharacterSetCode
Domain: ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2, 8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10, 8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii, ebcdic, eucKR, big5, GB2312
Multiplicity: optional *this is a NAP requirement*
Attributes: nilReason
Best Practices: The character set for the metadata is set to 'utf8' by default. See Annex C.

locale – Other languages used in metadata free text descriptions.

Type: PT_Locale
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: locale is mandatory when more than one language is used in free text descriptions

subCatalogue – A catalogue where the entries taken from a list of subject headings or an authority file are filed by subjects either in alphabetical or in classified order.

Type: CT_CodelistCatalogue or CT_CrsSatalogue or CT_UomCatalogue or FC_FeatureCatalog
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

producer – Contact information of the person or organisation having primary responsibility for the intellectual content of the feature catalogue.

Type: CI_ResponsibleParty
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

functionalLanguage – Language in which feature operations are formally specified.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: functionalLanguage is mandatory if featureOperation formal definition occurs in the feature catalogue.

featureType – Role that links this feature catalogue to the feature types that it contains.

Type: FC_FeatureType or FC_FeatureAssociation
Multiplicity: mandatory, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

definitionSource – Role that links this feature catalogue to the sources of definitions of feature types, property types, and listed values that it contains.

Type: FC_DefinitionSource
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

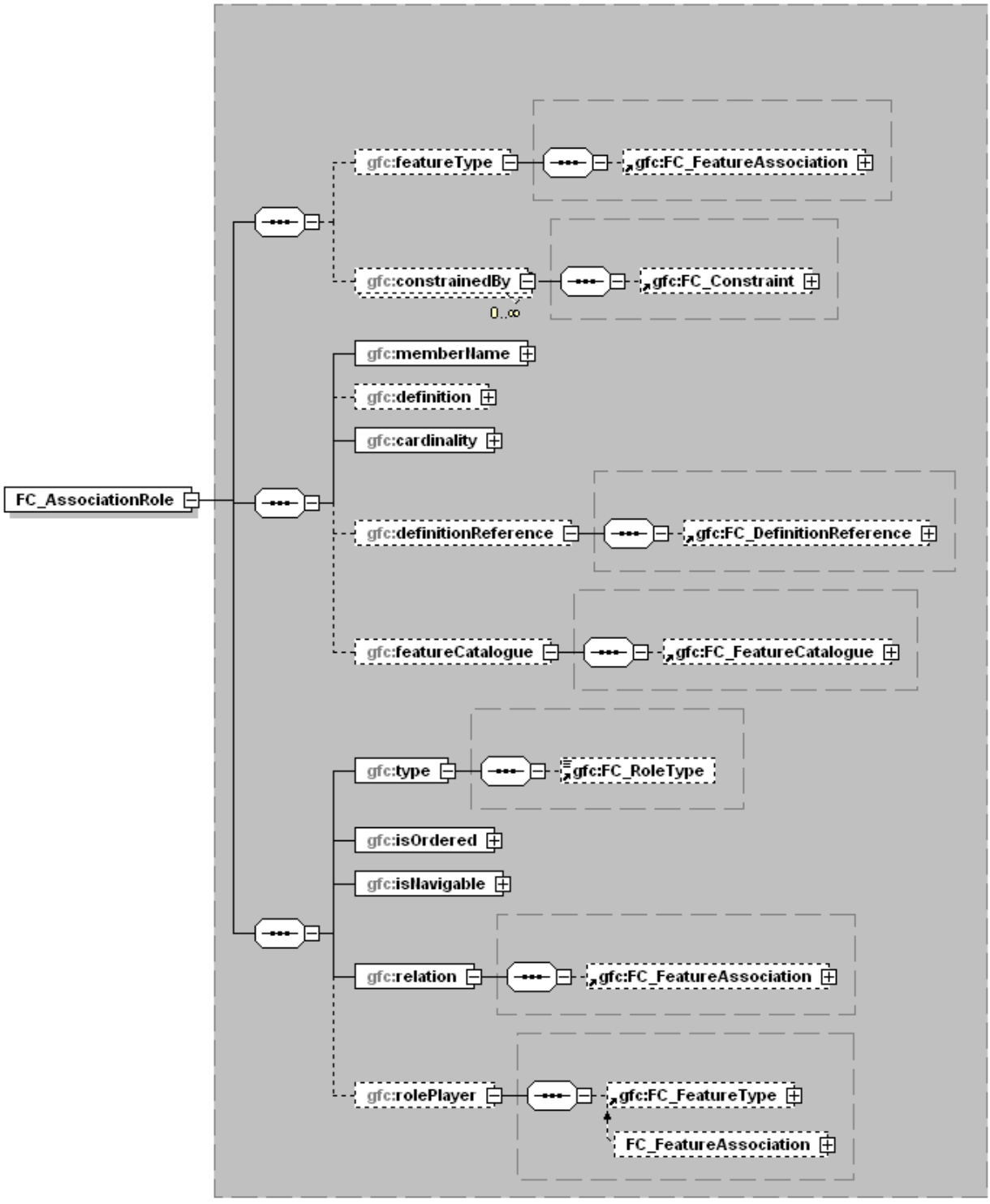
globalProperty – Feature properties.

Type: FC_AssociationRole or FC_FeatureAttribute or FC_FeatureOperation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

inheritanceRelation – Relationships that link a more generalized feature type (supertype) with a more specialized feature type (subtype).

Type: FC_InheritanceRelation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FC_AssociationRole



FC_AssociationRole – Real world phenomena with common properties.

Type: compound
Multiplicity: optional
Attributes: id, uuid
Best Practices: Association roles included in a feature catalogue shall be identified by a name that is unique within that feature catalog.

featureType – Role that links the operations with feature types that contain them.

Type: FC_FeatureType
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

constrainedBy – Role that links this property type to the constraints placed upon it.

Type: FC_Constraint
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

memberName – Member name that located this member within a feature type.

Type: gco:LocalName
Multiplicity: mandatory
Attributes: nilReason

definition – Definition of the feature type in a natural language.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

cardinality – Cardinality of the member in a feature class.

Type: gco:Multiplicity
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Default value is '0…*'.

definitionReference – Role that links this instance to the source of its definition.

Type: FC_DefinitionReference
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

featureCatalogue – Role that links this instance to the feature catalogue that it is found within.

Type:FC_FeatureCatalogue
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: This is mandatory but a bit recursive, use the nilReason attribute and fill in 'inapplicable' if this is not needed. If this is not the case, reference the feature catalogue identifier.

type – Type of association role, indicating whether this role acts as 'is part of' or 'is a member of' semantics.

Type: FC_RoleType
Multiplicity: mandatory
Attributes: nilReason

isOrdered – Indicates if the instances of this association role within the containing feature instance are ordered or not with FALSE = not ordered and TRUE = ordered.

Type: gco:Boolean
Domain: 0, 1 (0 = ‘false’, 1 = ‘true’)
Multiplicity: mandatory
Attributes: nilReason
Best Practices: Default value = FALSE.

isNavigable – Indicates whether this role is navigable from the source feature to the target feature of the association.

Type: gco:Boolean
Domain: 0, 1 (0 = ‘false’, 1 = ‘true’)
Multiplicity: mandatory
Attributes: nilReason
Best Practices: Default value = TRUE.

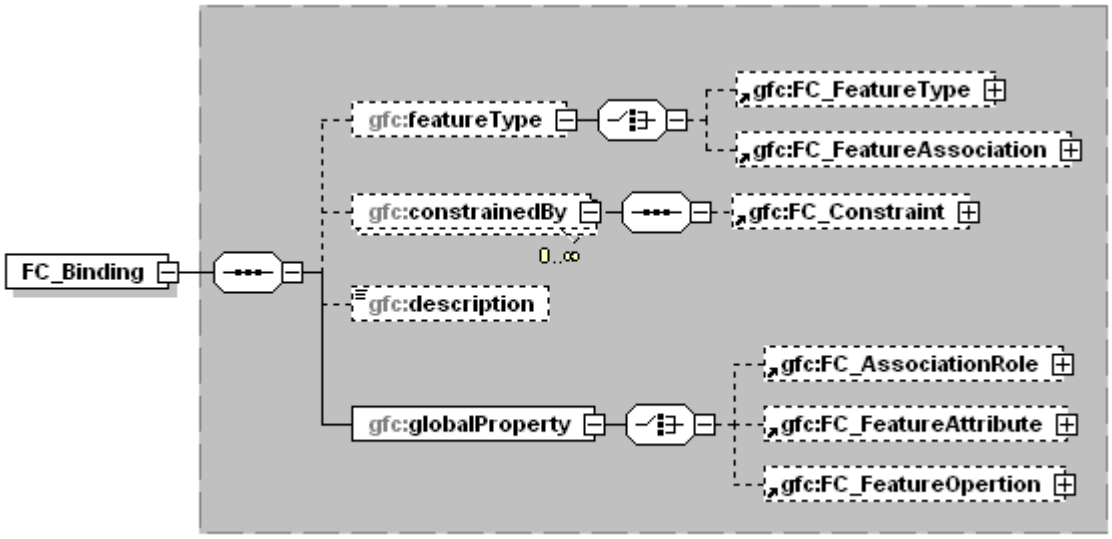
relation – Relation of which this association role is a part.

Type: FC_FeatureAssociation
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

rolePlayer – Type of the target value of this association role.

Type: FC_FeatureType
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FC_Binding



FC_Binding – Class that is used to describe the specifics of how a property type is bound to a particular feature type.

Type: compound
Multiplicity: optional
Attributes: id, uuid

featureType – Describes particular information regarding the use of this property type within this feature type.

Type: FC_FeatureType or FC_FeatureAssociation
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

constrainedBy – Role that links this property type to the constraints placed upon it.

Type: FC_Constraint
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

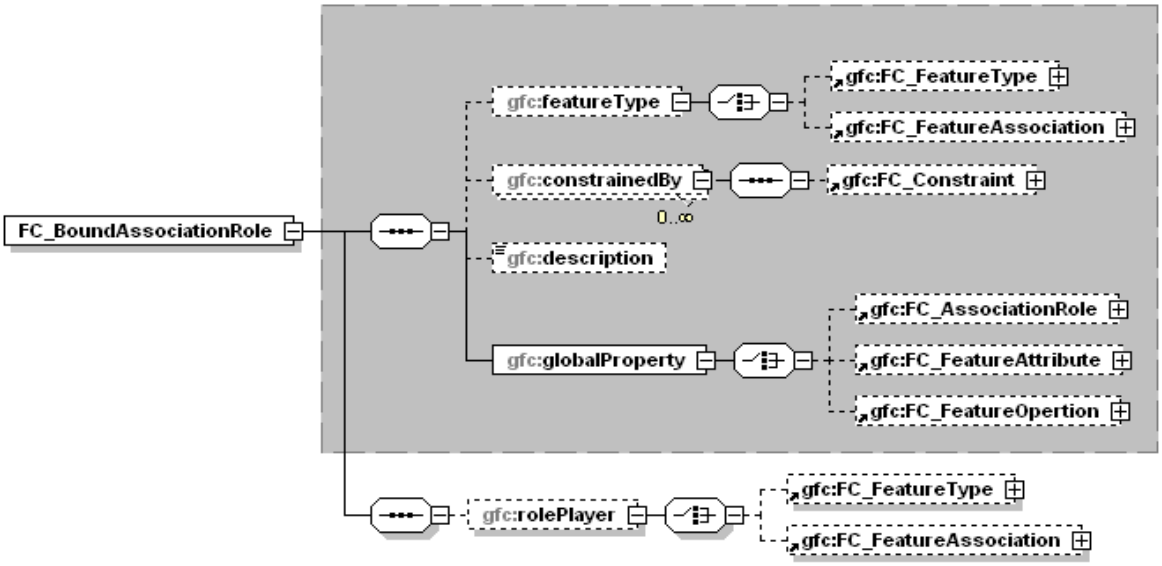
description – Description of how a property is bound to a particular feature type.

Type: gco:CharacterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

globalProperty – Role that links this to feature properties.

Type: FC_AssociationRole or FC_FeatureAttribute or FC_FeatureOperation
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FC_BoundAssociationRole



FC_BoundAssociationRole –

Type: compound
Multiplicity: optional
Attributes: id, uuid

featureType – Feature type involved in the binding

Type: FC_FeatureType or FC_FeatureAssociation
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

constrainedBy – Role that links this property type to the constraints placed upon it.

Type: FC_Constraint
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

description – Description of how a property is bound to a particular feature type.

Type: gco:CharacterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

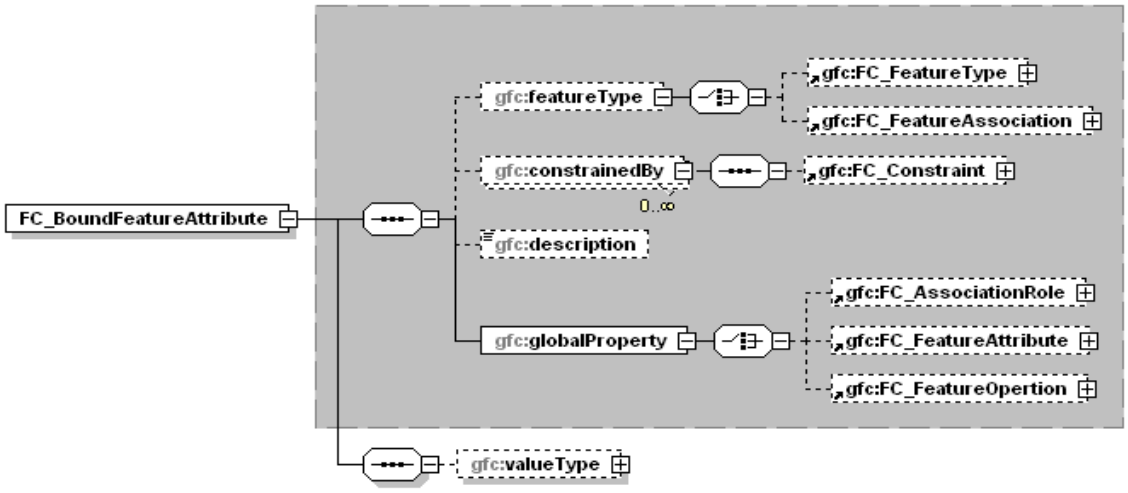
globalProperty – Role that links this to feature properties.

Type: FC_AssociationRole or FC_FeatureAttribute or FC_FeatureOperation
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

rolePlayer –

Type: FC_FeatureType or FC_FeatureAssociation
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FC_BoundFeatureAttribute



FC_BoundFeatureAttribute – Class that represents an association between a particular feature type and a particular property type, in order that operational effect information may be supplied for feature operations

Type: compound
Multiplicity: optional
Attributes: id, uuid

featureType – Feature type involved in the binding

Type: FC_FeatureType or FC_FeatureAssociation
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

constrainedBy – Role that links this property type to the constraints placed upon it.

Type: FC_Constraint
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

description – Description of how a property is bound to a particular feature type.

Type: gco:CharacterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

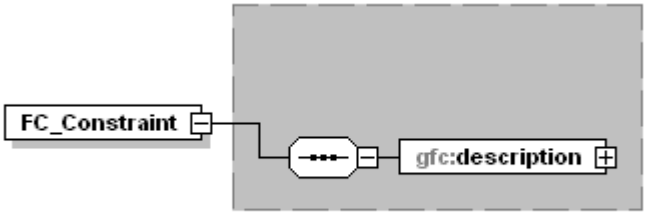
globalProperty – Role that links this to feature properties.

Type: FC_AssociationRole or FC_FeatureAttribute or FC_FeatureOperation
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

valueType – Type of value of this feature attribute.

Type: gco:TypeName
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FC_Constraint



FC_Constraint – Class for defining constraints for types.
Type: compound
Multiplicity: optional
Attributes: id, uuid

description – Description of the constraint that is being applied.
Type: gco:CharacterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

FAQ: **What is an example of a constraint?**

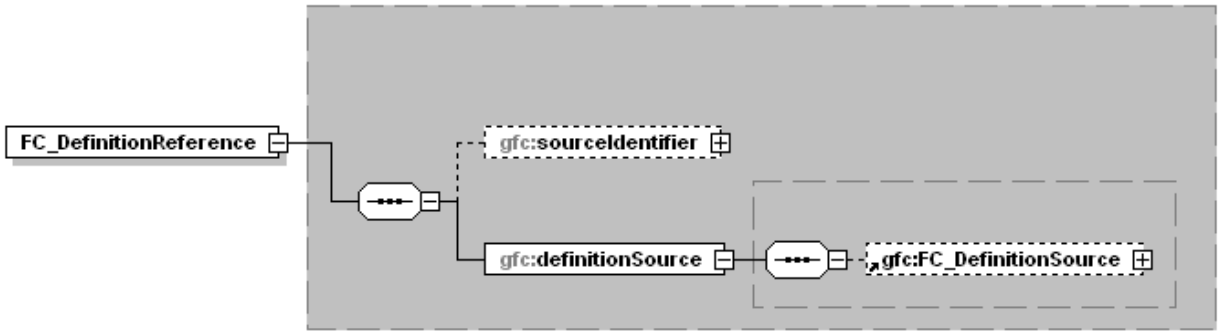
The example below shows that the measurement value of the 'depth' feature attribute is constrained as to direction of measurement.

Class FC_FeatureAttribute (identity = 4)	
Attribute FC_PropertyType.memberName	Depth
Attribute FC_PropertyType.definition	Distance measured from the highest point at surface level to the lowest point of the feature below the surface.
Attribute FC_PropertyType.cardinality	**1**
Role FC_PropertyType.featureType	**FC_FeatureType** (identity = 3)
	FC_Binding (identity = 6)
Role FC_PropertyType.constrainedBy	**FC_Constraint** (identity = 5)
Attribute FC_FeatureAttribute.code	DEP
Attribute FC_FeatureAttribute.valueMeasurementUnit	Meter
Attribute FC_FeatureAttribute.valueType	Real

Class FC_Constraint (identity = 5)	
Attribute FC_Constraint.description	Positive values represent distance below the reference point from which the measurement is made.

```
<gfc:FC_Constraint id="5">
        <gfc:description>
                <gco:CharacterString>Positive values represent distance below the reference point from which the
measurement is made.</gco:CharacterString>
        </gfc:description>
</gfc:FC_Constraint>
```

FC_DefinitionReference



FC_DefinitionReference – Class that links a data instance to the source of its definition.

Type: compound
Multiplicity: optional
Attributes: id, uuid

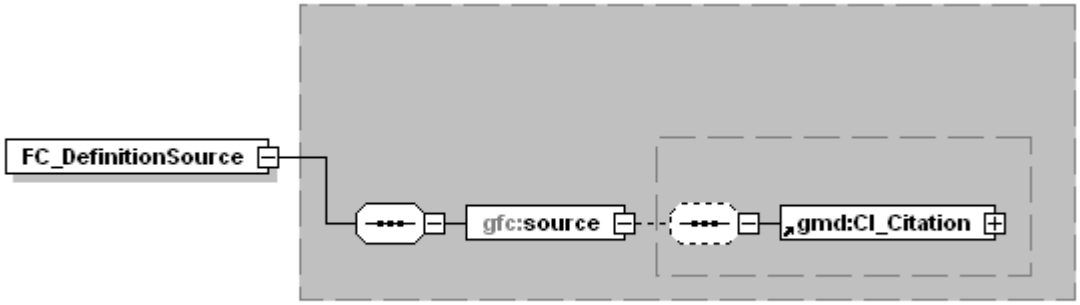
sourceIdentifier – Additional information to help locate the definition in the source document.

