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# ISO 19115-2

## Geographic information — Metadata

### Part 2: Extensions for imagery and gridded data

# *Workbook*

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*Guide to implementing ISO 19115-2:2009(E),  
the North American Profile (NAP), and  
ISO 19110 Feature Catalogue*

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January 2012

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Prepared by:  
National Coastal Data Development Center  
National Oceanographic Data Center  
National Oceanic and Atmospheric Administration

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 19115-2 Geographic information — Metadata Part 2: Extensions for imagery and gridded data ISO 19115-2:2009(E).

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The maintenance authority for this workbook is the National Oceanographic and Atmospheric Administration's (NOAA) National Coastal Data Development Center (NCDDC). Questions and/or comments concerning the workbook should be addressed to: NOAA National Coastal Data Development Center, Building 1100, Suite 101, Stennis Space Center, MS 39529; telephone toll free: 866-732-2382; telephone: 228-688-2936; facsimile: 228-688-2968; electronic mail: [ncddcmetadata@noaa.gov](mailto:ncddcmetadata@noaa.gov).

### **Acknowledgments**

Principle author Jacqueline Mize, NOAA/NESDIS/NCDDC with contributions from: Anna Milan, NOAA/NESDIS/NGDC; Anne Ball, NOAA/NOS/CSC; Emily Fergusson, NOAA/NMFS/AFSC; Kathy Martinolich, NOAA/NESDIS/NCDDC; Kim Jenkins, NOAA/NOS/OCIO; Lynda Wayne, FGDC/GeoMaxim; Peter Schweitzer, USGS; Philip Herndon, NOAA/NOS/OCIO; Sarah O'Connor, NOAA/NESDIS/NODC; Sharon Mesick, NOAA/NESDIS/NCDDC; Ted Habermann, NOAA/NESDIS/NGDC; and Vivian Hutchison, USGS/NBII.

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# INTRODUCTION

## ISO 19115-2:2009(E)

### Geographic information – Metadata – Part 2: Extensions for imagery and gridded data

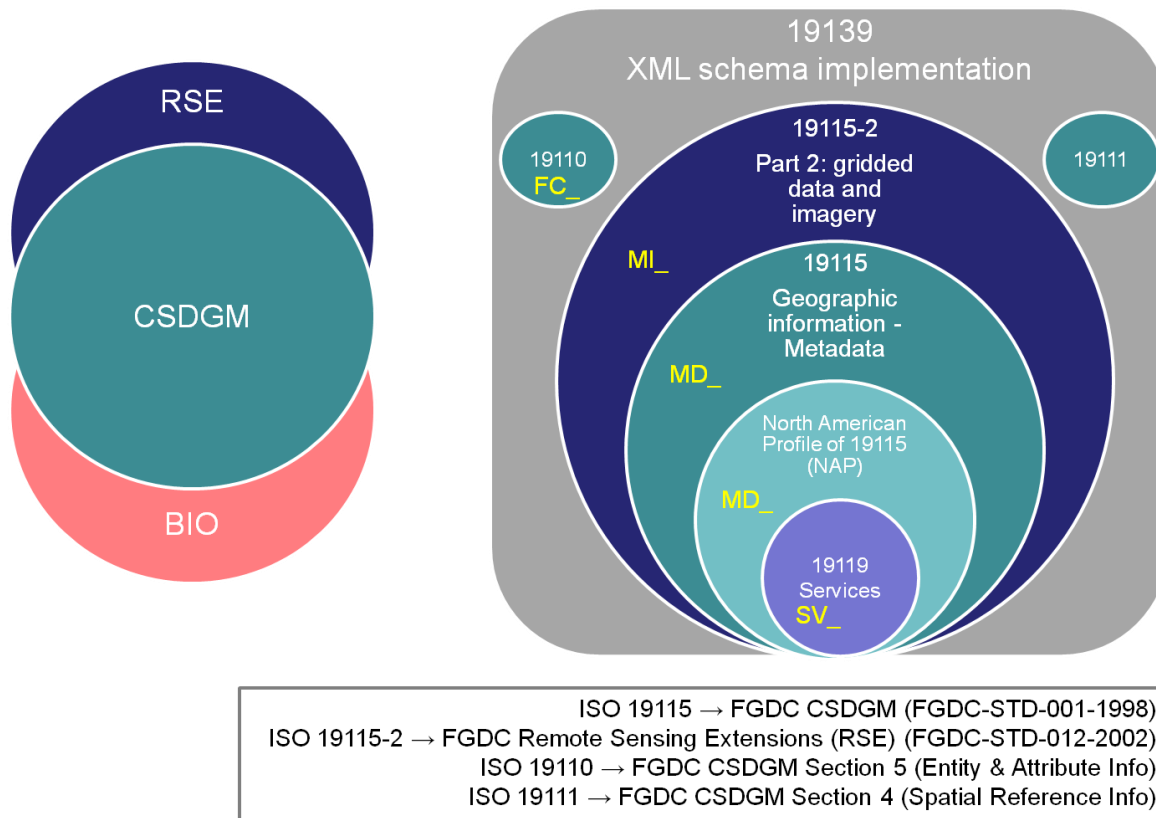
| Main Sections of ISO Metadata                                         |                                                                                                            |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------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



## Comparing FGDC and ISO Standards

The content of ISO 19115-2 strongly resembles the sections of the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata (CSDGM) Remote Sensing Extensions (RSE). The following information is **new** with ISO/NAP:

- Far more flexible.
- Depict 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.



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 the ISO 19115 Geographic information – Metadata. ISO 19115-2 Geographic information – Metadata – Part 2: Extensions for imagery and gridded data extend the 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 the ISO 19115. The NAP shortened the core and changed conditionality and multiplicity on several elements. The ISO 19110 Geographic information – Methodology for feature

cataloguing is a separate standard and separate document that the ISO 19115 will reference if it exists. The ISO 19110 is much like 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 the ISO 19115. The ISO 19111 is much like Section 4, Spatial Reference Information, of the CSDGM. The ISO 19139 defines the XML encoding of the ISO metadata standards. The 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 maybe found in multiple locations within the main sections (similar to the “supporting sections” of the FGDC CSDGM). You may 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                                               |

## Using ISO 19115 and ISO 19115-2

ISO 19115-2 extends ISO 19115 specifically for imagery and gridded data. The root of ISO 19115 metadata records will change from MD\_Metadata to MI\_Metadata when using ISO 19115-2. A new section is also added, gmi:acquisitionInformation includes the new package, MI\_AcquisitionInformation.

MI\_Acquisition includes several other new packages. MI\_Operation provides information of the overall data gathering program. MI\_Platform provides information about the platform from which the data were taken. MI\_Instrument provides designation of the measuring instruments used to acquire the data. MI\_Objective describes the characteristics and geometry of the intended object to be observed. MI\_Requirement details the requirements used to derive the acquisition plan. MI\_Plan details the implementation. MI\_Event describes a significant even that occurred. MI\_PlatformPass identifies a particular pass made by the platform during data acquisition.

The spatial representation package is extended in ISO 19115-2. MD\_Georectified is extended to include checkpoint information to further specify georectification details, from MI\_GCP, in MI\_Georectified. MD\_Georeferenceable is extended to include additional information that can be used to geolocate the data, from MI\_GeolocationInformation, in MI\_Georeferenceable.

Content information is extended to describe the content of a coverage. MD\_Band is extended to define additional attributes for specifying properties of individual wavelength bands in MI\_Band. MI\_RangeElementDescription was added to provide identification of the range of elements used in a coverage dataset. MD\_ImageDescription is extended to include MI\_RangeElementDescription in MI\_ImageDescription. MD\_CoverageDescription is also extended to include MI\_RangeElementDescription in MI\_CoverageDescription.

Data Quality was also extended in ISO 19115-2. LI\_Source was extended to describe the output of a process step in LE\_Source. LE\_ProcessStepReport was added to identify external information about the processing steps. LE\_Algorithm is added to describe the methodology used to derive the data from the source data. LE\_Processing includes LE\_Algorithm and adds information to describe the procedure by which the algorithm is applied to generate the product. LI\_ProcessStep is extended to describe additional information on the history of algorithms used and the processing performed to produce the data in LE\_ProcessStep. QE\_Usability is added to provide specific quality information about a dataset's suitability for a particular application. DQ\_Result is extended to include information required to report data quality for a coverage in QE\_CoverageResult. MD\_SpatialRepresentation, MD\_CoverageDescription, and MD\_Format are added to data quality in order to describe the coverage result. MX\_DataFile is added to identify a complete report of the quality of the coverage.

In a nutshell, the extensions are:

- MD\_Metadata → MI\_Metadata
- MD\_Georectified → MI\_Georectified
- MD\_Georeferenceable → MI\_Georeferenceable
- MD\_Band → MI\_Band
- MD\_ImageDescription → MI\_ImageDescription
- MD\_CoverageDescription → MI\_CoverageDescription
- DQ\_Result → QE\_CoverageResult
- DQ\_Element → QE\_Usability
- LI\_ProcessStep → LE\_ProcessStep
- LI\_Source → LE\_Source

## XML Basics

**Note: All elements 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:thesaurusName> 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 attributes 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:identifier>

<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 positions and can be used alone or it can qualify a specific value 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 xlink:s). 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”.

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 which uniquely identifies the metadata file**

**Type:** gco:characterString

**Domain:** free text

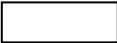
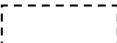
**Multiplicity:** optional \*This is NAP requirement\*

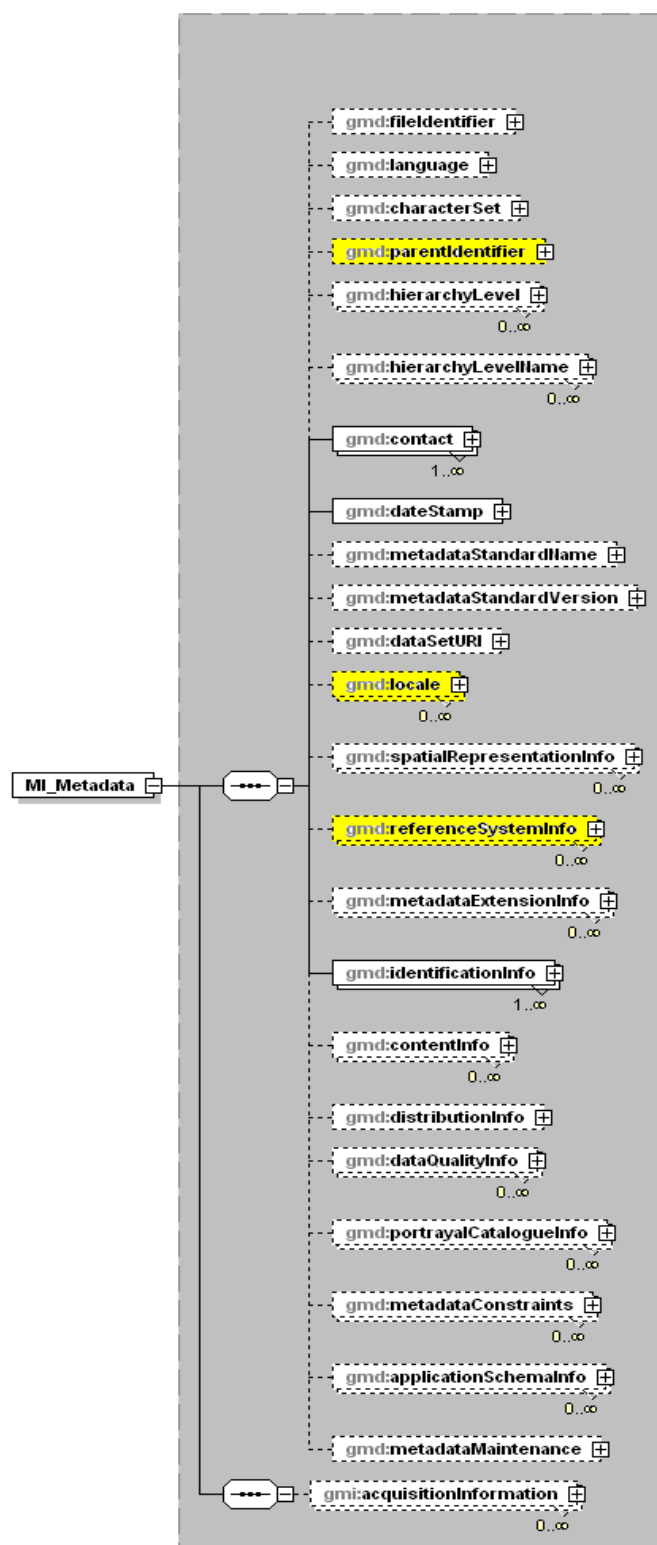
**Attributes:** nilReason

**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   |



## Metadata for Imagery and Gridded Data

- 0 MI\_Metadata – Root entity that defines information about imagery or gridded data. (MD\_Metadata extended)  
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 19115-2 Geographic Information – Metadata – Part 2: Extensions for Imagery and Gridded Data
- 0.10 metadataStandardVersion – Version of the metadata standard/profile used.  
Type: gco:characterString  
Domain: free text  
Multiplicity: optional  
Attributes: nilReason  
Best Practices: ISO 19115-2:2009(E)

- 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.
- 

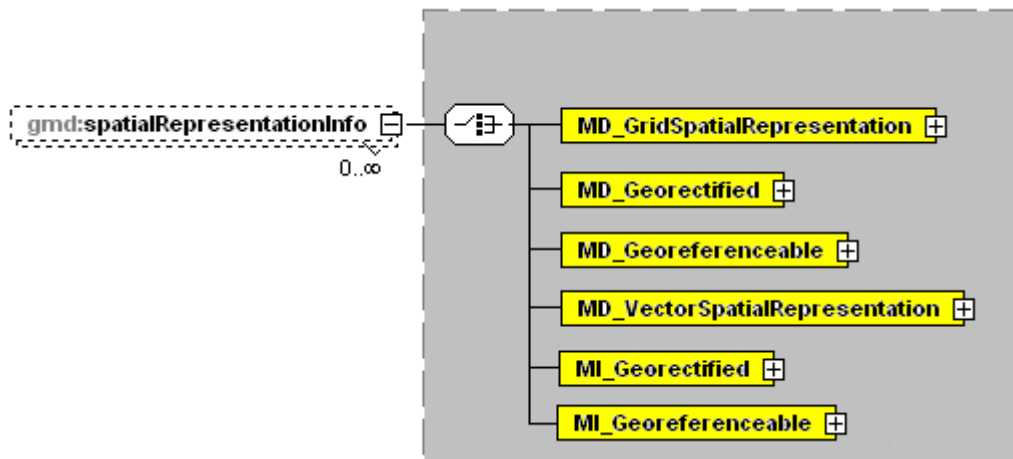
**FAQ:     Why is the dataSetURI a link to the metadata vs. the data?**

The dataSetURI is found within MI\_Metadata, defining information about the metadata. Because of the 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.

---

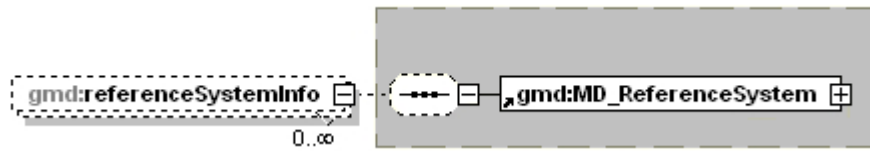
- 0.12     **locale** – Other languages used in metadata free text descriptions.  
          Type: [PT\\_Locale](#)  
          Multiplicity: conditional, repeatable  
          Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason  
          Best Practices: locale is mandatory 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 [MI\\_Georectified](#) or [MD\\_Georeferenceable](#) or [MI\\_Georeferenceable](#)  
 Multiplicity: optional, repeatable  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

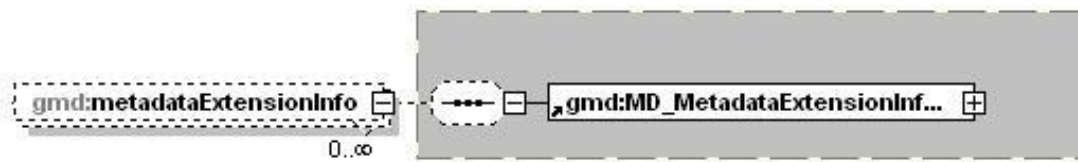
## Reference System Information



- 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: referenceSystemInfo is mandatory if spatialRepresentationType in dataIdentification is vector, grid, or tin.

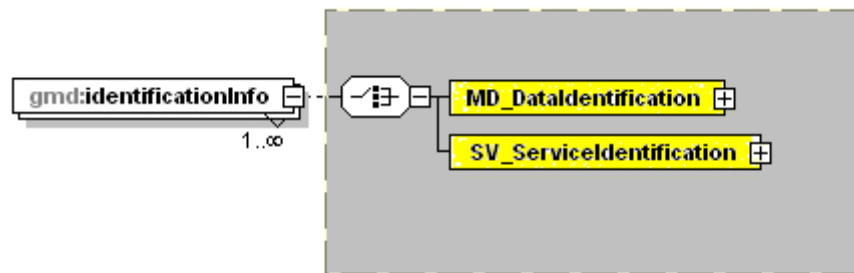


## Metadata Extension Information



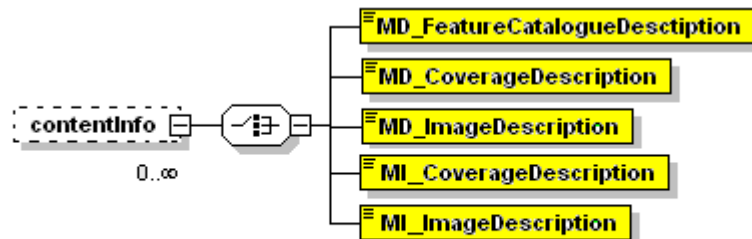
- 3 metadataExtensionInfo – Information describing metadata extensions  
Type: [MD\\_MetadataExtensionInformation](#)  
Multiplicity: optional, repeatable \*this is not in NAP\*  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

## Identification Information



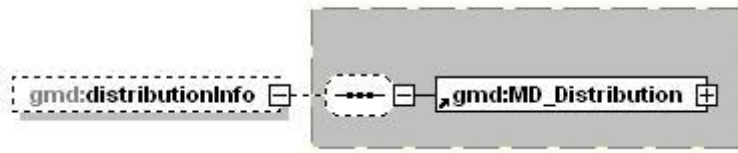
- 4      `identificationInfo` – Basic information about the dataset.  
Type: [MD\\_DataIdentification](#) or [SV\\_ServiceIdentification](#)  
Multiplicity: mandatory, repeatable  
Attributes: `type`, `href`, `role`, `arcrole`, `title`, `show`, `actuate`, `uuidref`, `nilReason`  
Best Practices: There must be one occurrence of `MD_DataIdentification` 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\\_CoverageDescription](#) or [MD\\_ImageDescription](#) or [MI\\_CoverageDescription](#) or [MI\\_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

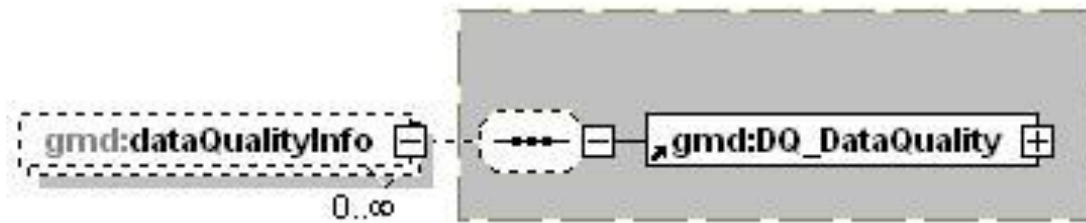
---

**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.

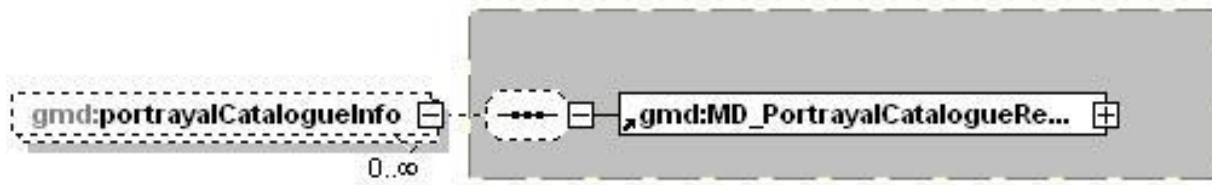
---

## Data Quality Information



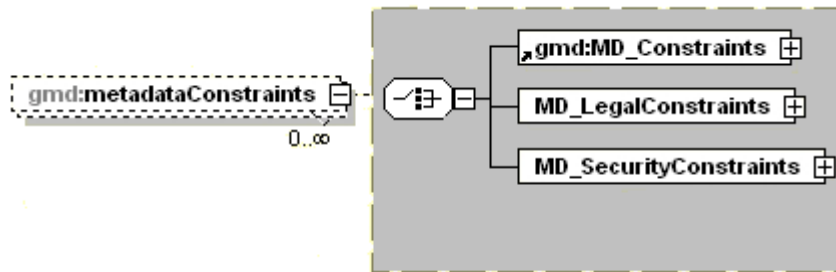
- 7      dataQualityInfo – Information on the quality of the data that is specified by a data quality scope.  
Type: [DQ\\_DataQuality](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

## Portrayal Catalogue Information



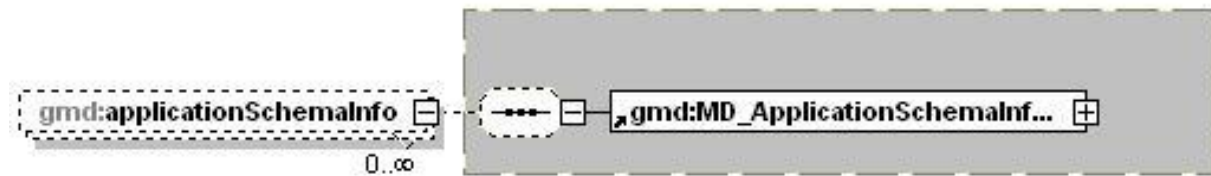
- 8      portrayalCatalogueInfo – A portrayal catalogue is a collection of defined symbols used to depict, to humans, features on a map.  
        Type: [MD\\_PortrayalCatalogueReference](#)  
        Multiplicity: optional, repeatable  
        Attributes: type, href, role, arcrole, title, show, actuate, 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

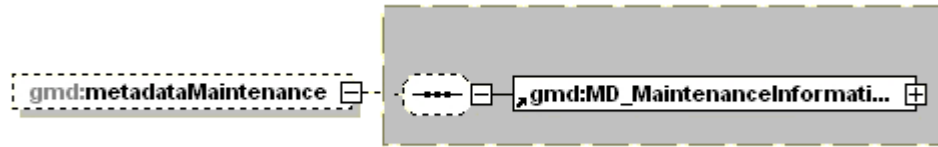
## Application Schema Information



- 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

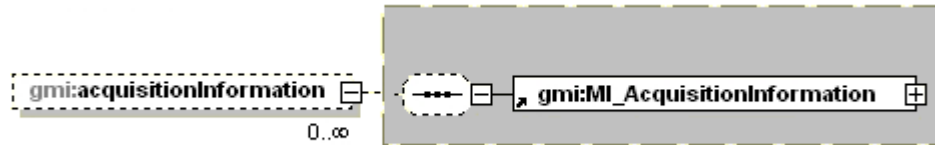


## Metadata Maintenance Information



- 11 metadataMaintenance – Information about metadata updates.  
Type: [MD\\_MaintenanceInformation](#)  
Multiplicity: optional  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

## Acquisition Information



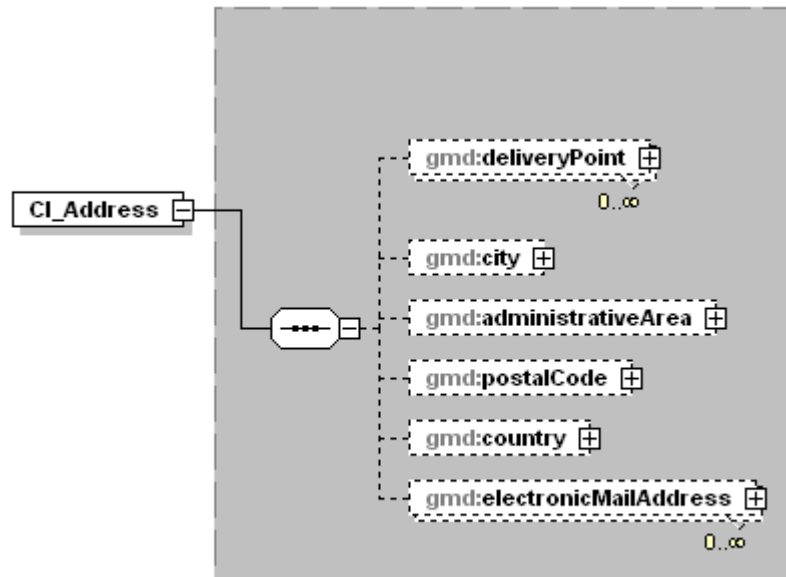
- 12 acquisitionInformation – Information about the acquisition of the data.  
Type: [MI\\_AquisitionInformation](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

---

## 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

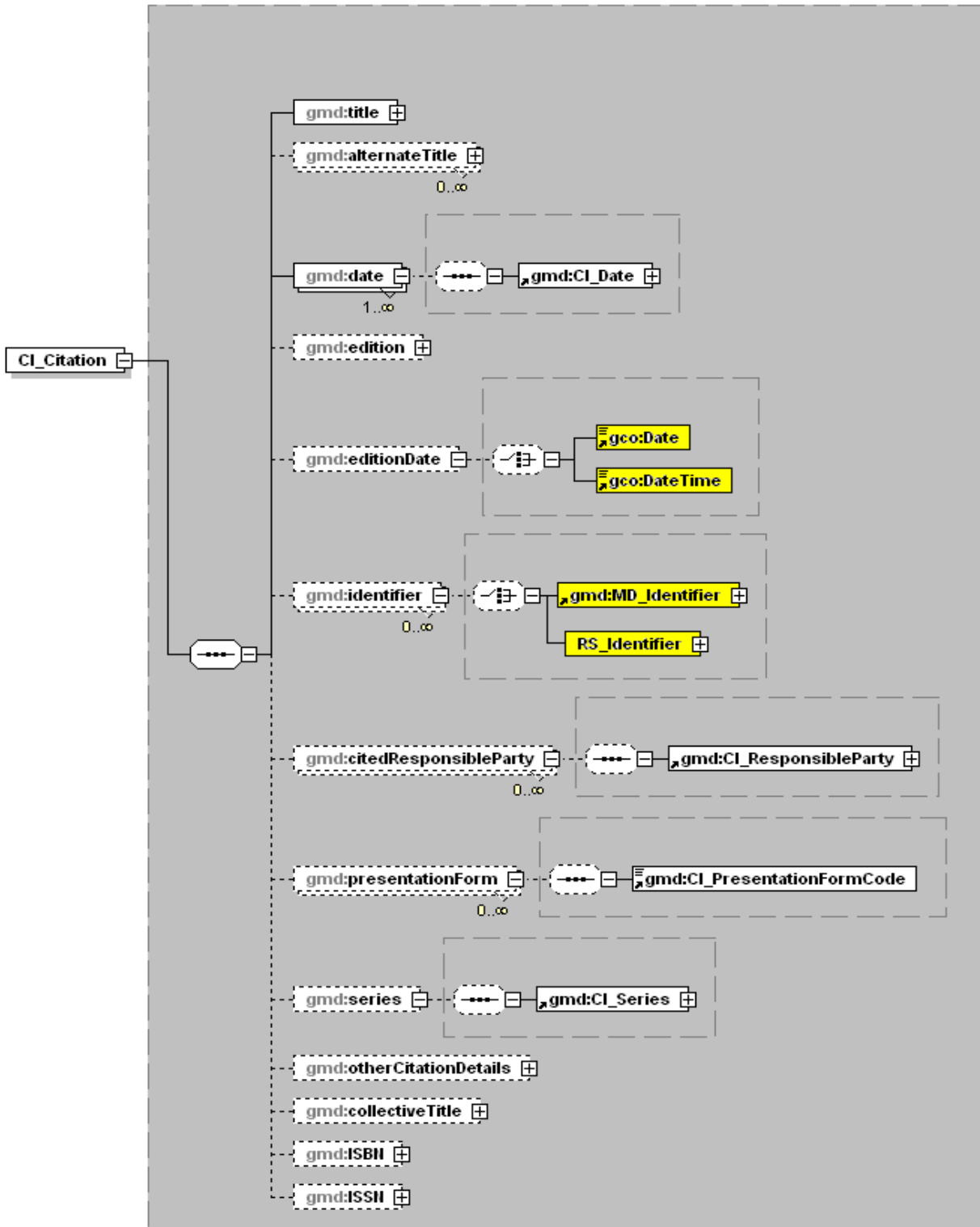
Multiplicity: optional, repeatable

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 – 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 if 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

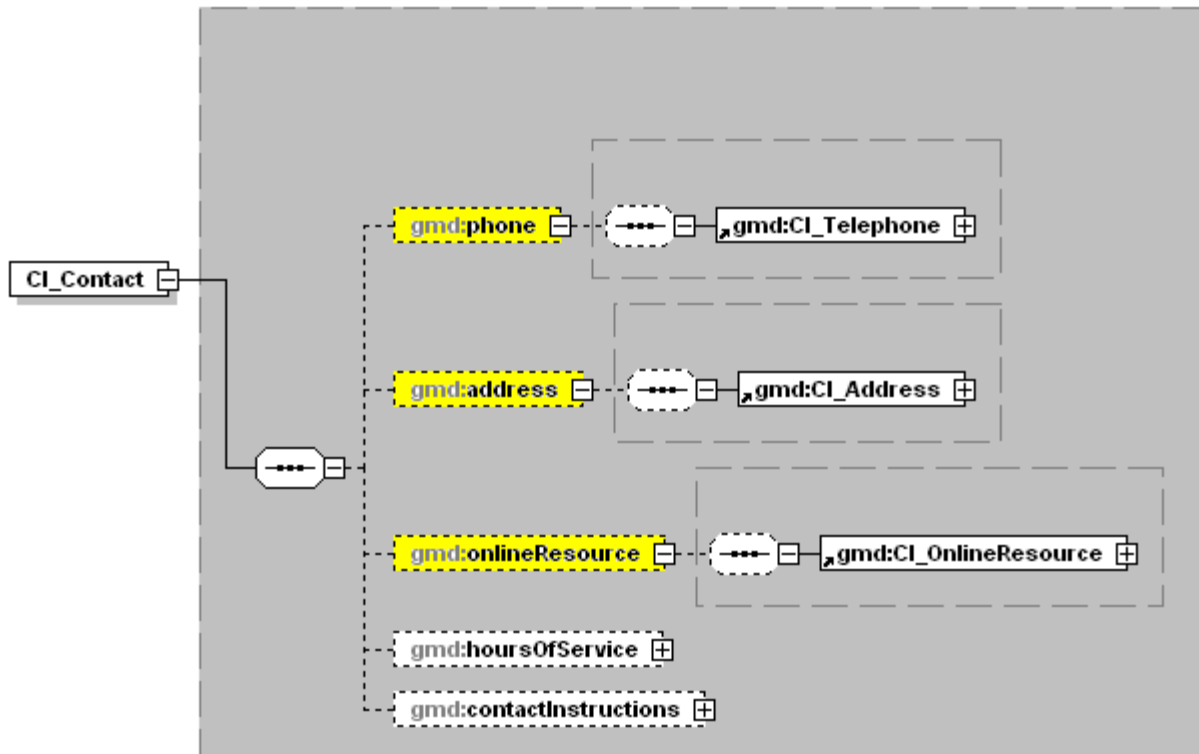
Domain: free text

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.