Type: gco:CharacterString
Domain: free text
Multiplicity: optional
Attributes: nilReason
Best Practices: The format of this information is specific to the structure of the source document.

definitionSource – Role that links this definition reference to the citation for the source document.

Type: FC_DefinitionSource
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

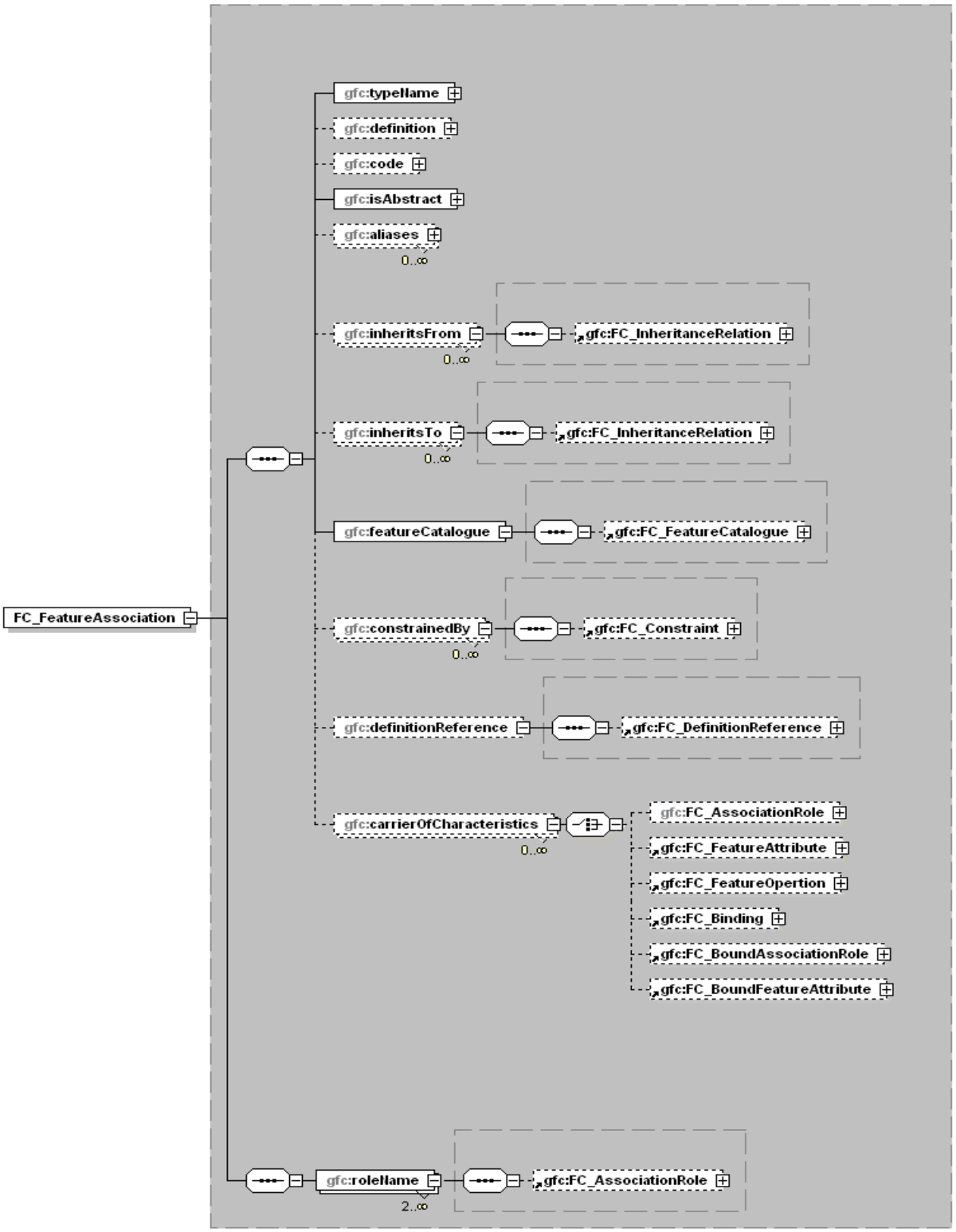
FC_DefinitionSource



FC_DefinitionSource – Class that specifies the source of a definition.
Type: compound
Multiplicity: optional
Attributes: id, uuid

source – Actual citation of the source, sufficient to identify the document and how to obtain it.
Type: CI_Citation
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FC_FeatureAssociation



FC_FeatureAssociation – Relationship that links instances of this feature type with instances of the same or of a different feature type.

Type: compound
Multiplicity: optional
Attributes: id, uuid
Best Practices: All feature attributes included in a feature catalogue shall be identified by a name that is unique within that feature catalogue.

typeName – Name that uniquely identifies the feature type within the catalogue.

Type: gco:LocalName
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

definition – Definition of the feature type in a natural language.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

code – Code that uniquely identifies the feature type within a catalogue.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

isAbstract – Boolean expression indicating if this is an abstract class.

Type: gco:Boolean
Domain: 0, 1 (0 = 'false', 1 = 'true')
Multiplicity: mandatory
Attributes: nilReason
Best Practices: Default value is set to false.

aliases – Other names by which the association is known.

Type: gco:LocalName
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

inheritsFrom – Identifies one or more feature types from which the subject feature type inherits all properties, including feature operations, feature attributes, and feature associations.

Type: FC_InheritanceRelation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

inheritsTo – Identifies one or more feature types which inherit all properties from subject feature type, including feature operations, feature attributes, and feature associations.

Type: FC_InheritanceRelation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

featureCatalogue – A feature catalogue contains its identification and contact information, and definition of some number of feature types with other information necessary for those definitions.

Type: FC_FeatureCatalogue
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: This is mandatory but a bit recursive, use the nilReason attribute and fill in 'inapplicable' if this is not needed. If this is not the case, reference the feature catalogue identifier.

constrainedBy – Role that links this feature type to the constraints placed upon it.

Type: FC_Constraint
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

definitionReference – Role that links this feature type to the source of its definition.

Type: FC_DefinitionReference
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

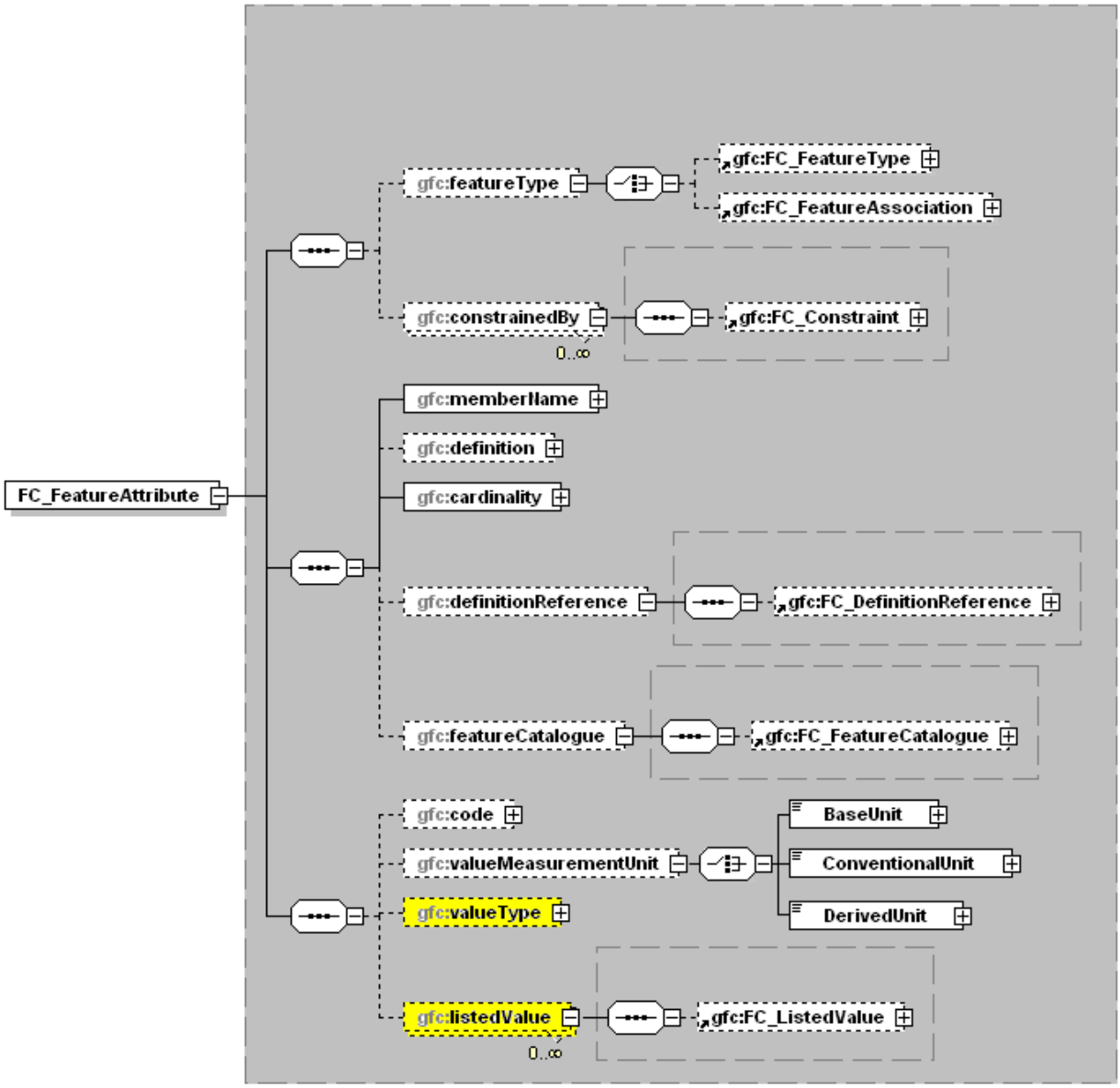
carrierOfCharacteristics – Property types that the feature type contains.

Type: FC_AssociationRole or FC_FeatureAttribute or FC_FeatureOperation or FC_Binding or FC_BoundAssociationRole or FC_BoundFeatureAttribute
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

roleName – Roles that are a part of this association.

Type: FC_AssociationRole
Multiplicity: mandatory, repeatable, minimum of two
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FC_FeatureAttribute



FC_FeatureAttribute – Characteristic of a feature type.

Type: compound
Multiplicity: optional
Attributes: id, uuid
Best Practices: Feature attributes included in a feature catalogue shall be identified by a name that is unique within that feature catalog.

featureType – Role that links the operations with feature types that contain them.

Type: FC_FeatureType or FC_FeatureAssociation
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

constrainedBy – Role that links this property type to the constraints placed upon it.
Type: FC_Constraint
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

memberName – Member name that located this member within a feature type.
Type: gco:LocalName
Multiplicity: mandatory
Attributes: nilReason

definition – Definition of the feature type in a natural language.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

cardinality – Cardinality of the member in a feature class.
Type: gco:Multiplicity
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Default value is '1'.

definitionReference – Role that links this instance to the source of its definition.
Type: FC_DefinitionReference
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

featureCatalogue – Role that links this instance to the feature catalogue that it is found within.
Type: FC_FeatureCatalogue
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: This is mandatory but a bit recursive, use the nilReason attribute and fill in 'inapplicable' if this is not needed. If this is not the case, reference the feature catalogue identifier.

code – Numeric of alphanumeric code that uniquely identifies the feature attribute within the feature catalogue.
Type: gco:CharacterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

valueMeasurementUnit – Unit of measure used for values of this feature attribute.
Type: BaseUnit or ConventionalUnit or DerivedUnit
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: See Annex D.

valueType – Type of the value of this feature attribute; a name from some namespace.
Type: gco:TypeName
Multiplicity: conditional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: valueType is mandatory if feature attribute listedValue is empty.

listedValue – Permissible values of this feature attribute. If present, then this feature attribute is enumerated.

Type: FC_ListedValue
Multiplicity: conditional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: listedValue is mandatory if valueType is not given.

FAQ: What is an example of a feature attribute?

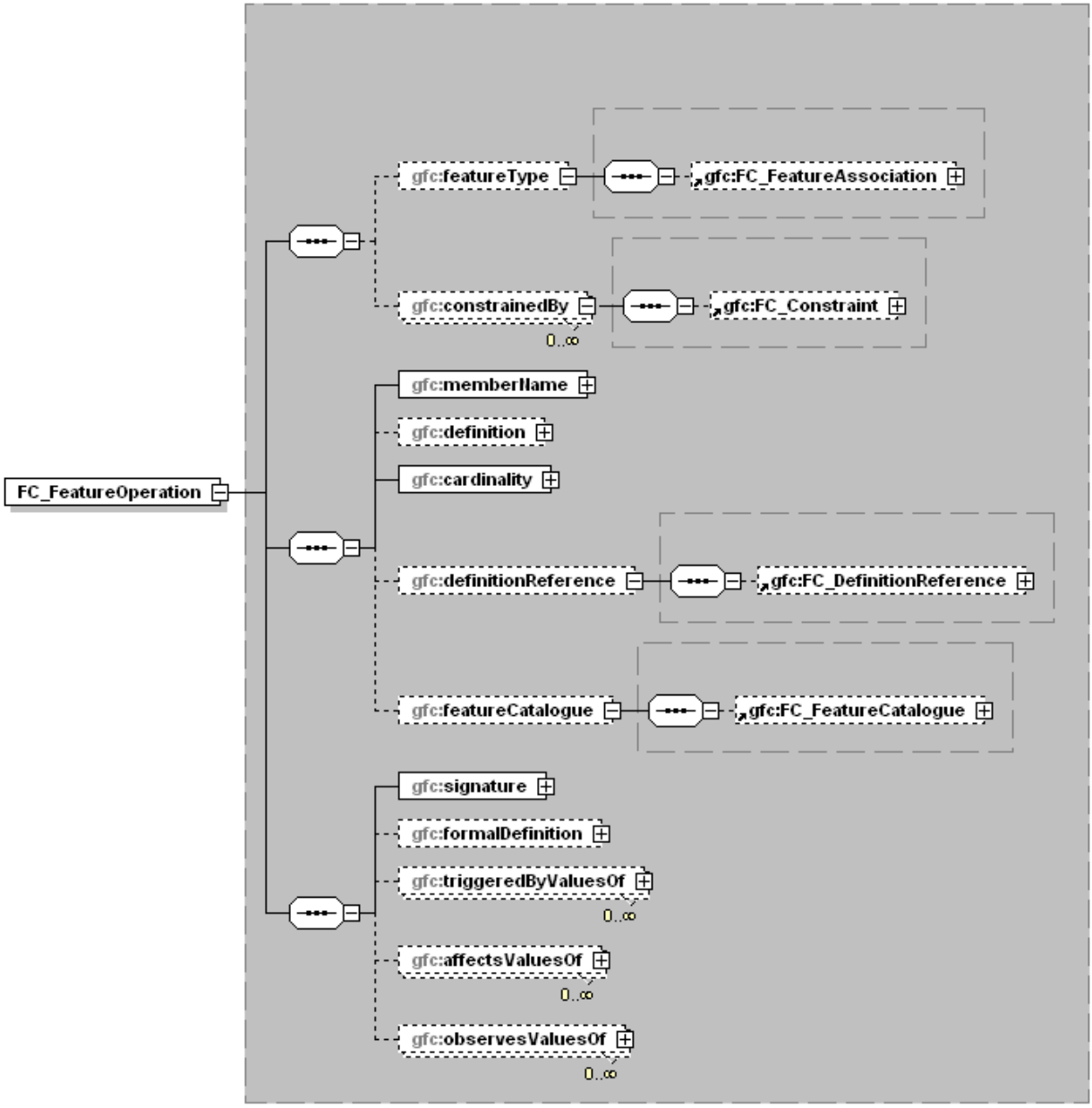
A feature attribute can have a name, a data type, and a value domain associated to it. A feature attribute for a feature instance also has an attribute value taken from the value domain.

Ex:
A feature named ‘color’ may have an attribute value ‘green’.

A feature named ‘length’ may have an attribute value ’54.6’.

A feature type of ‘Roads’ may have several attributes, such as ‘Number of Lanes’ and ‘Road Surface’, etc.

FC_FeatureOperation



FC_FeatureOperation – Operation that every feature of a feature type may perform.

Type: compound

Multiplicity: conditional

Attributes: id, uuid

Beat Practices: Mandatory if feature operation name occurs in feature operations names list. All feature operations included in a feature catalogue shall be identified by a name that is unique within that feature catalogue.

featureType – Role that links the operations with feature types that contain them.
Type: FC_FeatureType
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

constrainedBy – Role that links this property type to the constraints placed upon it.
Type: FC_Constraint
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

memberName – Member name that located this member within a feature type.
Type: gco:LocalName
Multiplicity: mandatory
Attributes: nilReason

definition – Definition of the feature type in a natural language.
Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

cardinality – Cardinality of the member in a feature class.
Type: gco:Multiplicity
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: Default value is '1'.

definitionReference – Role that links this instance to the source of its definition.
Type: FC_DefinitionReference
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

featureCatalogue – Role that links this instance to the feature catalogue that it is found within.
Type:FC_FeatureCatalogue
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: This is mandatory but a bit recursive, use the nilReason attribute and fill in 'inapplicable' if this is not needed. If this is not the case, reference the feature catalogue identifier.

signature – Name and parameters for this operation.
Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason
Best Practices: The signature of an operation must be unique. The signature is usually derived from the formal definition.

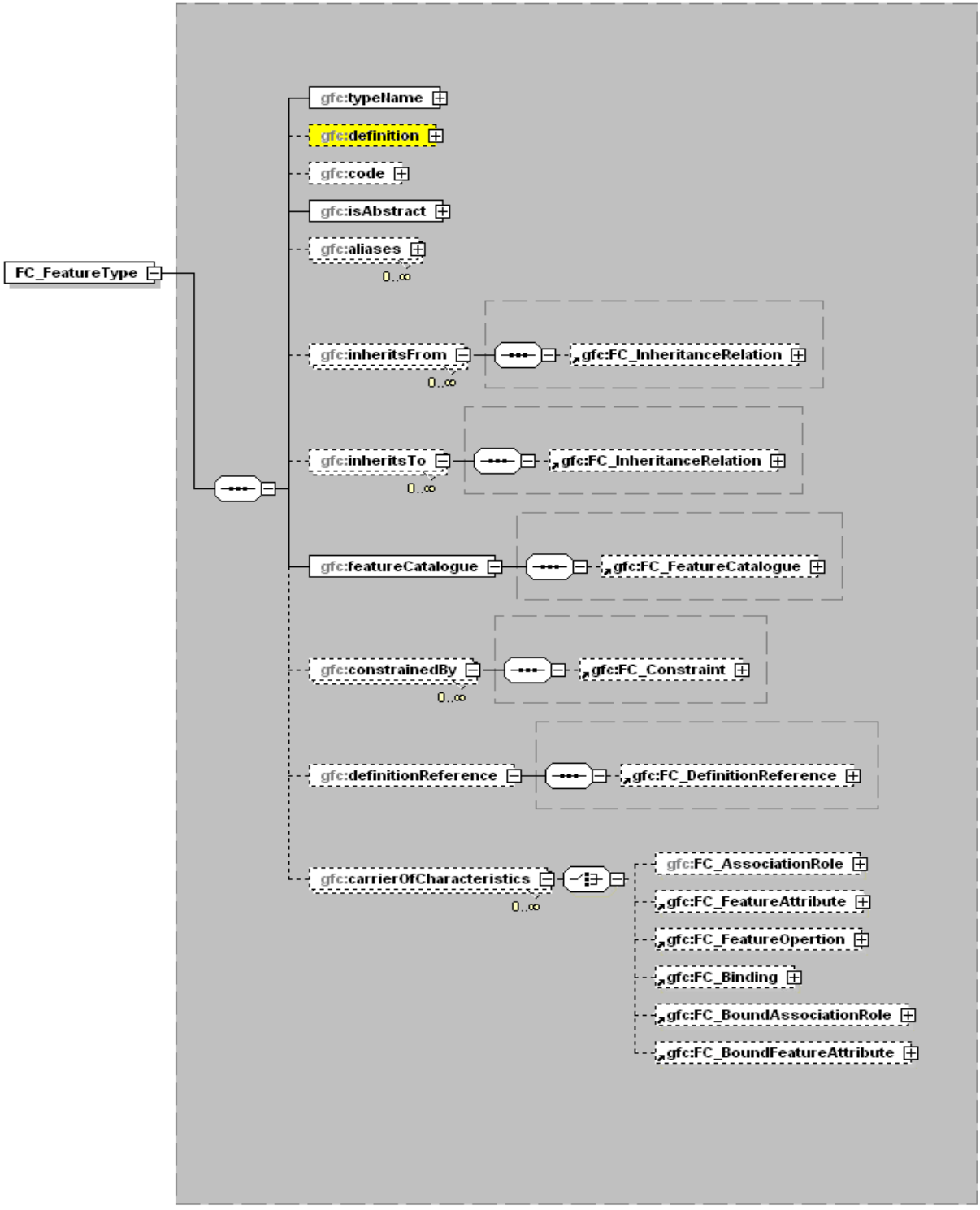
formalDefinition – Formal description of the behavior of the member.
Type: gco:characterString
Domain: free text

Multiplicity: optional
Attributes: nilReason
triggeredByValuesOf – Specifies attributes which may trigger an operation.
Type: FC_BoundFeatureAttribute
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

affectsValuesOf – Specifies attributes that will be affected by an operation.
Type: FC_BoundFeatureAttribute
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

observesValuesOf – Specifies attributes that may be used as input to perform an operation.
Type: FC_BoundFeatureAttribute
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FC_FeatureType



FC_FeatureType – Real world phenomena with common properties.

Type: compound
Multiplicity: optional
Attributes: id, uuid
Best Practices: All feature types included in a feature catalogue shall be identified by a name that is unique within that feature catalogue.

typeName – Name that uniquely identifies the feature type within the catalogue.

Type: gco:LocalName
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

definition – Definition of the feature type in a natural language.

Type: gco:characterString
Domain: free text
Multiplicity: conditional
Attributes: nilReason
Best Practices: definition is mandatory if definition is not provided by definition source.

code – Code that uniquely identifies the feature type within a catalogue.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

isAbstract – Boolean expression indicating if this is an abstract class.

Type: gco:Boolean
Domain: 0, 1 (0 = 'false', 1 = 'true')
Multiplicity: mandatory
Attributes: nilReason
Best Practices: Default value is set to false.

aliases – Other names by which the type is known.

Type: gco:LocalName
Domain: free text
Multiplicity: optional, repeatable
Attributes: nilReason

inheritsFrom – Identifies one or more feature types from which the subject feature type inherits all properties, including feature operations, feature attributes, and feature associations.

Type: FC_InheritanceRelation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

inheritsTo – Identifies one or more feature types which inherit all properties from subject feature type, including feature operations, feature attributes, and feature associations.

Type: FC_InheritanceRelation
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

featureCatalogue – A feature catalogue contains its identification and contact information, and definition of some number of feature types with other information necessary for those definitions.

Type: FC_FeatureCatalogue
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason
Best Practices: This is mandatory but a bit recursive, use the nilReason attribute and fill in 'inapplicable' if this is not needed. If this is not the case, reference the feature catalogue identifier.

constrainedBy – Role that links this feature type to the constraints placed upon it.

Type: FC_Constraint
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

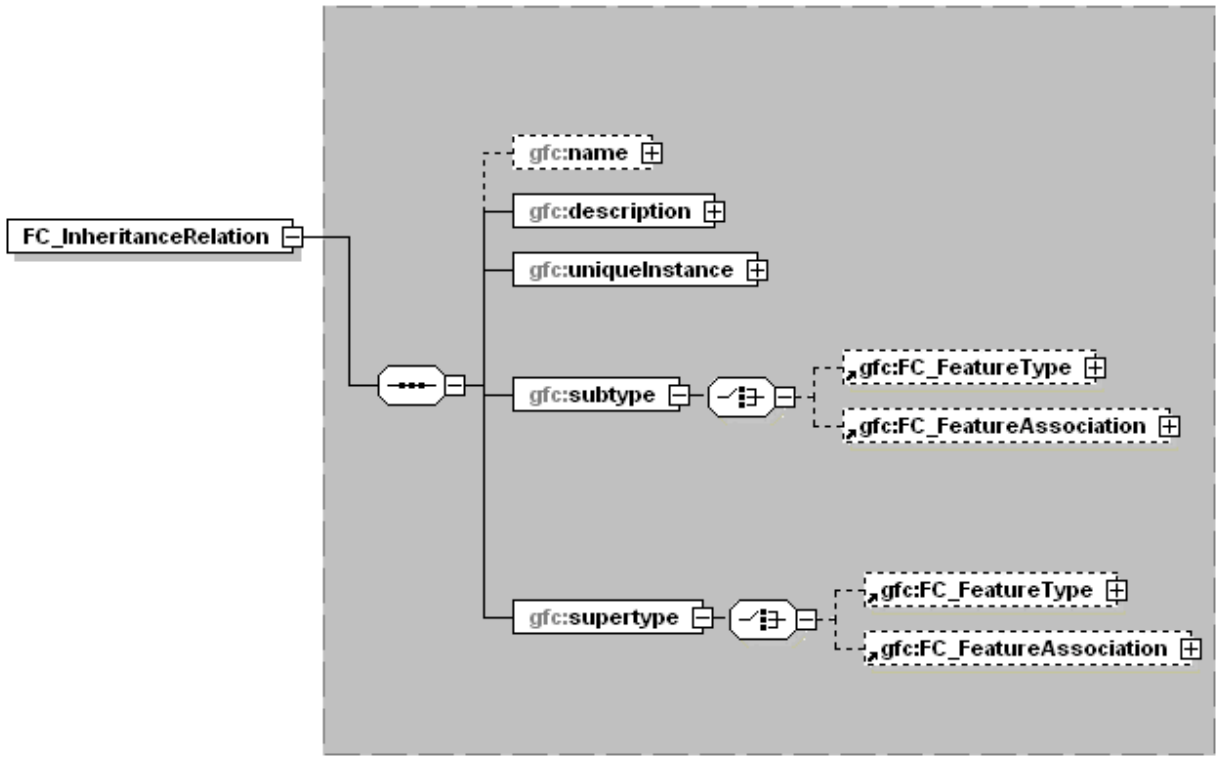
definitionReference – Role that links this feature type to the source of its definition.

Type: FC_DefinitionReference
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

carrierOfCharacteristics – Property types that the feature type contains.

Type: FC_AssociationRole or FC_FeatureAttribute or FC_FeatureOperation or FC_Binding or FC_BoundAssociationRole or FC_BoundFeatureAttribute
Multiplicity: optional, repeatable
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FC_InheritanceRelation



FC_InheritanceRelation – Links a more generalized supertype with a more specialized subtype.

Type: compound
Multiplicity: optional
Attributes: id, uuid

name – Name that uniquely identifies this inheritance relationship within the feature catalogue that contains this inherited relation.

Type: gco:characterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

description – Natural language description of the inheritance relationship.

Type: gco:characterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

uniqueInstance – Indicates if an instance of the supertype can be an instance of at most one of its subtypes.

Type: gco:Boolean
Domain: 0,1 (0 = false, 1 = true)
Multiplicity: mandatory
Attributes: nilReason

subtype – Identifies one feature type to which the associated Superclass feature type supplies inherence properties, associations, and operations.

Type: FC_FeatureType
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

supertype – Identifies one feature type from which the associated subtype class inherits properties, associations, and operations.

Type: FC_FeatureType
Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

---

FAQ: What is an example of an inheritance relation?

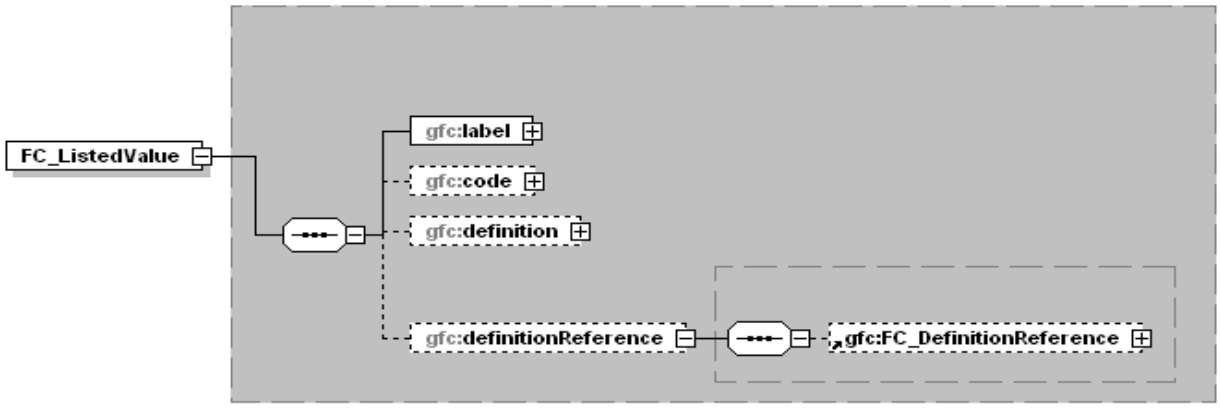
Below is an example of a feature catalogue that contains the **'is a'** inheritance relation relating the two feature types 'building' and 'lighthouse'. An instance of a 'lighthouse' feature type is also an instance of a 'building' feature type; feature properties, feature associations, and feature operations to the 'building' feature type in the example feature catalogue also apply to the 'lighthouse' feature type. Pay special attention to the identities.

Class FC_FeatureType (identity = 25)	
Attribute FC_FeatureType.typeName	Building
Attribute FC_FeatureType.definition	A relatively permanent structure, roofed and usually walled and designed for some particular use.
Attribute FC_FeatureType.code	AL015
Attribute FC_FeatureType.isAbstract	FALSE
Role FC_FeatureType.inheritsTo	**FC_FeatureInheritanceRelation** (identity = 27)
Role FC_FeatureType.featureCatalogue	**FC_FeatureCatalogue** (identity = 1)

Class FC_FeatureType (identity = 26)	
Attribute FC_FeatureType.typeName	Lighthouse
Attribute FC_FeatureType.definition	A distinctive structure exhibiting light(s) designed to serve as an aid to navigation.
Attribute FC_FeatureType.code	BC050
Attribute FC_FeatureType.isAbstract	FALSE
Role FC_FeatureType.inheritsFrom	**FC_FeatureInheritanceRelation** (identity = 27)
Role FC_FeatureType.featureCatalogue	**FC_FeatureCatalogue** (identity = 1)

Class FC_InheritanceRelation (identity = 27)	
Attribute FC_InheritanceRelation.name	is a (see above)
Attribute FC_InheritanceRelation.description	An object is classified as a specialization of another object.
Attribute FC_InheritanceRelation.uniqueInstance	TRUE
Role FC_InheritanceRelation.subtype	**FC_FeatureType** (identity = 26)
Role FC_InheritanceRelation.supertype	**FC_FeatureType** (identity = 25)

FC_ListedValue



FC_ListedValue – Value for an enumerated feature attribute domain, including its codes and interpretation.
Type: compound
Multiplicity: optional
Attributes: id, uuid

label – Descriptive label that uniquely identifies one value of the feature attribute.
Type: gco:CharacterString
Domain: free text
Multiplicity: mandatory
Attributes: nilReason

code – Numeric or alphanumeric code that uniquely identifies this value of the feature attribute.
Type: gco:CharacterString
Domain: free text
Multiplicity: optional
Attributes: nilReason

FAQ: What is an example of a listed value attribute code?

A country code would be an example of an alphanumeric code that uniquely identifies a value.

---

definition – Definition of the attribute value in a natural language.
Type: gco:CharacterString
Domain: free text
Multiplicity: optional
Attributes: nilReason
Best Practices: If definition is not provided, the definitionReference may specify a citation where the definition may be found as well as any additional information.

definitionReference – Role that links this instance to the source of its definition.
Type: FC_DefinitionReference
Multiplicity: optional
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

FAQ: What is an example of FC_ListedValue and how is it used?

If I have a feature type named 'Roads' and a feature attribute of that type named 'Road Surface', I will want to document the domain that identifies the road surface materials.

Ex:

Label	Code
Gravel	001
Concrete	002
Dirt	003
Asphalt	004

```
<gfc:listedValue>
        <gfc:FC_ListedValue>
                <gfc:label>
                        <gco:CharacterString>gravel</gco:CharacterString>
                </gfc:label>
                <gfc:code>
                        <gco:CharacterString>001</gco:CharacterString>
                </gfc:code>
                <gfc:definition>
                        <gco:CharacterString>unpaved road surfaced with gravel</gco:CharacterString>
                </gfc:definition>
        </gfc:FC_ListedValue>
</gfc:listedValue>
<gfc:listedValue>
        <gfc:FC_ListedValue>
                <gfc:label>
                        <gco:CharacterString>concrete</gco:CharacterString>
                </gfc:label>
                <gfc:code>
                        <gco:CharacterString>002</gco:CharacterString>
                </gfc:code>
                <gfc:definition>
                        <gco:CharacterString>road paved with concrete, includes jointed plain (JPCP), jointed reinforced (JRCP) and continuously
                reinforced (CRCP)</gco:CharacterString>
                </gfc:definition>
        </gfc:FC_ListedValue>
</gfc:listedValue>
<gfc:listedValue>
        <gfc:FC_ListedValue>
                <gfc:label>
                        <gco:CharacterString>dirt</gco:CharacterString>
                </gfc:label>
                <gfc:code>
                        <gco:CharacterString>003</gco:CharacterString>
                </gfc:code>
                <gfc:definition>
                        <gco:CharacterString>unpaved road made from subgrade material</gco:CharacterString>
                </gfc:definition>
        </gfc:FC_ListedValue>
</gfc:listedValue>
<gfc:listedValue>
        <gfc:FC_ListedValue>
                <gfc:label>
                        <gco:CharacterString>asphalt</gco:CharacterString>
                </gfc:label>
                <gfc:code>
                        <gco:CharacterString>004</gco:CharacterString>
                </gfc:code>
                <gfc:definition>
                        <gco:CharacterString>road paved with the petroleum based asphalt concrete</gco:CharacterString>
                </gfc:definition>
        </gfc:FC_ListedValue>
</gfc:listedValue>
```

FEATURE CATALOG EXAMPLE

Feature Catalog Example – Transportation96	
Feature Catalogue *id=_1*	
Name:	Transportation96
Scope:	Road network in Urbana-Champaign surveyed in 1996 for all transportation facilities within the twin cities.
Field of Application:	Transportation planning, Land use planning
Version Number:	1.1
Version Date:	1996-10-01
Definition Source:	Transportation Survey Guide in 1996
Feature Catalogue Producer:	CCRPC 10 Main St. Urbana, IL 61801 Telephone: +1 217 488-3331 Fax: +1 217 482-9331 Email: landuse96@urbana.net

Feature Catalog Example – Transportation96	
Feature Type *id=_2*	
Name:	Roads
Definition:	Open way for the movement of motor vehicles on land
Code:	TR96-02
Feature Attribute Names:	Number of lanes *(id=_3)*, Road Surface *(id=_4)*
Feature Attribute *id=_3*	
Name:	Number of Lanes
Definition:	Number of lanes of the road, including both directions
Code:	15942
Value Data Type:	Long
Value Measurement Unit:	lanes
Value Domain Type:	0 = 'not enumerated'
Value Domain:	N/A
Feature Attribute *id=_4*	
Name:	Road Surface
Definition:	Road surface material
Code:	19586
Value Data Type:	text
Value Domain Type:	1 = 'enumerated'
Value Domain:	