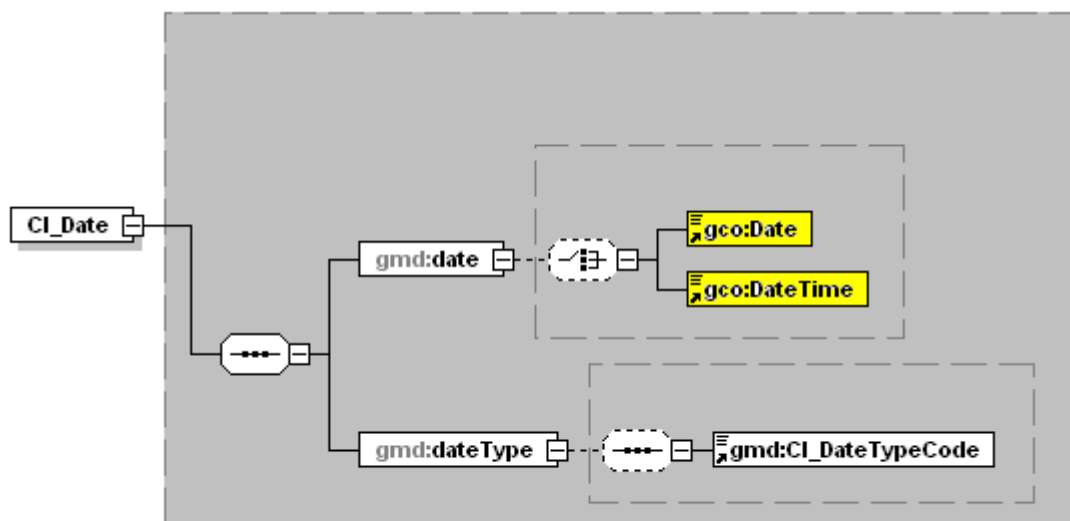
Type: gco:characterString

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*

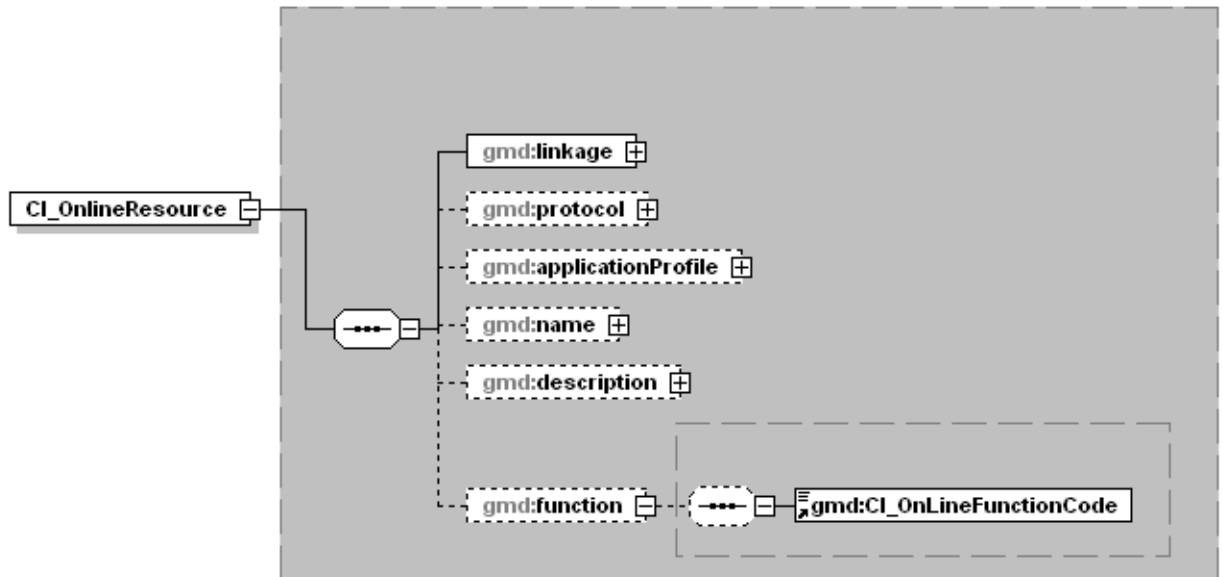
where *T* is used to separate the date and time components.

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

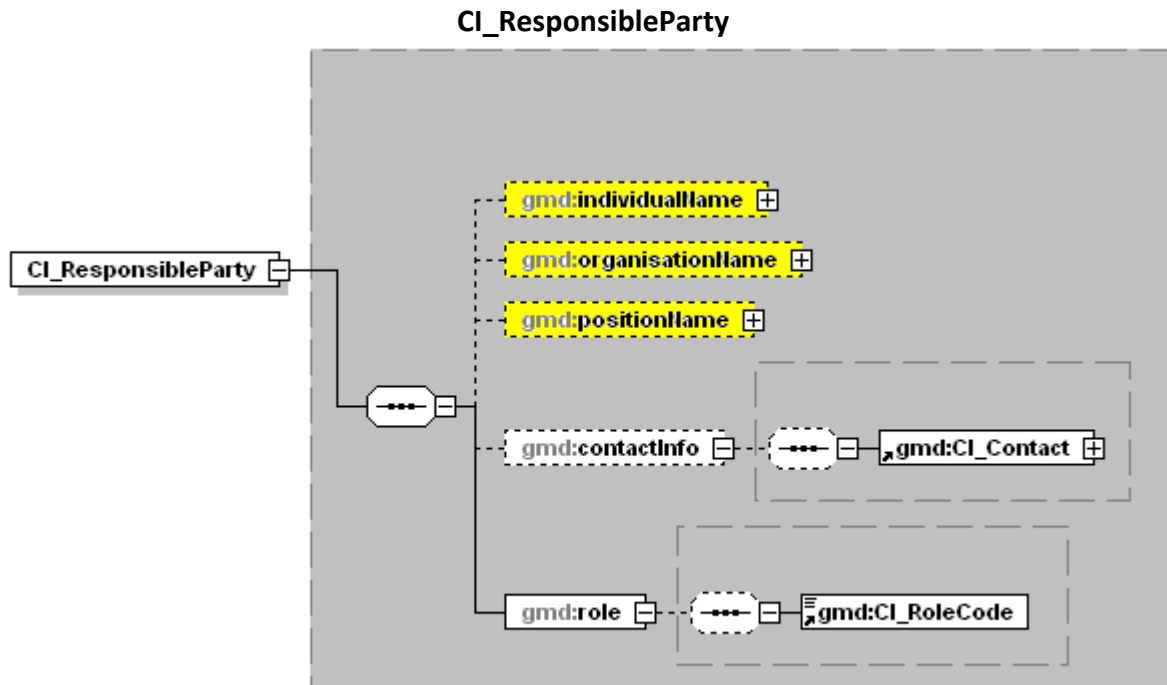
function – Code for function performed by the online resource.

Type: [CI\\_OnlineFunctionCode](#)

Domain: download, information, offlineAccess, order, search

Multiplicity: optional

Best Practices: See Annex C.



**CI\_ResponsibleParty** – 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/gmx/Codelists.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](#)

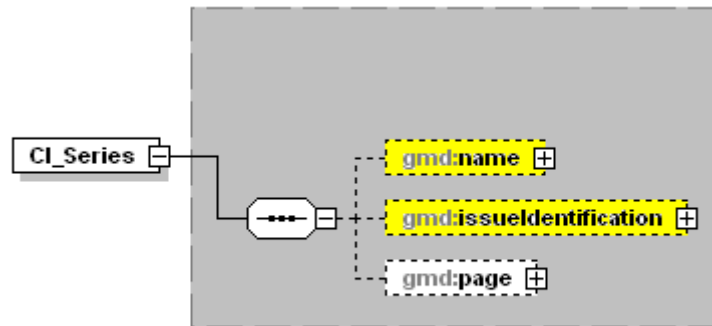
Domain: resourceProvider, custodian, owner, user, distributor, originator, pointOfContact, principalInvestigator, processor, publisher, author

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.

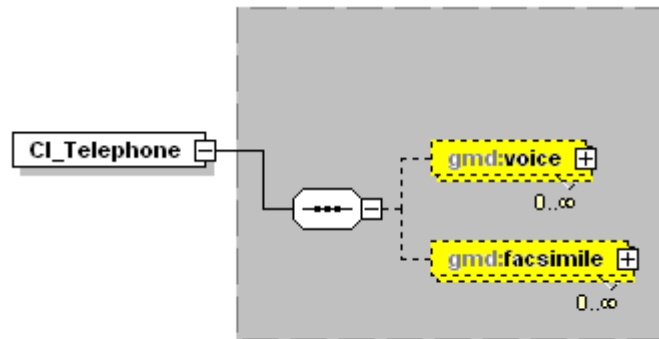
issueIdentification – Identification of the series' issue information.

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

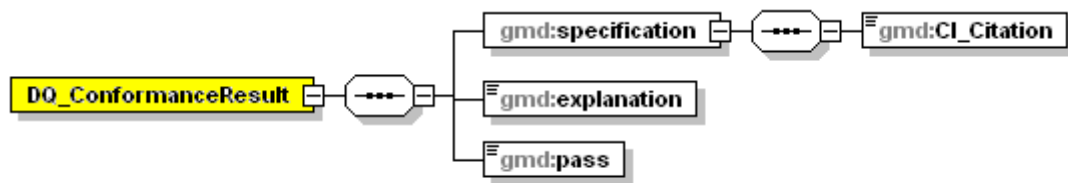
Best Practices: facsimile is mandatory if voice is not documented.

---

## **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.

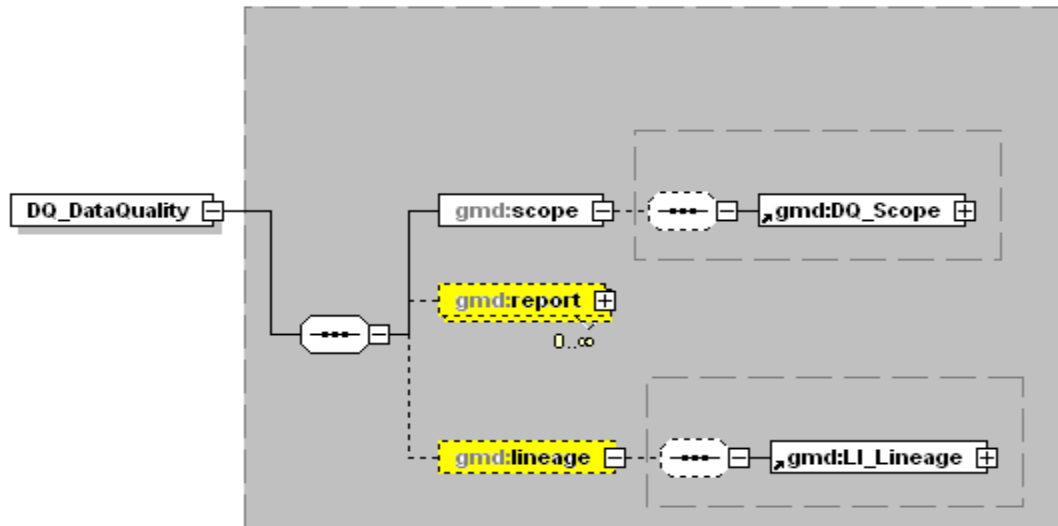
Type: Boolean

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: There 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](#) or [QE\\_Usability](#)

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

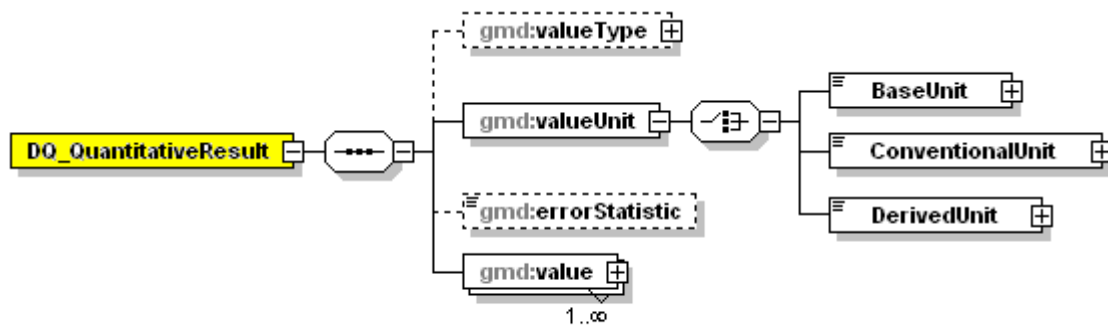
Type: [LI\\_Lineage](#)

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.

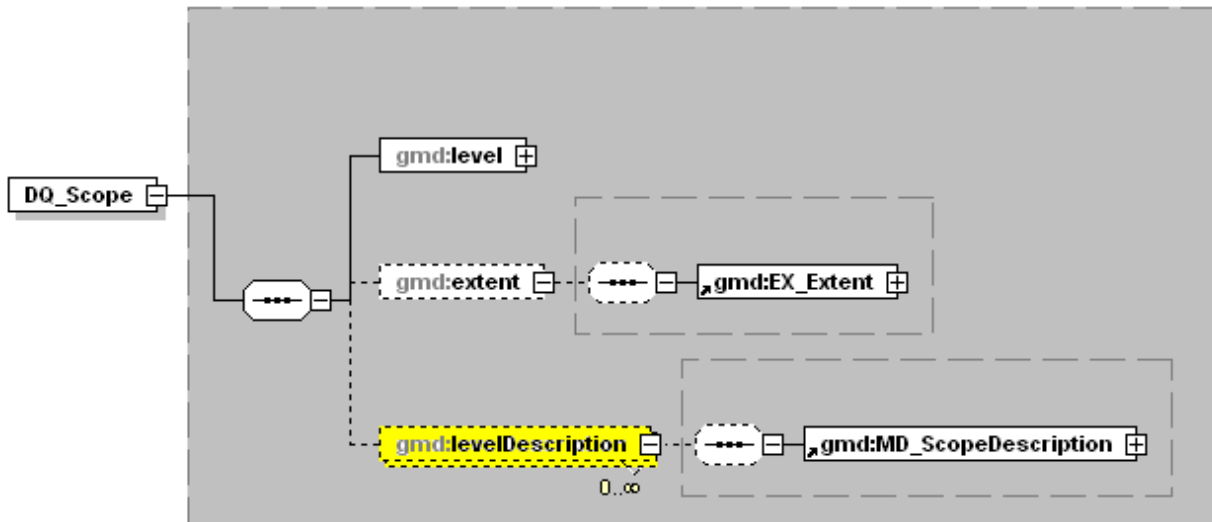
Type: gco:Record  
 Multiplicity: mandatory, repeatable  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

Ex:

```

<gmd:DQ_QuantitativeResult>
  <gmd:valueUnit>
    <gml:BaseUnit gml:id="meters">
      <gml:identifier codeSpace="SI">meters</gml:identifier>
      <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](#)

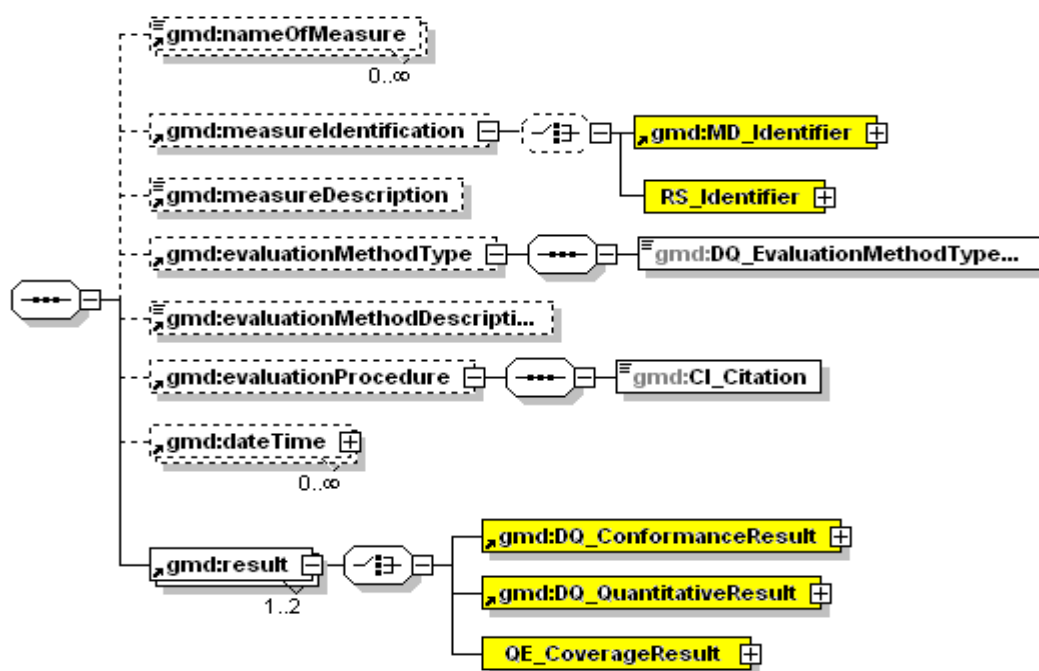
Multiplicity: conditional, repeatable

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\_AccuracyOfTimeMeasurement – 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](#) or [QE\\_CoverageResult](#)

Multiplicity: mandatory, repeatable twice

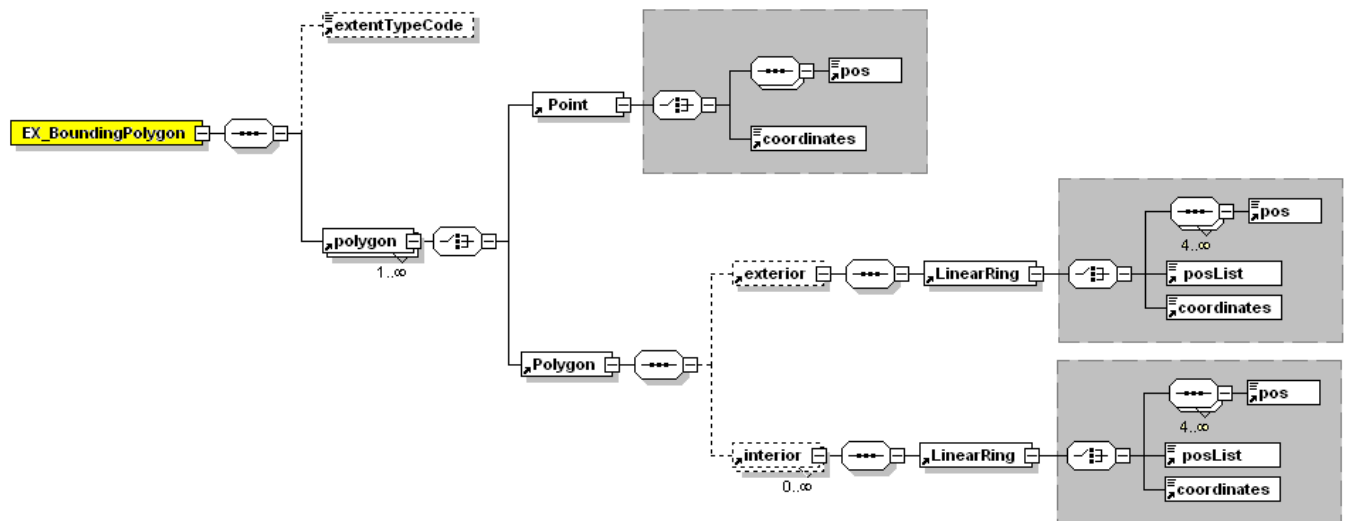
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

---

## **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.

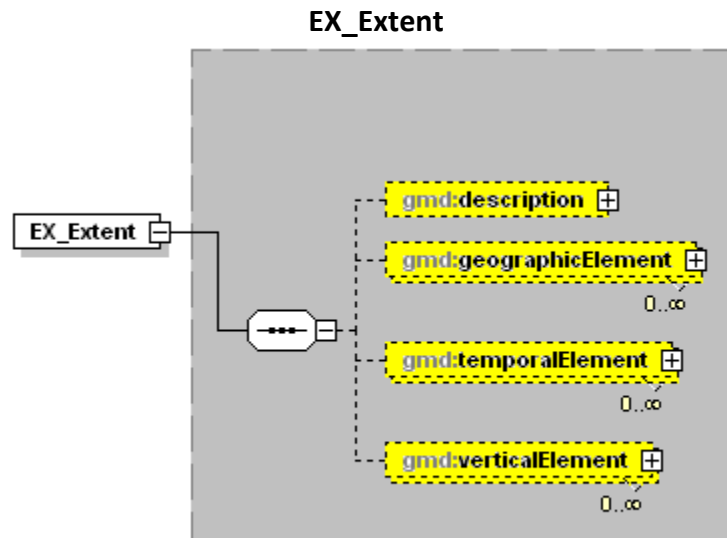
Ex:

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** – 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.

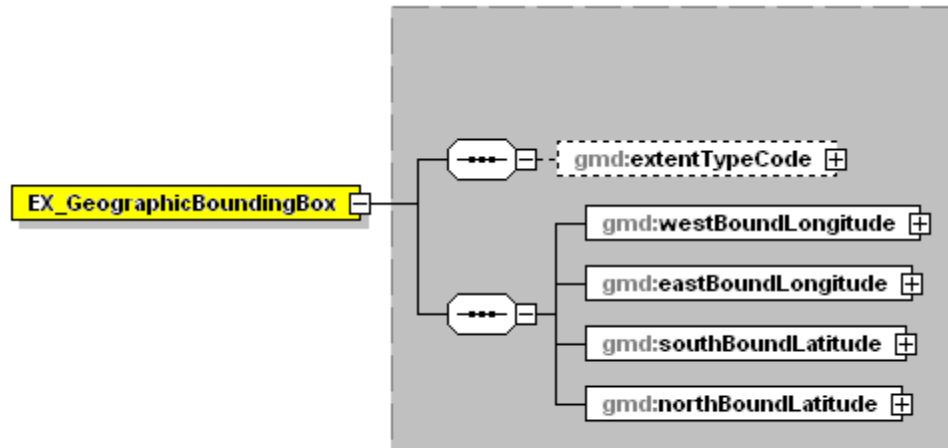
Type: [EX\\_VerticalExtent](#)

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.

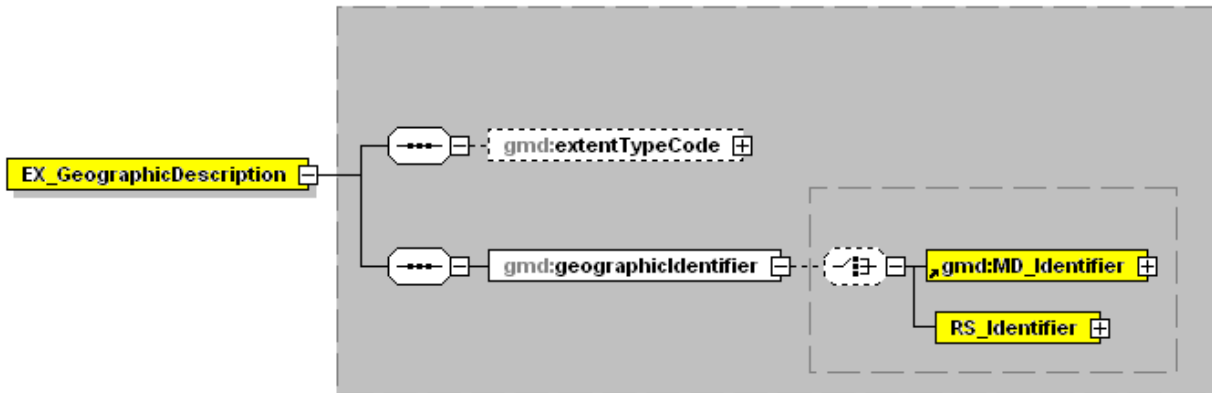
Type: gco:Decimal

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

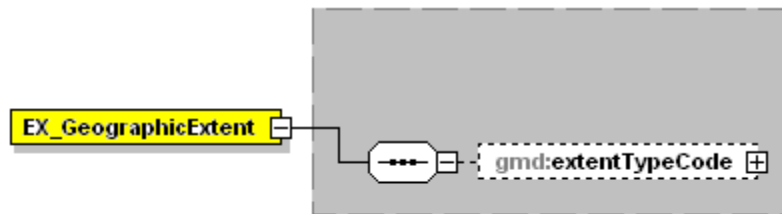
geographicIdentifier – Identifier used to represent a geographic area.

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

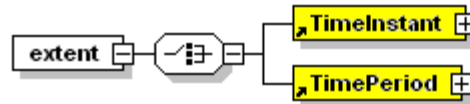
Attributes: nilReason

## EX\_TemporalExtent



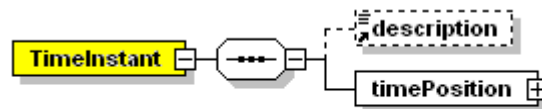
EX\_TemporalExtent – Time period covered by the content of the dataset

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.

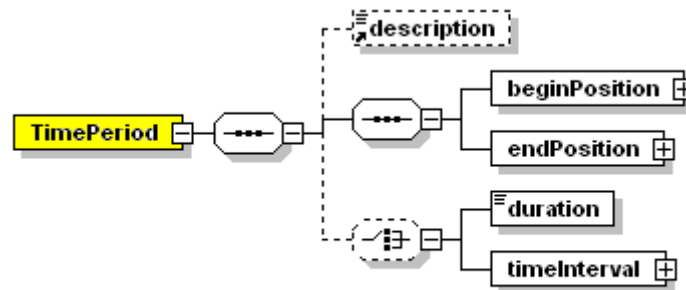
Domain: free text  
 Multiplicity: optional  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason  
 Best Practices: The currentness reference (the basis on which the time period of content information is determined) is often documented here.

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 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”.

**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>
```

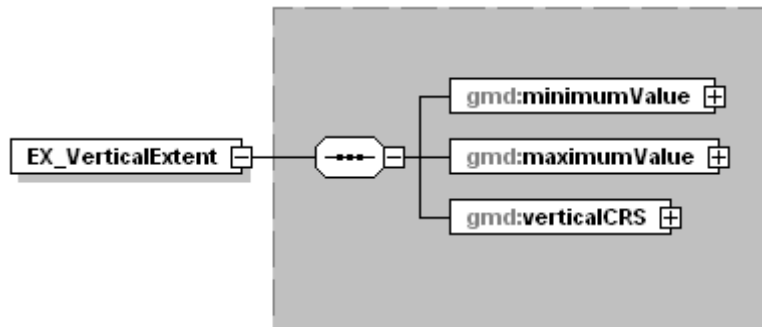
---

**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 contained 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_VeriticalExtent>
  <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_VeriticalExtent>
```

**Or when there is something to reference in EPSG:**