Label	**Code**
gravel	**001**
concrete	**002**
dirt	**003**
asphalt	**004**

```
<?xml version="1.0" encoding="UTF-8"?>
<gfc:FC_FeatureCatalogue id="_1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:gfc="http://www.isotc211.org/2005/gfc" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmx="http://www.isotc211.org/2005/gmx" xsi:schemaLocation="http://www.isotc211.org/2005/gfc
Q:\users\mize.jacqueline\ISO\gfc\gfc.xsd">
 <gmx:name>
  <gco:CharacterString>Transportation96</gco:CharacterString>
 </gmx:name>
 <gmx:scope>
  <gco:CharacterString>Road network in Urbana-Champaign surveyed in 1996 for all transportation facilities within the twin
cities.</gco:CharacterString>
 </gmx:scope>
 <gmx:fieldOfApplication>
  <gco:CharacterString>Transportation planning, Land use planning</gco:CharacterString>
 </gmx:fieldOfApplication>
 <gmx:versionNumber>
  <gco:CharacterString>1.1</gco:CharacterString>
 </gmx:versionNumber>
 <gmx:versionDate>
  <gco:Date>1996-10-01</gco:Date>
 </gmx:versionDate>
 <gmx:language>
  <gco:CharacterString>eng; US</gco:CharacterString>
 </gmx:language>
 <gmx:characterSet>
  <gmd:MD_CharacterSetCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_CharacterSetCodeType" codeListValue="utf8"/>
 </gmx:characterSet>
 <gfc:producer>
  <gmd:CI_ResponsibleParty>
   <gmd:organisationName>
    <gco:CharacterString>CCRPC</gco:CharacterString>
   </gmd:organisationName>
   <gmd:contactInfo>
    <gmd:CI_Contact>
     <gmd:phone>
      <gmd:CI_Telephone>
       <gmd:voice>
        <gco:CharacterString>+1 217 488-3331</gco:CharacterString>
       </gmd:voice>
       <gmd:facsimile>
        <gco:CharacterString>+1 217 482-9331</gco:CharacterString>
       </gmd:facsimile>
      </gmd:CI_Telephone>
     </gmd:phone>
     <gmd:address>
      <gmd:CI_Address>
       <gmd:deliveryPoint>
        <gco:CharacterString>10 Main St.</gco:CharacterString>
       </gmd:deliveryPoint>
       <gmd:city>
        <gco:CharacterString>Urbana</gco:CharacterString>
       </gmd:city>
       <gmd:administrativeArea>
        <gco:CharacterString>IL</gco:CharacterString>
       </gmd:administrativeArea>
       <gmd:postalCode>
        <gco:CharacterString>61801</gco:CharacterString>
       </gmd:postalCode>
       <gmd:country>
        <gco:CharacterString>US</gco:CharacterString>
       </gmd:country>
       <gmd:electronicMailAddress>
        <gco:CharacterString>landuse96@urbana.net</gco:CharacterString>
       </gmd:electronicMailAddress>
      </gmd:CI_Address>
```

```
     </gmd:address>
    </gmd:CI_Contact>
   </gmd:contactInfo>
   <gmd:role>
    <gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="resourceProvider"/>
   </gmd:role>
  </gmd:CI_ResponsibleParty>
 </gfc:producer>
 <gfc:featureType>
  <gfc:FC_FeatureType id="_2">
   <gfc:typeName>
    <gco:LocalName>Roads</gco:LocalName>
   </gfc:typeName>
   <gfc:definition>
    <gco:CharacterString>Open way for the movement of motor vehicles on land</gco:CharacterString>
   </gfc:definition>
   <gfc:code>
    <gco:CharacterString>TR96-02</gco:CharacterString>
   </gfc:code>
   <gfc:isAbstract>
    <gco:Boolean>false</gco:Boolean>
   </gfc:isAbstract>
   <gfc:featureCatalogue gco:nilReason="unknown"/>
   <gfc:carrierOfCharacteristics>
    <gfc:FC_FeatureAttribute id="_3">
     <gfc:memberName>
      <gco:LocalName>Number of Lanes</gco:LocalName>
     </gfc:memberName>
     <gfc:definition>
      <gco:CharacterString>Number of lanes of the road, including both directions</gco:CharacterString>
     </gfc:definition>
     <gfc:cardinality>
      <gco:Multiplicity>
       <gco:range>
        <gco:MultiplicityRange>
         <gco:lower>
          <gco:Integer>1</gco:Integer>
         </gco:lower>
         <gco:upper>
          <gco:UnlimitedInteger xsi:nil="true" isInfinite="true"/>
         </gco:upper>
        </gco:MultiplicityRange>
       </gco:range>
      </gco:Multiplicity>
     </gfc:cardinality>
     <gfc:code>
      <gco:CharacterString>15942</gco:CharacterString>
     </gfc:code>
     <gfc:valueMeasurementUnit>
      <gml:UnitDefinition gml:id="lanes">
       <gml:identifier codeSpace="lanes"/>
      </gml:UnitDefinition>
     </gfc:valueMeasurementUnit>
     <gfc:valueType>
      <gco:TypeName>
       <gco:aName>
        <gco:CharacterString>Long</gco:CharacterString>
       </gco:aName>
      </gco:TypeName>
     </gfc:valueType>
    </gfc:FC_FeatureAttribute>
   </gfc:carrierOfCharacteristics>
   <gfc:carrierOfCharacteristics>
    <gfc:FC_FeatureAttribute id="_4">
     <gfc:memberName>
      <gco:LocalName>Road Surface</gco:LocalName>
```

```
    </gfc:memberName>
    <gfc:definition>
     <gco:CharacterString>Road surface material</gco:CharacterString>
    </gfc:definition>
    <gfc:cardinality>
     <gco:Multiplicity>
      <gco:range>
       <gco:MultiplicityRange>
        <gco:lower>
         <gco:Integer>1</gco:Integer>
        </gco:lower>
        <gco:upper>
         <gco:UnlimitedInteger xsi:nil="true" isInfinite="true"/>
        </gco:upper>
       </gco:MultiplicityRange>
      </gco:range>
     </gco:Multiplicity>
    </gfc:cardinality>
    <gfc:code>
     <gco:CharacterString>19586</gco:CharacterString>
    </gfc:code>
    <gfc:valueType>
     <gco:TypeName>
      <gco:aName>
       <gco:CharacterString>text</gco:CharacterString>
      </gco:aName>
     </gco:TypeName>
    </gfc:valueType>
    <gfc:listedValue>
     <gfc:FC_ListedValue>
      <gfc:label>
       <gco:CharacterString>gravel</gco:CharacterString>
      </gfc:label>
      <gfc:code>
       <gco:CharacterString>001</gco:CharacterString>
      </gfc:code>
      <gfc:definition>
       <gco:CharacterString>unpaved road surfaced with gravel</gco:CharacterString>
      </gfc:definition>
     </gfc:FC_ListedValue>
    </gfc:listedValue>
    <gfc:listedValue>
     <gfc:FC_ListedValue>
      <gfc:label>
       <gco:CharacterString>concrete</gco:CharacterString>
      </gfc:label>
      <gfc:code>
       <gco:CharacterString>002</gco:CharacterString>
      </gfc:code>
      <gfc:definition>
       <gco:CharacterString>road paved with concrete, includes jointed plain (JPCP), jointed reinforced (JRCP) and continuously
reinforced (CRCP)</gco:CharacterString>
      </gfc:definition>
     </gfc:FC_ListedValue>
    </gfc:listedValue>
    <gfc:listedValue>
     <gfc:FC_ListedValue>
      <gfc:label>
       <gco:CharacterString>dirt</gco:CharacterString>
      </gfc:label>
      <gfc:code>
       <gco:CharacterString>003</gco:CharacterString>
      </gfc:code>
      <gfc:definition>
       <gco:CharacterString>unpaved road made from subgrade material</gco:CharacterString>
      </gfc:definition>
     </gfc:FC_ListedValue>
```

```
    </gfc:listedValue>
    <gfc:listedValue>
     <gfc:FC_ListedValue>
      <gfc:label>
       <gco:CharacterString>asphalt</gco:CharacterString>
      </gfc:label>
      <gfc:code>
       <gco:CharacterString>004</gco:CharacterString>
      </gfc:code>
      <gfc:definition>
       <gco:CharacterString>road paved with the petroleum based asphalt concrete</gco:CharacterString>
      </gfc:definition>
     </gfc:FC_ListedValue>
    </gfc:listedValue>
   </gfc:FC_FeatureAttribute>
  </gfc:carrierOfCharacteristics>
 </gfc:FC_FeatureType>
</gfc:featureType>
<gfc:definitionSource>
 <gfc:FC_DefinitionSource>
  <gfc:source>
   <gmd:CI_Citation>
    <gmd:title>
     <gco:CharacterString>Transportation Survey Guide in 1996</gco:CharacterString>
    </gmd:title>
    <gmd:date>
     <gmd:CI_Date>
      <gmd:date>
       <gco:Date>1996</gco:Date>
      </gmd:date>
      <gmd:dateType>
       <gmd:CI_DateTypeCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_DateTypeCode"
codeListValue="creation"/>
      </gmd:dateType>
     </gmd:CI_Date>
    </gmd:date>
   </gmd:CI_Citation>
  </gfc:source>
 </gfc:FC_DefinitionSource>
</gfc:definitionSource>
</gfc:FC_FeatureCatalogue>
```

ANNEX A. DATA TYPES

A.1 Binary
Any binary data (e.g., image, sound) encoded as a sequence of bits (see *ISO/TS19133:2005, Geographic information – Location based services – Tracking and navigation*, clause 10.2.3).

A.2 Boolean
Truth value representing true or false. True can be represented by {true, 1} and false by {false,0} (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.2.11).

A.3 CharacterString
An arbitrary-length sequence of characters, including accents and special characters from the identified character set. CharacterStrings provide an area for free text. If an element has a characterString allowing free text, and you want to restrict this to using a controlled vocabulary, substitute gco:CharacterString with gmx:Anchor.

A.4 Date
Date gives values for the representation of:

1. year, e.g., 2006
2. year and month, e.g., 2006-10;
3. year, month, and day, e.g., 2006-10-01-05:00;
4. year, month, day, and time, e.g., 2006-10-01T12:00:00-05:00 (see A.5 DateTime).

Case 3 and 4 include optionally a time zone representation showing the time shift related to Coordinated Universal Time (UTC) origin. (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.2.8, and *ISO/TS19139:2007, Geographic information – Metadata – XML schema implementation*, clause 8.5.8.4.7)

A.5 DateTime
Date gives values for the representation of year, month, day, and time of the day in terms of hours, minutes, and second, with an optional time zone. Example 2006-10-01T12:00:00-05:00 corresponds to noon on October 1st, 2002, Eastern Standard Time in the U.S. NAP – Metadata, version 1.0.1 (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.2.8, and *ISO/TS19139:2007, Geographic information – Metadata – XML schema implementation*, clause 8.5.8.4.7)

A.6 Decimal
A number that represents an exact value, e.g., 2.5, 5.25, 12.125 (see *ISO/TS19103:2005, Geographic information – Conceptual schema language*, clause
6.5.2.4).

A.7 Distance
Measure of length between two points. (see *ISO/TS19103:2005, Geographic information – Conceptual schema language*, clause 6.5.7.7).

A.8 GenericName
Abstract class for the representation of a name in a namespace. A GenericName can be either a LocalName of a ScopedName. A LocalName is either a MemberName (see A.15) or a TypeName. A TypeName is a name that references either a RecordType or an object in a schema. (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.6.3).

A.9 GF_AttributeType
ISO19109:2005, Geographic information – Rules for application schema metaclass used for the representation of an attribute of a class of features, e.g., 'numberOfLane', and 'buildingUsage' (see *ISO19109:2005, Geographic information – Rules for application schema*, clause 7.3.6).

A.10 GF_FeatureType
ISO19109:2005, Geographic information – Rules for application schema metaclass used for the representation of a class of features, e.g., 'road', 'river', and 'building' (see *ISO19109:2005, Geographic information – Rules for application schema*, clause 7.3.4).

A.11 GM_Object
ISO19107:2003, Geographic information – Spatial schema abstract classes standing for any geometric objects (e.g., GM_Point, GM_Curve, GM_Surface) for the representation of the geometry of objects (see *ISO19107:2003, Geographic information – Spatial schema*, clause 6.2.2). NAP – Metadata, version 1.0.1

A.12 GM_Point
ISO19107:2003, Geographic information – Spatial schema data type for the representation of a single point (see *ISO19107:2003, Geographic information – Spatial schema*, clause 6.3.11).

A.13 Integer
A signed number with no fractional part, e.g., -12, 125, 12000963 (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.2.3).

A.14 Measure
A value resulting from the process to evaluate an amount or a quantity expressed in a unit of measure. (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.7.2).

A.15 MemberName
Name that references an attribute in a record, a RecordType, an attribute, an operation, or an association role (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.6.7).

A.16 Real
A signed floating point number composed of a mantissa and an optional exponent, e.g., -2E5, 364.236E8, 15.32e-3, 24, -0, 0.(see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.2.5).

A.17 Record
A structure of logically related elements (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.5).

A.18 RecordType
Specification of the content and structure of a Record.(see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.5). NAP – Metadata, version 1.0.1

*The usage of the RecordType and Record are described in ISO 19139. A RecordType element refers to a definition a type. The RecordType is implemented in XML as an xlink to the definition of that type. A Record is an instance of that type. The content of the tags RecordType and Record are free text. In the example below, the RecordType is an xlink to the definition of a netCDF variable type from the NcML schema. The Record is an xlink to an instance of the variable provided by a web service (ncmlService).

Ex.

```
<gmd:dimension>
  <gmd: SampleDimension >
    <gmd:otherAttributeType>
      <gco:RecordType xlink:href="http://www.unidata.ucar.edu/schemas/netcdf/ncml-2.2.xsd
        #xpointer(//element[@name='variable'])">netCDF Variable Type</gco:RecordType>
    </gmd:otherAttributeType>
    <gmd: otherAttributeValue>
      <gco:Record xlink:href="http://www.ngdc.noaa.gov/ncmlService/granuleIdentifier
        #xpointer(/netcdf/variable[@name=MemberName])"> Attributes for variable = memberName in granule =
```

granuleIdentifier</gco:Record>
</gmd: otherAttributeValue>
</gmd: SampleDimension >
</gmd: dimension >

A.19 SC_CRS
Coordinate reference system documented according to *ISO/TS19111:2003, Geographic information – Spatial referencing by coordinates*.

A.20 TM_PeriodDuration
Time span of an object or an event. A TM_PeriodDuration of 5 year, 1 months, 6 days, 12 hours, and 35 minutes is represented by P5Y1M6DT10H35M. Any subset of this representation is allowed a long as one unit is represented, e.g., a period duration of minus 80 days is represented as –P80D. (see *ISO19108:2003, Geographic information – Temporal schema*, clause 5.2.3.7).

A.21 TM_Primitive
TM_Primitive is an abstract data type for temporal geometric primitives (TM_Instant and TM_Period) and temporal topological primitives (TM_Node and TM_Edge)' (see *ISO19108:2003, Geographic information – Temporal schema*, clause 5.2.2).

A.22 Type
Any acceptable data type.

A.23 UnitOfMeasure
A quantity adopted as a standard unit of measure, e.g., metre, degree, kilogram (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.7.3).

A.24 UomLength
Reference quantities to express the value of a length, e.g., metre (see *ISO/TS19103:2005, Geographic information - Conceptual schema language*, clause 6.5.7.8).

A.25 URL
A uniform resource locator, e.g., http://napmetadata.org.

A.26 Anchor
Anchor can be used as a substitute for a characterString when you want to restrict the free text to a controlled vocabulary.

Ex:
<gmx:Anchor xlink:href="http://www.rvdata.us/voc/port#101065">Pearl Harbor, HI</gmx:Anchor>

This restricts the field to the controlled vocabulary located at http://www.rvdata.us/voc/port and selects the term as defined.

ANNEX B. COMMONLY USED ISO CODES

B.1 ISO 639-2/T Three-letter Language Codes
English = eng
Spanish = spa
French = fre

B.2 ISO 3166-1 Country Codes
Canada
Short name: Canada
Alpha-2: CA
Alpha-3: CAN
Numeric: 124

United Mexican States
Short name: Mexico
Alpha-2: MX
Alpha-3: MEX
Numeric: 484

United States of America
Short name: United States
Alpha-2: US
Alpha-3: USA
Numeric: 840

ANNEX C. ISO CODELISTS

ISO codeLists are located at http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml and are listed below. (For NAP codeLists, go to http://www.geoconnections.org/developersCorner/nap/metadata/register/registerItemClasses.html#IC_97).

C.1 CI_DateTypeCode - identification of when a given event occurred

Name	Domain code	Definition
creation	001	date identifies when the resource was brought into existence
publication	002	date identifies when the resource was issued
revision	003	date identifies when the resource was examined or re-examined and improved or amended

C.2 CI_OnlineFunctionCode - function performed by the resource

Name	Domain code	Definition
download	001	online instructions for transferring data from one storage device or system to another
information	002	online information about the resource
offlineAccess	003	online instructions for requesting the resource from the provider
order	004	online order process for obtaining the resource
search	005	online search interface for seeking out information about the resource

C.3 CI_PresentationFormCode - mode in which the data is represented

Name	Domain code	Definition
documentDigital	001	digital representation of a primarily textual item (can contain illustrations also)
documentHardcopy	002	representation of a primarily textual item (can contain illustrations also) on paper, photographic material, or other media
imageDigital	003	likeness of natural or man-made features, objects, and activities acquired through the sensing of visual or any other segment of the electromagnetic spectrum by sensors, such as thermal infrared, and high resolution radar and stored in digital format
imageHardcopy	004	likeness of natural or man-made features, objects, and activities acquired through the sensing of visual or any other segment of the electromagnetic spectrum by sensors, such as thermal infrared, and high resolution radar and reproduced on paper, photographic material, or other media for use directly by the human user

mapDigital	005	map represented in raster or vector form
mapHardcopy	006	map printed on paper, photographic material, or other media for use directly by the human user
modelDigital	007	multi-dimensional digital representation of a feature, process, etc.
modelHardcopy	008	3-dimensional, physical model
profileDigital	009	vertical cross-section in digital form
profileHardcopy	010	vertical cross-section printed on paper, etc.
tableDigital	011	digital representation of facts or figures systematically displayed, especially in columns
tableHardcopy	012	representation of facts or figures systematically displayed, especially in columns, printed on paper, photographic material, or other media
videoDigital	013	digital video recording
videoHardcopy	014	video recording on film

C.4 CI_RoleCode - function performed by the responsible party

Name	Domain code	Definition
resourceProvider	001	party that supplies the resource
custodian	002	party that accepts accountability and responsibility for the data and ensures appropriate care and maintenance of the resource
owner	003	party that owns the resource
user	004	party who uses the resource
distributor	005	party who distributes the resource
originator	006	party who created the resource
pointOfContact	007	party who can be contacted for acquiring knowledge about or acquisition of the resource
principalInvestigator	008	key party responsible for gathering information and conducting research
processor	009	party who has processed the data in a manner such that the resource has been modified
publisher	010	party who published the resource
author	011	party who authored the resource

C.5 DQ_EvaluationMethodTypeCode - type of method for evaluating an identified data quality measure

Name	Domain code	Definition
directInternal	001	method of evaluating the quality of a dataset based on inspection of items within the dataset, where all data required is internal to the dataset being evaluated
directExternal	002	method of evaluating the quality of a dataset based on inspection of items within the

		dataset, where reference data external to the dataset being evaluated is required
indirect	003	method of evaluating the quality of a dataset based on external knowledge

C.6 DS_AssociationTypeCode - justification for the correlation of two datasets

Name	Domain code	Definition
crossReference	001	reference from one dataset to another
largerWorkCitation	002	reference to a master dataset of which this one is a part
partOfSeamlessDatabase	003	part of same structured set of data held in a computer
source	004	mapping and charting information from which the dataset content originates
stereoMate	005	part of a set of imagery that when used together, provides three-dimensional images

C.7 DS_InitiativeTypeCode - type of aggregation activity in which datasets are related

Name	Domain code	Definition
campaign	001	series of organized planned actions
collection	002	accumulation of datasets assembled for a specific purpose
exercise	003	specific performance of a function or group of functions
experiment	004	process designed to find if something is effective or valid
investigation	005	search or systematic inquiry
mission	006	specific operation of a data collection system
sensor	007	device or piece of equipment which detects or records
operation	008	action that is part of a series of actions
platform	009	vehicle or other support base that holds a sensor
process	010	method of doing something involving a number of steps
program	011	specific planned activity
project	012	organized undertaking, research, or development
study	013	examination or investigation
task	014	piece of work
trial	015	process of testing to discover or demonstrate something

C.8 MD_CellGeometryCode - code indicating whether grid data is point or area

Name	Domain code	Definition
point	001	each cell represents a point
area	002	each cell represents an area

C.9 MD_CharacterSetCode – name of the character coding standard used for the resource

Name	Domain code	Definition
ucs2	001	16-bit fixed size Universal Character Set, based on ISO/IEC 10646
ucs4	002	32-bit fixed size Universal Character Set, based on ISO/IEC 10646
utf7	003	7-bit variable size UCS Transfer Format, based on ISO/IEC 10646
utf8	004	8-bit variable size UCS Transfer Format, based on ISO/IEC 10646
utf16	005	16-bit variable size UCS Transfer Format, based on ISO/IEC 10646
8859part1	006	ISO/IEC 8859-1, Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1
8859part2	007	ISO/IEC 8859-2, Information technology – 8-bit single-byte coded graphic character sets – Part 2: Latin alphabet No. 2
8859part3	008	ISO/IEC 8859-3, Information technology – 8-bit single-byte coded graphic character sets – Part 3: Latin alphabet No. 3
8859part4	009	ISO/IEC 8859-3, Information technology – 8-bit single-byte coded graphic character sets – Part 3: Latin alphabet No. 4
8859part5	010	ISO/IEC 8859-51, Information technology – 8-bit single-byte coded graphic character sets – Part 5: Latin/Cyrillic alphabet
8859part6	011	ISO/IEC 8859-6, Information technology – 8-bit single-byte coded graphic character sets – Part 6: Latin/Arabic alphabet
8859part7	012	ISO/IEC 8859-7, Information technology – 8-bit single-byte coded graphic character sets – Part 7: Latin/Greek alphabet
8859part8	013	ISO/IEC 8859-8, Information technology – 8-bit single-byte coded graphic character sets – Part 8: Latin/Hebrew alphabet
8859part9	014	ISO/IEC8859-9, Information technology – 8-bit single-byte coded graphic character sets – Part 9: Latin alphabet No. 5
8859part10	015	ISO/IEC 8859-10, Information technology – 8-bit single-byte coded graphic character sets – Part 10: Latin alphabet No. 6
8859part11	016	ISO/IEC 8859-11, Information technology – 8-bit single-byte coded graphic character sets – Part 11: Latin/Thai alphabet

(reserved for future use)	017	a future ISO/IEC 8-bit single-byte coded graphic character set (e.g., possibly 8859 part 12)
8859part13	018	ISO/IEC 8859-13, Information technology – 8-bit single-byte coded graphic character sets – Part 13: Latin alphabet No. 7
8859part14	019	ISO/IEC 8859-14, Information technology – 8-bit single-byte coded graphic character sets – Part 14: Latin alphabet No. 8 (Celtic)
8859part15	020	ISO/IEC 8859-15, Information technology – 8-bit single-byte coded graphic character sets – Part 15: Latin alphabet No. 9
8859part16	021	ISO/IEC 8859-16, Information technology – 8-bit single-byte coded graphic character sets – Part 16: Latin alphabet No. 10
Jis	022	japanese code set used for electronic transmission
shiftJIS	023	japanese code set used on MS-DOS based machines
eucJP	024	japanese code set used on UNIX based machines
usAscii	025	united states ASCII code set (ISO 646 US)
ebcdic	026	ibm mainframe code set
eucKR	027	korean code set
big5	028	traditional Chinese code set used in Taiwan, Hong Kong of China and other areas
GB2312	029	simplified Chinese code set

C.10 MD_ClassificationCode - name of the handling restrictions on the dataset

Name	Domain code	Definition
unclassified	001	available for general disclosure
restricted	002	not for general disclosure
confidential	003	available for someone who can be entrusted with information
secret	004	kept or meant to be kept private, unknown, or hidden from all but a select group of people
topSecret	005	of the highest secrecy

C.11 MD_CoverageContentTypeCode - specific type of information represented in the cell

Name	Domain code	Definition
image	001	meaningful numerical representation of a physical parameter that is not the actual value of the physical parameter
thematicClassification	002	code value with no quantitative meaning, used to represent a physical quantity
physicalMeasurement	003	value in physical units of the quantity being measured

C.12 MD_DatatypeCode - datatype of element or entity

Name	Domain code	Definition
class	001	descriptor of a set of objects that share the same attributes, operations, methods, relationships, and behavior
codelist	002	flexible enumeration useful for expressing a long list of values, can be extended
enumeration	003	data type whose instances form a list of named literal values, not extendable
codelistElement	004	permissible value for a codelist or enumeration
abstractClass	005	class that cannot be directly instantiated
aggregateClass	006	class that is composed of classes it is connected to by an aggregate relationship
specifiedClass	007	subclass that may be substituted for its superclass
datatypeClass	008	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
interfaceClass	009	named set of operations that characterize the behavior of an element
unionClass	010	class describing a selection of one of the specified types
metaClass	011	class whose instances are classes
typeClass	012	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
characterString	013	free text field
integer	014	numerical field
association	015	semantic relationship between two classes that involves connections among their instances

C.13 MD_DimensionNameTypeCode - name of the dimension

Name	Domain code	Definition
row	001	ordinate (y) axis
column	002	abscissa (x) axis
vertical	003	vertical (z) axis
track	004	along the direction of motion of the scan point
crossTrack	005	perpendicular to the direction of motion of the scan point
line	006	scan line of a sensor
sample	007	element along a scan line
time	008	duration

C.14 MD_GeometricObjectTypeCode - name of point or vector objects used to locate zero-, one-, two-, or three-dimensional spatial locations in the dataset

Name	Domain code	Definition
complex	001	set of geometric primitives such that their boundaries can be represented as a union of other primitives
composite	002	connected set of curves, solids or surfaces
curve	003	bounded, 1-dimensional geometric primitive, representing the continuous image of a line
point	004	zero-dimensional geometric primitive, representing a position but not having an extent
solid	005	bounded, connected 3-dimensional geometric primitive, representing the continuous image of a region of space
surface	006	bounded, connected 2-dimensional geometric primitive, representing the continuous image of a region of a plane

C.15 MD_ImagingConditionCode - code which indicates conditions which may affect the image

Name	Domain code	Definition
blurredImage	001	portion of the image is blurred
cloud	002	portion of the image is partially obscured by cloud cover
degradingObliquity	003	acute angle between the plane of the ecliptic (the plane of the Earth's orbit) and the plane of the celestial equator
fog	004	portion of the image is partially obscured by fog
heavySmokeOrDust	005	portion of the image is partially obscured by heavy smoke or dust
night	006	image was taken at night
rain	007	image was taken during rainfall
semiDarkness	008	image was taken during semi-dark conditions—twilight conditions
shadow	009	portion of the image is obscured by shadow
snow	010	portion of the image is obscured by snow
terrainMasking	011	the absence of collection data of a given point or area caused by the relative location of topographic features which obstruct the collection path between the collector(s) and the subject(s) of interest

C.16 MD_KeywordTypeCode - methods used to group similar keywords

Name	Domain code	Definition
discipline	001	keyword identifies a branch of instruction or specialized learning
place	002	keyword identifies a location

stratum	003	keyword identifies the layer(s) of any deposited substance
temporal	004	keyword identifies a time period related to the dataset
theme	005	keyword identifies a particular subject or topic

C.17 MD_MaintenanceFrequencyCode - frequency with which modifications and deletions are made to the data after it is first produced

Name	Domain code	Definition
continual	001	data is repeatedly and frequently updated
daily	002	data is updated each day
weekly	003	data is updated on a weekly basis
fortnightly	004	data is updated every two weeks
monthly	005	data is updated each month
quarterly	006	data is updated every three months
biannually	007	data is updated twice each year
annually	008	data is updated every year
asNeeded	009	data is updated as deemed necessary
irregular	010	data is updated in intervals that are uneven in duration
notPlanned	011	there are no plans to update the data
unknown	012	frequency of maintenance for the data is not known

C.18 MD_MediumFormatCode - method used to write to the medium

Name	Domain code	Definition
cpio	001	Copy In / Out (UNIX file format and command)
tar	002	Tape Archive
highSierra	003	high sierra file system
iso9660	004	information processing – volume and file structure of CD-ROM
iso9660RockRidge	005	rock ridge interchange protocol (UNIX)
iso9660AppleHFS	006	hierarchical file system (Macintosh)

C.19 MD_MediumNameCode - name of the medium

Name	Domain code	Definition
cdRom	001	read-only optical disk
dvd	002	digital versatile disk
dvdRom	003	digital versatile disk, read only
3halfInchFloppy	004	3.5 inch magnetic disk
5quarterInchFloppy	005	5.25 inch magnetic disk
7trackTape	006	7 track magnetic tape
9trackTape	007	9 track magnetic tape
3480Cartridge	008	3480 cartridge tape drive
3490Cartridge	009	3490 cartridge tape drive

3580Cartridge	010	3580 cartridge tape drive
4mmCartridgeTape	011	4 millimeter magnetic tape
8mmCartridgeTape	012	8 millimeter magnetic tape
1quarterInchCartridgeTape	013	0.25 inch magnetic tape
digitalLinearTape	014	half inch cartridge streaming tape drive
onLine	015	direct computer linkage
satellite	016	linkage through a satellite communication system
telephoneLink	017	communication through a telephone network
hardcopy	018	pamphlet or leaflet giving descriptive information

C.20 MD_ObligationCode - obligation of the element or entity

Name	Domain code	Definition
mandatory	001	element is always required
optional	002	element is not required
conditional	003	element is required when a specific condition is met

C.21 MD_PixelOrientationCode - point in a pixel corresponding to the Earth location of the pixel

Name	Domain code	Definition
center	001	point halfway between the lower left and the upper right of the pixel
lowerLeft	002	the corner in the pixel closest to the origin of the SRS; if two are at the same distance from the origin, the one with the smallest x-value
lowerRight	003	next corner counterclockwise from the lower left
upperRight	004	next corner counterclockwise from the lower right
upperLeft	005	next corner counterclockwise from the upper right

C.22 MD_ProgressCode - status of the dataset or progress of a review

Name	Domain code	Definition
completed	001	production of the data has been completed
historicalArchive	002	data has been stored in an offline storage facility
obsolete	003	data is no longer relevant
onGoing	004	data is continually being updated
planned	005	fixed date has been established upon or by which the data will be created or updated
required	006	data needs to be generated or updated
underDevelopment	007	data is currently in the process of being created

C.23 MD_RestrictionCode - limitation(s) placed upon the access or use of the data

Name	Domain code	Definition
copyright	001	exclusive right to the publication, production, or sale of the rights to a literary, dramatic, musical, or artistic work, or to the use of a commercial print or label, granted by law for a specified period of time to an author, composer, artist, distributor
patent	002	government has granted exclusive right to make, sell, use or license an invention or discovery
patentPending	003	produced or sold information awaiting a patent
trademark	004	a name, symbol, or other device identifying a product, officially registered and legally restricted to the use of the owner or manufacturer
license	005	formal permission to do something
intellectualPropertyRights	006	rights to financial benefit from and control of distribution of non-tangible property that is a result of creativity
restricted	007	withheld from general circulation or disclosure
otherRestrictions	008	limitation not listed

C.24 MD_ScopeCode - class of information to which the referencing entity applies

Name	Domain code	Definition
attribute	001	information applies to the attribute class
attributeType	002	information applies to the characteristic of a feature
collectionHardware	003	information applies to the collection hardware class
collectionSession	004	information applies to the collection session
dataset	005	information applies to the dataset
series	006	information applies to the series
nonGeographicDataset	007	information applies to non-geographic data
dimensionGroup	008	information applies to a dimension group
feature	009	information applies to a feature
featureType	010	information applies to a feature type
propertyType	011	information applies to a property type
fieldSession	012	information applies to a field session
software	013	information applies to a computer program or routine
service	014	information applies to a capability which a service provider entity makes available to a service user entity through a set of interfaces that define a behaviour, such as a use case

model	015	information applies to a copy or imitation of an existing or hypothetical object
tile	016	information applies to a tile, a spatial subset of geographic data

C.25 MD_SpatialRepresentationTypeCode - method used to represent geographic information in the dataset

Name	Domain code	Definition
vector	001	vector data is used to represent geographic data
grid	002	grid data is used to represent geographic data
textTable	003	textual or tabular data is used to represent geographic data
tin	004	triangulated irregular network
stereoModel	005	three-dimensional view formed by the intersecting homologous rays of an overlapping pair of images
video	006	scene from a video recording

C.25 MD_TopicCategoryCode - high-level geographic data thematic classification to assist in the grouping and search of available geographic data sets. Can be used to group keywords as well. Listed examples are not exhaustive.

NOTE: It is understood there are overlaps between general categories and the user is encouraged to select the one most appropriate.

Name	Domain Code	Definition
farming	001	rearing of animals and/or cultivation of plants Examples: agriculture, irrigation, aquaculture, plantations, herding, pests and diseases affecting crops and livestock
biota	002	flora and/or fauna in natural environment Examples: wildlife, vegetation, biological sciences, ecology, wilderness, sealife, wetlands, habitat
boundaries	003	legal land descriptions Examples: political and administrative boundaries
climatologyMeteorologyAtmosphere	004	processes and phenomena of the atmosphere Examples: cloud cover, weather, climate, atmospheric conditions, climate change, precipitation
economy	005	economic activities, conditions and employment Examples: production, labour, revenue, commerce, industry, tourism and ecotourism, forestry, fisheries, commercial or subsistence hunting, exploration and exploitation of resources, such as minerals, oil and gas
elevation	006	height above or below sea level Examples: altitude, bathymetry, digital elevation models, slope, derived products
environment	007	environmental resources, protection and conservation Examples: environmental pollution, waste storage

		and treatment, environmental impact assessment, monitoring environmental risk, nature reserves, landscape
geoscientificInformation	008	information pertaining to earth sciences Examples: geophysical features and processes, geology, minerals, sciences dealing with the composition, structure and origin of the earth's rocks, risks of earth-quakes, volcanic activity, landslides, gravity information, soils, permafrost, hydrogeology, erosion
health	009	health, health services, human ecology, and safety Examples: disease and illness, factors affecting health, hygiene, substance abuse, mental and physical health, health services
imageryBaseMapsEarthCover	010	base maps Examples: land cover, topographic maps, imagery, unclassified images, annotations
intelligenceMilitary	011	military bases, structures, activities Examples: barracks, training grounds, military transportation, information collection
inlandWaters	012	inland water features, drainage systems and their characteristics Examples: rivers and glaciers, salt lakes, water utilization plans, dams, currents, floods, water quality, hydrographic charts
location	013	positional information and services Examples: addresses, geodetic networks, control points, postal zones and services, place names
oceans	014	features and characteristics of salt water bodies (excluding inland waters) Examples: tides, tidal waves, coastal information, reefs
planningCadastre	015	information used for appropriate actions for future use of the land Examples: land use maps, zoning maps, cadastral surveys, land ownership
society	016	characteristics of society and cultures Examples: settlements, anthropology, archaeology, education, traditional beliefs, manners and customs, demographic data, recreational areas and activities, social impact assessments, crime and justice, census information
structure	017	man-made construction Examples: buildings, museums, churches, factories, housing, monuments, shops, towers
transportation	018	means and aids for conveying persons and/or goods Examples: roads, airports/airstrips, shipping routes, tunnels, nautical charts, vehicle or vessel location, aeronautical charts, railways
utilitiesCommunication	019	energy, water and waste systems and communications infrastructure and services Examples: hydroelectricity, geothermal, solar and nuclear sources of energy, water purification and distribution, sewage collection and disposal,

		electricity and gas distribution, data communi-cation, telecommunication, radio, communication networks

C.26 MD_TopologyLevelCode - degree of complexity of the spatial relationships

Name	Domain code	Definition
geometryOnly	001	geometry objects without any additional structure which describes topology
topology1D	002	1-dimensional topological complex – commonly called 'chain-node' topology
planarGraph	003	1-dimensional topological complex that is planar. (A planar graph is a graph that can be drawn in a plane in such a way that no two edges intersect except at a vertex.)
fullPlanarGraph	004	2-dimensional topological complex that is planar. (A 2-dimensional topological complex is commonly called 'full topology" in a cartographic 2D environment.)
surfaceGraph	005	1-dimensional topological complex that is isomorphic to a subset of a surface. (A geometric complex is isomorphic to a topological complex if their elements are in a one-to-one, dimensional- and boundary-preserving correspondence to one another.)
fullSurfaceGraph	006	2-dimensional topological complex that is isomorphic to a subset of a surface
topology3D	007	3-dimensional topological complex. (A topological complex is a collection of topological primitives that are closed under the boundary operations.)
fullTopology3D	008	complete coverage of a 3D Euclidean coordinate space
abstract	009	topological complex without any specified geometric realisation

ANNEX D. Units

D.1 BaseUnit

Name	Unit Symbol	Quantity
metre	m	length
kilogram	kg	mass
second	s	time
ampere	A	electric current
kelvin	K	thermodynamic temperature
candela	cd	luminous intensity
mole	mol	amount of substance

BaseUnit – A base unit is a unit of measure that cannot be derived by combination of other base units within a particular system of units. For example, in the SI system of units, the base units are metre, kilogram, second, ampere, kelvin, mole, and candela, for the physical quantity types of length, mass, time interval, electric current, thermodynamic temperature, amount of substance and luminous intensity, respectively.

Type: compound
Multiplicity: optional
Attributes: id
Best Practices: The id attribute is mandatory. It is recommend to reference the International System of Units (SI) at http://www.bipm.org/en/si/.

identifier – Special identifier assigned to the unit by the maintaining authority.

Multiplicity: mandatory
Attributes: codeSpace
Best Practices: The codeSpace attribute is mandatory.

unitsSystem – Reference to the maintaining authority or system of the unit.

Multiplicity: mandatory
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

Ex:

```
<gml:BaseUnit gml:id="lengthUnit">
   <gml:identifier codeSpace="meters"/>
   <gml:unitsSystem xlink:href="http://www.bipm.org/en/si/"/>
</gml:BaseUnit>
```

D.2 DerivedUnit

DerivedUnit - Units formed from the multiplication and division of the seven base units.

Type: compound
Multiplicity: optional
Attributes: id
Best Practices: The id attribute is mandatory.

FAQ: What is an example of a derived unit?

Name	Unit Symbol	Quantity
metre per second	m/s	unit of speed
ohm	Ω (m^2*kg*s^{-3}*A^{-2})	electrical resistance

identifier - Special identifier assigned to the unit by the maintaining authority.
Multiplicity: mandatory
Attributes: codeSpace
Best Practices: The codeSpace attribute is mandatory.

derivationUnitTerm - Describes a derived unit of measure. This unit term references another unit of measure (uom) and provides an integer exponent applied to that unit in defining the compound unit.
Multiplicity: mandatory, repeatable
Attributes: uom, exponent
Best Practices: The uom attribute is mandatory. The exponent attribute may be positive or negative, but not zero.

FAQ: How would you document mass density measured in kg/m^3?

```
<gml:DerivedUnit gml:id="massDensity">
        <gml:identifier codeSpace="mass density"/>
        <gml:derivationUnitTerm uom="kg" exponent="1"/>
        <gml:derivationUnitTerm uom="m" exponent="-3"/>
</gml:DerivedUnit>
```

D.3 ConventionalUnit

ConventionalUnit – A unit of measure for which there is a conversion to a Base Unit.
Type: compound
Multiplicity: optional
Attributes: id
Best Practices: The id attribute is mandatory.

identifier – Special identifier assigned to the unit by the maintaining authority.
Multiplicity: mandatory
Attributes: codeSpace
Best Practices: The codeSpace attribute is mandatory.

conversionToPreferredUnit – Parameters used to convert conventional units to preferred units.
Type: factor or formula
Multiplicity: conditional
Attributes: uom
Best Practices: There must be one occurrence of either conversionToPreferredUnit or roughConversionUnit. The uom attribute is mandatory.

factor – Scale factor for the conversion.
Domain: any number
Multiplicity: conditional

Best Practices: There must be one occurrence of either factor or formula.

formula – Formula for the conversion.
Type: compound
Multiplicity: conditional
Best Practices: There must be once occurrence of either factor or formula. Formula consists of the elements a, b, c, and d; b and c are mandatory.

roughConversionToPreferredUnit – Parameters used to convert conventional units to preferred units.
Type: factor or formula
Multiplicity: conditional
Attributes: uom
Best Practices: There must be one occurrence of either conversionToPreferredUnit or roughConversionUnit. The uom attribute is mandatory.

factor – Scale factor for the conversion.
Domain: any number
Multiplicity: conditional
Best Practices: There must be one occurrence of either factor or formula.