```
<gmd:verticalElement>
  <gmd:EX_VeriticalExtent>
    <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_VeriticalExtent>
</gmd:verticalElement>
```

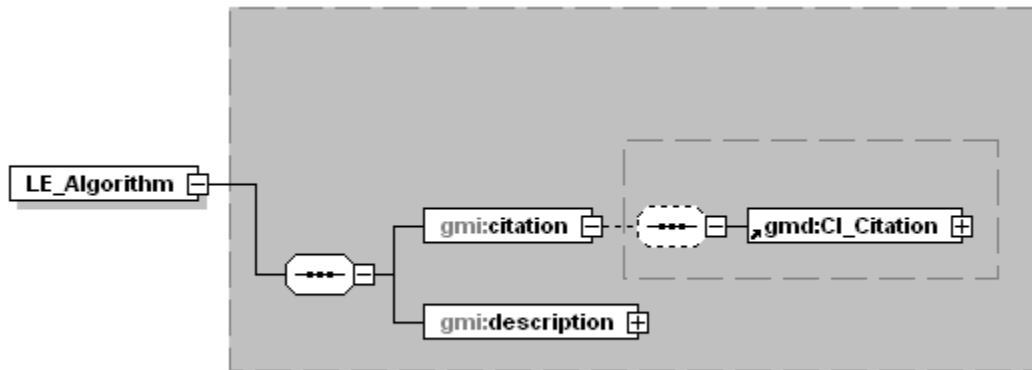
---

---

## LE PACKAGE

---

## LE\_Algorithm



LE\_Algorithm – Details of the methodology by which geographic information was derived from the instrument readings.

Type: compound  
 Multiplicity: mandatory  
 Attributes: id, uuid

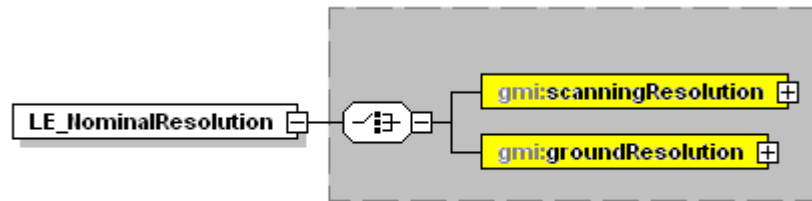
citation – Information identifying the algorithm and version or date.

Type: [CI\\_Citation](#)  
 Multiplicity: mandatory  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

description – Information describing the algorithm used to generate the data.

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

## LE\_NominalResolution



LE\_NominalResolution – Distance between consistent parts of (center, left, right) adjacent pixels.

Type: scanningResolution or groundResolution

Multiplicity: mandatory

scanningResolution – Distance between consistent parts of adjacent pixels in the scan plane.

Type: gco:Distance

Multiplicity: conditional

Attributes: nilReason

Best Practices: scanningResolution is mandatory if groundResolution is not present. gco:Distance has an attribute 'uom' that is mandatory.

groundResolution – Distance between consistent parts of adjacent pixels in the object space.

Type: gco:Distance

Multiplicity: conditional

Attributes: nilReason

Best Practices: groundResolution is mandatory if scanningResolution is not present. gco:Distance has an attribute 'uom' that is mandatory.

---

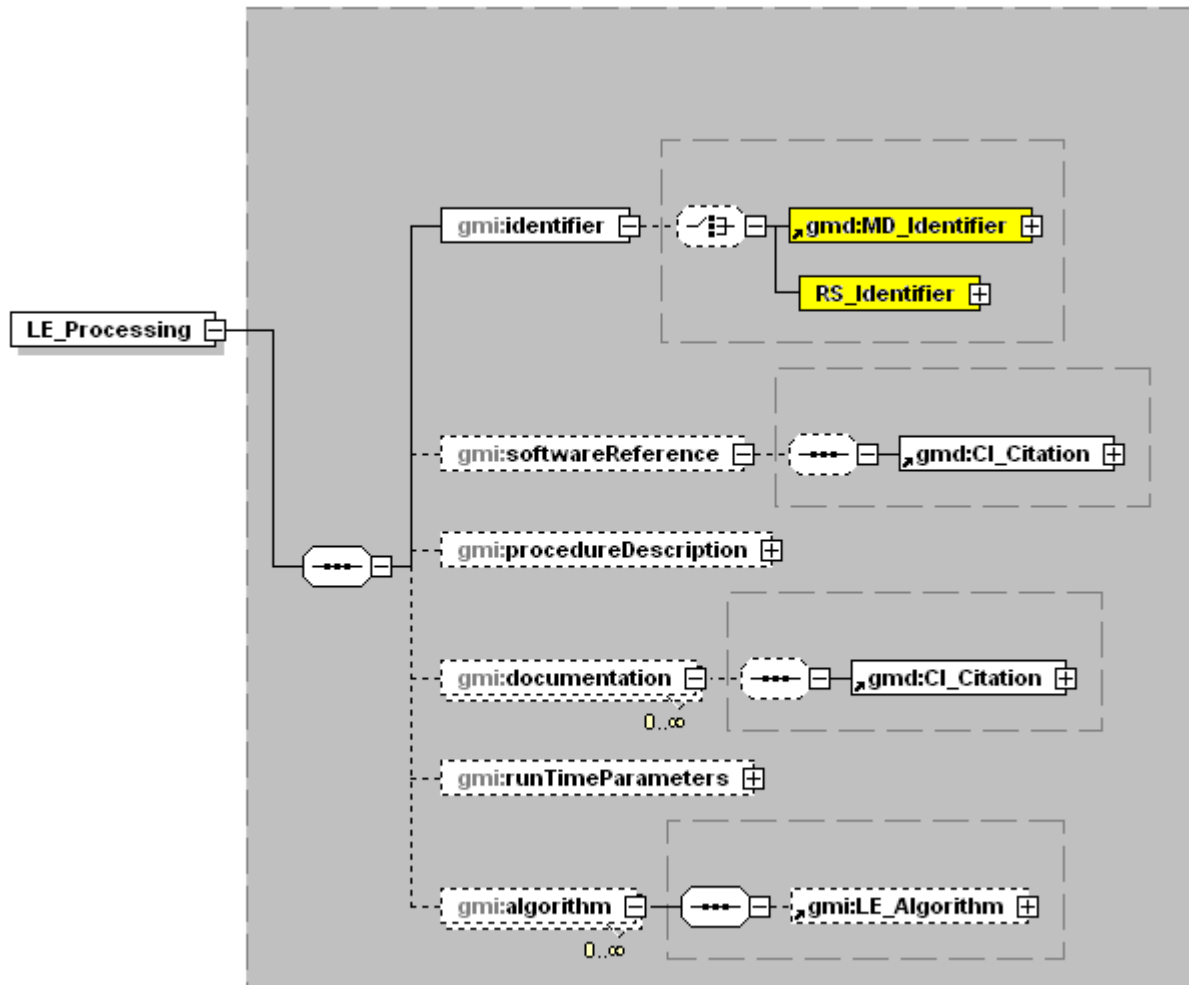
**FAQ:** How would you document ground features no smaller than 10x10 meters?

Ex:

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

---

## LE\_Processing



LE\_Processing – Comprehensive information about the procedure(s), process(es), and algorithm(s) applied in the process step.

Type: compound  
 Multiplicity: mandatory  
 Attributes: id, uuid

identifier – Information to identify the processing package that produced the data.

Type: [MD\\_Identifier](#) or [RS\\_Identifier](#)  
 Multiplicity: mandatory  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

softwareReference – Reference to a document describing the processing software.

Type: [CI\\_Citation](#)  
 Multiplicity: optional  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

procedureDescription – Additional details about the processing procedures.

Type: gco:CharacterString

Domain: free text

Multiplicity: optional

Attributes: nilReason

documentation – Reference to documentation describing the processing.

Type: [CI\\_Citation](#)

Multiplicity: optional, repeatable

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

runTimeParameters – Parameters to control the processing operations entered at runtime.

Type: gco:CharacterString

Domain: free text

Multiplicity: optional

Attributes: nilReason

algorithm – Details of the methodology by which geographic information was derived from the instrument readings.

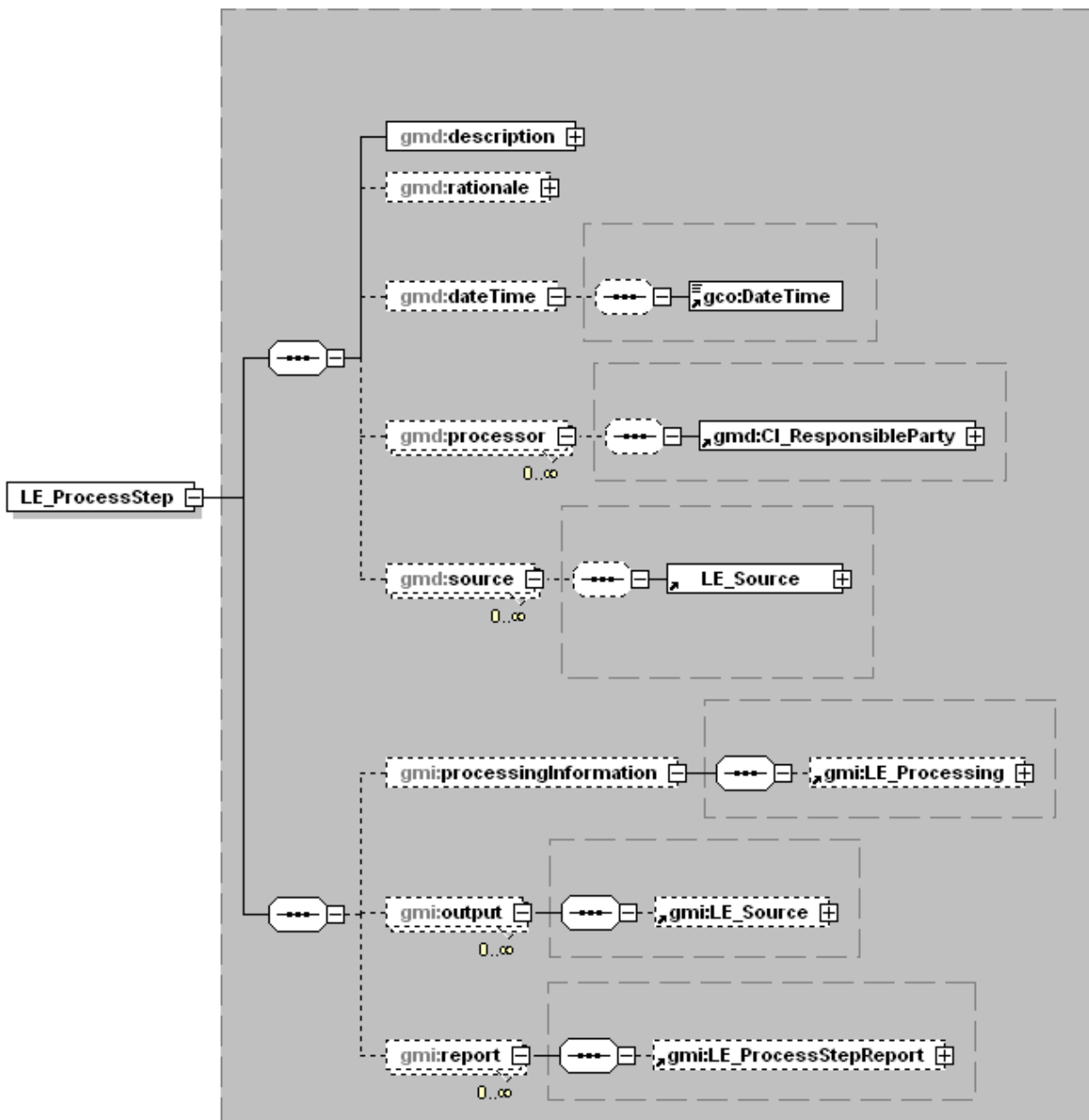
Type: [LE\\_Algorithm](#)

Multiplicity: optional, repeatable

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



## LE\_ProcessStep



LE\_ProcessStep – The events in the development of the dataset (LI\_ProcessStep extended).

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: [LE\\_Source](#)

Multiplicity: optional, repeatable

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

processingInformation – Comprehensive information about the procedure by which the algorithm was applied to derive geographic data from the raw instrument measurements, such as datasets, software used, and the processing environment.

Type: [LE\\_Processing](#)

Multiplicity: optional

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

output – Description of the product generated as a result of the process step.

Type: [LE\\_Source](#)

Multiplicity: optional, repeatable

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

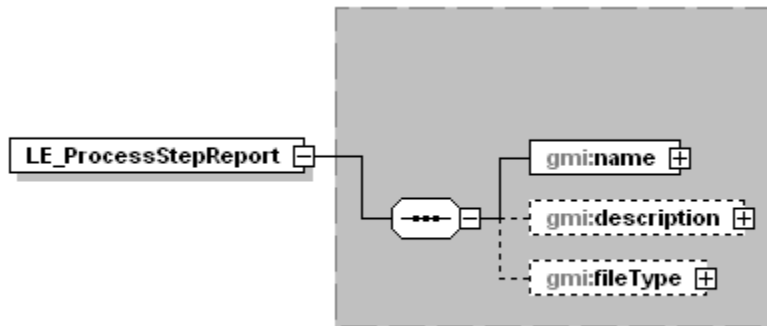
report – Report generated by the process step.

Type: [LE\\_ProcessStepReport](#)

Multiplicity: optional, repeatable

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

## LE\_ProcessStepReport



LE\_ProcessStepReport – Report of what occurred during the process step.

Type: compound  
Multiplicity: mandatory  
Attributes: id, uuid

name – Name of the processing report.

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

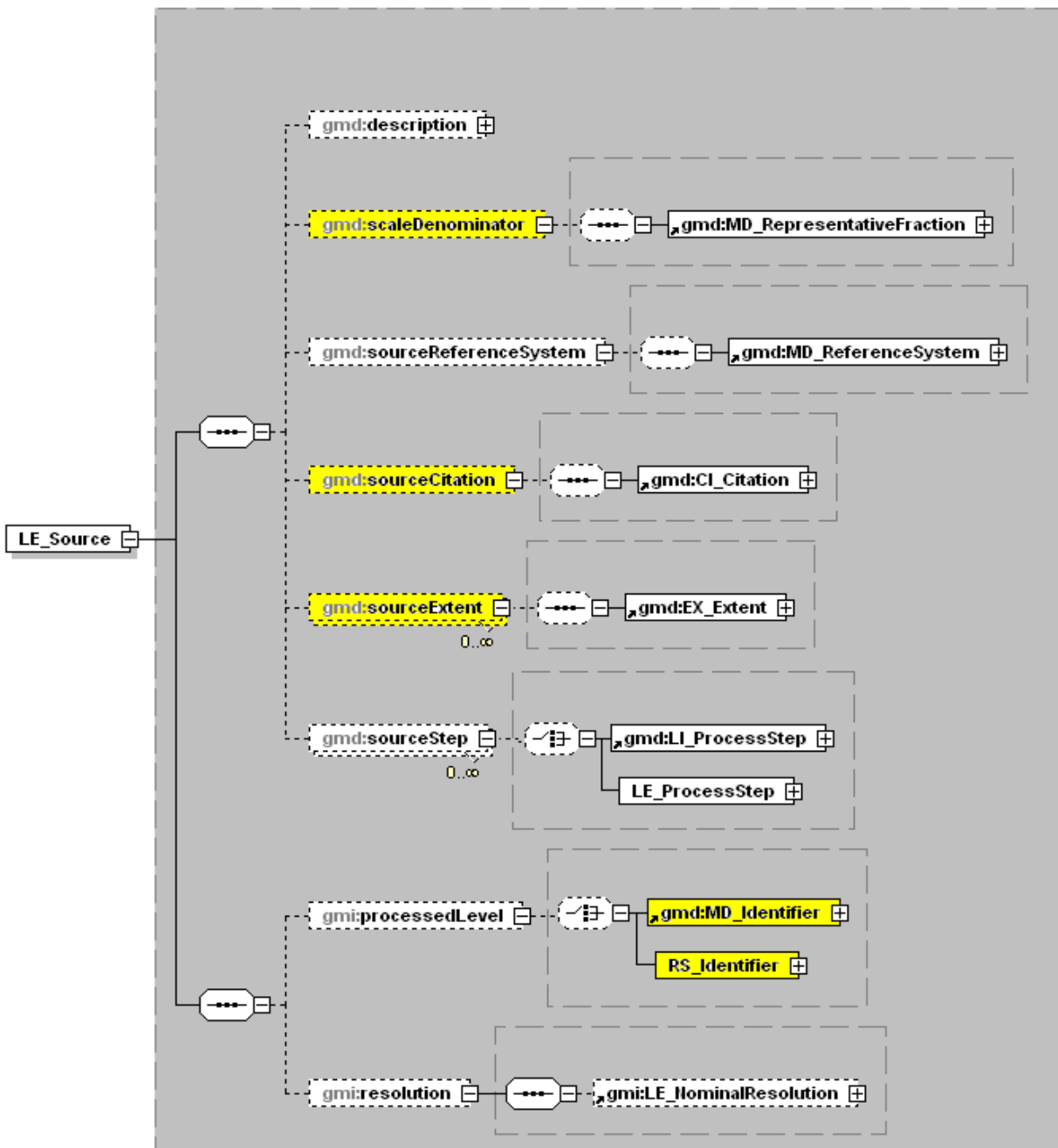
description – Textual description of what occurred during the process step.

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

fileType – Type of file that contains the processing report.

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

## LE\_Source



LE\_Source – Information about the source data used in creating the data (LI\_Source extended).

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

description – Statement that describes the source data.

Type: gco:characterString

Domain: free text  
Multiplicity: optional  
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 fraction that the numerator is equal to 1.

Type: [MD\\_RepresentativeFraction](#)

Multiplicity: conditional

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

Best Practices: If LE\_Source>resolution>LE\_NominalResolution>scanningResolution is specified, then scaleDenominator is mandatory.

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.

sourceExtent – Describes the spatial, horizontal and/or vertical, and the temporal coverage in the 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](#) or [LE\\_ProcessStep](#)

Multiplicity: optional, repeatable

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

processedLevel – Processing level of the source data.

Type: [MD\\_Identifier](#) or [RS\\_Identifier](#)

Multiplicity: optional

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

resolution – Distance between consistent parts (center, left, right) of two adjacent pixels.

Type: [LE\\_NominalResolution](#)

Multiplicity: optional

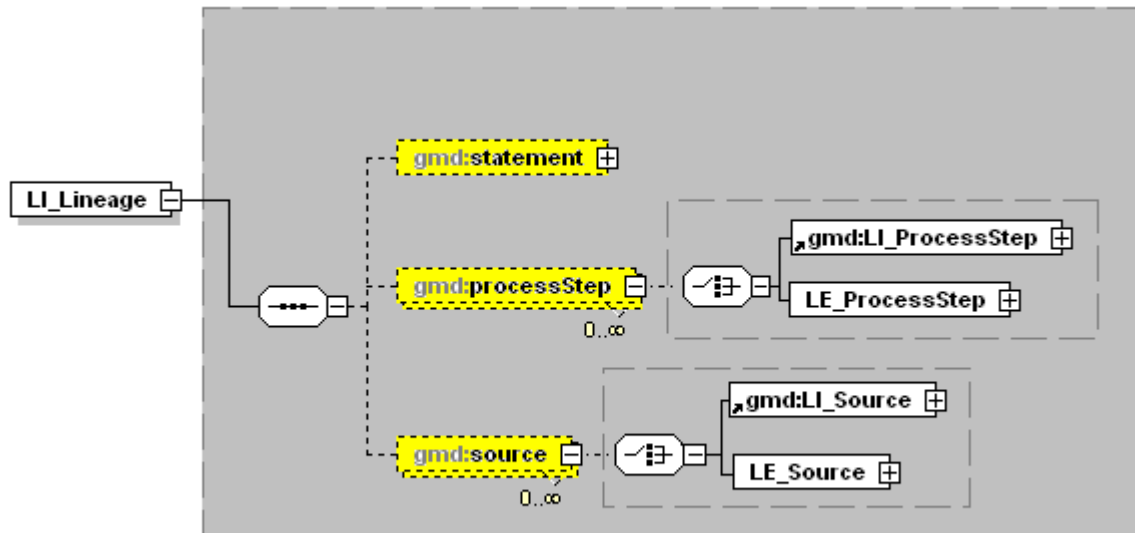
Attributes: nilReason

---

## **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](#) or [LE\\_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.

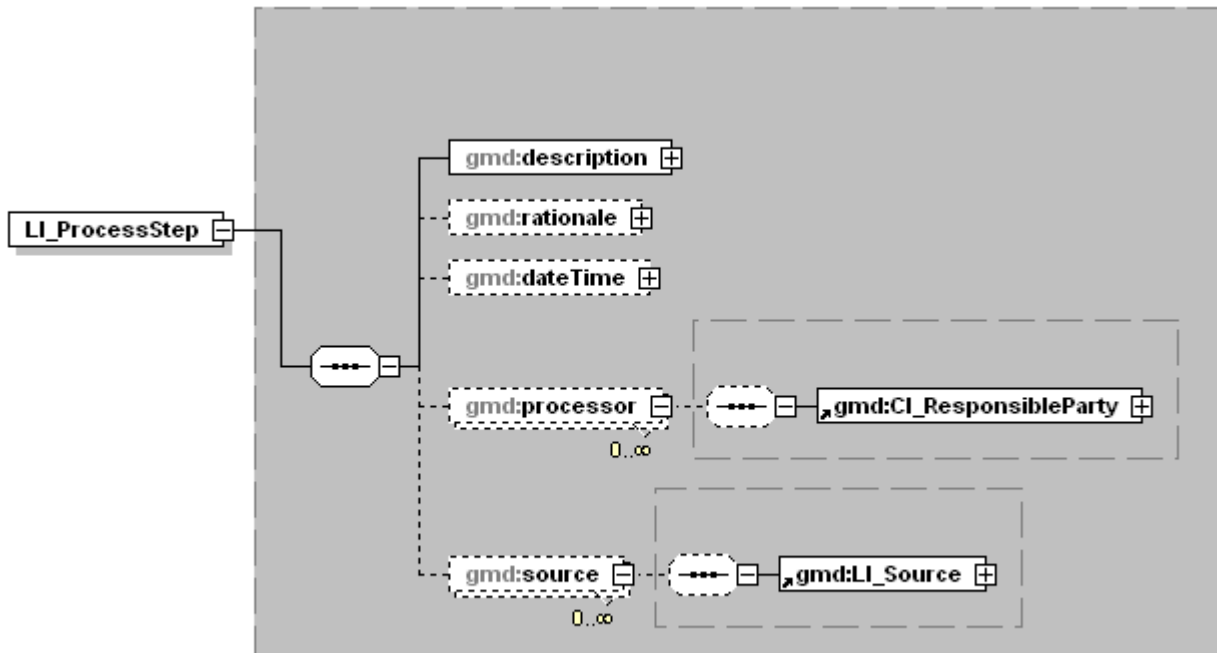
Type: [LI\\_Source](#) or [LE\\_Source](#)

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



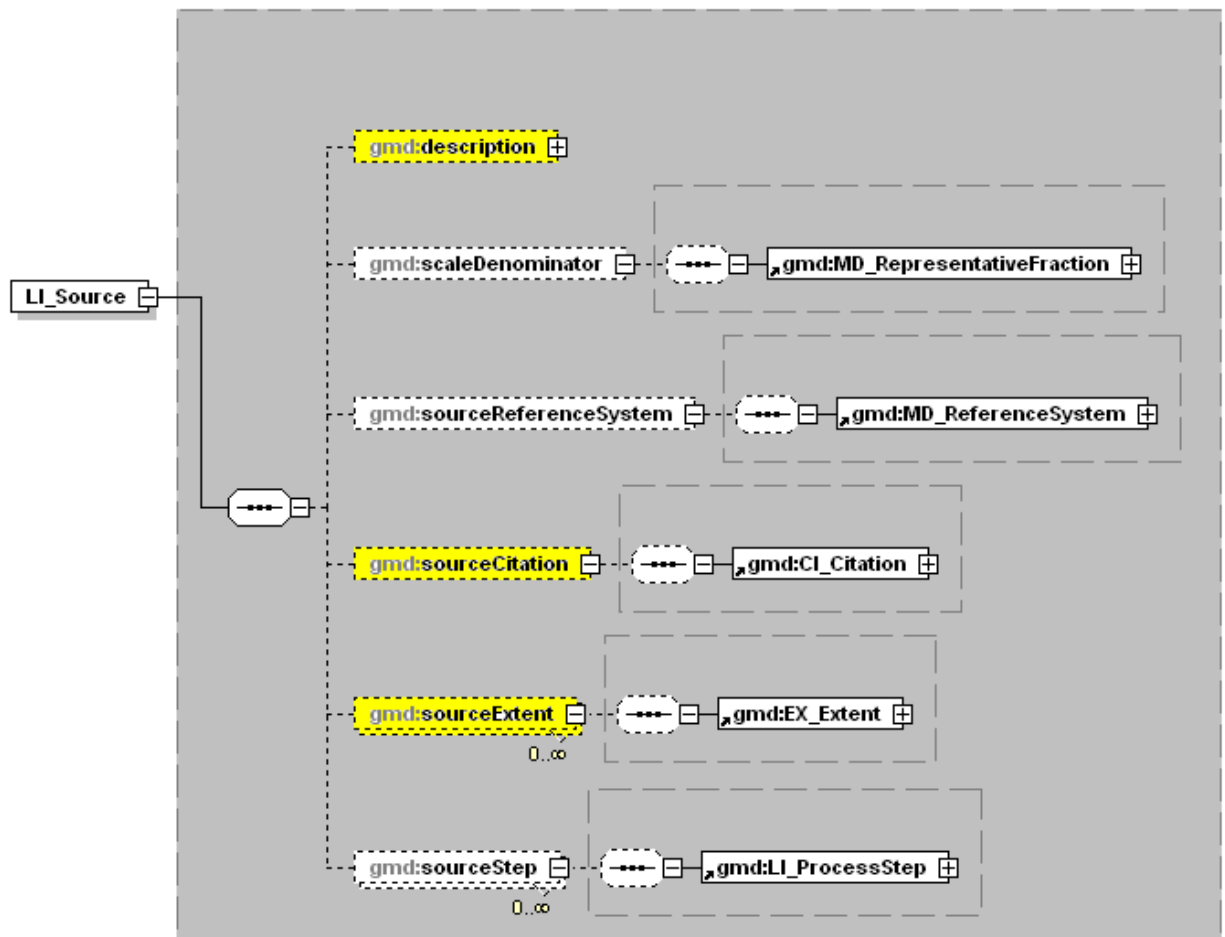
source – Information about the source data related to the creation of the data within the scope.

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 fraction 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 source 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, but 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

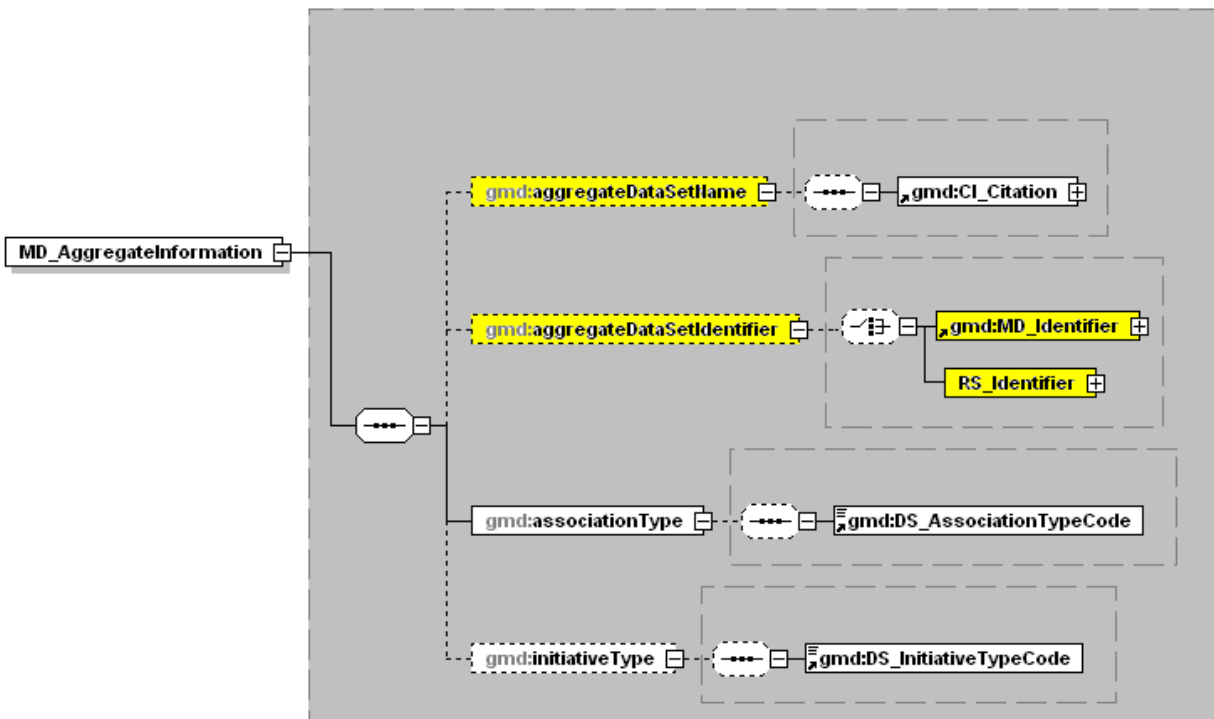
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

---

## **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 aggregateDataSetName 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, seteroMate

Multiplicity: mandatory

Attributes: nilReason

Best Practices: See Annex C.

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

Type: [DS\\_InitiativeTypeCode](#)

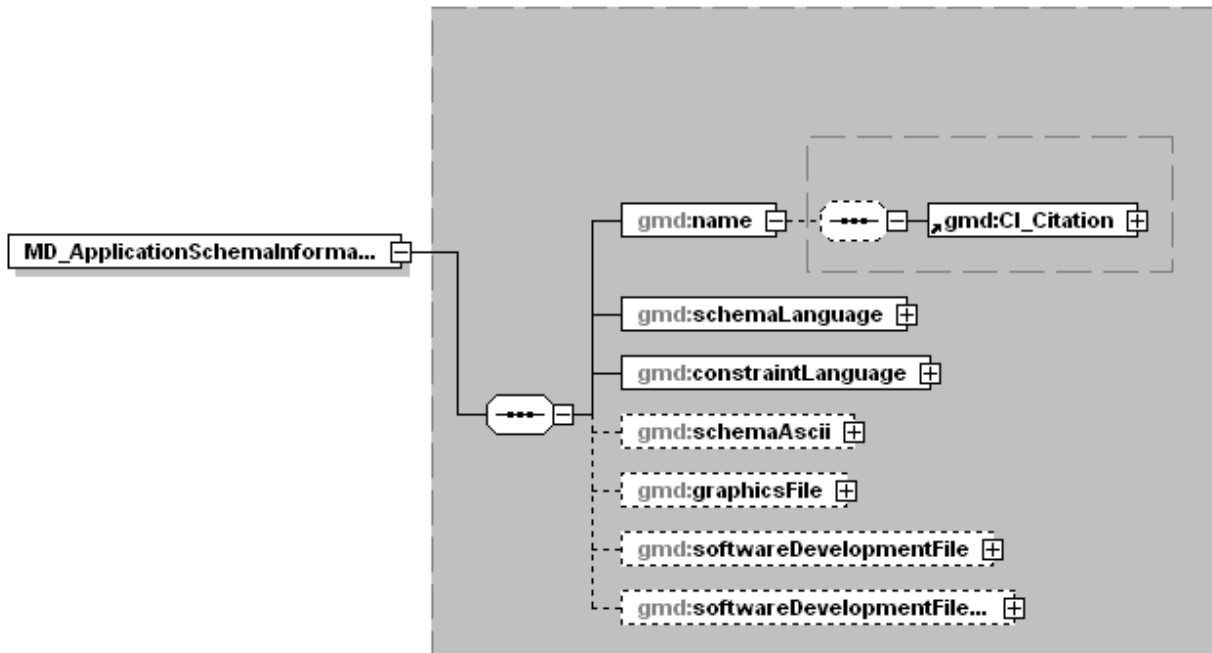
Domain: campaign, collection, exercise, experiement, investigation, mission, sensor, operation, platform, process, program, project, study, task, trial

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

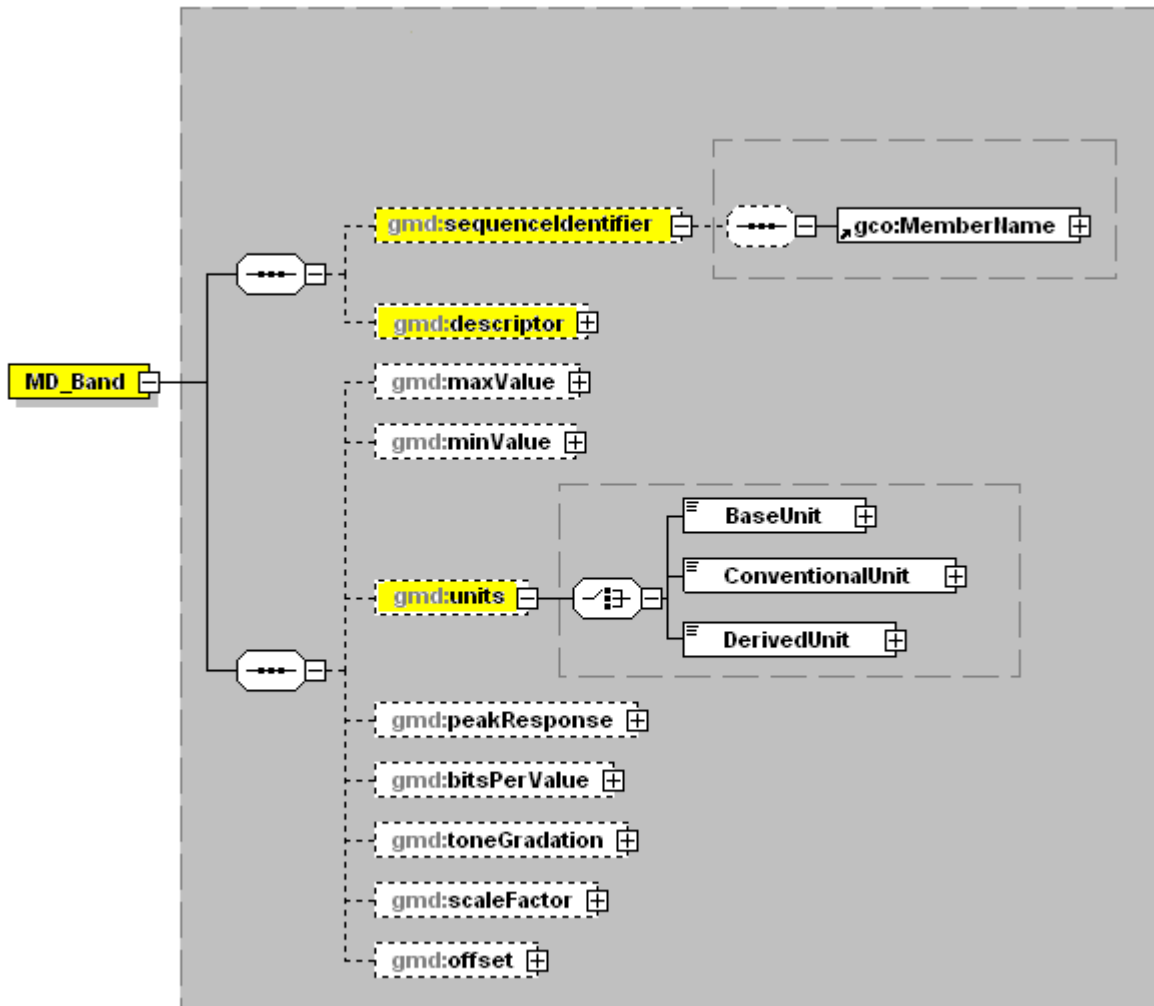
Domain: free text

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

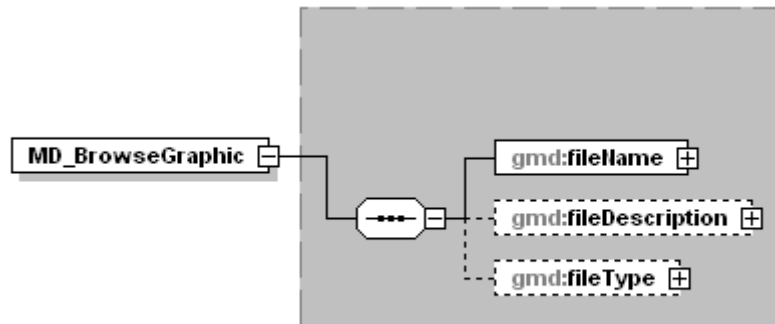
scaleFactor – Scale factor applied to each cell value.

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

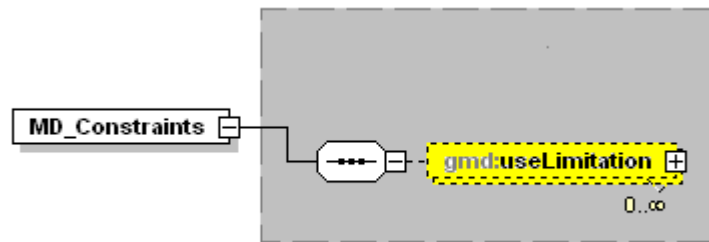
Domain: free text

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

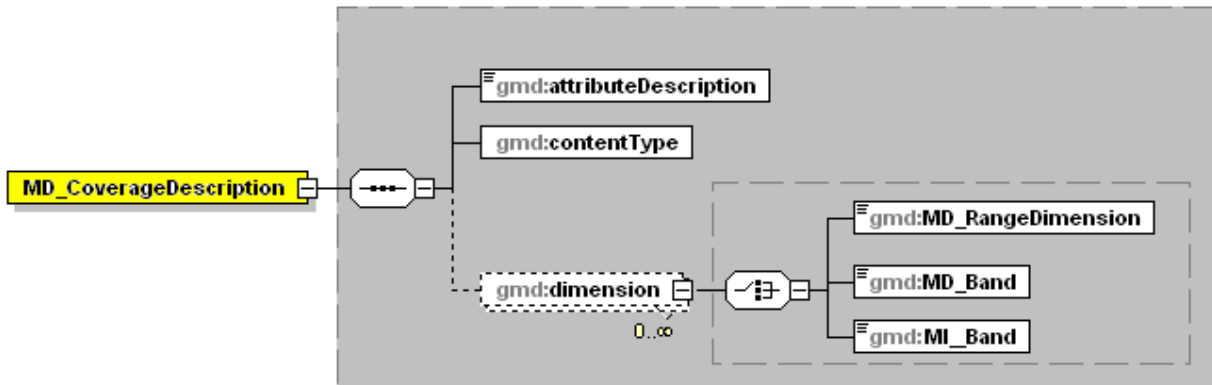
Domain: free text

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

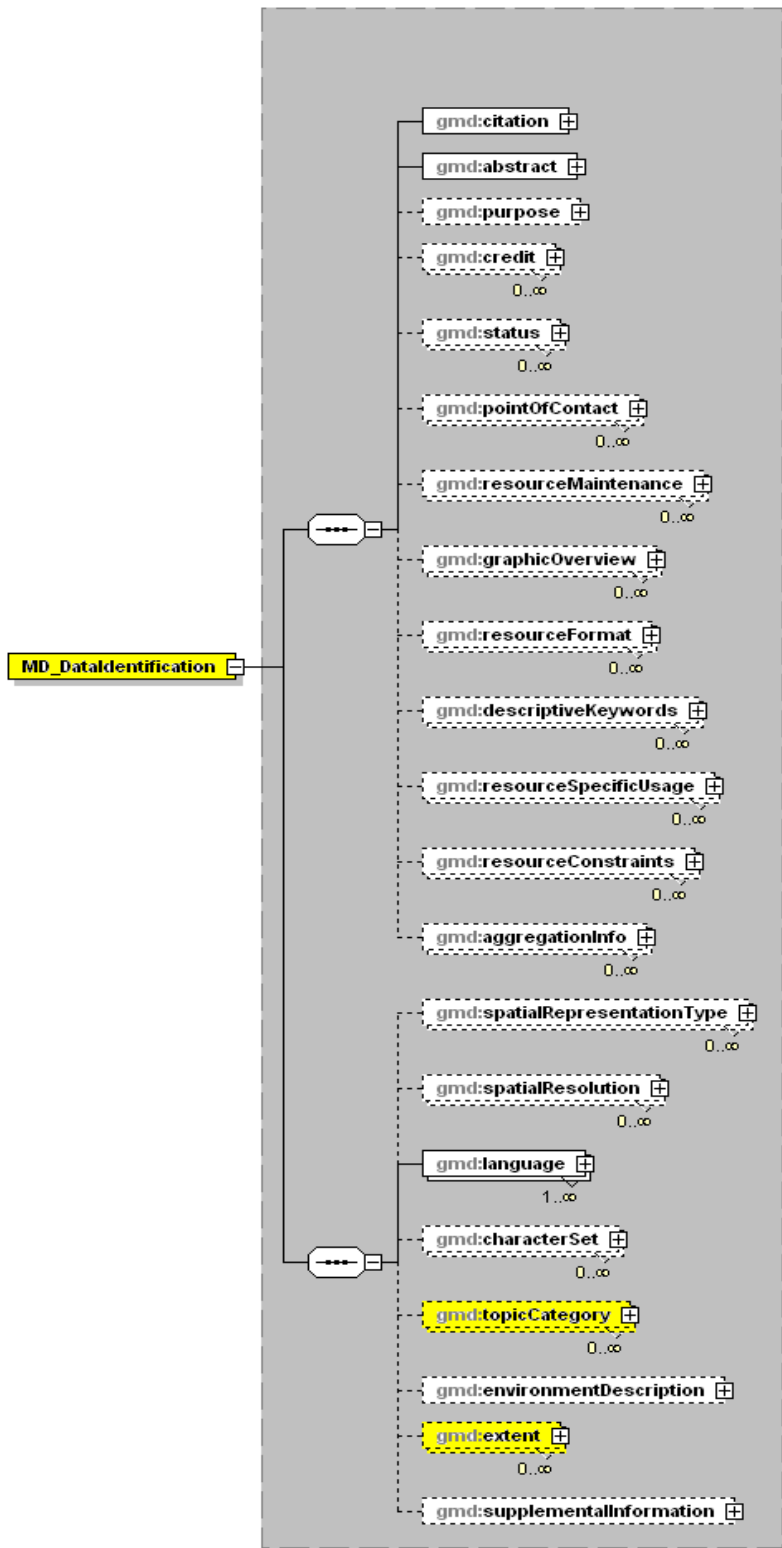
contentType – Information represented by the cell.

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](#) or [MI\\_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, climatologyMeteorologyAtmosphere, economy, elevation, environment, geoscientificInformation, health, imageryBaseMapsEarthCover, 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.

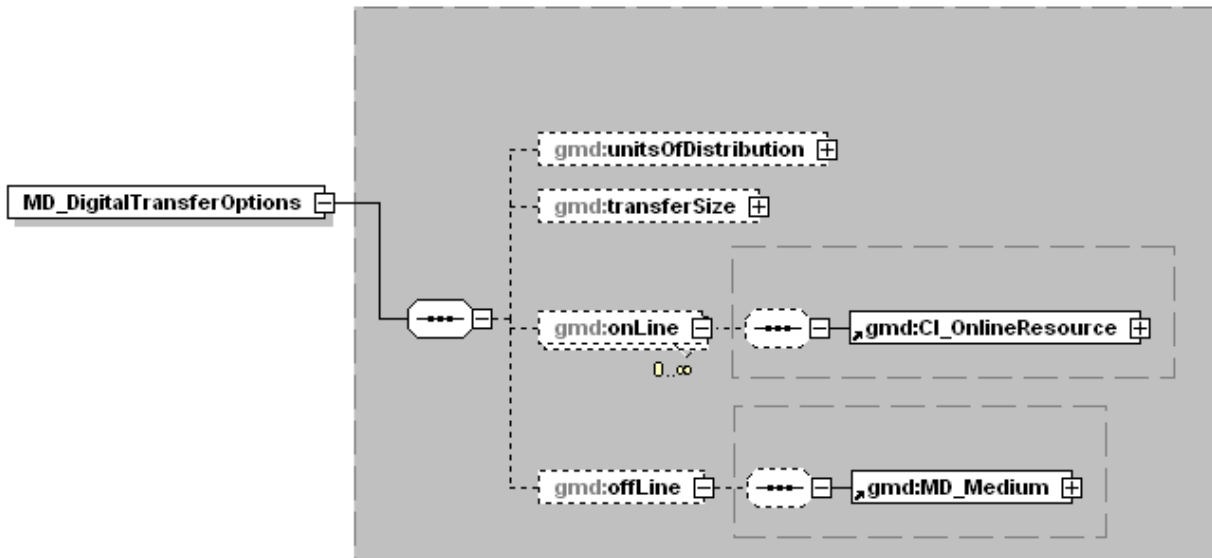
Type: gco:characterString

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 than "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.

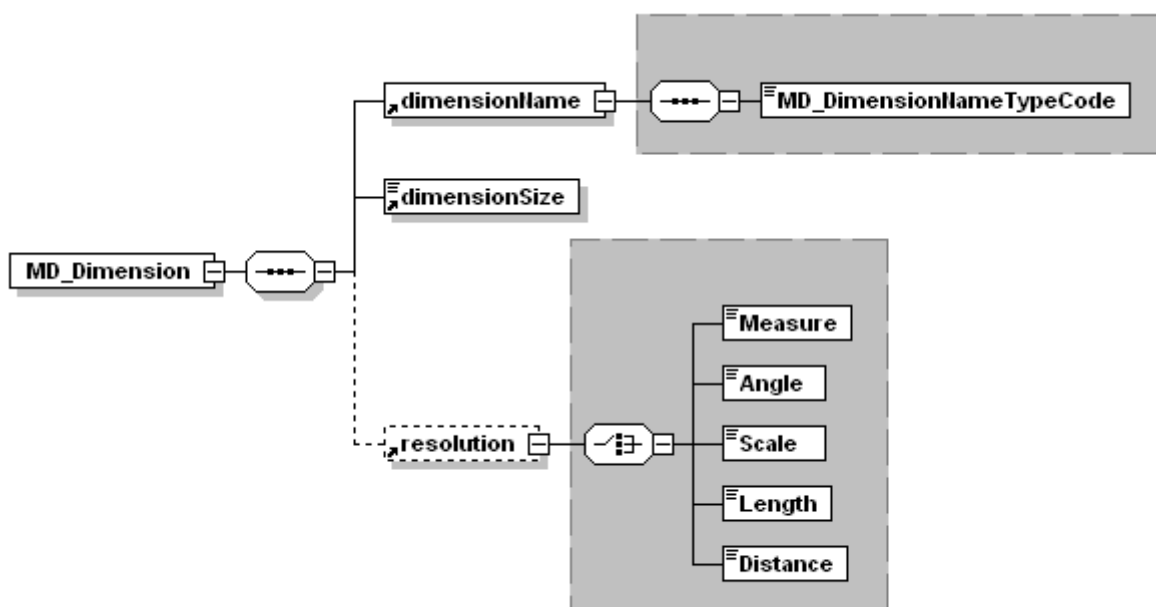
Type: [MD\\_Medium](#)

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

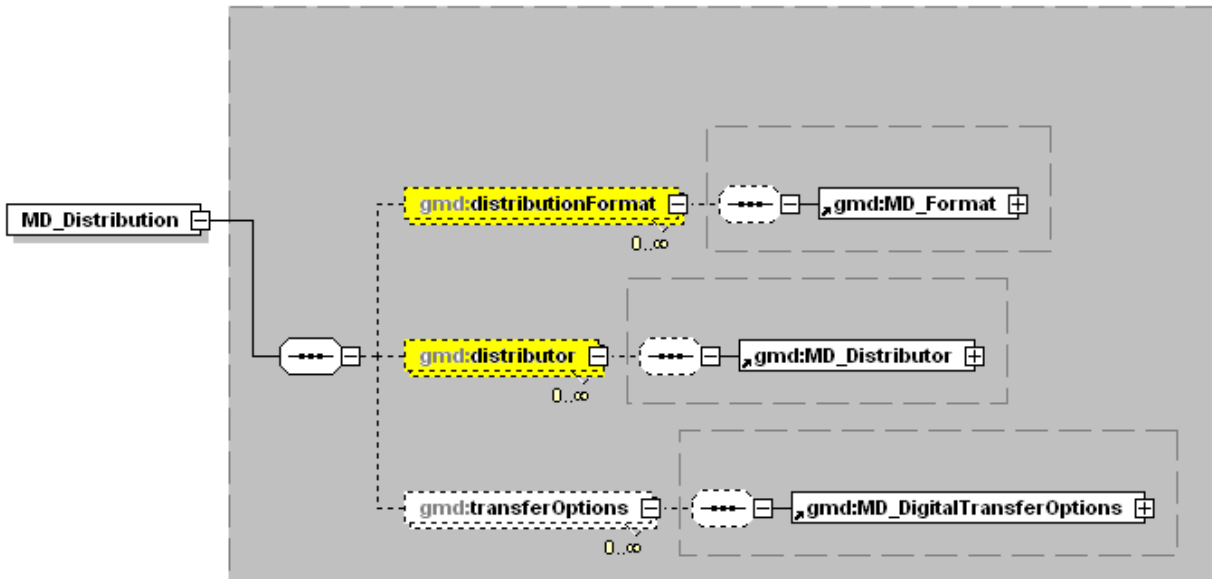
Attributes: nilReason

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.

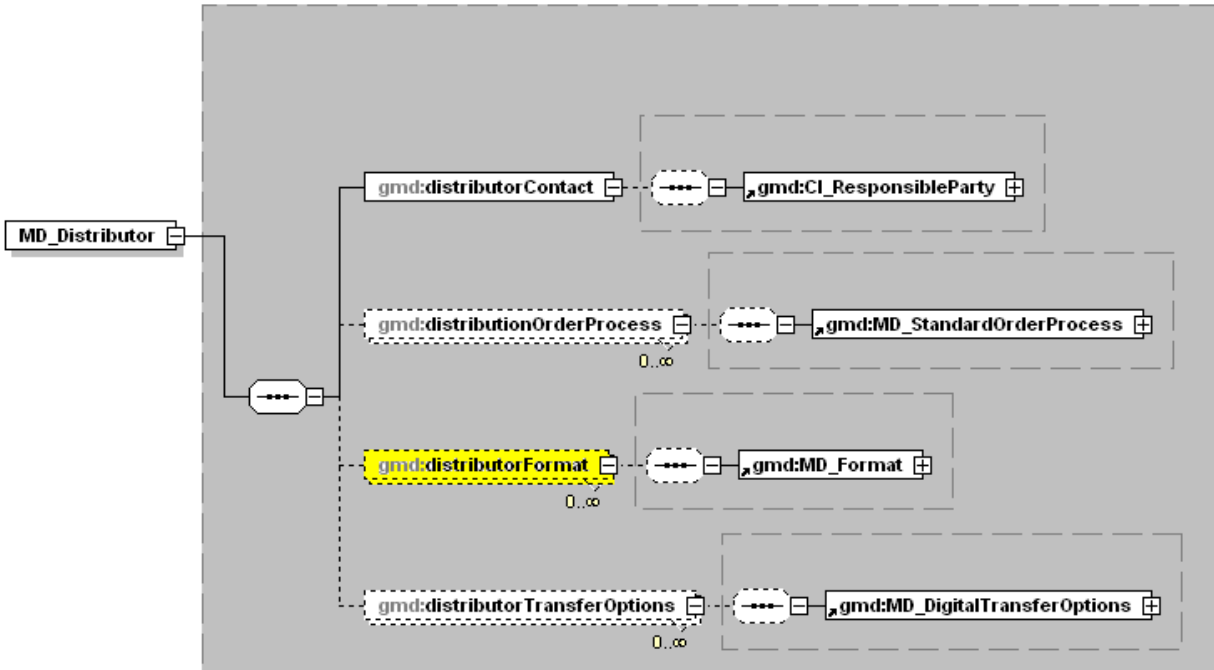
transferOptions – The means and media by which the data/dataset is obtained from the distributor.

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.

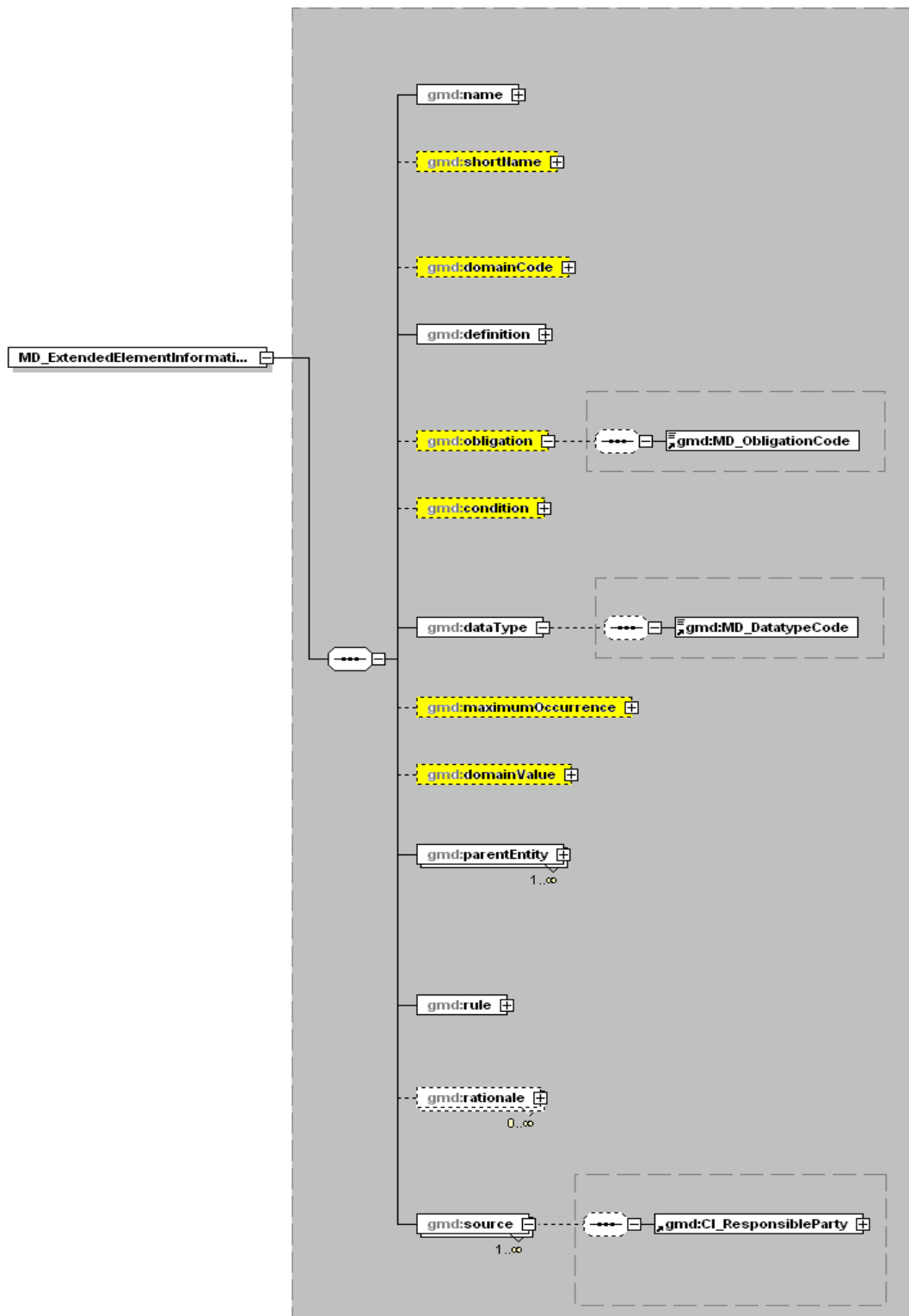
distributorTransferOptions – Provides information about the technical means and media used by the distributor.

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

---

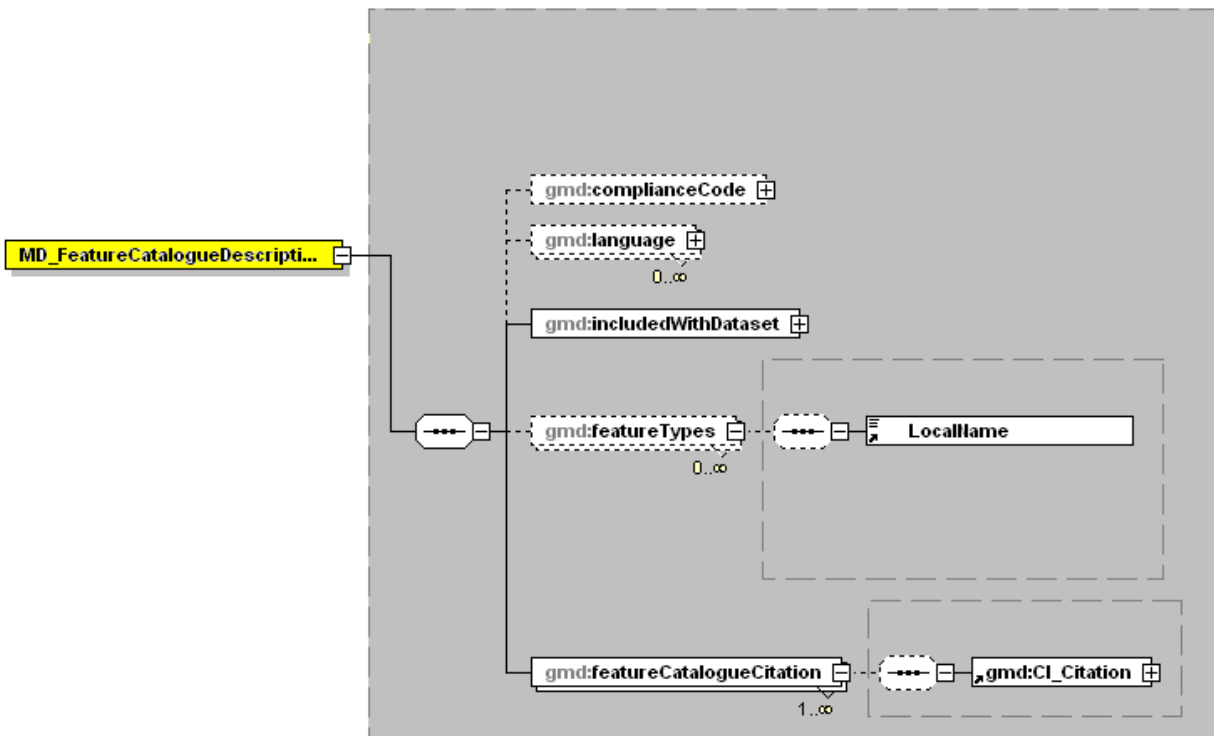
## FAQ: How would I document extended element information for biological information?

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 a 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>
```