FAQ: How would you show the conversion for the unit 'foot' to 'meters' using the factor element?

```
<gml:ConventionalUnit gml:id="ft">
    <gml:identifier codeSpace="foot"/>
    <gml:conversionToPreferredUnit uom="m">
        <gml:factor>0.305</gml:factor>
    </gml:conversionToPreferredUnit>
</gml:ConventionalUnit>
```

In this case, the factor element contains a scale factor of 0.305. The scale factor is multiplied by the value of the conventional unit of measure (foot) to obtain the corresponding value for the preferred unit of measure (metre).

---

formula – Formula for the conversion.
Type: compound
Multiplicity: conditional
Best Practices: There must be once occurrence of either factor or formula. Formula consists of the elements a, b, c, and d; b and c are mandatory.

FAQ: How would you show the conversion for the unit 'Celsius' to 'Kelvin' using the formula element?

```
<gml:ConventionalUnit gml:id="degC">
    <gml:identifier codeSpace="degree Celsius"/>
    <gml:conversionToPreferredUnit uom="K">
        <gml:formula>
            <gml:a>273.15</gml:a>
            <gml:b>1</gml:b>
            <gml:c>1</gml:c>
        </gml:formula>
    </gml:conversionToPreferredUnit>
</gml:ConventionalUnit>
```

The formula element can contain the four elements, a, b, c and d, whose values provide the parameters for converting the value of the conventional unit of measure (degrees Celsius) to the corresponding value for the preferred unit of measure (Kelvin). The values of the elements a, b, c and d are used in the formula y = (a + bx) / (c + dx), where x is a value using the current unit, and y is the corresponding value using the preferred unit. Elements a and d are optional. If those values are not provided, then those parameters are considered to be zero. The example above shows the conversion of Celsius to Kelvin so the formula becomes—

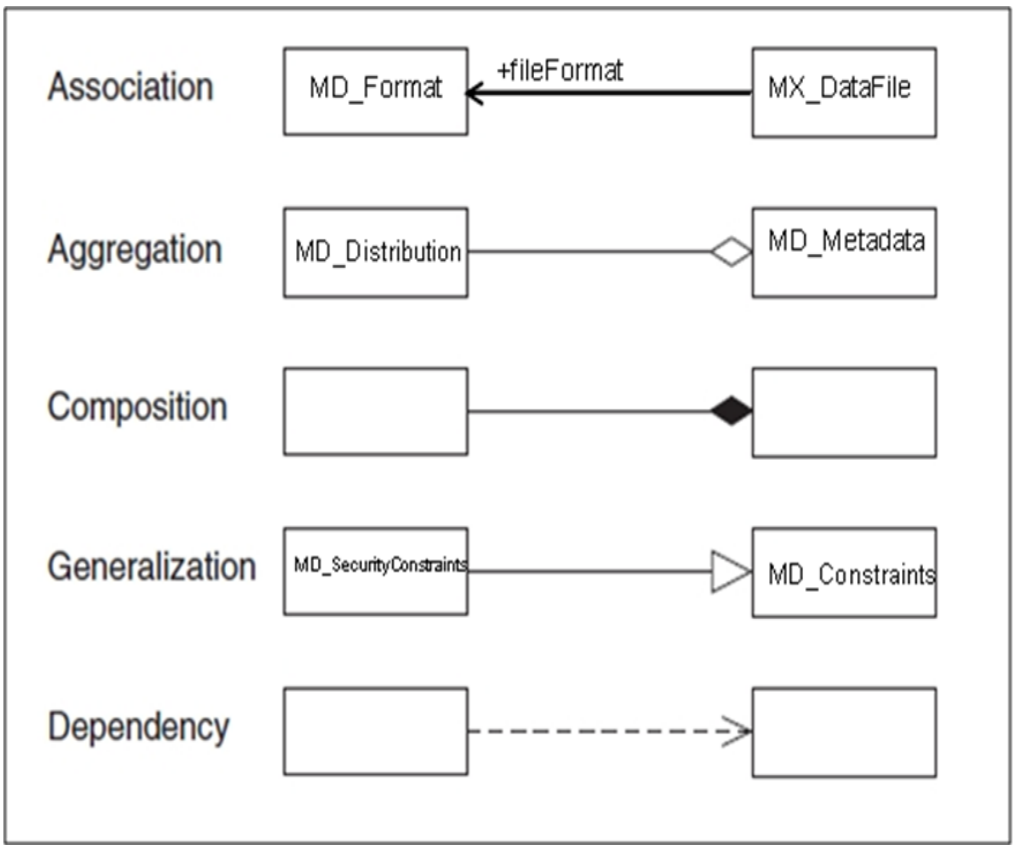
K = 273.15 + C.

ANNEX E. UML

Unified Modeling Language (UML) is used to represent the relationships among classes and objects in object oriented programming.

E.1 UML Notation

Relationships can be represented in the ISO UML models as associations, aggregations, compositions, generalizations, and dependencies.



Association

Associations are general relationships between classes, if direction is not specified it is assumed to be a two-way association. Arrows marking an end of a line mark the direction of an association. The model will also show the 'role' of the target object in relation to the source object.

Aggregation

Aggregations are when one class is the 'container' and the other class is within/inside

Ex: MD_Metadata 'contains' MD_Distribution

Composition

Compositions are also known as strong aggregations. Compositions are used when the parts inside the container cannot exist without the container. If the container is deleted, then all of the objects 'inside' the container are deleted as well.

Generalization

Generalizations show depict a superclass and subclasses that may be substituted for the superclass

> Ex: General overall constraints are documents through MD_Constraints but the subclass MD_SecurityConstraints can substitute it's Superclass MD_Constraints (Security constraints has the same objects as MD_Constraints but also adds a few more objects to specifically deal with documenting constraints dealing with security.)

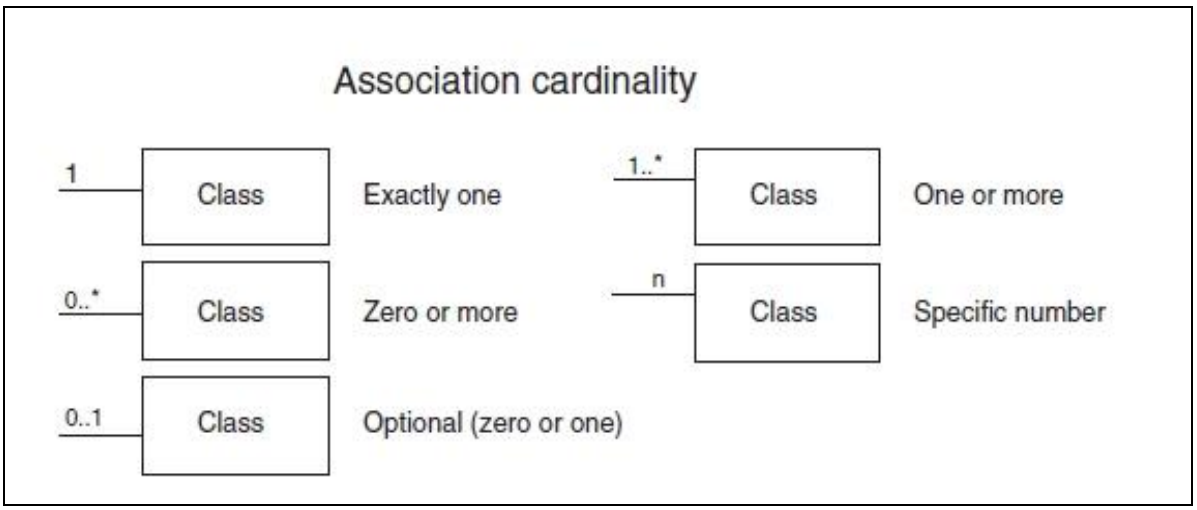
Dependency

Dependencies are also known as instantiation. Dependencies are kind of like an 'IF' statement.

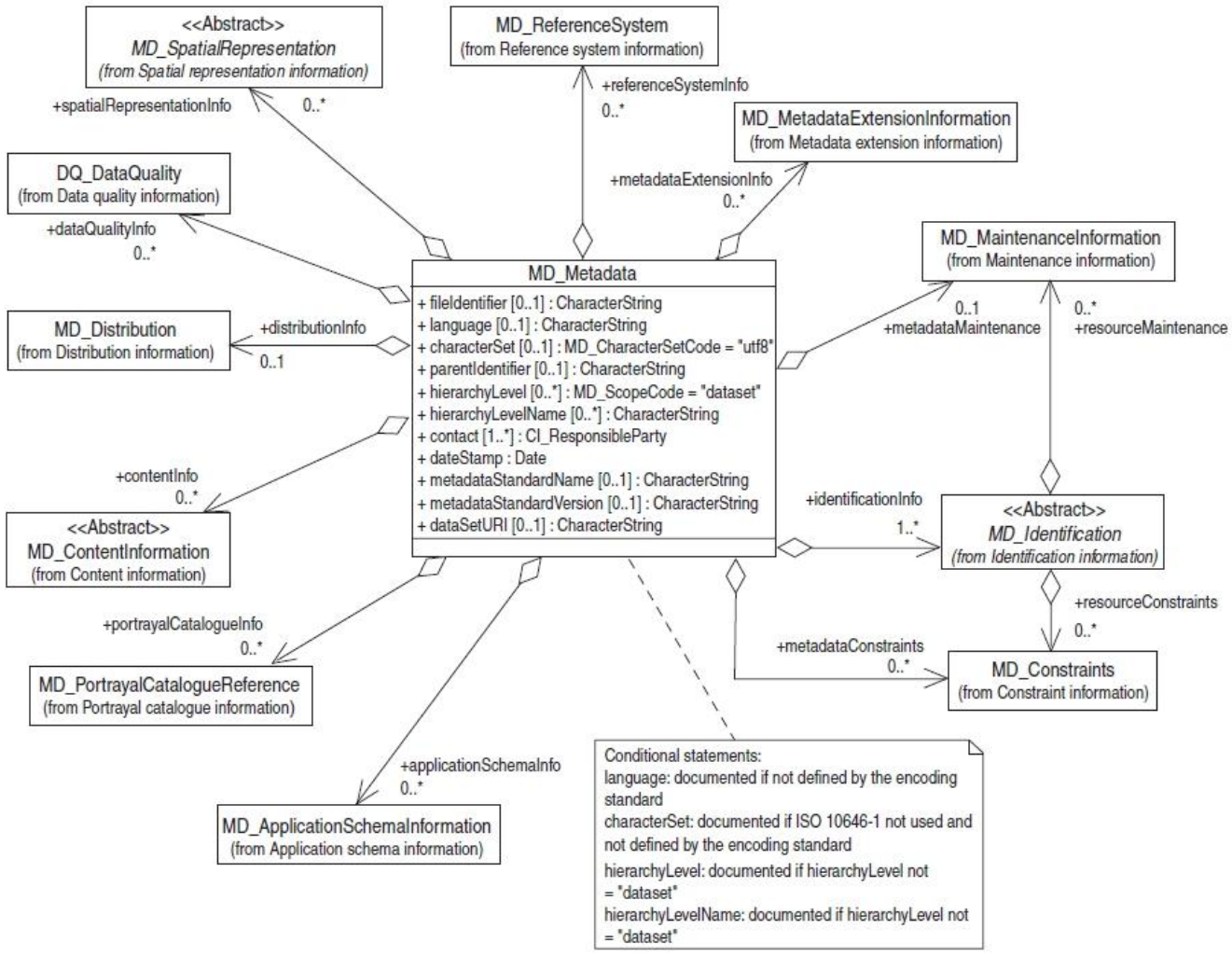
> Ex: If accessConstraints or useConstraints = "otherRestrictions" then "otherConstraints" must be used.

E.2 UML Cardinality

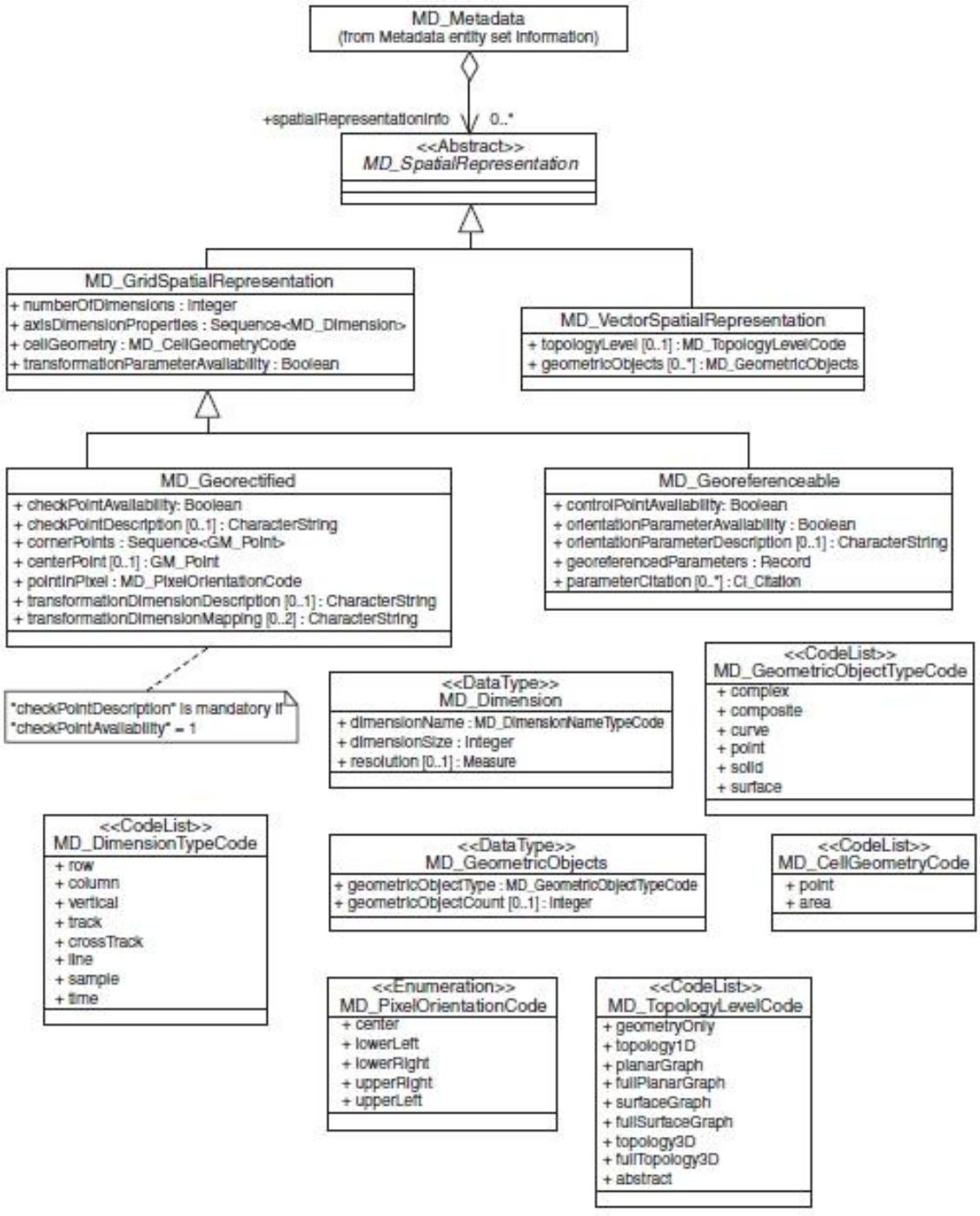
Multiplicity and cardinality are denoted on the UML associations to depict if classes are mandatory, optional, and how many times they may repeat as noted in the table below.



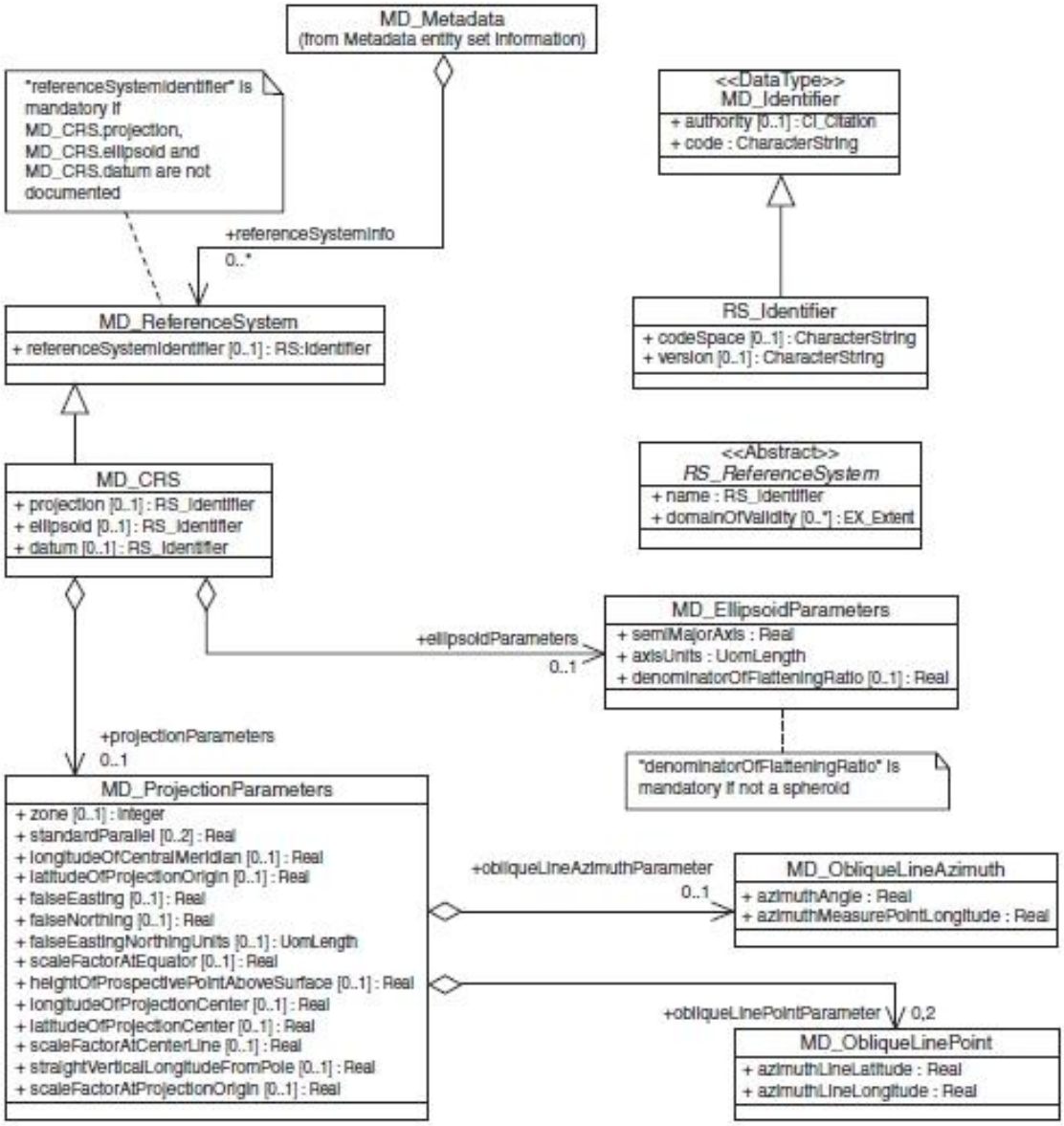
E.3 Metadata Entity UML



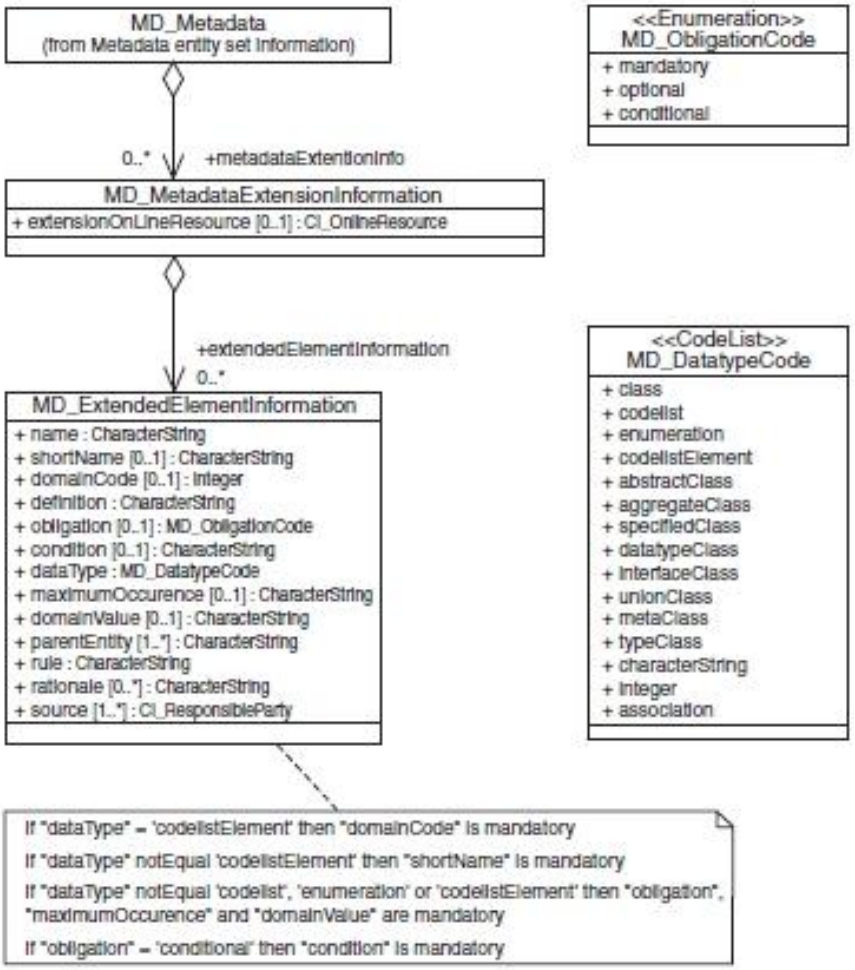
E.4 Spatial Representation UML



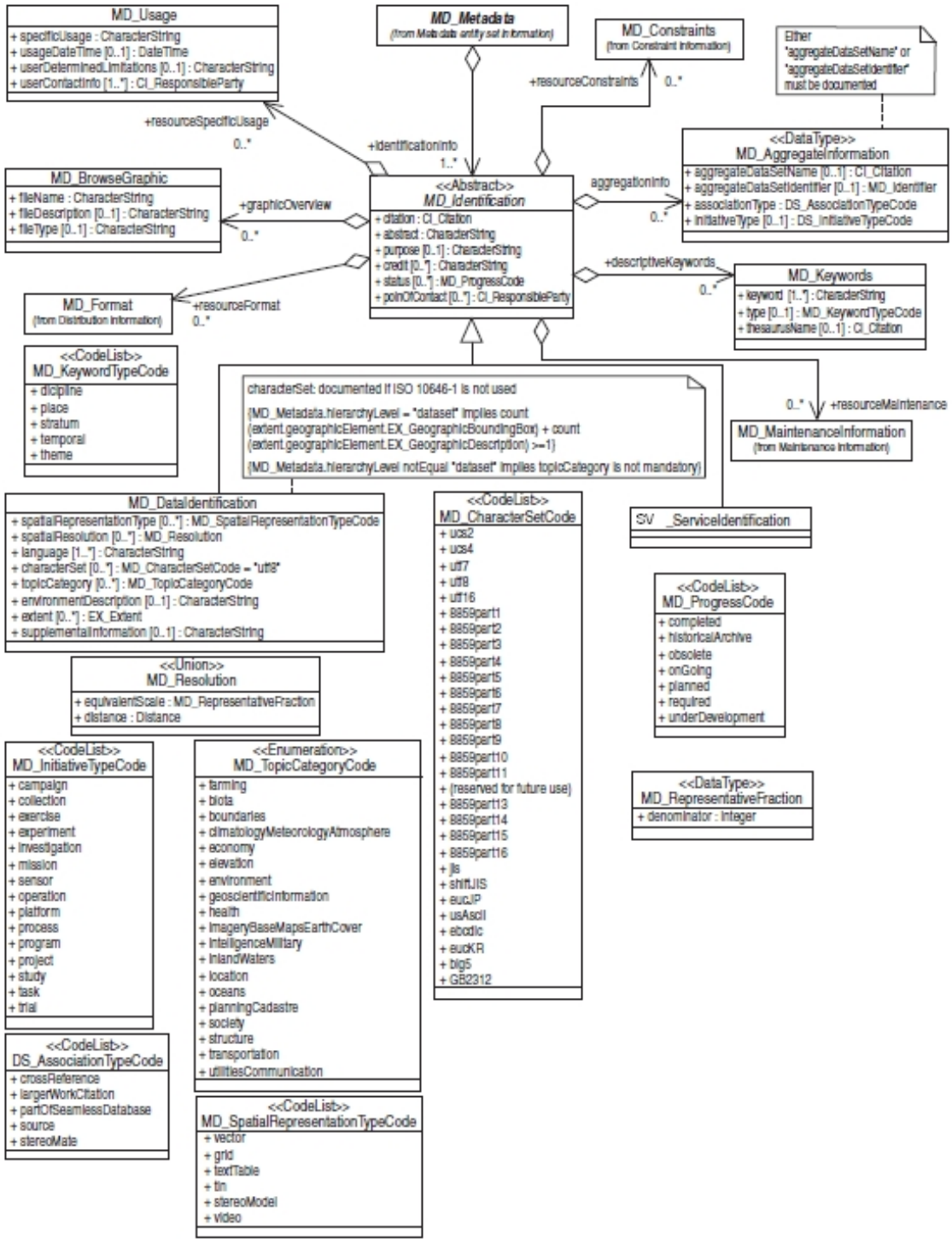
E.5 Reference System UML

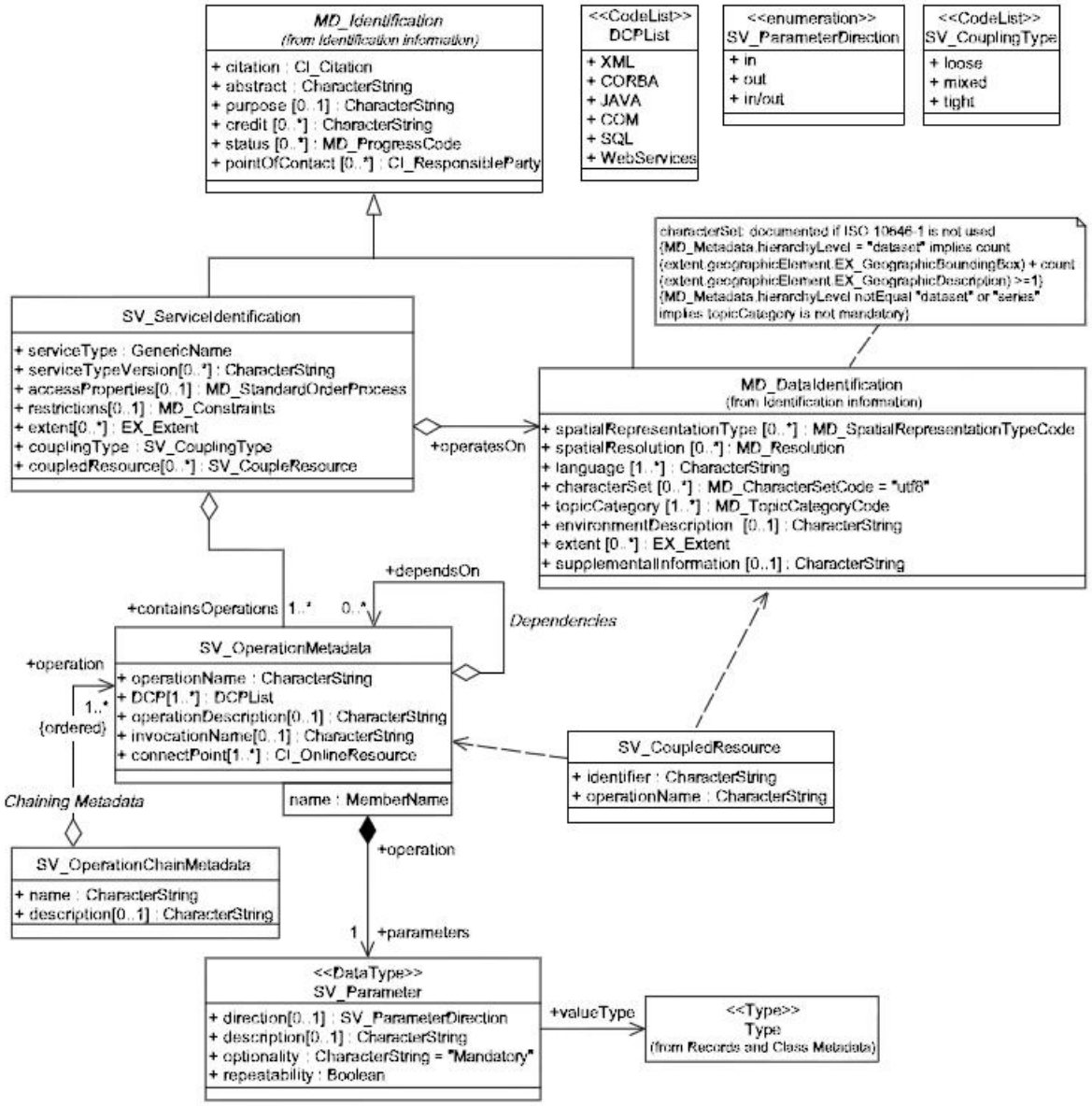


E.6 Metadata Extension UML

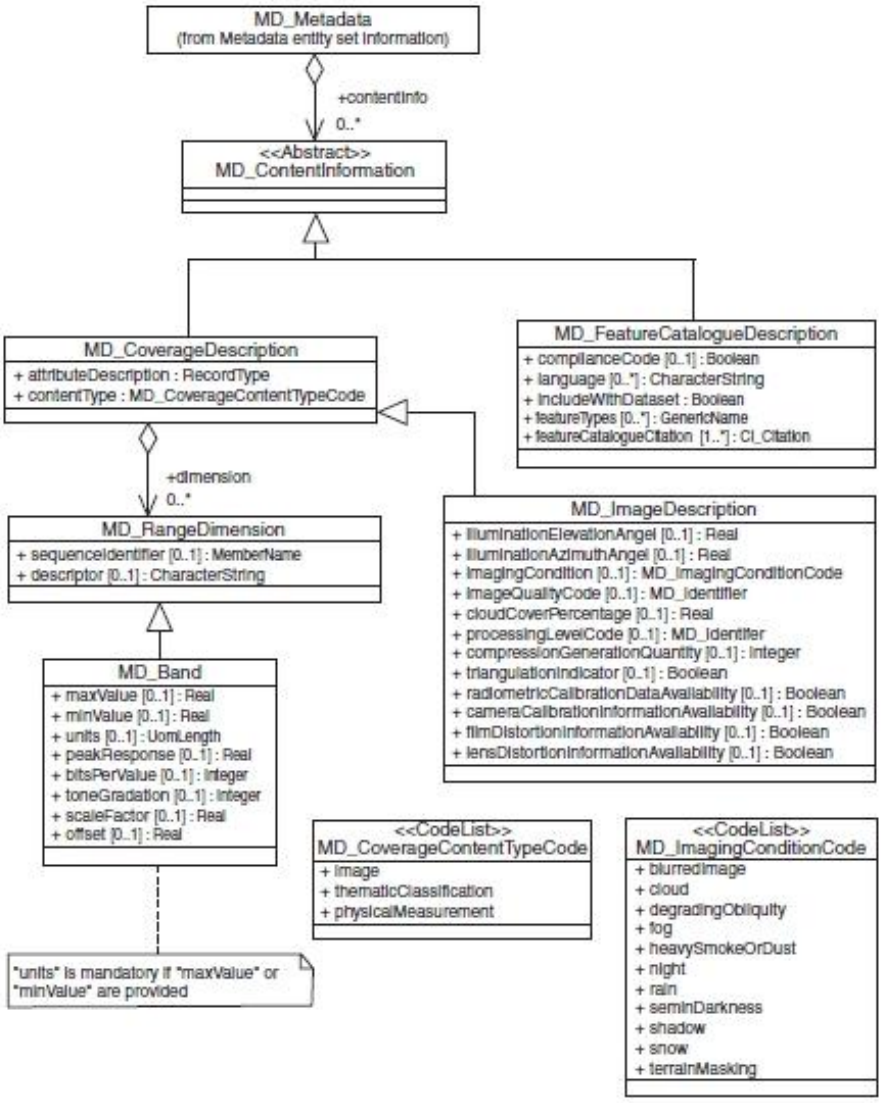


E.7 Identification (Data and Services) UML

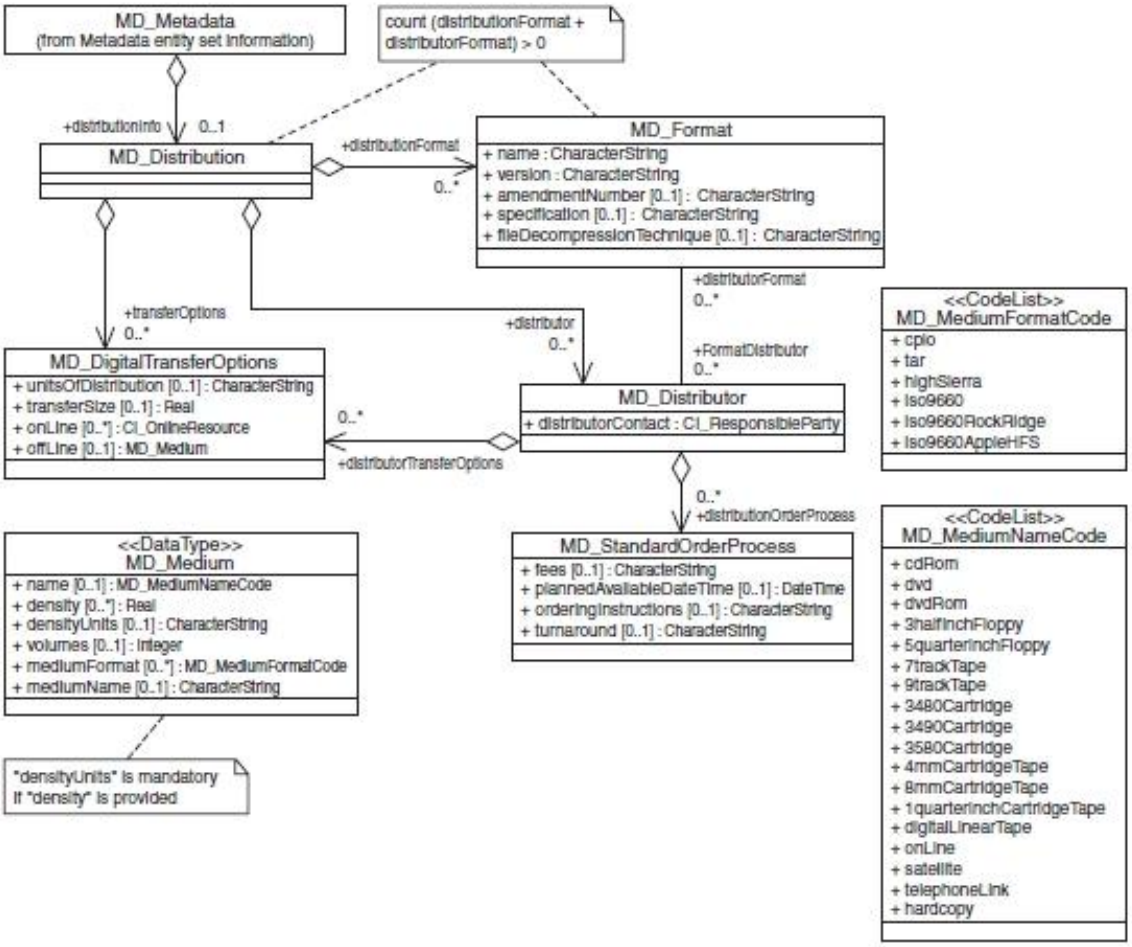



MD_Identification
(from Identification information)
+ citation : CI_Citation
+ abstract : CharacterString
+ purpose [0..1] : CharacterString
+ credit [0..*] : CharacterString
+ status [0..*] : MD_ProgressCode
+ pointOfContact [0..*] : CI_ResponsibleParty
<<CodeList>>
DCPList
+ XML
+ CORBA
+ JAVA
+ COM
+ SQL
+ WebServices
<<enumeration>>
SV_ParameterDirection
+ in
+ out
+ in/out
<<CodeList>>
SV_CouplingType
+ loose
+ mixed
+ tight
characterSet: documented if ISO 10646-1 is not used
{MD_Metadata.hierarchyLevel = "dataset" implies count
(extent.geographicElement.EX_GeographicBoundingBox) + count
(extent.geographicElement.EX_GeographicDescription) >=1}
{MD_Metadata.hierarchyLevel notEqual "dataset" or "series"
implies topicCategory is not mandatory}
SV_ServiceIdentification
+ serviceType : GenericName
+ serviceTypeVersion[0..*] : CharacterString
+ accessProperties[0..1] : MD_StandardOrderProcess
+ restrictions[0..1] : MD_Constraints
+ extent[0..*] : EX_Extent
+ couplingType : SV_CouplingType
+ coupledResource[0..*] : SV_CoupleResource
+operatesOn
MD_DataIdentification
(from Identification information)
+ spatialRepresentationType [0..*] : MD_SpatialRepresentationTypeCode
+ spatialResolution [0..*] : MD_Resolution
+ language [1..*] : CharacterString
+ characterSet [0..*] : MD_CharacterSetCode = "utf8"
+ topicCategory [1..*] : MD_TopicCategoryCode
+ environmentDescription [0..1] : CharacterString
+ extent [0..*] : EX_Extent
+ supplementalInformation [0..1] : CharacterString
+dependsOn
+containsOperations
1..*
0..*
Dependencies
+operation
1..*
{ordered}
SV_OperationMetadata
+ operationName : CharacterString
+ DCP[1..*] : DCPList
+ operationDescription[0..1] : CharacterString
+ invocationName[0..1] : CharacterString
+ connectPoint[1..*] : CI_OnlineResource
SV_CoupledResource
+ identifier : CharacterString
+ operationName : CharacterString
Chaining Metadata
name : MemberName
+operation
SV_OperationChainMetadata
+ name : CharacterString
+ description[0..1] : CharacterString
1
+parameters
<<DataType>>
SV_Parameter
+ direction[0..1] : SV_ParameterDirection
+ description[0..1] : CharacterString
+ optionality : CharacterString = "Mandatory"
+ repeatability : Boolean
+valueType
<<Type>>
Type
(from Records and Class Metadata)