---

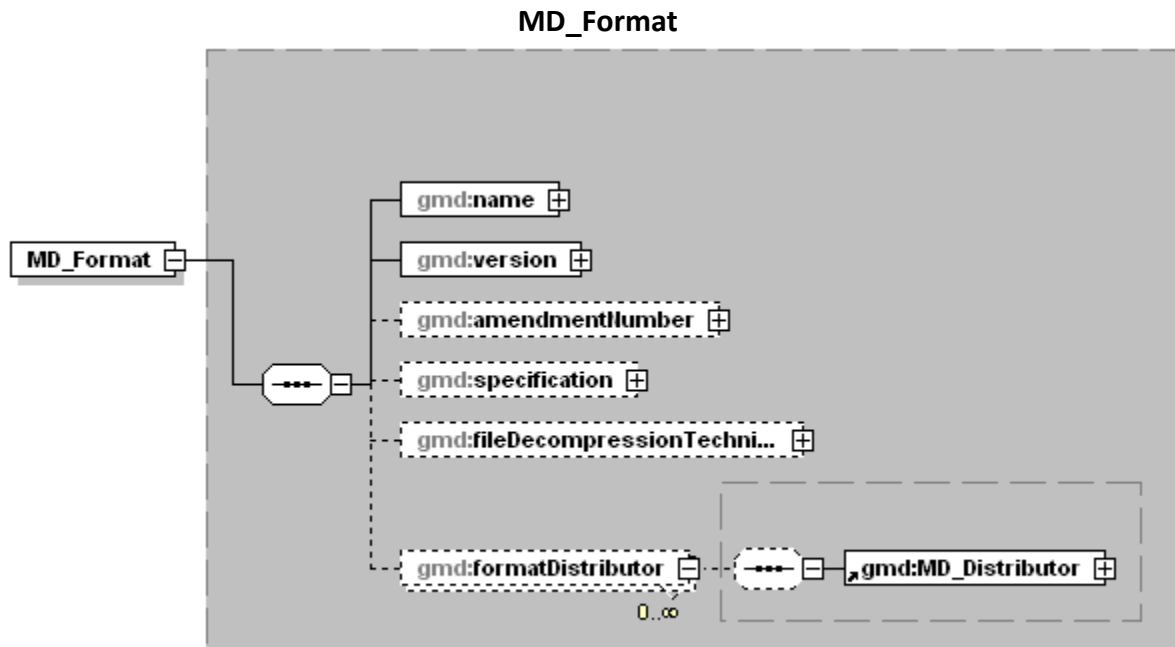
featureCatalogueCitation – Citation to reference the feature catalogue.

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 – 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

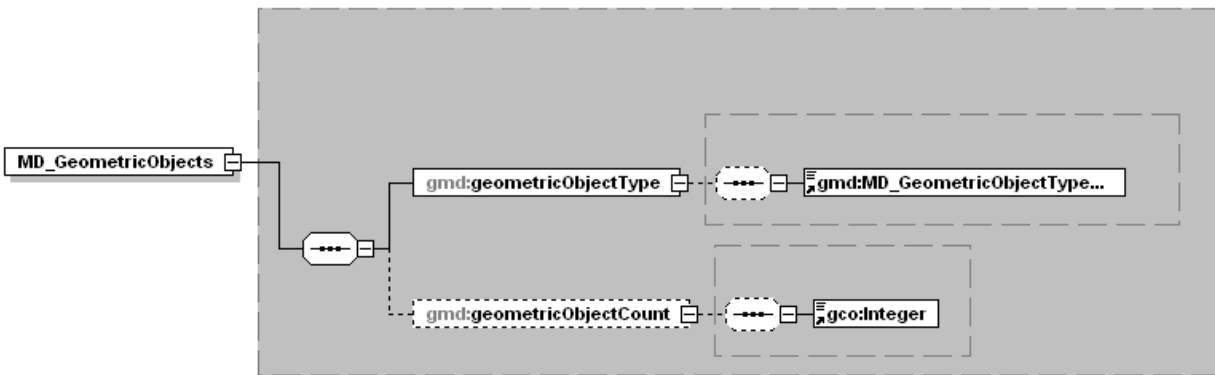
formatDistributor – Provides information about the distributor's format.

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.

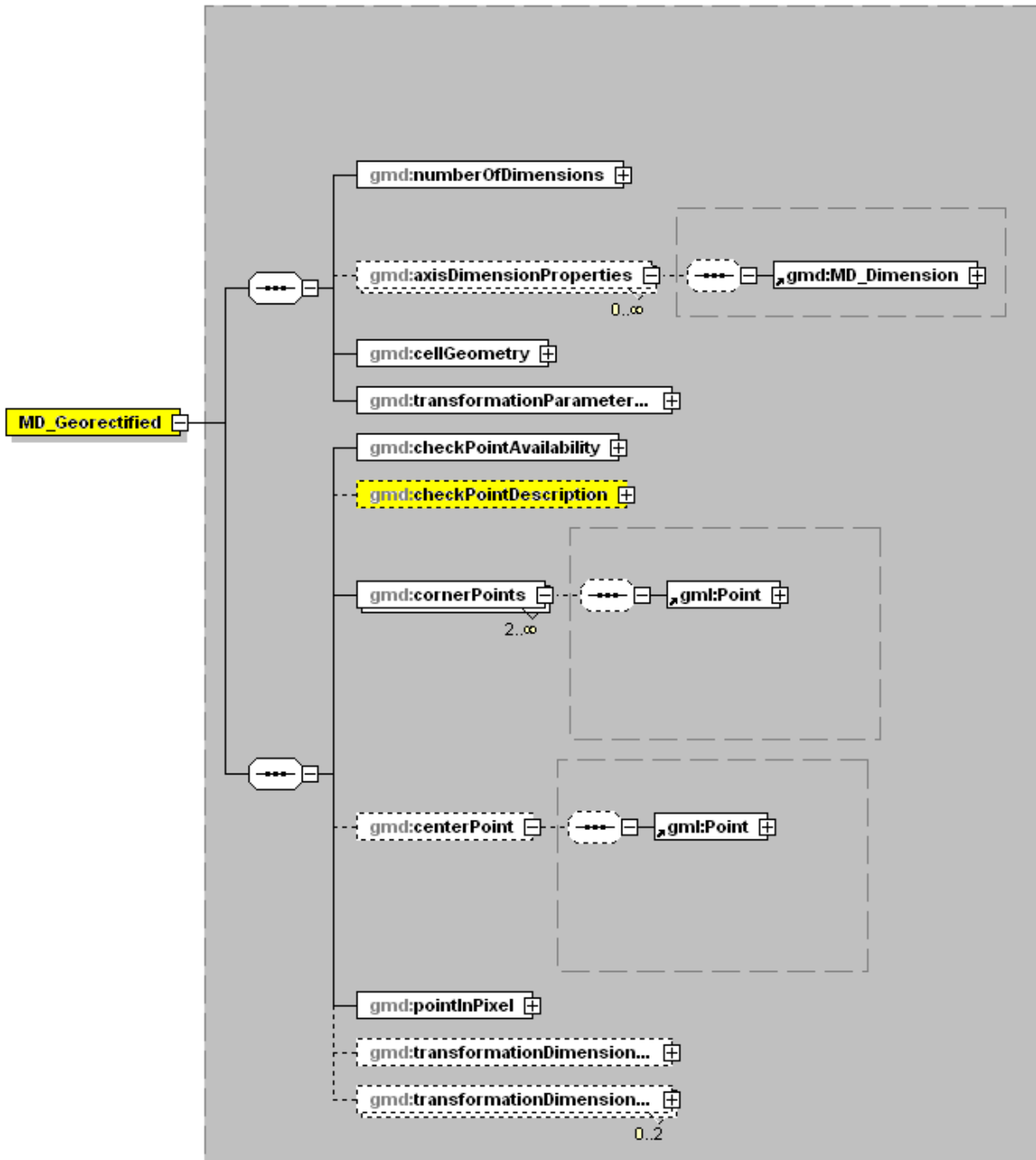
Type: gco:Integer

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.

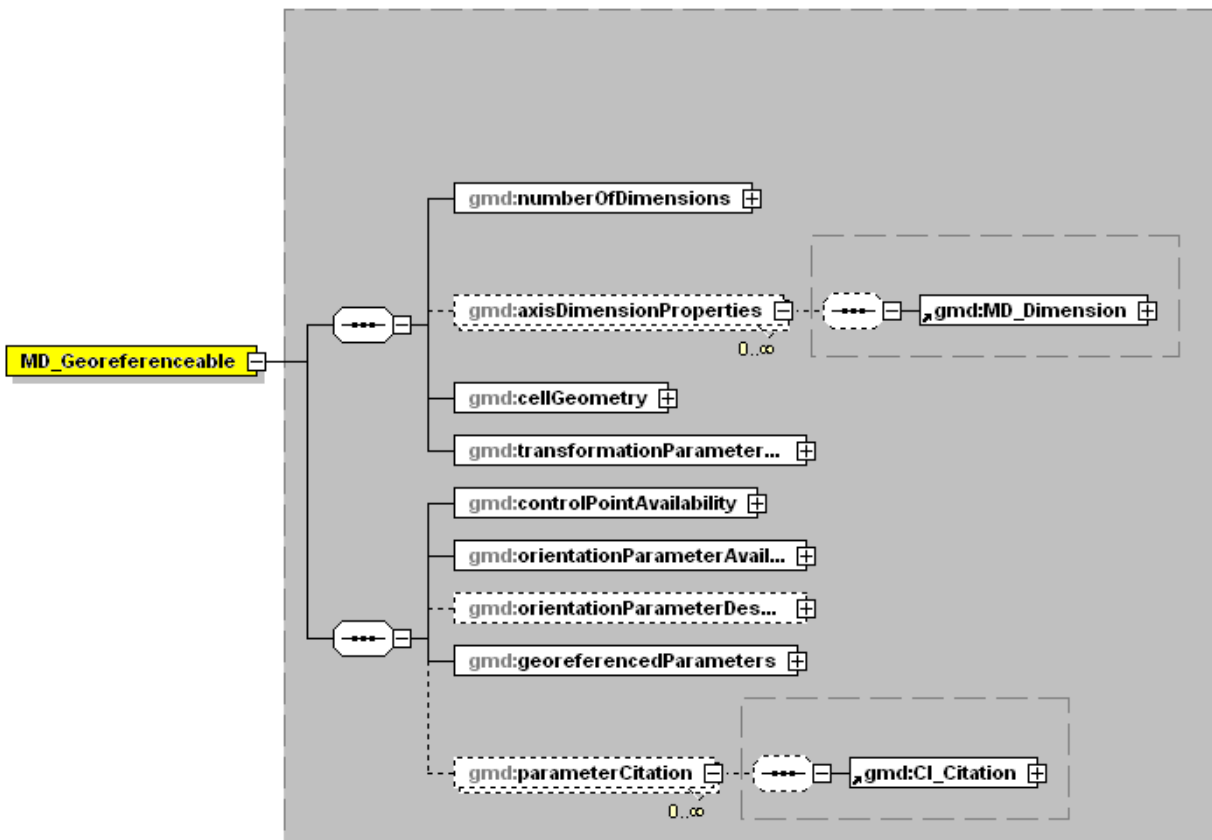
transformationDimensionDescription – General description of the transformation.

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 geographic or map coordinates availability.

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

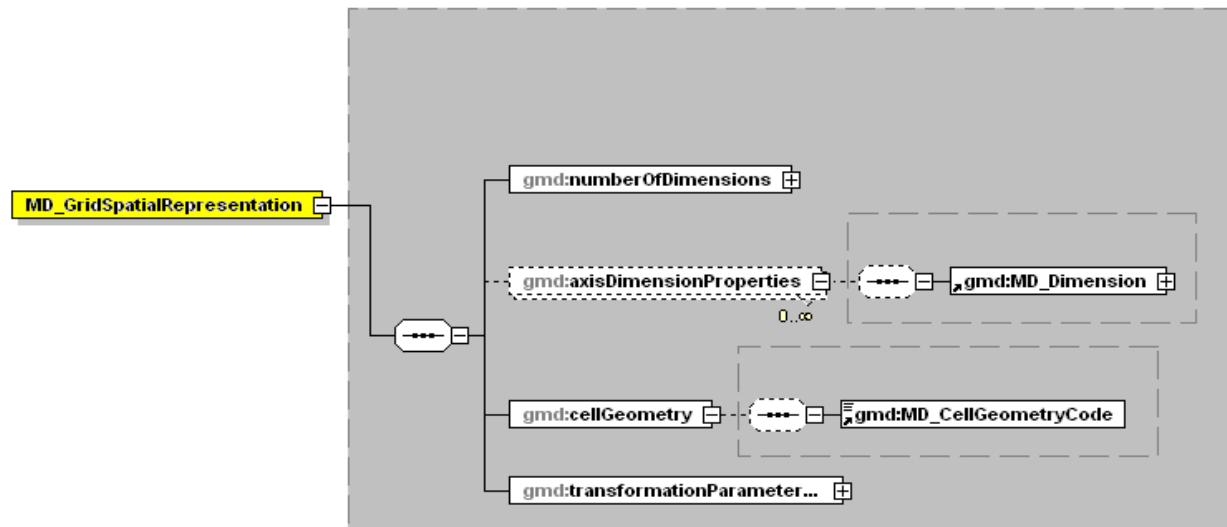
parameterCitation – Citation for the parameter reference.