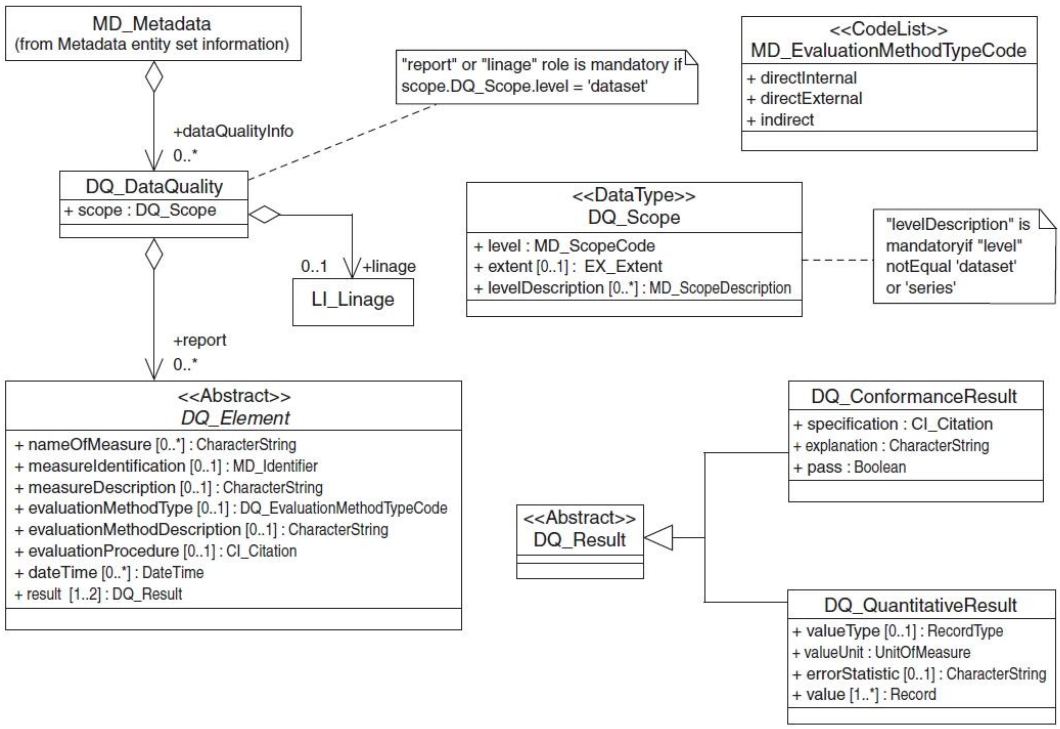
E.8 Content UML

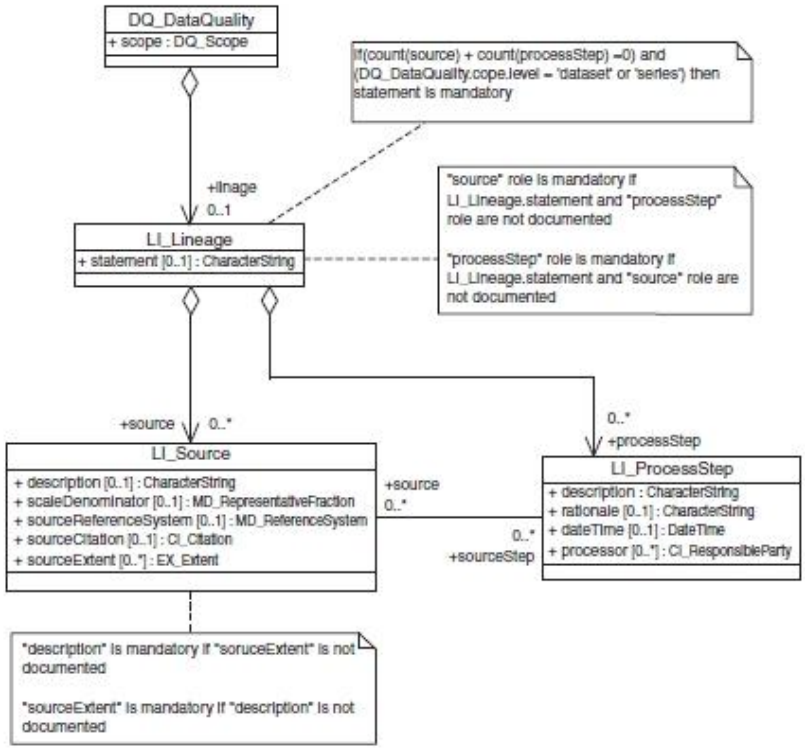


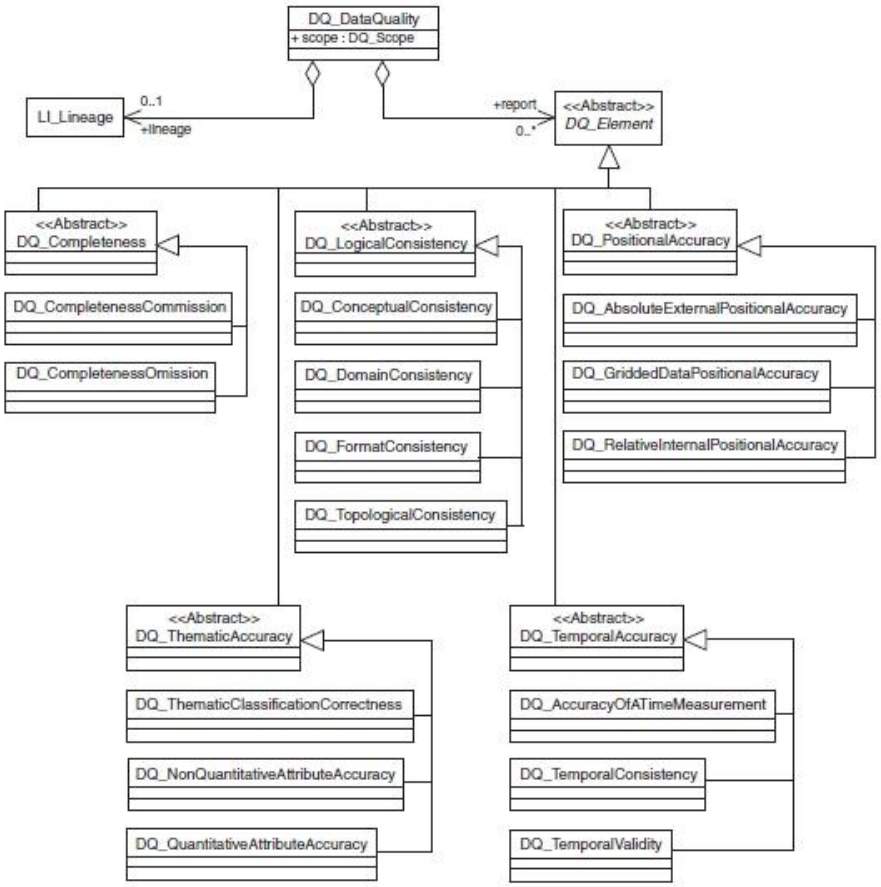
E.9 Distribution UML



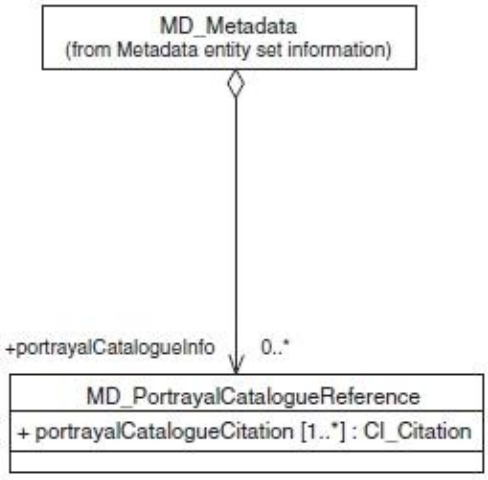
E.10 Data Quality UML



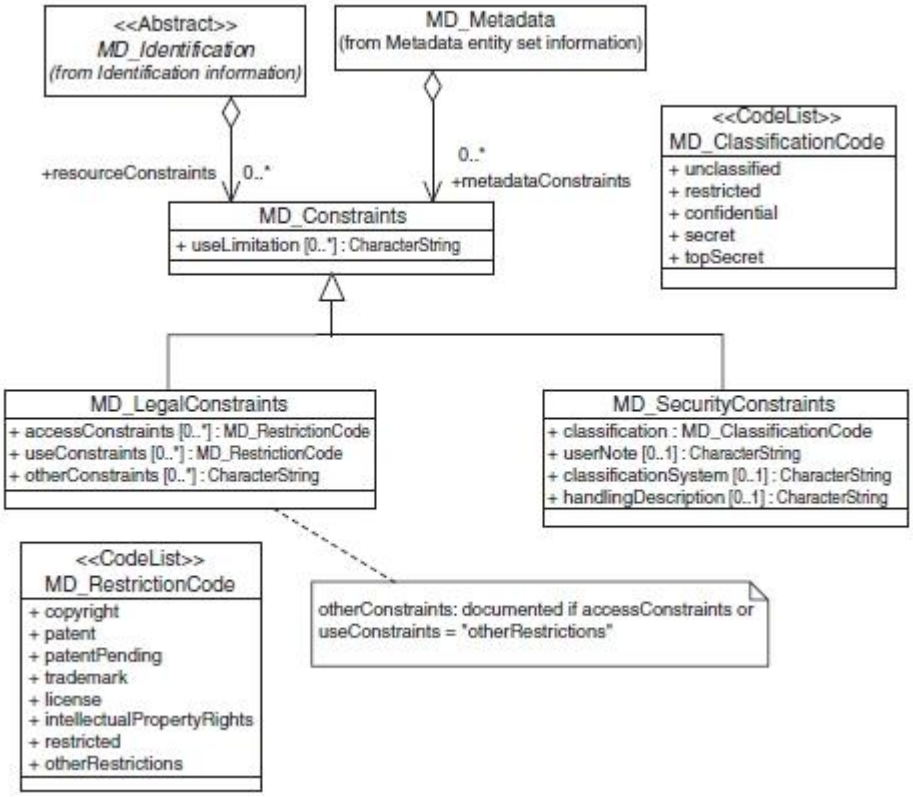




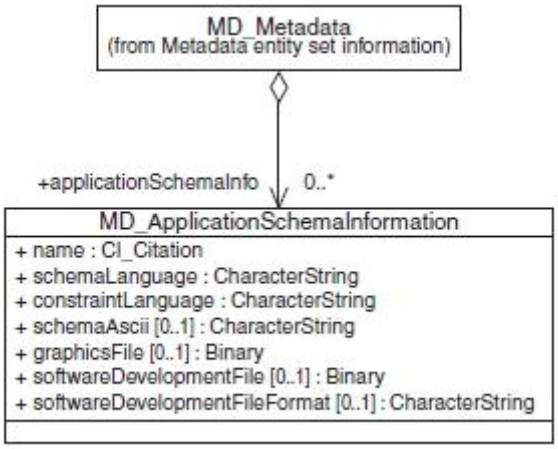
E.11 Portrayal Catalogue UML



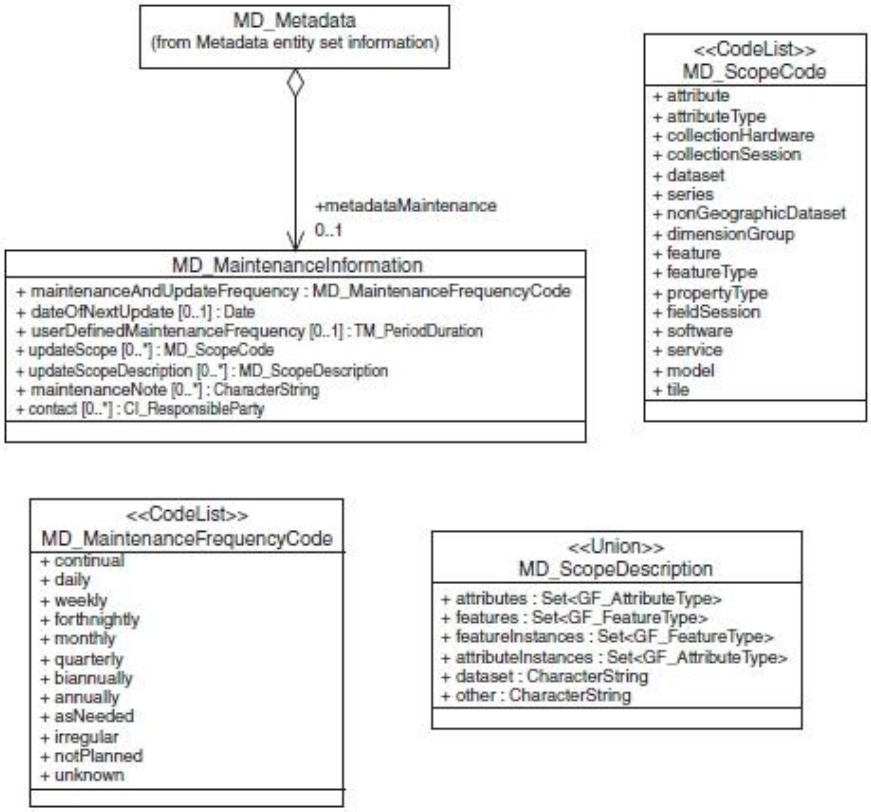
E.12 Constraint UML



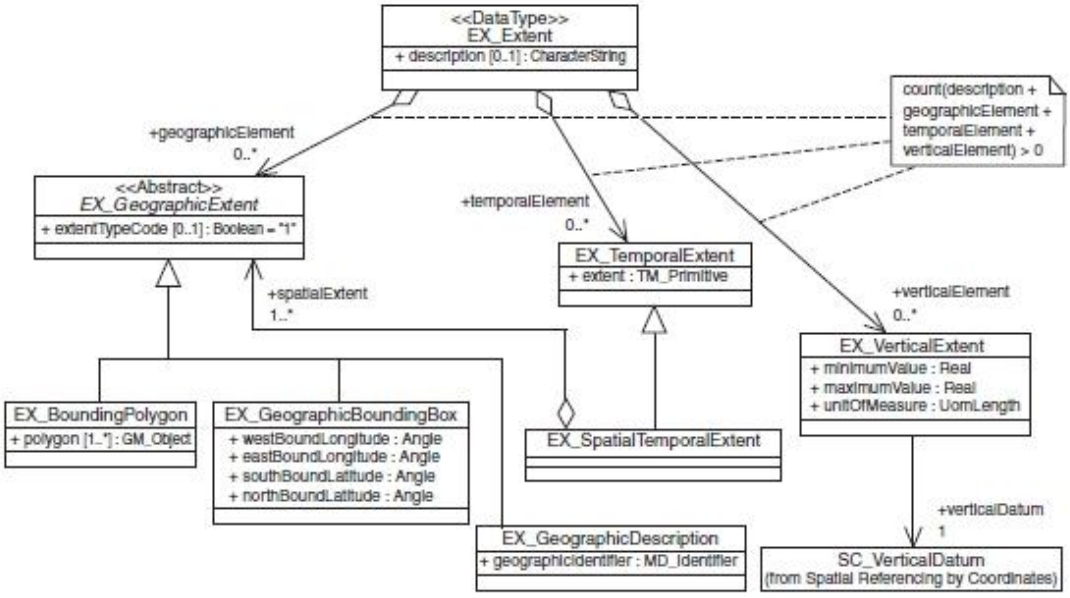
E.13 Application Schema UML



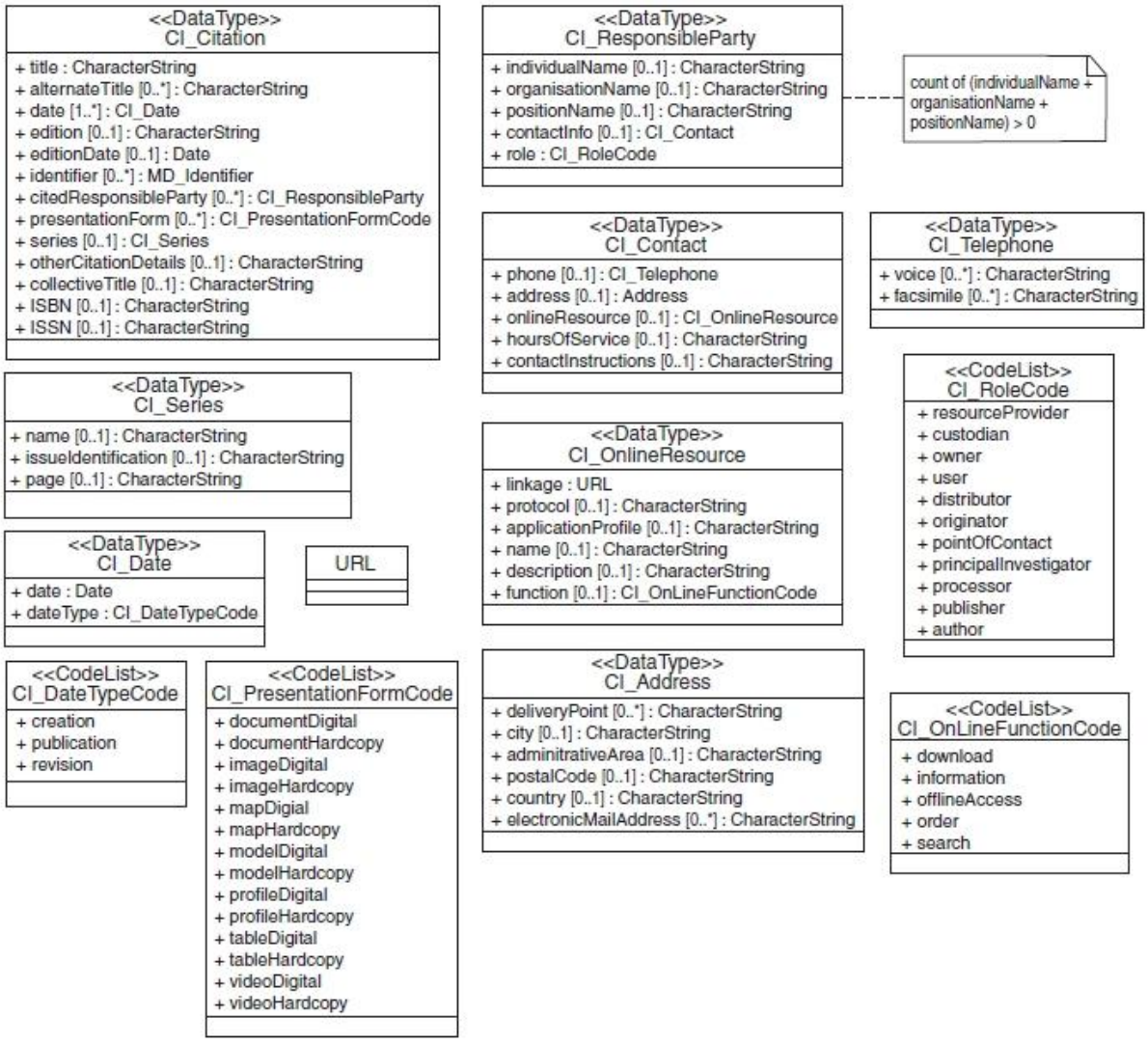
E.14 Maintenance UML



E.15 Extent UML



E.16 Citation UML



E.17 Feature Catalogue UML