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 MI\_Georectified or MD\_Georeferenceable or MI\_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 geographic or map coordinates availability.

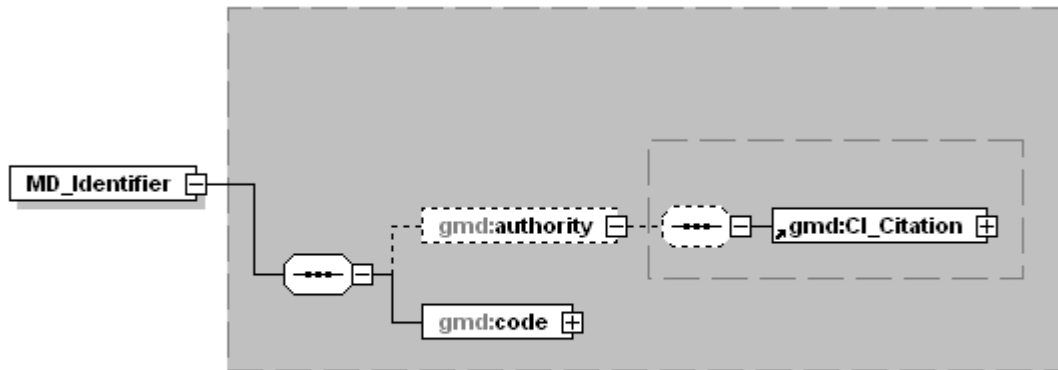
Type: gco:Boolean

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>

```

System (NTS)</gco:CharacterString>

<gco:CharacterString>National Topographic

</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>

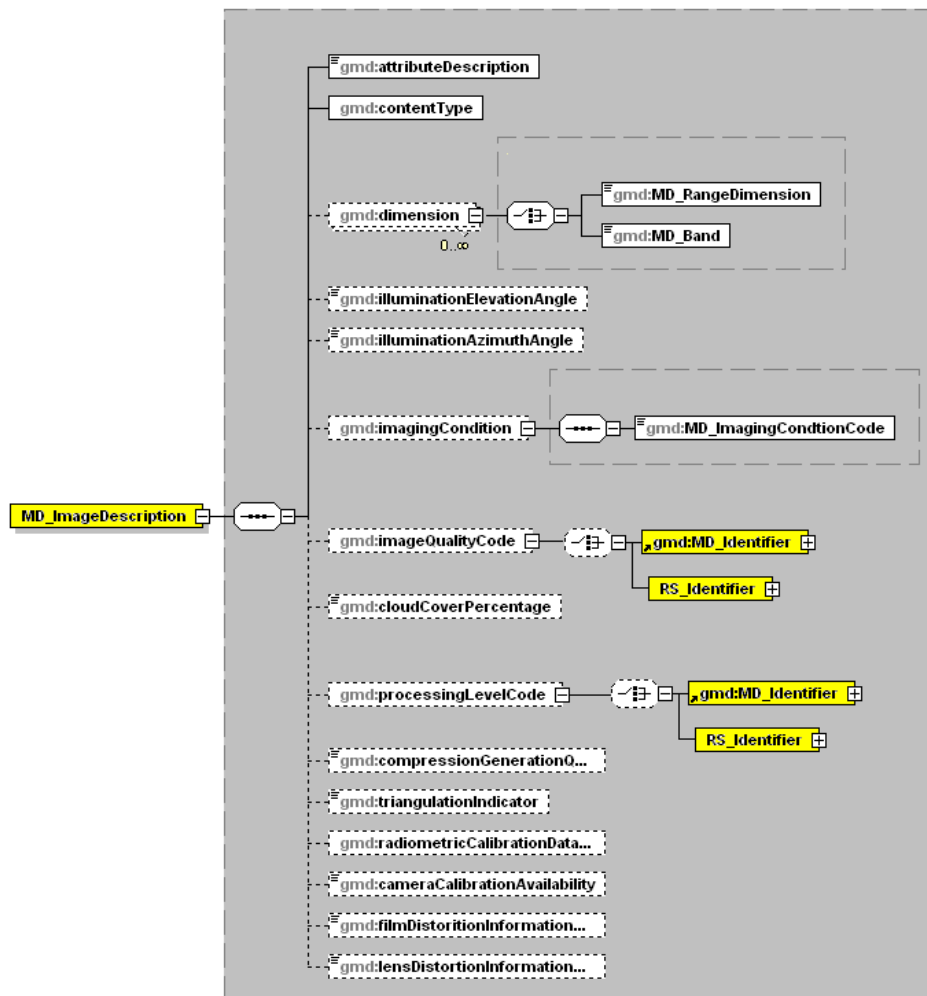
<gco:CharacterString>21E05</gco:CharacterString>

</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.

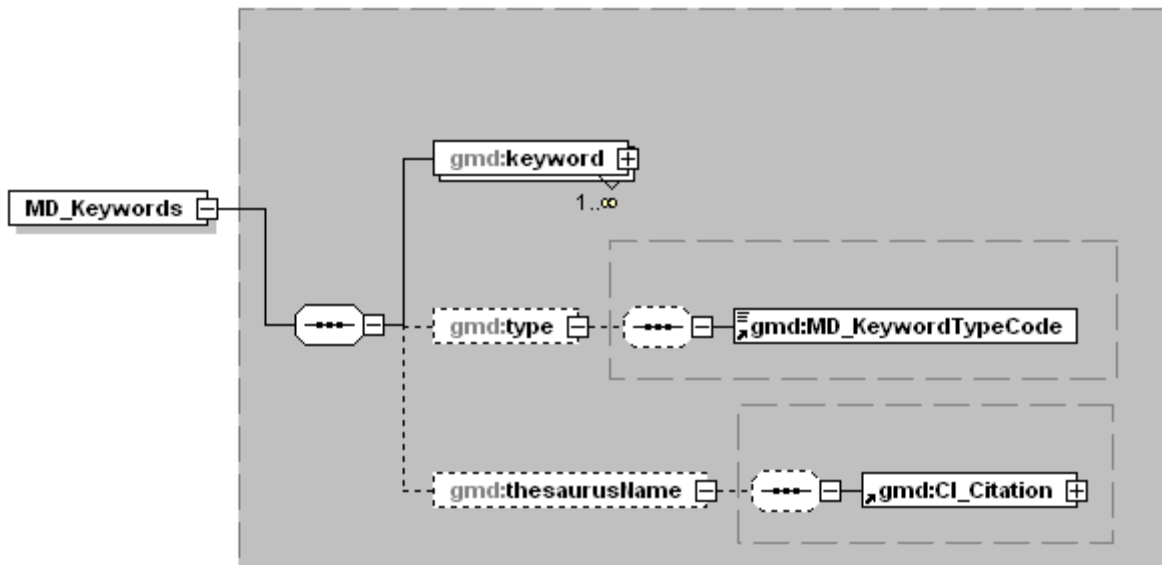
Type: gco:Boolean

Domain: 0,1 (0 = no and 1 = yes)

Multiplicity: optional

Attributes: nilReason

## MD\_Keywords



MD\_Keywords – Commonly used words or phrases which 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.

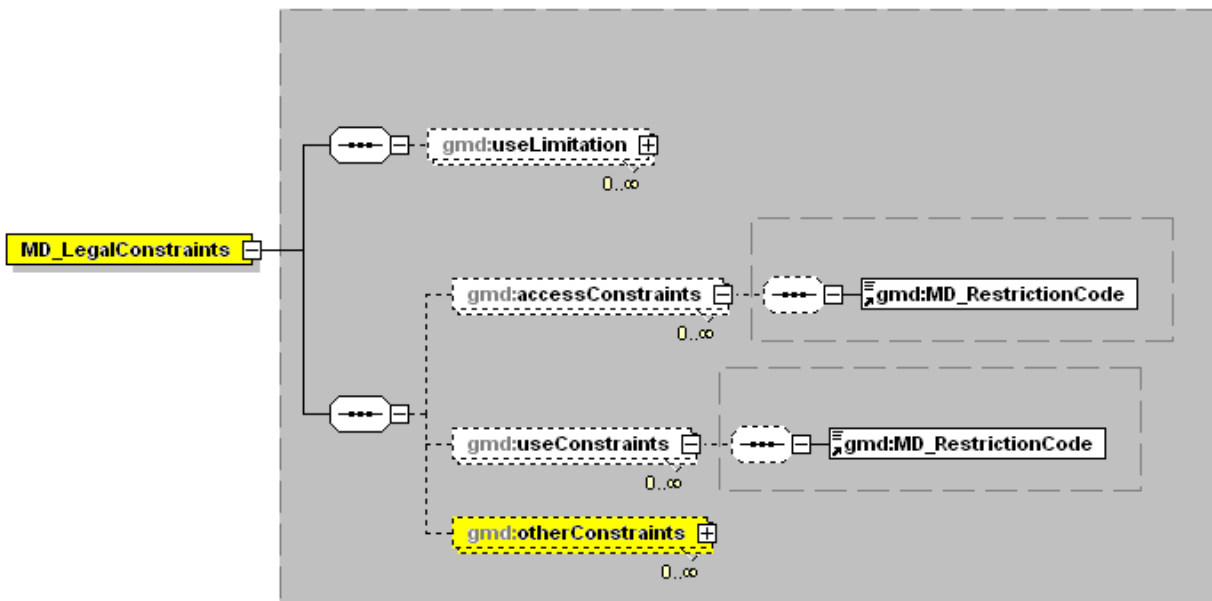
Type: [CI\\_Citation](#)

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 useCosntraints are set to “otherRestrictions”.

---

**FAQ: Why are some use and access constraints found in ‘otherConstraints’?**

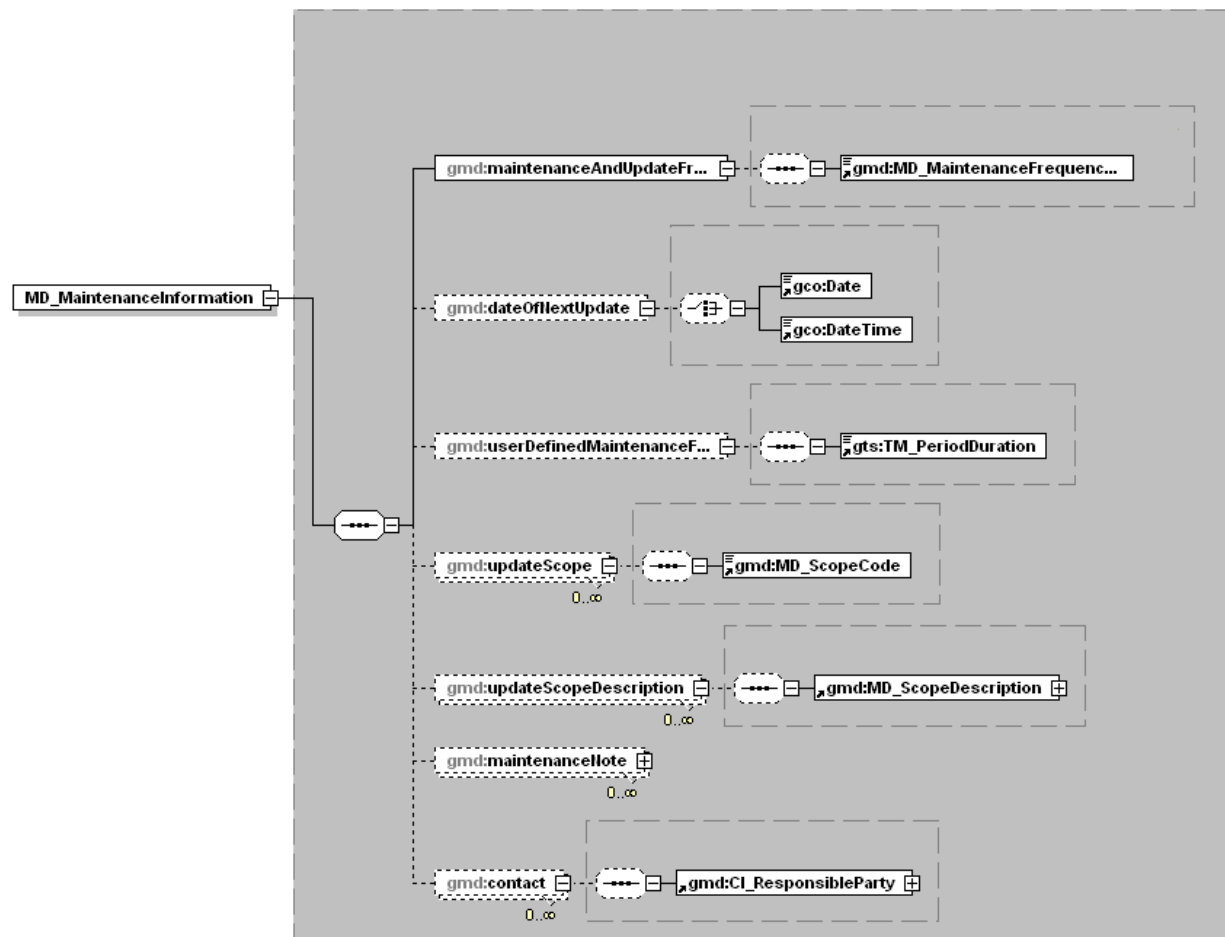
useConstraints and accessConstraints are restricted to only allow use of the codelist values. If none of the values can accurately describe the constraints, other constraints allows free text. Often, when translating from legacy metadata, it is difficult to translate to the codelist values with accuracy. 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, dtaset, 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

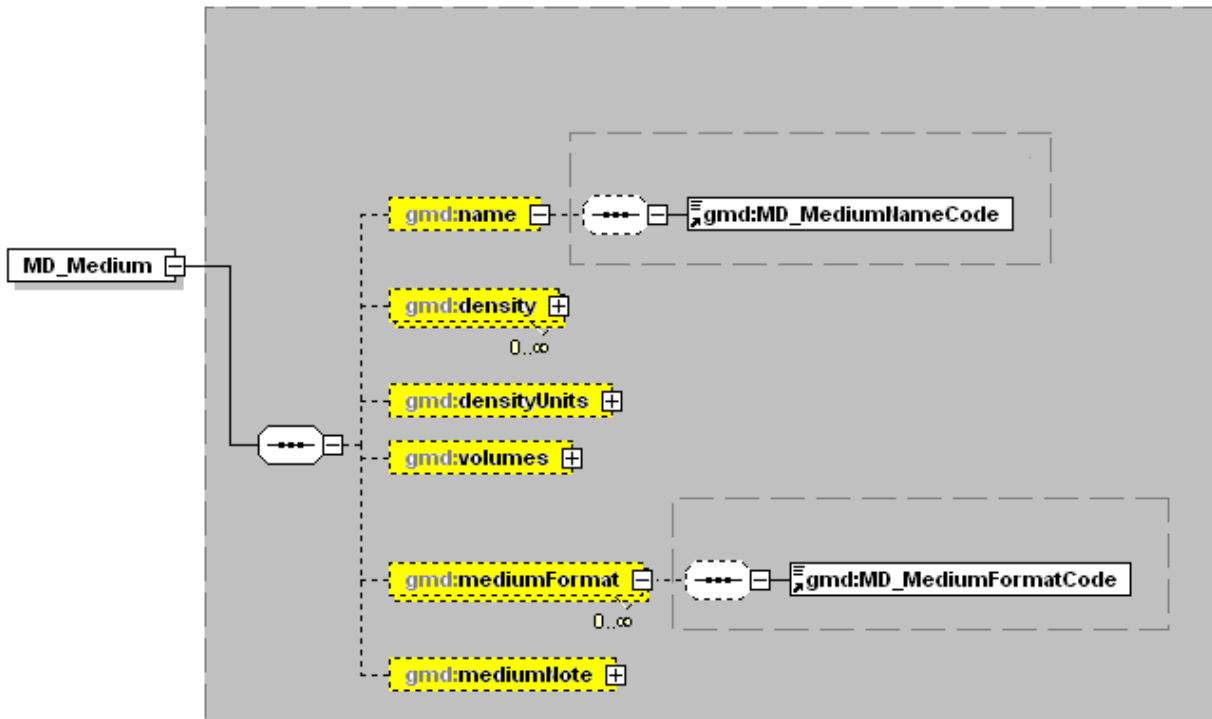
contact – Identification of and means of communicating with the person or organisation with responsibility for maintaining the resource.

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, 3490Cartridge, 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.

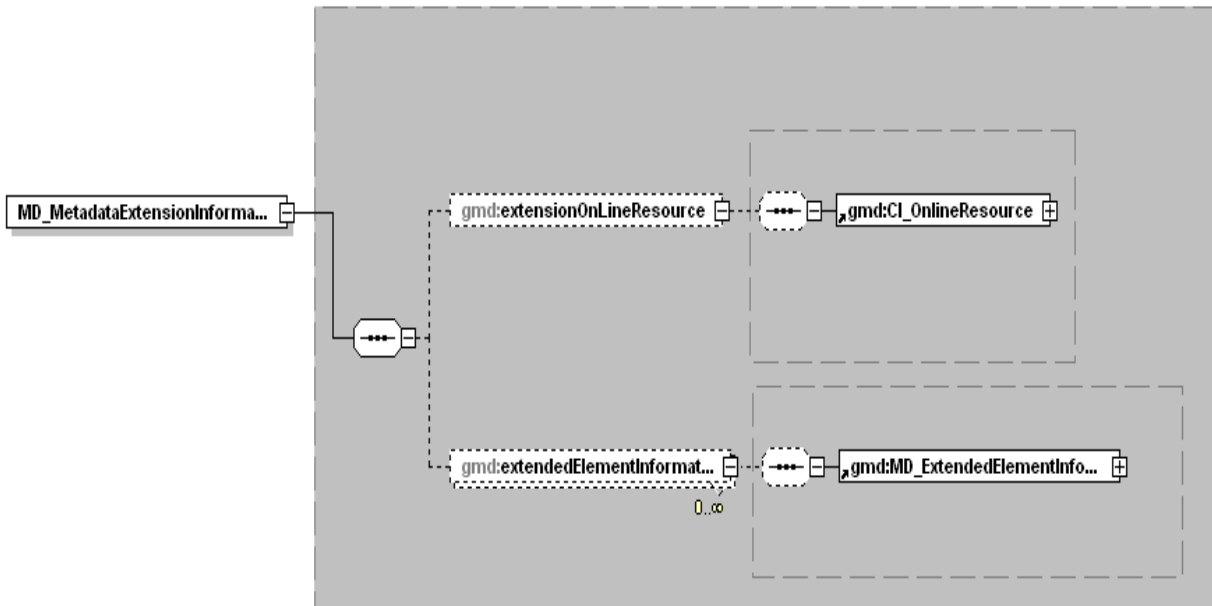
Type: gco:characterString

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

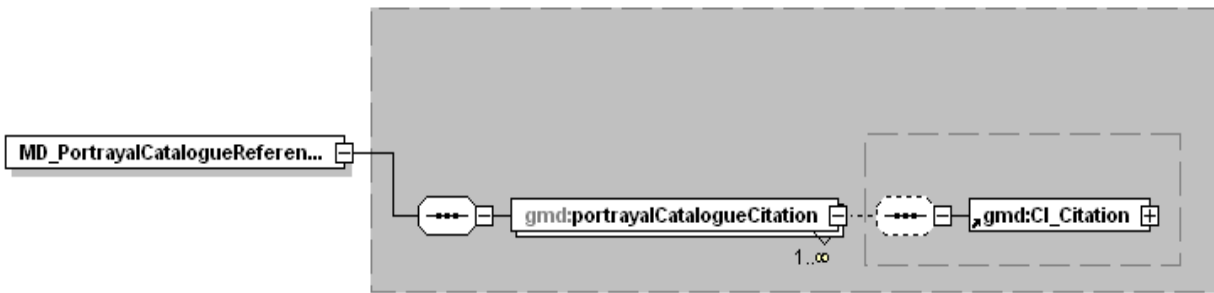
extendedElementInformation – Provides information about a new metadata element.

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

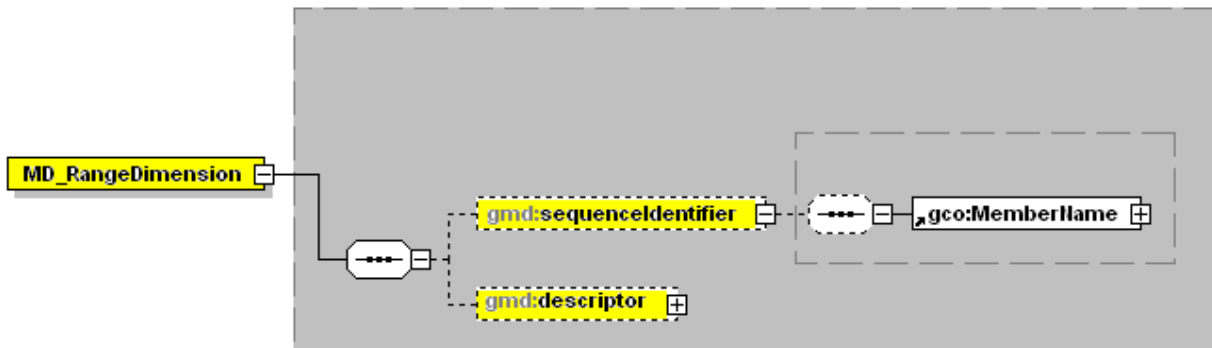
portrayalCatalogueCitation – Bibliographic citation for the portrayal catalogue.

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

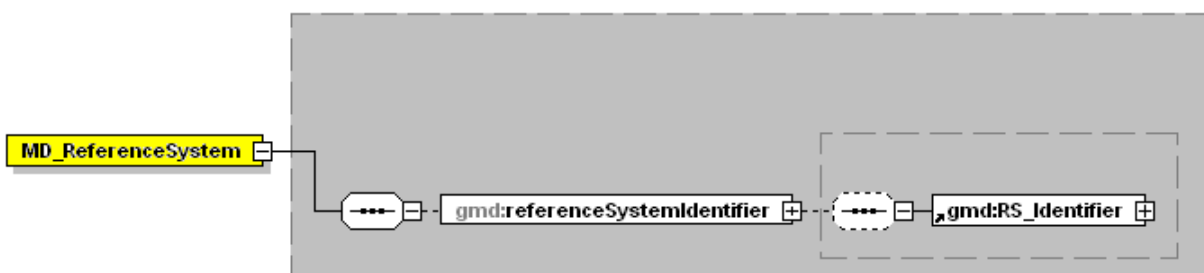
Domain: free text

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:CI_Date>
            </gmd:date>
            <gmd:dateType>
```

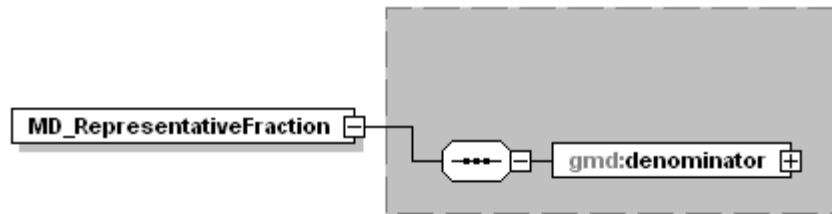
```

<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



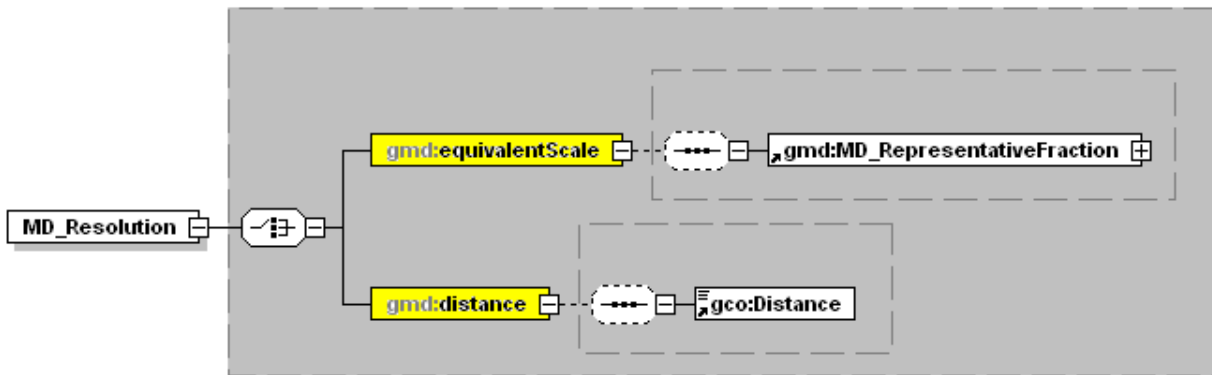
**MD\_RepresentativeFraction** – The scale of a map or other cartographic object expressed as a fraction or ratio which relates unit distance on the map or other cartographic object to distance, measured in the same units, on the ground.

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). “uom” is an attribute of distance and is mandatory.

---

**FAQ:** How would you populate the element “distance” for a distance of 5 meters?

Ex:

```

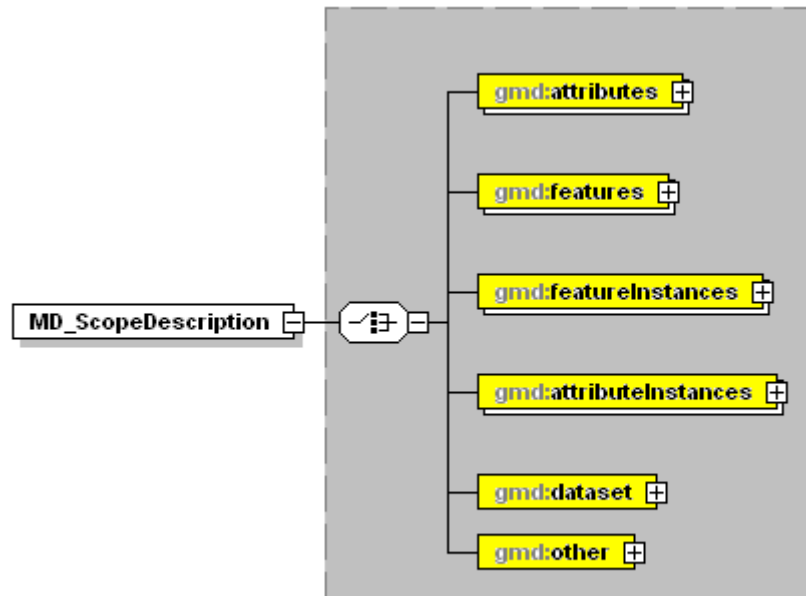
<MD_Resolution>
  <distance>
    <gco:Distance uom="meters">5</gco:Distance>
  </distance>
</MD_Resolution>

```

---



## 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>
```

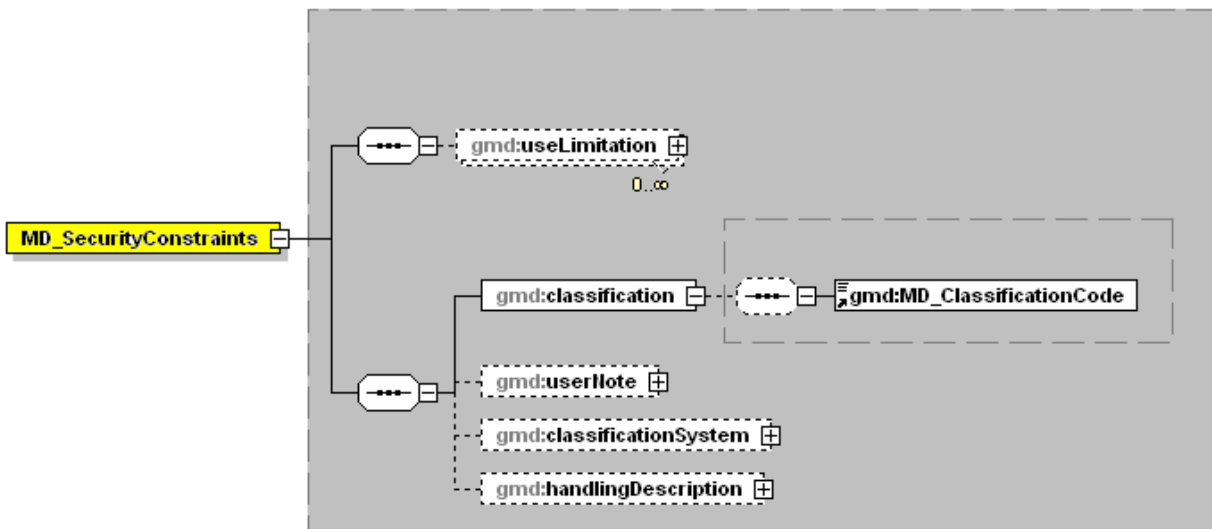
```
  <gmd:dataset>
```

```
    <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.

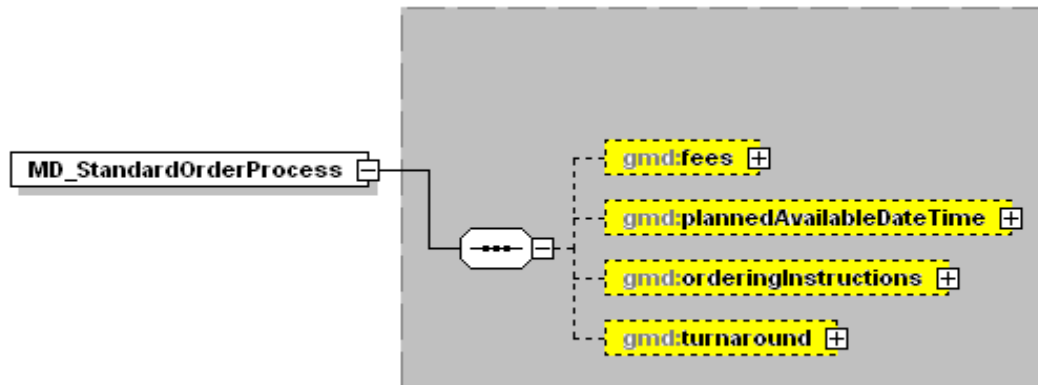
Type: gco:characterString

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](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.

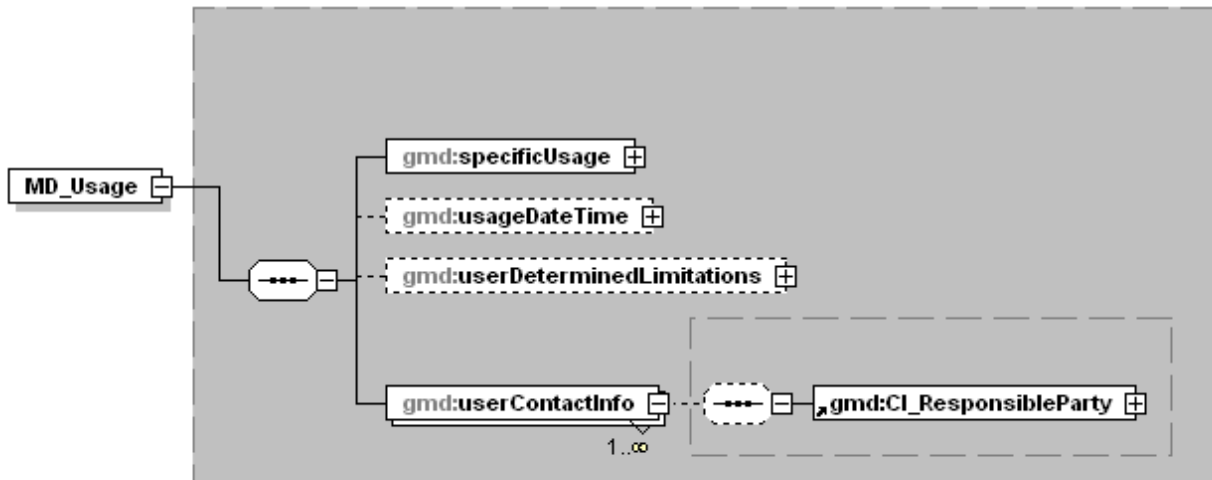
Type: gco:characterString

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

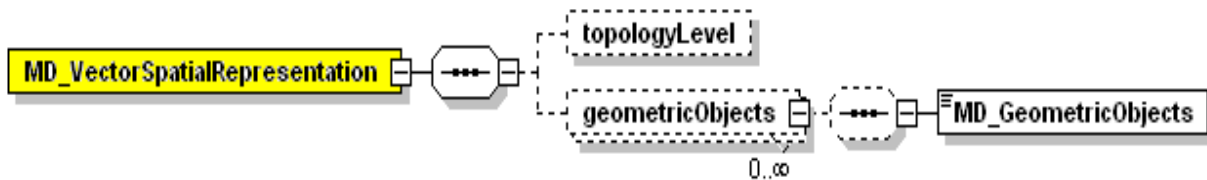
userDeterminedLimitations – Applications determined by the user for which the resource and/or resource series is not suitable.

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.

topologyLevel – 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

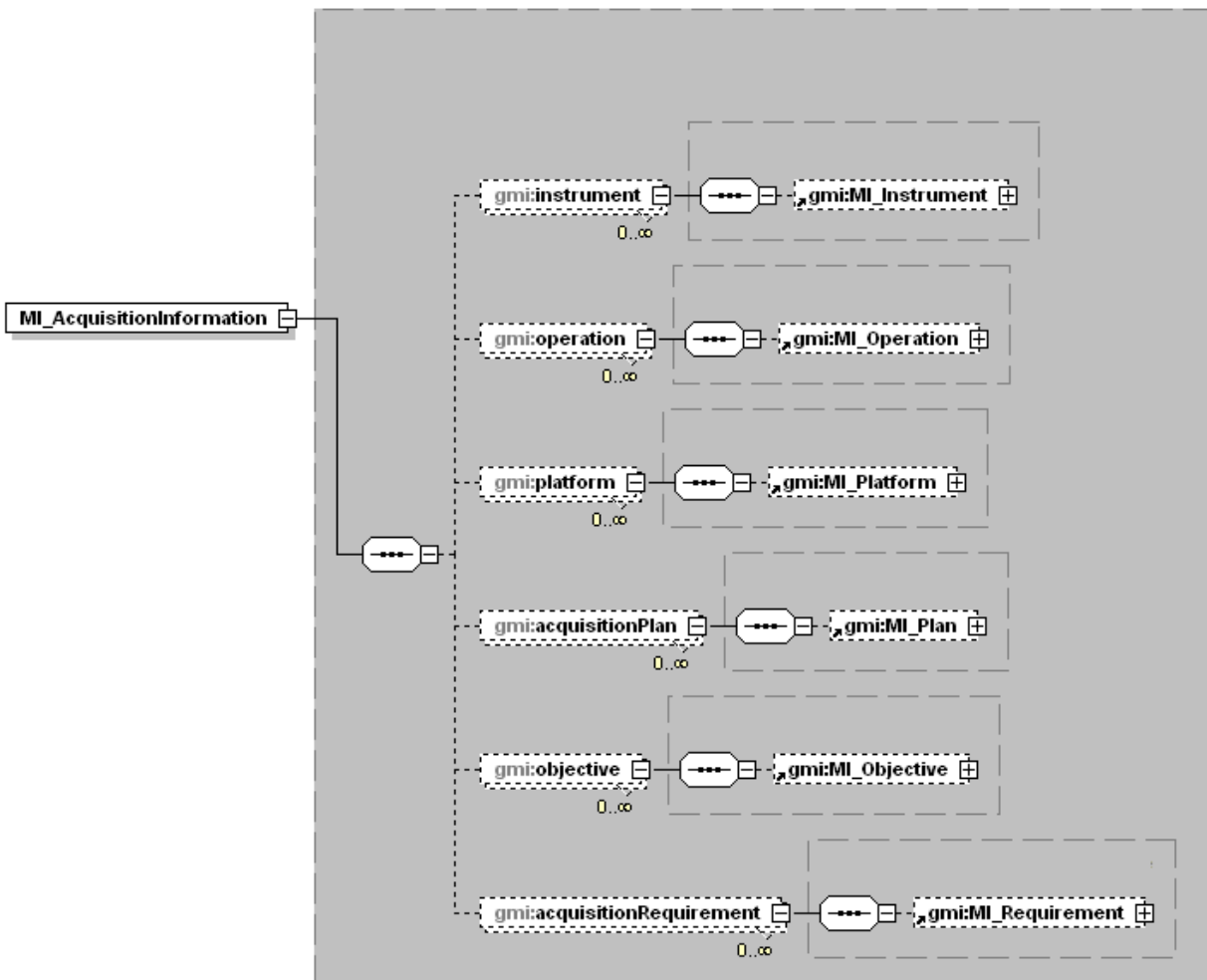


---

## MI PACKAGE

---

## MI\_AcquisitionInformation



**MI\_AcquisitionInformation** – Designations for the measuring instruments, the platform carrying them, and the mission to which the data contributes.

Type: compound  
 Multiplicity: mandatory  
 Attributes: id, uuid

**instrument** – General information about the instrument ,sensor, or device used in data acquisition.

Type: [MI\\_Instrument](#)  
 Multiplicity: optional, repeatable  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

**operation** – General information about an identifiable activity which provided the data.

Type: [MI\\_Operation](#)  
 Multiplicity: optional, repeatable  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

platform – General information about the platform from which the data were taken.

Type: [MI\\_Platform](#)

Multiplicity: optional, repeatable

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

Best Practices: This information is the thing that the instrument is mounted on or carries the instrument. The instrument collects the data, not the platform.

acquisitionPlan – Identifies the plan as implemented by the acquisition.

Type: [MI\\_Plan](#)

Multiplicity: optional, repeatable

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

objective – Identification of the area or object to be sensed.

Type: [MI\\_Objective](#)

Multiplicity: optional, repeatable

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

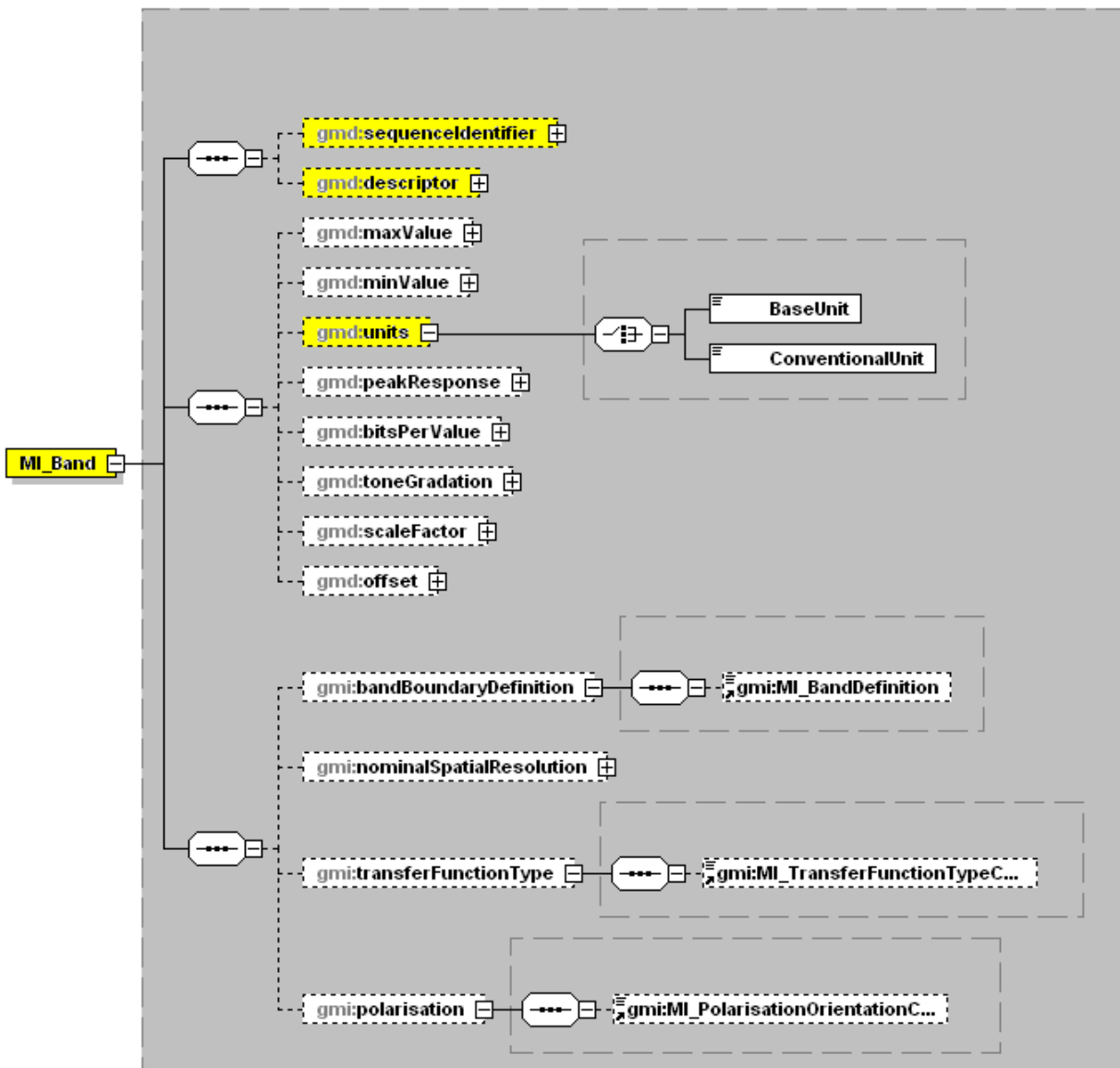
acquisitionRequirement – Identifies the requirement the data acquisition intends to satisfy.

Type: [MI\\_Requirement](#)

Multiplicity: optional, repeatable

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

## MI\_Band



MI\_Band – Range of wavelengths in the electromagnetic spectrum and extensions to electromagnetic spectrum wavelength description (MD\_Band extended).

Type: compound

Multiplicity: conditional

Attributes: id, uuid

sequenceIdentifier – Sensor band wavelengths.

Type: gco:MemberName

Multiplicity: conditional

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

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

bandBoundaryDefinition – Designation of criterion for defining maximum and minimum wavelengths for a spectral band.

Type: [MI\\_BandDefinition](#)  
Domain: 3dB, halfMaximum, fiftyPercent, oneOverE, equivalentWidth  
Multiplicity: optional  
Attributes: nilReason

nominalSpatialResolution – Smallest distance between which separate points can be distinguished, as specified in instrument design.

Type: gco:Real  
Domain: any number  
Multiplicity: optional  
Attributes: nilReason

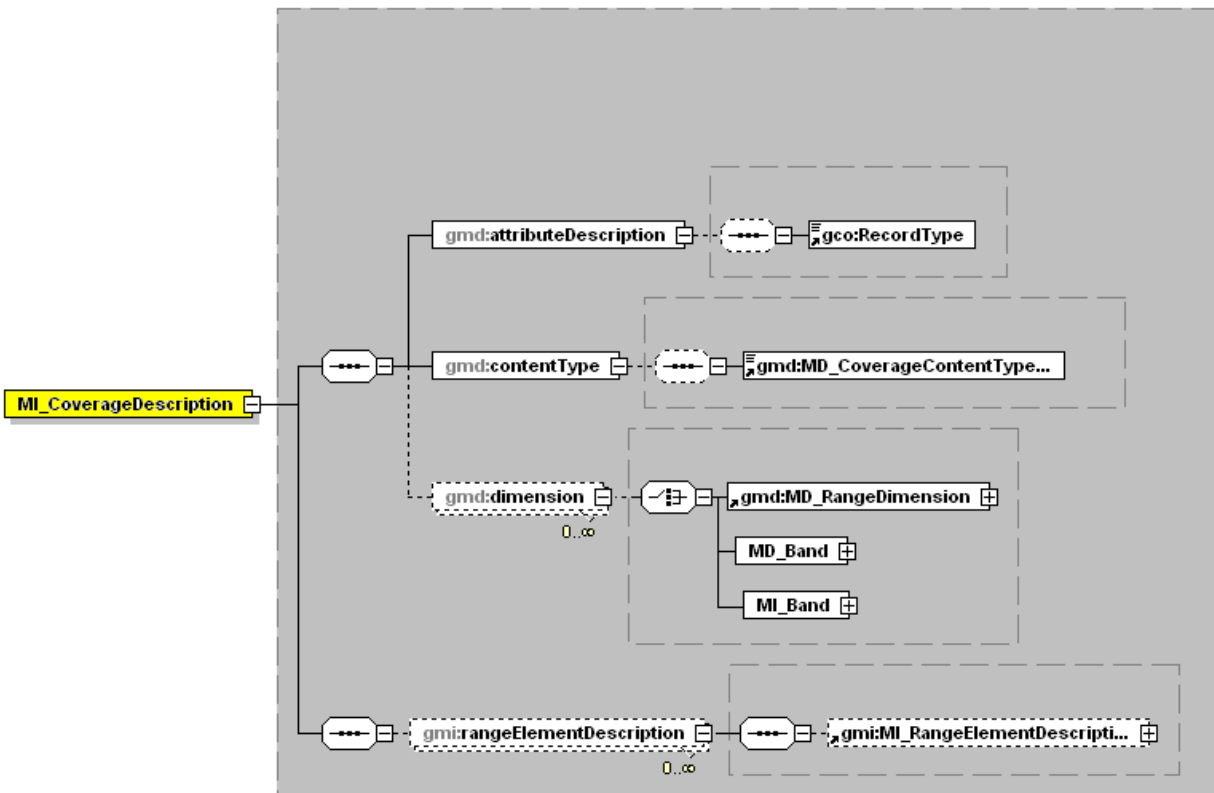
transferFunctionType – Type of transfer function to be used when scaling a physical value for a given element.

Type: [MI\\_TransferFunctionTypeCode](#)  
Domain: linear, logarithmic, exponential  
Multiplicity: optional  
Attributes: nilReason

polarisation – Polarization of the radiation

Type: [MI\\_PolarisationOrientationCode](#)  
Domain: horizontal, vertical, leftCircular, rightCircular, theta, phi  
Multiplicity: optional  
Attributes: nilReason

## MI\_CoverageDescription



MI\_CoverageDescription – Information about the content of a coverage, including the description of specific range elements (MD\_CoverageDescription extended).

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](#) or [MI\\_Band](#)

Multiplicity: optional, repeatable

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

rangeElementDescription – Provides the description of the specific range elements of a coverage.

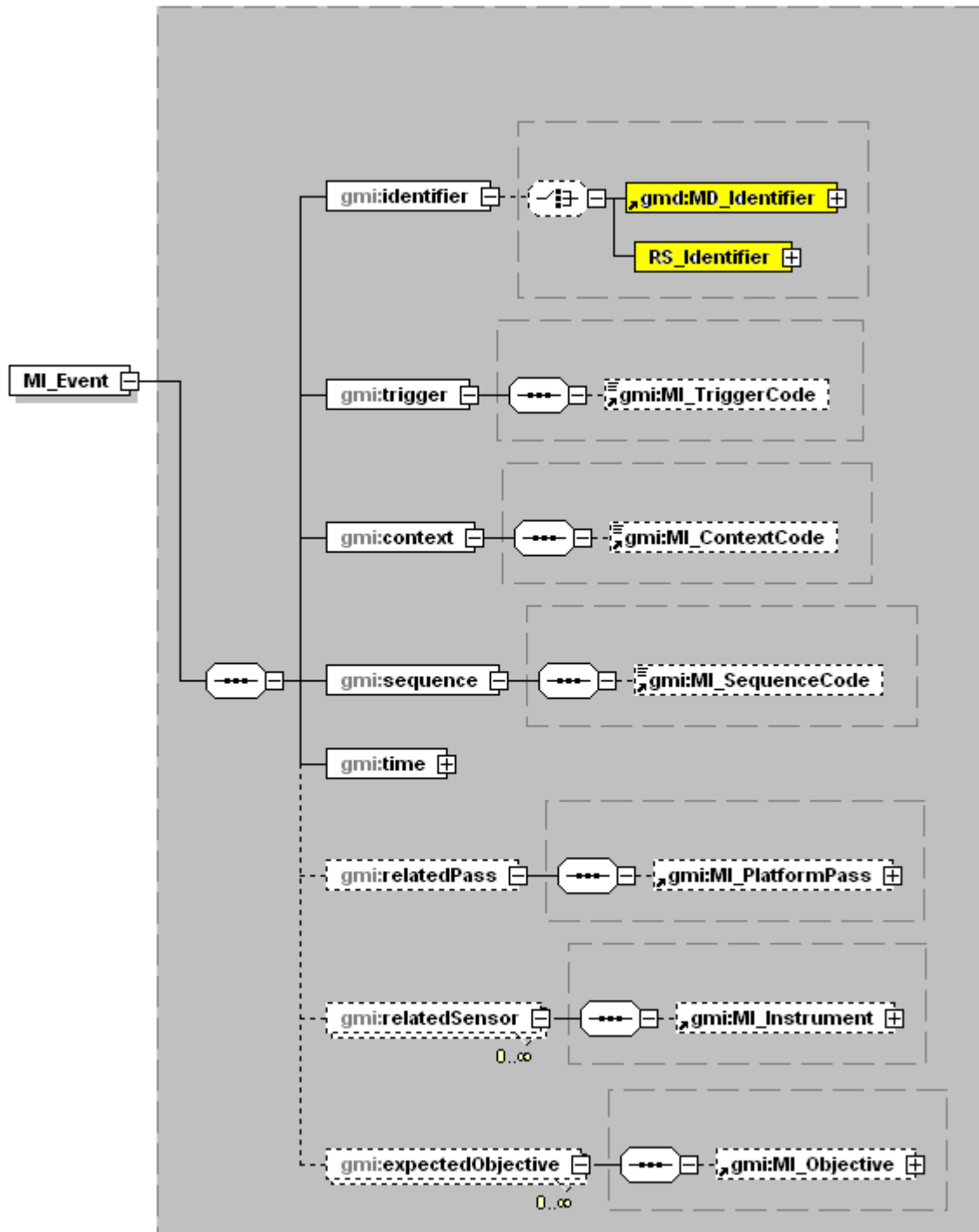
Type: [MI\\_RangeElementDescription](#)

Multiplicity: optional, repeatable

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



## MI\_Event



MI\_Event – Identification of a significant collection point within an operation.

Type: compound  
Multiplicity: mandatory  
Attributes: id, uuid

identifier – Event name or number.

Type: [MD\\_Identifier](#) or [RS\\_Identifier](#)  
Multiplicity: mandatory  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

trigger – Initiator of the event.

Type: [MI\\_TriggerCode](#)  
Domain: automatic, manual, preProgrammed  
Multiplicity: mandatory  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

context – Meaning of the event.

Type: [MI\\_ContextCode](#)  
Domain: acquisition, pass, wayPoint  
Multiplicity: mandatory  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

sequence – Relative time ordering of the event.

Type: [MI\\_SequenceCode](#)  
Domain: start, end, instantaneous  
Multiplicity: mandatory  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

time – Time the event occurred.

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

relatedPass – Pass during which an event occurs.

Type: [MI\\_PlatformPass](#)  
Multiplicity: optional  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

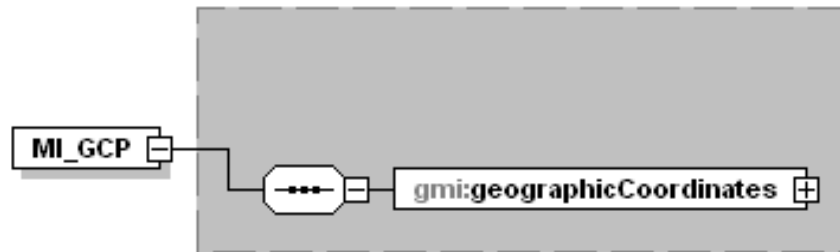
relatedSensor – Instrument(s) for which the event is meaningful.

Type: [MI\\_Instrument](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

expectedObjective – Objective(s) satisfied by an event.

Type: [MI\\_Objective](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

## MI\_GCP



MI\_GCP – Information on ground control point

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

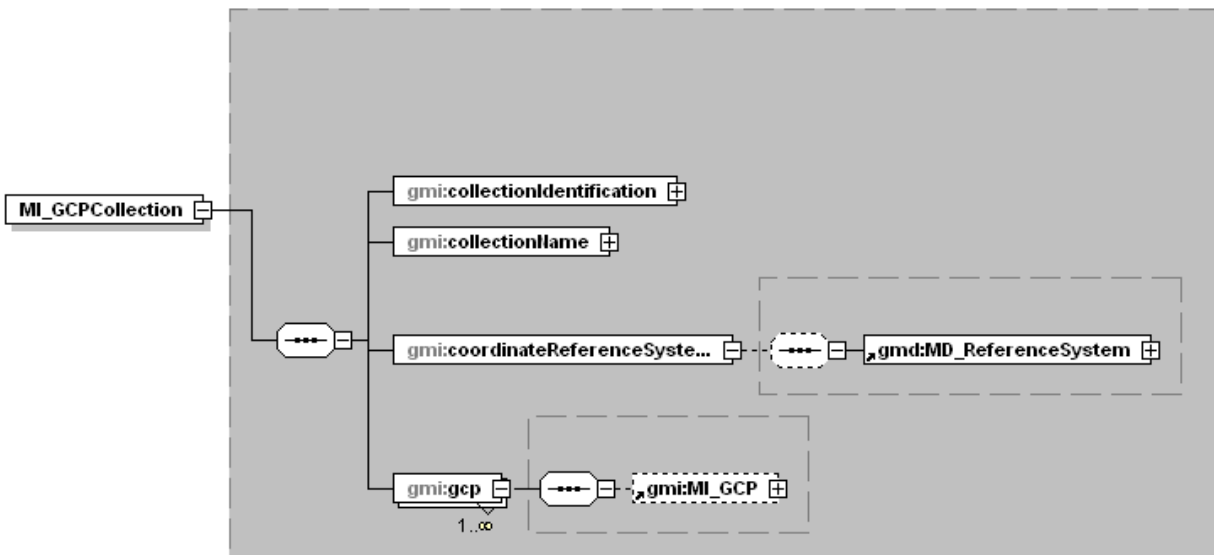
geographicCoordinates – Geographic or map position of the control point, in either two or three dimensions

Type: gml:pos

Multiplicity: mandatory

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

## MI\_GCPCollection



MI\_GCPCollection – Information about a control point collection.

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

collectionIdentification – Identifier of the GCP collection.

Type: gco:Integer

Domain: any whole number

Multiplicity: mandatory

Attributes: nilReason

collectionName – Name of the GCP collection.

Type: gco:CharacterString

Domain: free text

Multiplicity: mandatory

Attributes: nilReason

coordinateReferenceSystem – Coordinate system in which the ground control points are defined.

Type: [MD\\_ReferenceSystem](#)

Multiplicity: mandatory

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

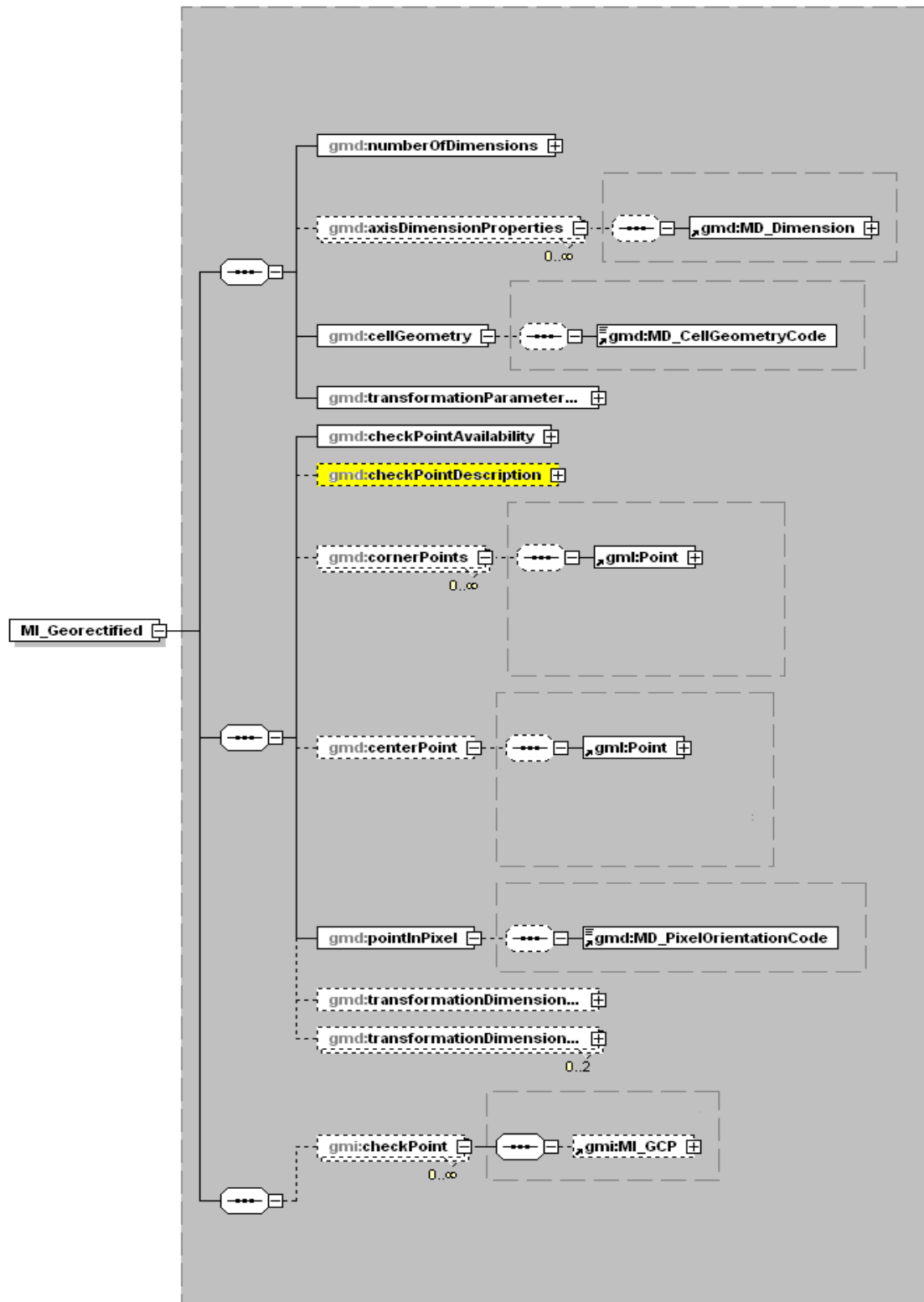
gcp – Ground control point(s) used in collection.

Type: [MI\\_GCP](#)

Multiplicity: mandatory, repeatable

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

## MI\_Georectified



MI\_Georectified – Extends georectified grid description to include associated checkpoints (MD\_Georectified extended).

Type: [MD\\_MaintenanceInformation](#)

Multiplicity: mandatory

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

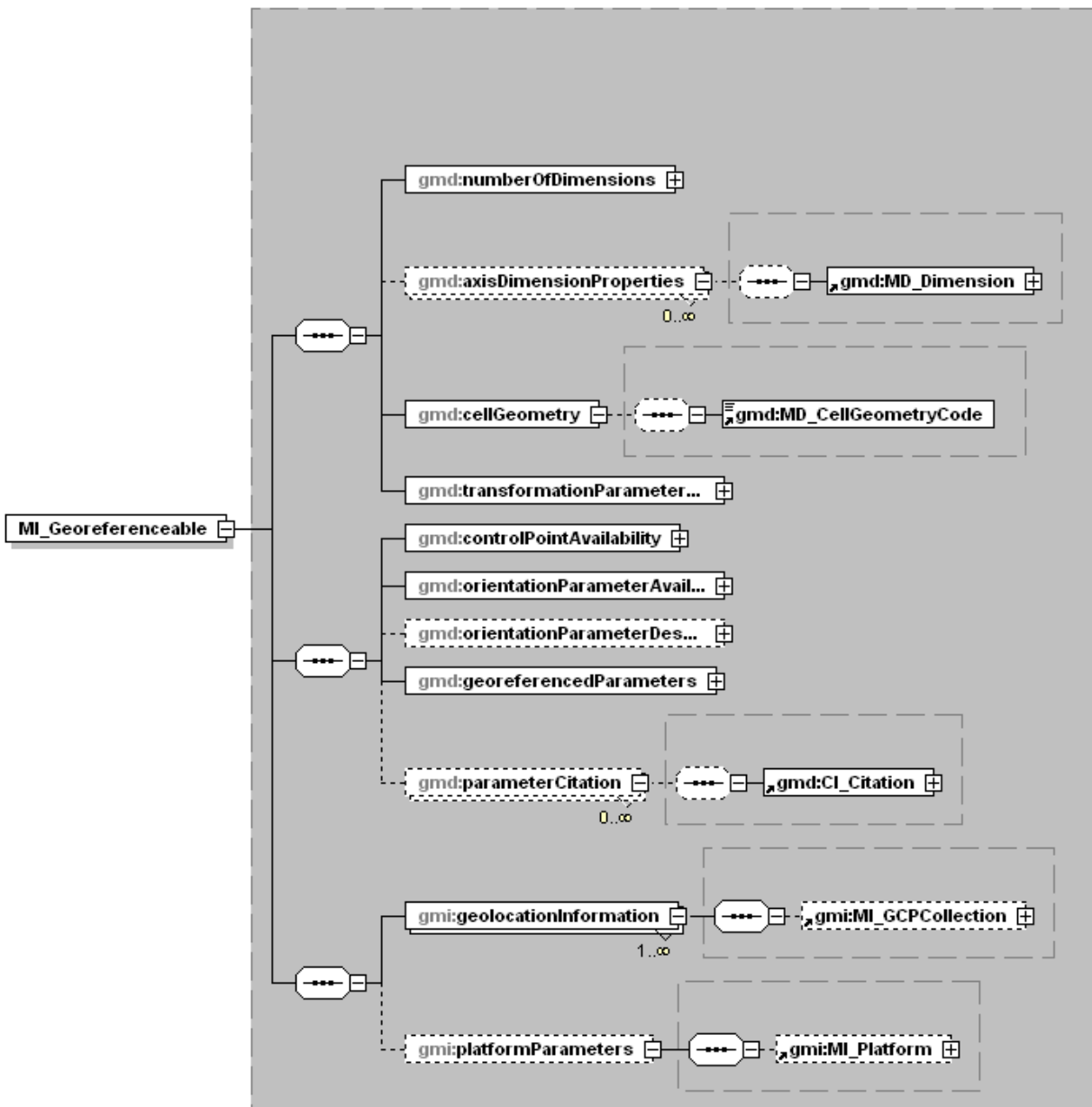
transformationDimensionMapping – Information about which grid axes are spatial axes.

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

checkPoint – Geographic references used to validated georectification of the data.

Type: [MI\\_GCP](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

## MI\_Georeferenceable



MI\_Georeferenceable – Description of information provided in metadata that allows the geographic or map location of the raster points to be located. (MD\_Georeferenceable extended).

Type: compound  
 Multiplicity: optional  
 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

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

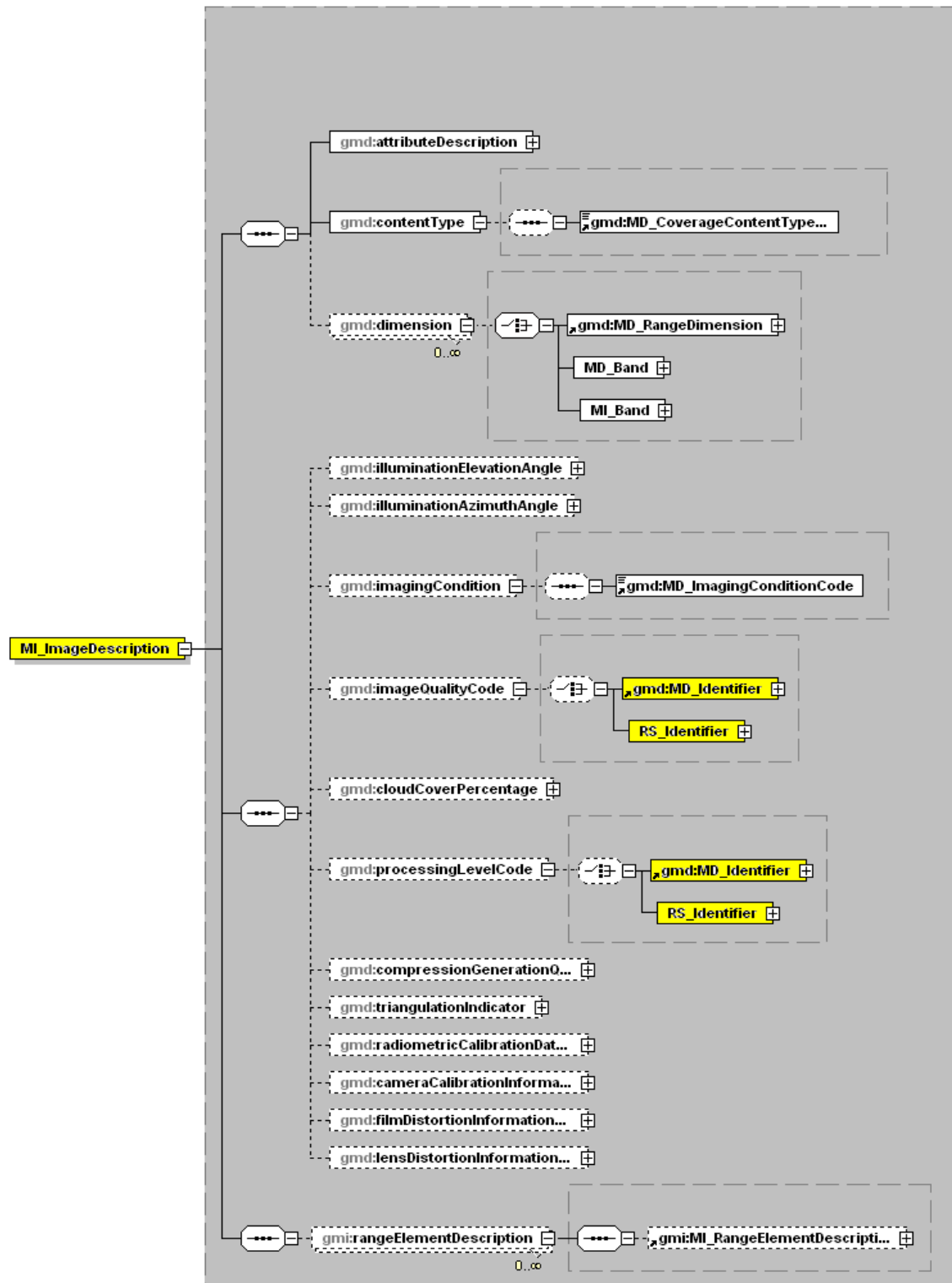
geolocationInformation – Information that can be used to geolocate the data.

Type: [MI\\_GCPCollection](#)

Multiplicity: mandatory, repeatable

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

## MI\_ImageDescription



MI\_ImageDescription – Information about the content of an image (MD\_ImageDescription extended).

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](#) or [MI\\_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

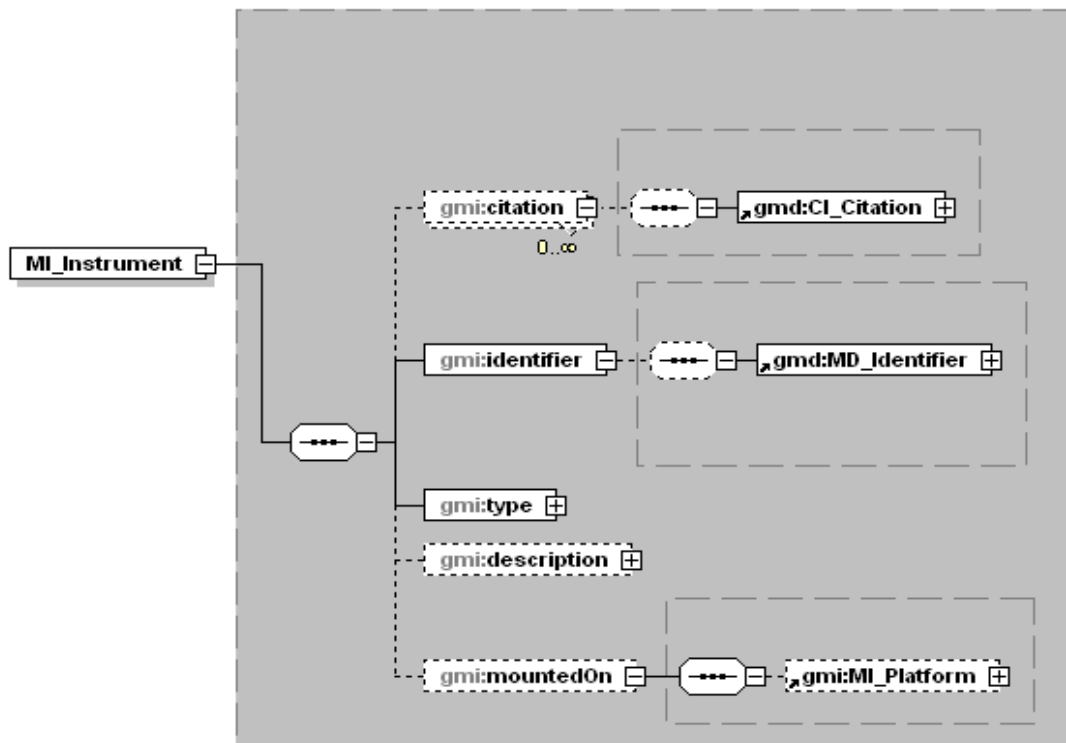
rangeElementDescription – Provides the description of the specific range elements of an image.

Type: [MI\\_RangeElementDescription](#)

Multiplicity: optional, repeatable

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

## MI\_Instrument



MI\_Instrument – Information about the measuring instruments.

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

citation – Complete citation of the instrument or reference to the instrument.

Type: [CI\\_Citation](#)

Multiplicity: optional, repeatable

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

Best Practices: If possible, use citation to reference supporting documentation versus being used to identify/name the instrument.

identifier – Unique identification of the instrument.

Type: [MD\\_Identifier](#)

Multiplicity: mandatory

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

Best Practices: Use the code to document an instruments serial number, otherwise use nilReason.

type – Name of the type of instrument.

Type: gco:CharacterString

Domain: free text

Multiplicity: mandatory

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

---

**FAQ: What is an example of an instrument type?**

Framing, line-scan, push-broom, and pan-frame are a few examples of instrument type.

Ex:

```
<gmi:type>
    <gco:CharacterString>push-broom</gco:CharacterString>
</gmi:type>
```

---

description – Textual description of the instrument.

Type: gco:CharacterString

Domain: free text

Multiplicity: optional

Attributes: nilReason

mountedOn – Platform on which the instrument is mounted.

Type: [MI\\_Platform](#)

Multiplicity: optional

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

Ex:

```
<gmi:MI_Instrument uuid="794feae0-679a-11e0-ae3e-0800200c9a66">
  <gmi:citation>
    <gmd:CI_Citation>
      <gmd:title>
        <gco:CharacterString>Kongsberg EM302 Multibeam Echosounder</gco:CharacterString>
      </gmd:title>
      <gmd:date gco:nilReason="unknown"/>
      <gmd:identifier>
        <gmd:MD_Identifier>
          <gmd:code>
            <gco:CharacterString>EM302</gco:CharacterString>
          </gmd:code>
        </gmd:MD_Identifier>
      </gmd:identifier>
      <gmd:citedResponsibleParty>
        <gmd:CI_ResponsibleParty>
          <gmd:organisationName>
            <gco:CharacterString>Kongsberg Maritime</gco:CharacterString>
          </gmd:organisationName>
          <gmd:contactInfo>
            <gmd:CI_Contact>
              <gmd:phone>
                <gmd:CI_Telephone>
                  <gmd:voice>
                    <gco:CharacterString>+47 214
98 364</gco:CharacterString>
                    </gmd:voice>
                  <gmd:facsimile>
                    <gco:CharacterString>+47 322
85 014</gco:CharacterString>
                  </gmd:facsimile>
                </gmd:CI_Telephone>
              </gmd:phone>
            </gmd:CI_Contact>
          </gmd:contactInfo>
        </gmd:CI_ResponsibleParty>
      </gmd:citedResponsibleParty>
    </gmd:CI_Citation>
  </gmi:citation>
</gmi:MI_Instrument>
```

```

                                <gmd:address>
                                    <gmd:CI_Address>
                                        <gmd:deliveryPoint>
                                            <gco:CharacterString>P.O. Box
483</gco:CharacterString>
                                        </gmd:deliveryPoint>
                                        <gmd:deliveryPoint>
                                            <gco:CharacterString>NO-
3601</gco:CharacterString>
                                        </gmd:deliveryPoint>
                                        <gmd:city>
                                            <gco:CharacterString>Kongsberg
</gco:CharacterString>
                                        </gmd:city>
                                        <gmd:country>
                                            <gco:CharacterString>Norway
</gco:CharacterString>
                                        </gmd:country>
                                        <gmd:electronicMailAddress>
                                            <gco:CharacterString>km.support@kongsberg.com </gco:CharacterString>
                                                </gmd:electronicMailAddress>
                                                    </gmd:CI_Address>
                                                        </gmd:address>
                                                            <gmd:onlineResource>
                                                                <gmd:CI_OnlineResource>
                                                                    <gmd:linkage>
                                                                        <gmd:URL>
http://www.km.kongsberg.com/ks/web/nokbg0240.nsf/AllWeb/871B055B3DE0DAC3C125715E002B5C68?OpenDocument
</gmd:URL>
                                                                    </gmd:linkage>
                                                                </gmd:CI_OnlineResource>
                                                            </gmd:onlineResource>
                                                        </gmd:CI_Contact>
                                                    </gmd:contactInfo>
                                                <gmd:role>
                                                    <gmd:CI_RoleCode
codeList="http://www.ngdc.noaa.gov/metadata/published/xsd/schema/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="resourceProvider" codeSpace="001">resourceProvider</gmd:CI_RoleCode>
                                                    </gmd:role>
                                                        </gmd:CI_ResponsibleParty>
                                                            </gmd:citedResponsibleParty>
                                                                </gmd:CI_Citation>
                                                                    </gmi:citation>
                                                                        <gmi:identifier>
                                                                            <gmd:MD_Identifier>
                                                                                <gmd:code>
                                                                                    <gco:CharacterString>Kongsberg EM302 Multibeam Echosounder</gco:CharacterString>
                                                                                </gmd:code>
                                                                            </gmd:MD_Identifier>
                                                                        </gmi:identifier>
                                                                    <gmi:type>
                                                                        <gco:CharacterString>Multibeam Echosounder</gco:CharacterString>
                                                                    </gmi:type>
                                                                <gmi:description>
                                                                    <gco:CharacterString>

```

The state of the art 30 kHz EM 302 deep water multibeam sonar is manufactured by Kongsberg, Inc of Norway. The EM 302 transducers are modular linear arrays in a Mills cross configuration with separate units for transmit and receive. This sonar offers significantly larger swath width, increased data density and resolution. Beam focusing is applied both during reception and transmission. The system has up to 288 beams / 432 soundings per swath with pointing angles automatically adjusted according to achievable coverage or operator defined limits. In multi-ping mode, 2 swaths are generated per ping cycle, with up to 864 soundings. With multi-ping the transmit fan is duplicated and transmitted with a small difference in along track tilt. The applied tilt takes into account depth, coverage and vessel speed to give a constant sounding separation along track. The beam spacing can be adjusted as equi-distant or equi-angular. EM 302 uses both CW pulses and FM sweep pulses with pulse compression on reception, in order to increase the maximum useful swath width. The transmit fan is split in several individual



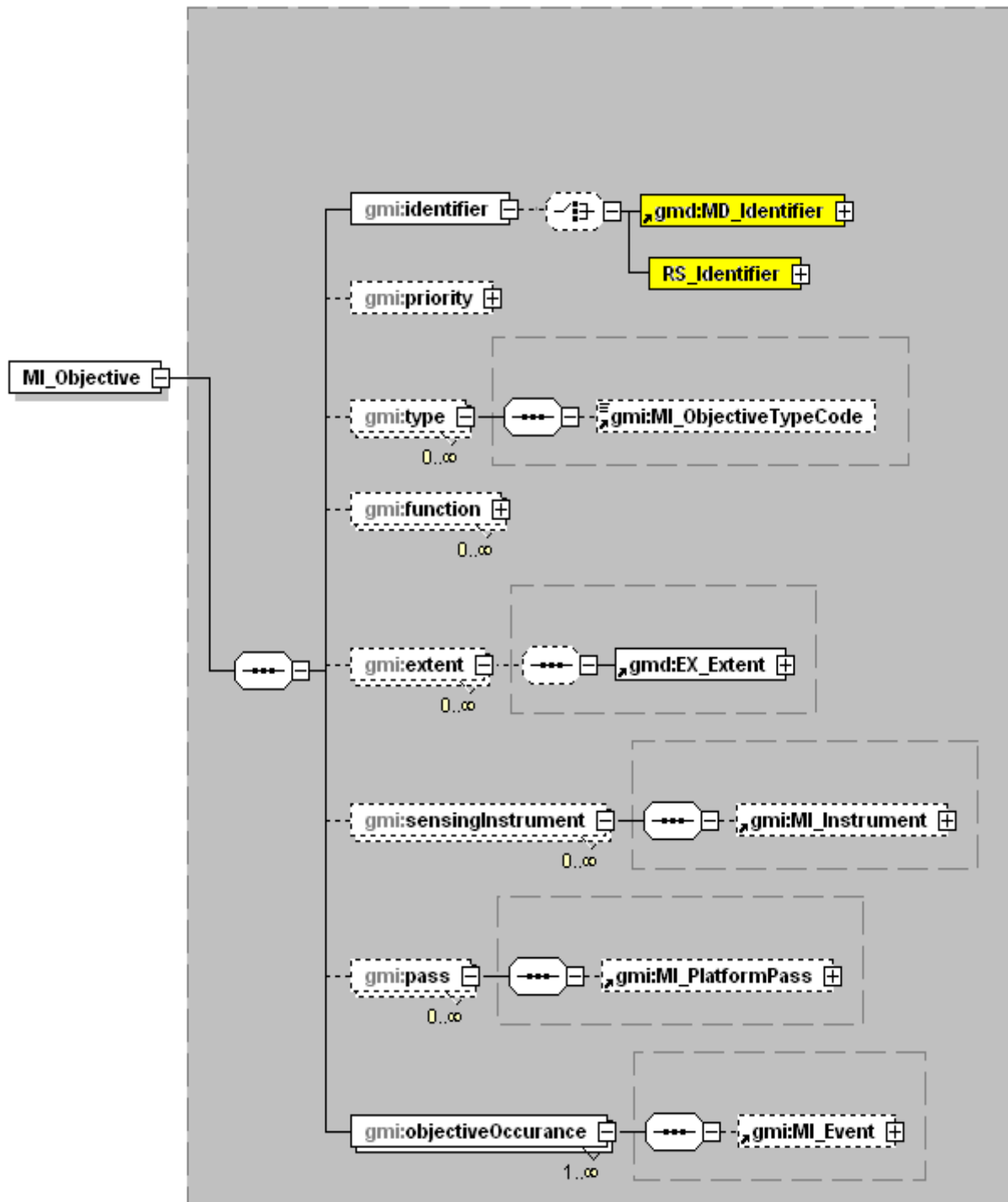
sectors with independent active steering according to accomplish compensation for the vessel movements: yaw, pitch and roll. The high density, high resolution, large coverage and water column capability makes EM 302 an ideal system to explore the sea bed and the water column for detection and characterization of a broad spectrum of features.

</gco:CharacterString>

</gmi:description>

</gmi:MI\_Instrument>

## MI\_Objective



MI\_Objective – Describes the characteristics, spatial and temporal extent of the intended object to be observed.

Type: compound  
Multiplicity: mandatory  
Attributes: id, uuid

identifier – Unique name of the objective.

Type: [MD\\_Identifier](#) or [RS\\_Identifier](#)  
Multiplicity: mandatory  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

priority – Priority applied to the target.

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

type – Collection technique for the objective.

Type: [MI\\_ObjectiveTypeCode](#)  
Domain: instantaneousCollection, persistentView, survey  
Multiplicity: optional, repeatable  
Attributes: nilReason

function – Role or purpose performed by or activity performed at the objective.

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

extent – Extent information including the bounding, vertical, and temporal extent of the objective.

Type: [EX\\_Extent](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

sensingInstrument – Instrument which senses the objective data.

Type: [MI\\_Instrument](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

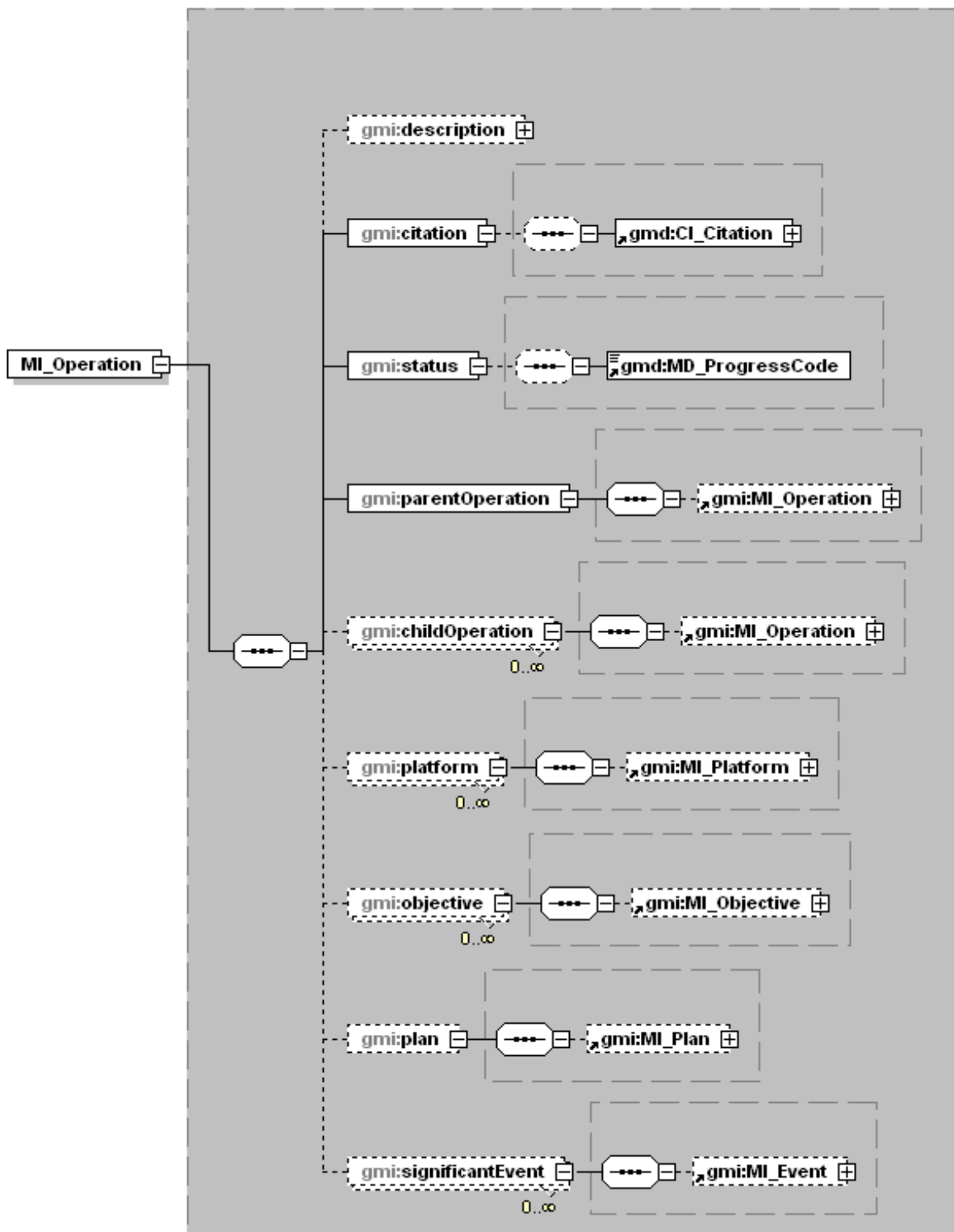
pass – Pass of the platform over the objective.

Type: [MI\\_PlatformPass](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

objectiveOccurance – Event(s) associated with objective completion.

Type: [MI\\_Event](#)  
Multiplicity: mandatory, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

## MI\_Operation



MI\_Operation – Designations for the operation used to acquire the dataset.

Type: compound  
Multiplicity: mandatory  
Attributes: id, uuid

description – Description of the mission and the objectives of that mission.

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

citation – Identification of the mission.

Type: [CI\\_Citation](#)  
Multiplicity: mandatory  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

status – Status of the data acquisition.

Type: [MD\\_ProgressCode](#)  
Domain: completed, historicalArchive, obsolete, ongoing, planned, required, underdevelopment  
Multiplicity: mandatory  
Attributes: nilReason

parentOperation – Heritage of the operation.

Type: [MI\\_Operation](#)  
Multiplicity: mandatory  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

childOperation – Sub-missions that make up part of a larger mission.

Type: [MI\\_Operation](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

platform – Platform(s) used in the operation.

Type: [MI\\_Platform](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

objective – Object(s) or area(s) of interest to be sensed.

Type: [MI\\_Objective](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

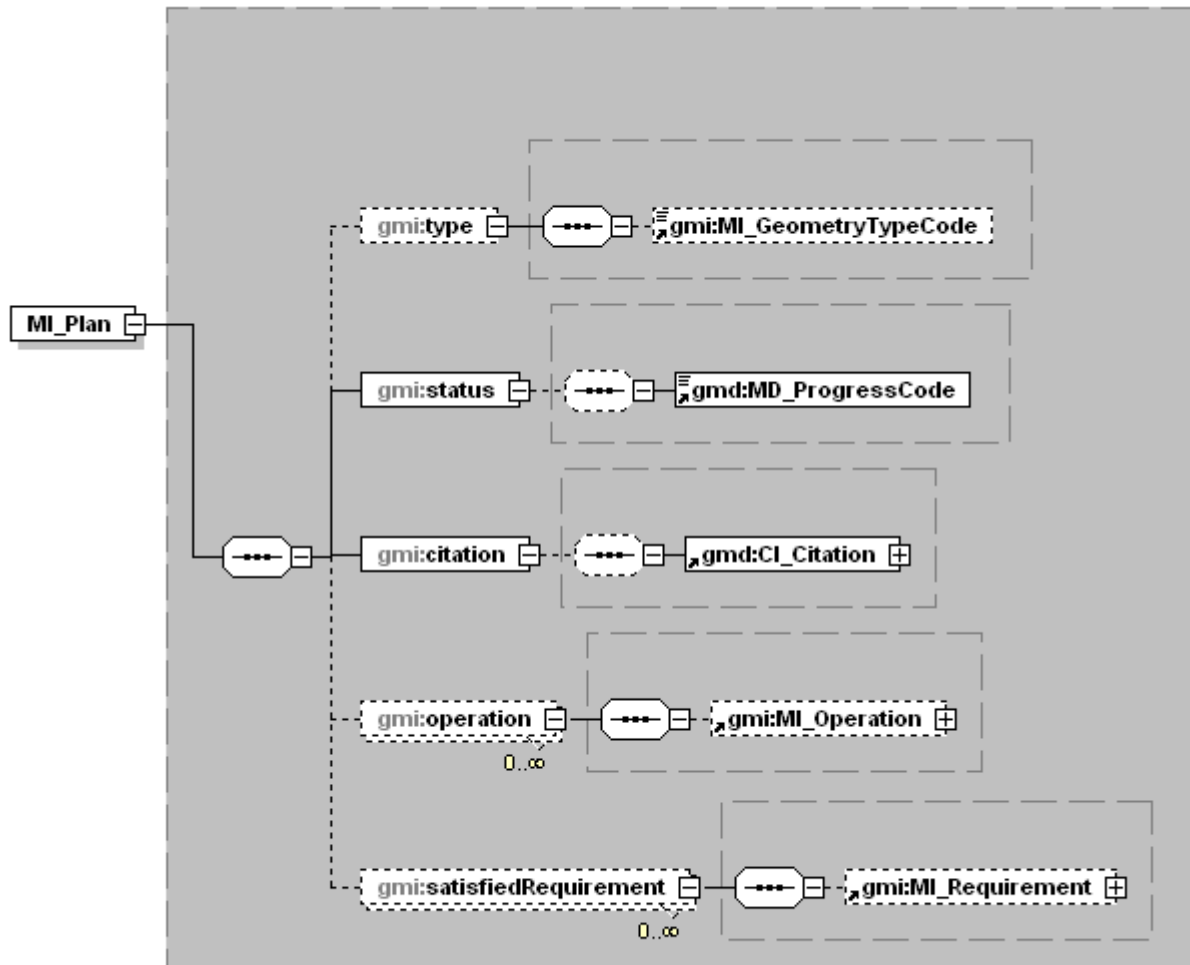
plan – Plan satisfied by the operation.

Type: [MI\\_Plan](#)  
Multiplicity: optional  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

significantEvent – Record of an event occurring during the operation.

Type: [MI\\_Event](#)  
Multiplicity: optional, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

## MI\_Plan



MI\_Plan – Designations for the planning information related to meeting the data acquisition requirements.

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

type – Manner of sampling geometry that the planner expects for collection of objective data.

Type: [MI\\_GeometryTypeCode](#)

Domain: point, linear, areal, strip

Multiplicity: optional

Attributes: nilReason

status – Current status of the plan.

Type: [MD\\_ProgressCode](#)

Domain: completed, historicalArchive, obsolete, ongoing, planned, required, underdevelopment

Multiplicity: mandatory

Attributes: nilReason

citation – Identification of authority requesting target collection.

Type: [CI\\_Citation](#)

Multiplicity: mandatory

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

operation – Identification of the activity that satisfies a plan.

Type: [MI\\_Operation](#)

Multiplicity: optional, repeatable

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

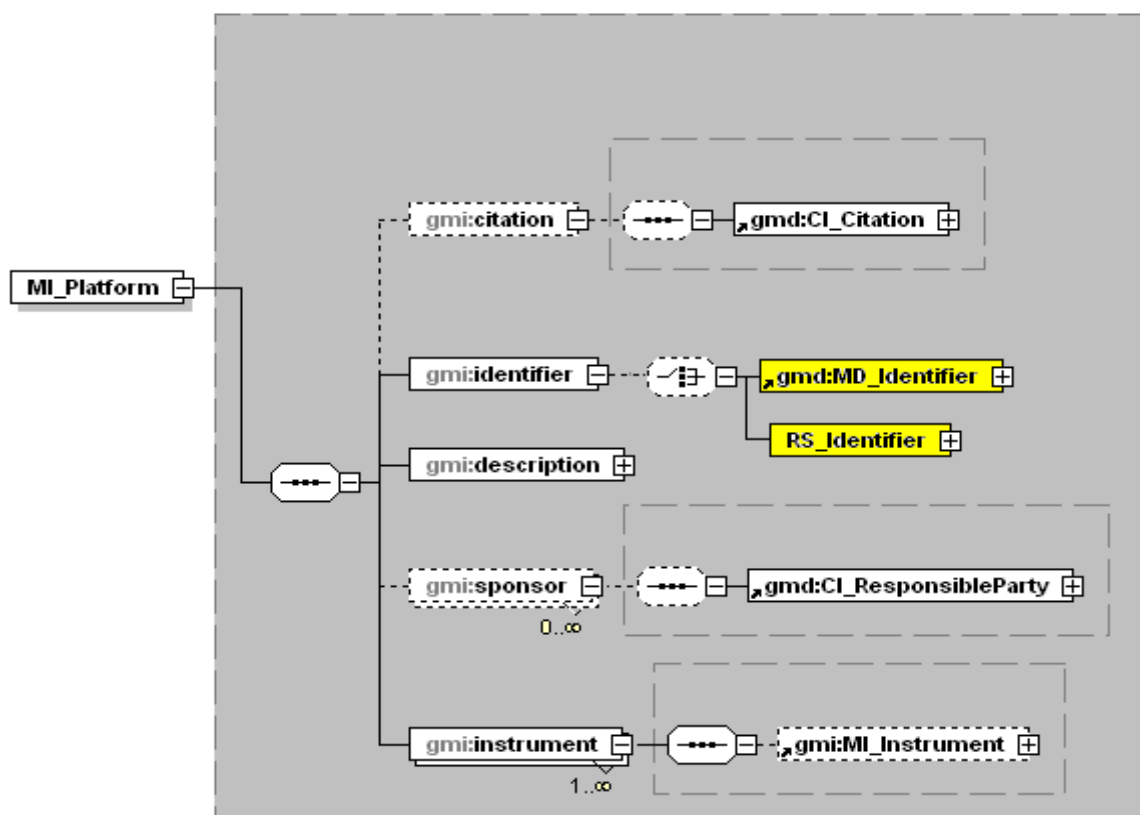
satisfiedRequirement – Requirement satisfied by the plan.

Type: [MI\\_Requirement](#)

Multiplicity: optional, repeatable

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

## MI\_Platform



MI\_Platform – Designation of the platform used to acquire the dataset.

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

citation – Source where information about the platform is described.

Type: [CI\\_Citation](#)

Multiplicity: optional

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

Best Practices: If possible, use citation to reference supporting documentation versus being used to identify/name the platform.

identifier – Unique identification of the platform.

Type: [MD\\_Identifier](#) or [RS\\_Identifier](#)

Multiplicity: mandatory

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

description – Narrative description of the platform supporting the instrument.

Type: gco:CharacterString

Domain: free text

Multiplicity: mandatory

Attributes: nilReason



sponsor – Organisation(s) responsible for building, launching, or operating the platform.

Type: [CI\\_ResponsibleParty](#)

Multiplicity: optional, repeatable

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

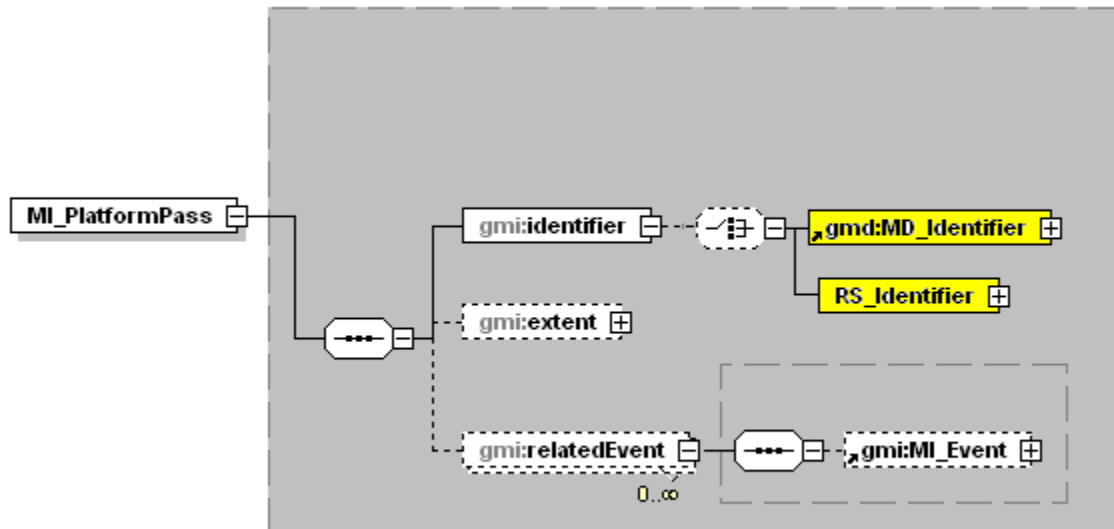
instrument – Instrument(s) mounted on a platform.

Type: [MI\\_Instrument](#)

Multiplicity: mandatory, repeatable

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

## MI\_PlatformPass



MI\_PlatformPass – Identification of collection coverage.

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

identifier – Unique name of the pass.

Type: [MD\\_Identifier](#) or [RS\\_Identifier](#)

Multiplicity: mandatory

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

extent – Area covered by the pass.

Type: GM\_Object

Multiplicity: optional

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

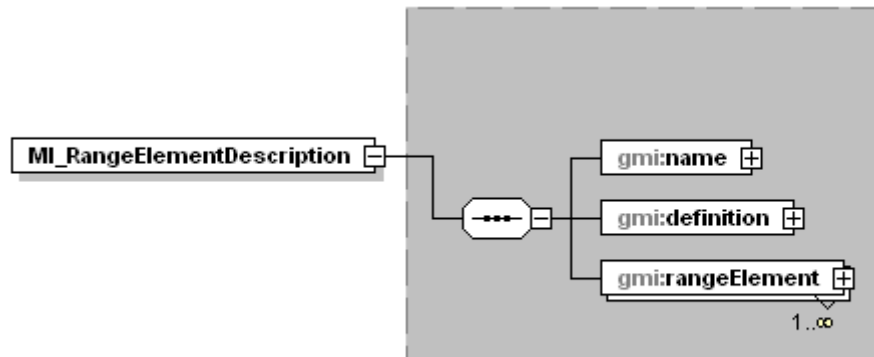
relatedEvent – Occurrence of one or more events for a pass.

Type: [MI\\_Event](#)

Multiplicity: optional, repeatable

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

## MI\_RangeElementDescription



**MI\_RangeElementDescription** – Description of specific range elements.

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

**name** – Designation associated with a set of range elements.

Type: gco:CharacterString

Domain: free text

Multiplicity: mandatory

Attributes: nilReason

**definition** – Description of a set of specific range elements.

Type: gco:CharacterString

Domain: free text

Multiplicity: mandatory

Attributes: nilReason

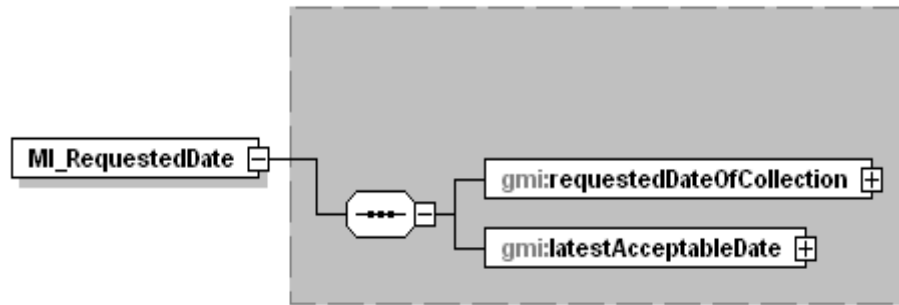
**rangeElement** – Specific range elements i.e. range elements associated with a name and their definition.

Type: gco:Record

Multiplicity: mandatory, repeatable

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

## MI\_RequestedDate



MI\_RequestedDate – Range of date validity.

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

requestedDateOfCollection – Preferred date and time of collection.

Type: gco:DateTime

Domain: date

Multiplicity: mandatory

Attributes: nilReason

latestAcceptableDate – Latest date and time collection must be completed.

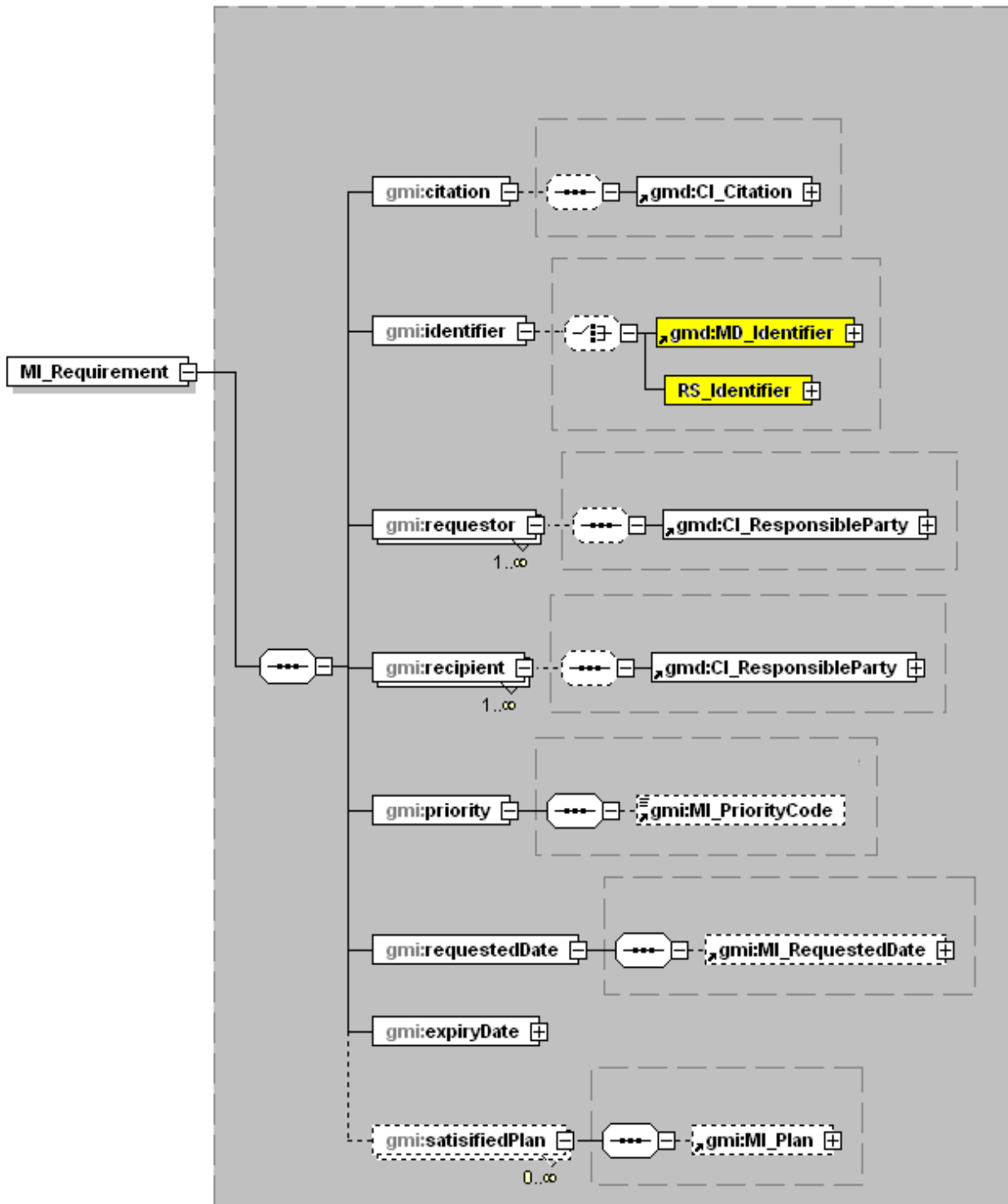
Type: gco:DateTime

Domain: date

Multiplicity: mandatory

Attributes: nilReason

## MI\_Requirement



MI\_Requirement – Requirement to be satisfied by the planned data acquisition.

Type: compound

Multiplicity: mandatory

Attributes: id, uuid

citation – Identification of reference or guidance material for the requirement.

Type: [CI\\_Citation](#)

Multiplicity: mandatory

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

identifier – Unique name or code for the requirement.

Type: [MD\\_Identifier](#) or [RS\\_Identifier](#)

Multiplicity: mandatory

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

requestor – Origin of the requirement.

Type: [CI\\_ResponsibleParty](#)

Multiplicity: mandatory, repeatable

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

recipient – Person(s) or organisation(s) to receive results of requirement.

Type: [CI\\_ResponsibleParty](#)

Multiplicity: mandatory, repeatable

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

priority – Relative ordered importance, or urgency, of the requirement.

Type: [MI\\_PriorityCode](#)

Domain: critical, highImportance, mediumImportance, lowImportance

Multiplicity: mandatory

Attributes: nilReason

requestedDate – Required or preferred acquisition date and time.

Type: [MI\\_RequestedDate](#)

Multiplicity: mandatory

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

expiryDate – Date and time after which collection is no longer valid.

Type: gco:DateTime

Domain: date

Multiplicity: mandatory

Attributes: nilReason

satisfiedPlan – Plan that identifies solution to satisfy the requirement.

Type: [MI\\_Plan](#)

Multiplicity: optional, repeatable

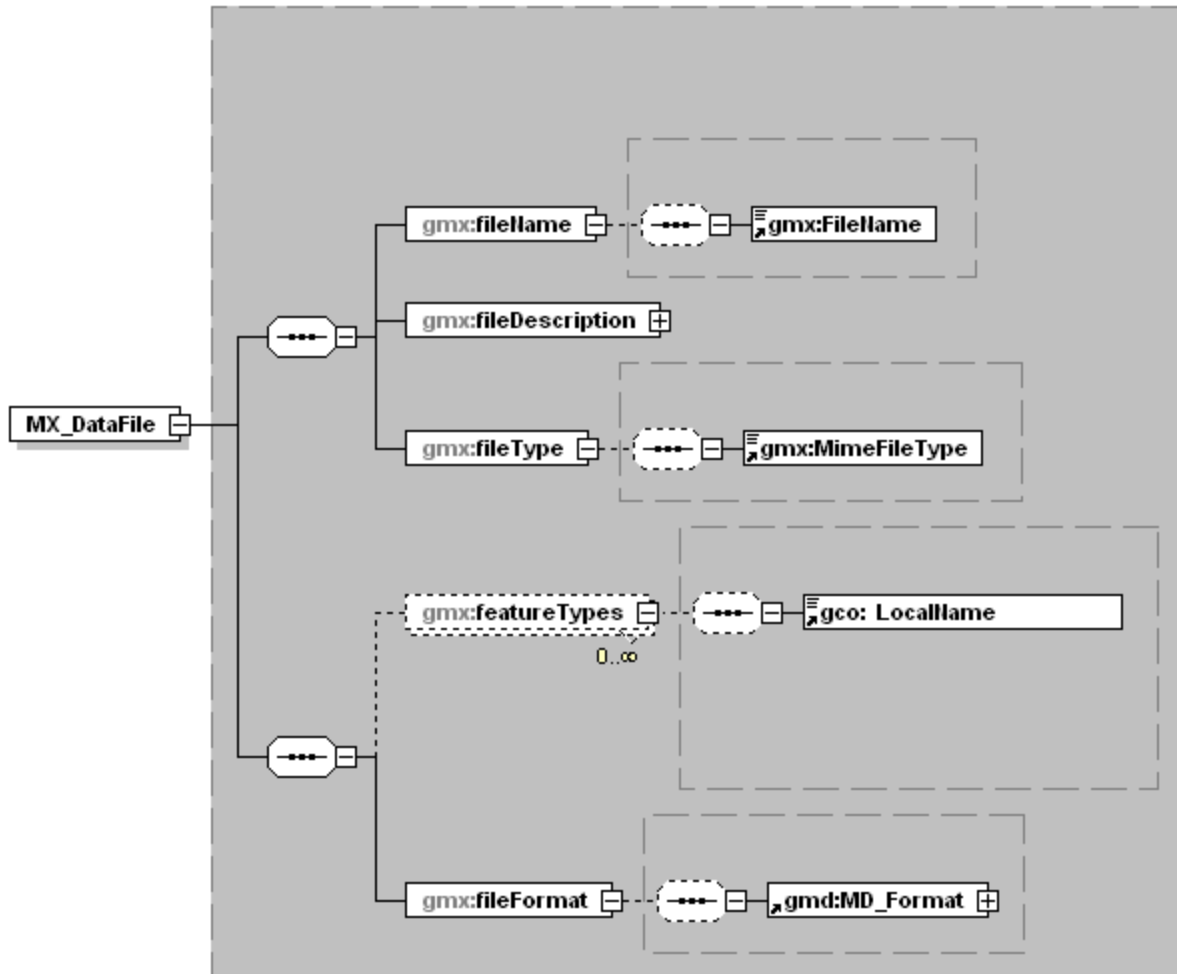
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

---

## MX PACKAGE

---

## MX\_DataFile



**MX\_DataFile** – Identifies a complete report of the quality of the coverage.

Type: compound  
 Multiplicity: mandatory  
 Attributes: id, uuid

**fileName** – Name of the file.

Type: FileName  
 Multiplicity: mandatory  
 Attributes: nilReason

**FileName** – File name.

Type: string  
 Domain: free text  
 Multiplicity: mandatory  
 Attributes: src  
 Best Practices: The src attribute is used to document the source URI. Any URI is valid in the src attribute.



fileDescription – Text description of the file named.

Type: gco:CharacterString

Domain: free text

Multiplicity: mandatory

Attributes: nilReason

fileType – Mime type of the file named.

Type: MimeFileType

Multiplicity: mandatory

Attributes: nilReason

MimeFileType – Type used to identify the type of information that a file contains.

Type: string

Domain: free text

Multiplicity: mandatory

Attributes: type

Best Practices: The attribute type is mandatory. Use list from

[http://www.w3schools.com/media/media\\_mimeref.asp](http://www.w3schools.com/media/media_mimeref.asp)

featureTypes – Type of features.

Type: LocalName

Domain: free text

Multiplicity: optional, repeatable

Attributes: nilReason

fileFormat – Format of the file.

Type: MD\_Format

Multiplicity: optional, repeatable

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

Ex:

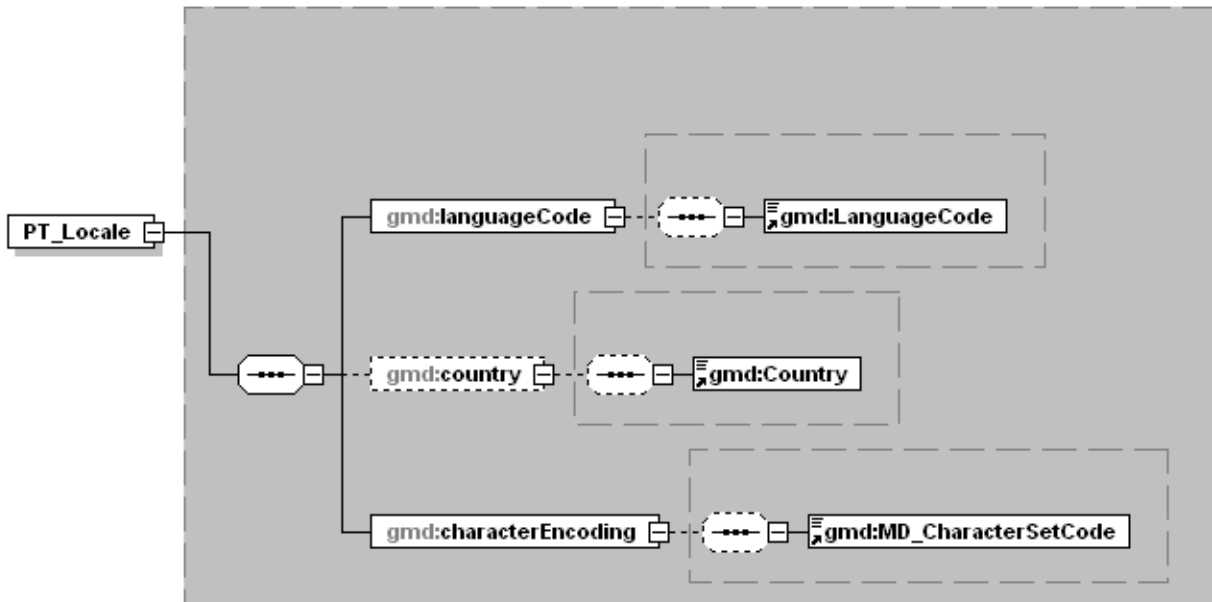
```
<gmx:MX_DataFile>
  <gmx:fileName>
    <gmx:FileName>filename.jpg</gmx:FileName>
  </gmx:fileName>
  <gmx:fileDescription>
    <gco:CharacterString>Description of the jpeg file named above. This jpeg contains...</gco:CharacterString>
  </gmx:fileDescription>
  <gmx:fileType>
    <gmx:MimeFileType type="image/jpeg">image/jpeg</gmx:MimeFileType>
  </gmx:fileType>
  <gmx:fileFormat>
    <gmd:MD_Format>
      <gmd:name>
        <gco:CharacterString>JPEG image file format</gco:CharacterString>
      </gmd:name>
      <gmd:version gco:nilReason="unknown"/>
    </gmd:MD_Format>
  </gmx:fileFormat>
</gmx:MX_DataFile>
```

---

**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:

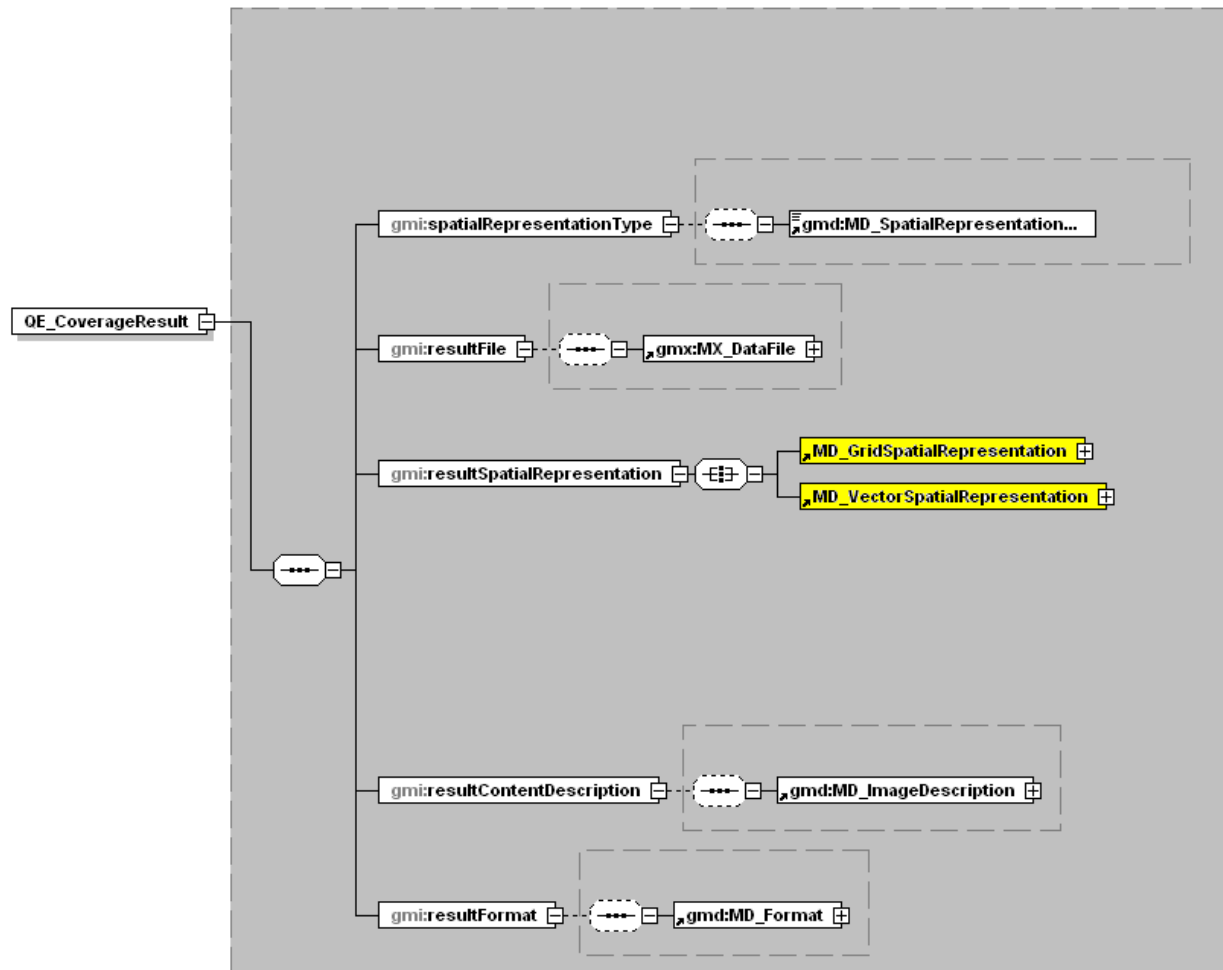
```
<gmd:locale>
  <gmd:PT_Locale>
    <gmd:languageCode>
      <gmd:LanguageCode codeList="../../Codelist/ML_gmxCodelists.xml#LanguageCode"
codeListValue="eng">English</gmd:LanguageCode>
    </gmd:languageCode>
    <gmd:country>
      <gmd:Country codeList="../../Codelist/ML_gmxCodelists.xml#Country"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

---

## QE PACKAGE

---

## QE\_CoverageResult



**QE\_CoverageResult** – Result of a data quality measure organizing the measured values as a coverage (DQ\_Result extended).

Type: compound  
 Multiplicity: mandatory  
 Attributes: id, uuid

**spatialRepresentationType** – Method used to spatially represent the coverage result.

Type: [MD\\_SpatialRepresentationTypeCode](#)  
 Domain: vector, grid, textTable, tin, stereoModel, video  
 Multiplicity: mandatory  
 Attributes: nilReason

**resultFile** – Provides information about the data file containing the result coverage data.

Type: [MX\\_DataFile](#)  
 Multiplicity: mandatory  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

resultSpatialRepresentation – Provides the digital representation of data quality measures composing the coverage result.

Type: [MD\\_GridSpatialRepresentation](#) or [MD\\_VectorSpatialRepresentation](#)

Multiplicity: mandatory

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

resultContentDescription – Provides the description of the content of the result coverage.

Type: [MD\\_ImageDescription](#)

Multiplicity: mandatory

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

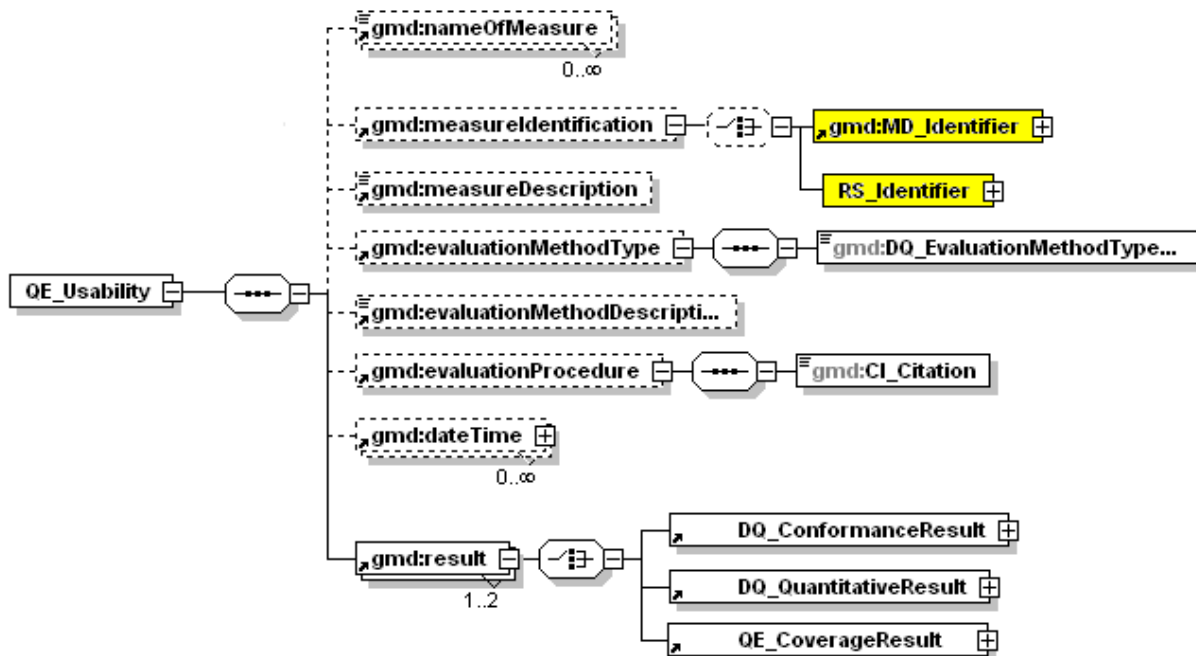
resultFormat – Provides information about the format of the result coverage data.

Type: [MD\\_Format](#)

Multiplicity: mandatory

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

## QE\_Usability



QE\_Usability – Degree of adherence of a dataset to a specific set of user requirements (reports extended).

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.

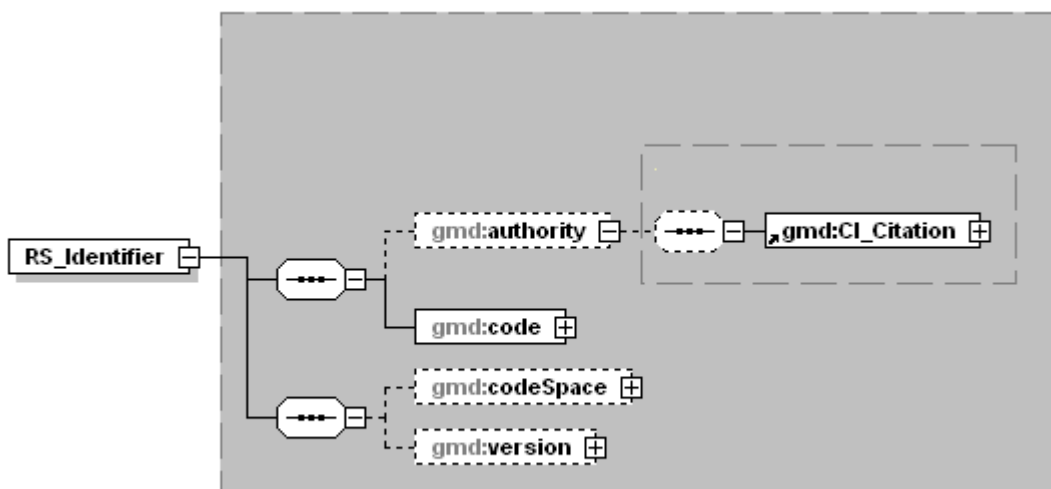
Type: [DQ\\_QuantitativeResult](#) or [DQ\\_ConformanceResult](#) or [QE\\_CoverageResult](#)  
Multiplicity: mandatory, repeatable twice  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

---

## 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](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 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>
```

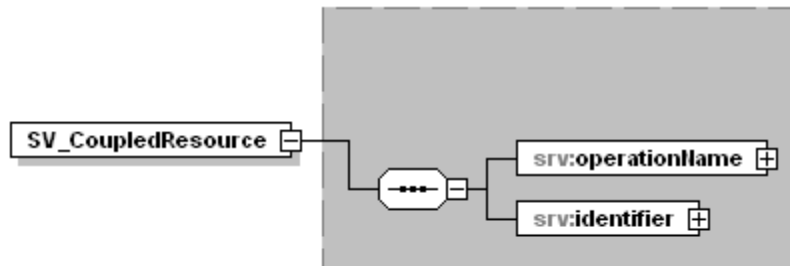
---

---

## 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

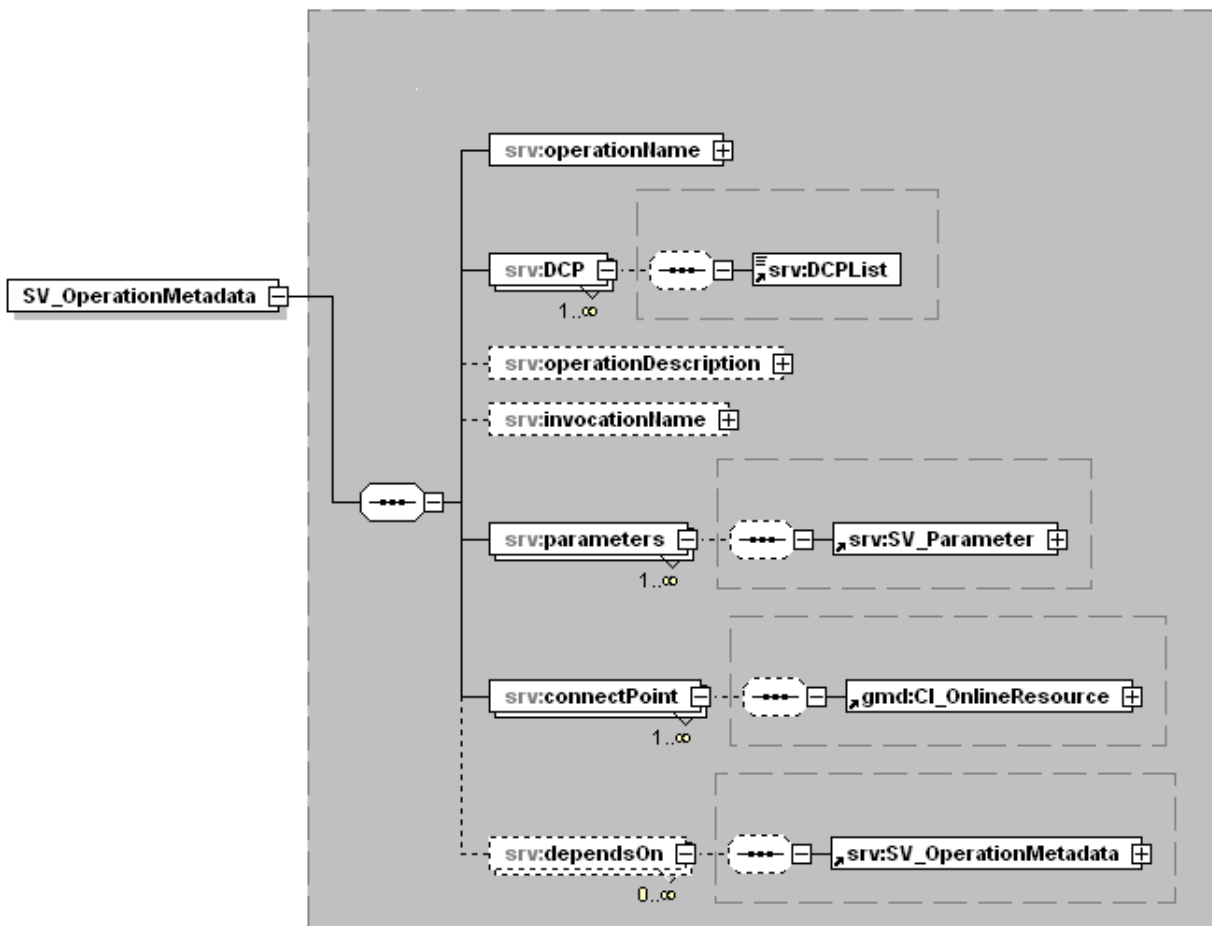
**operationName** – Designation of the operation

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.

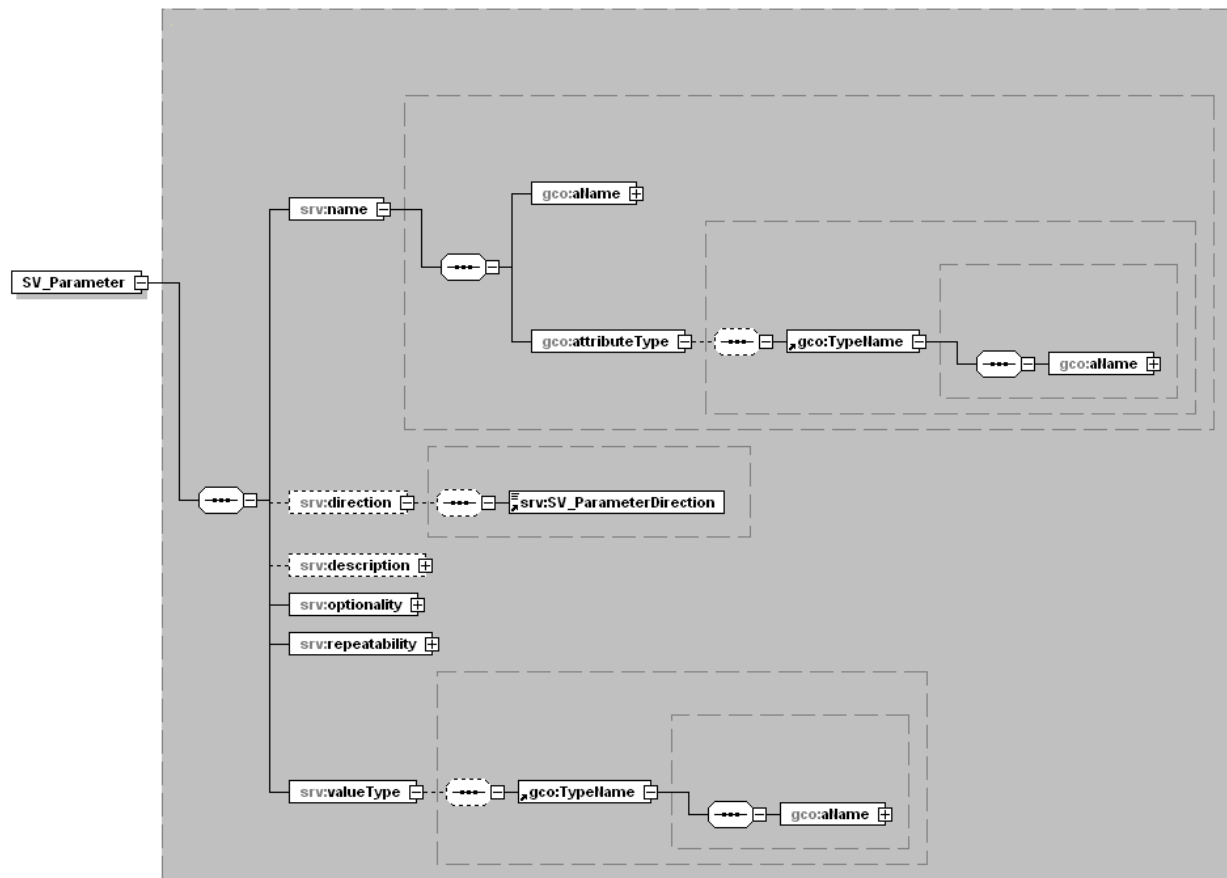
Type: [CI\\_OnlineResource](#)  
Multiplicity: mandatory, repeatable  
Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

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

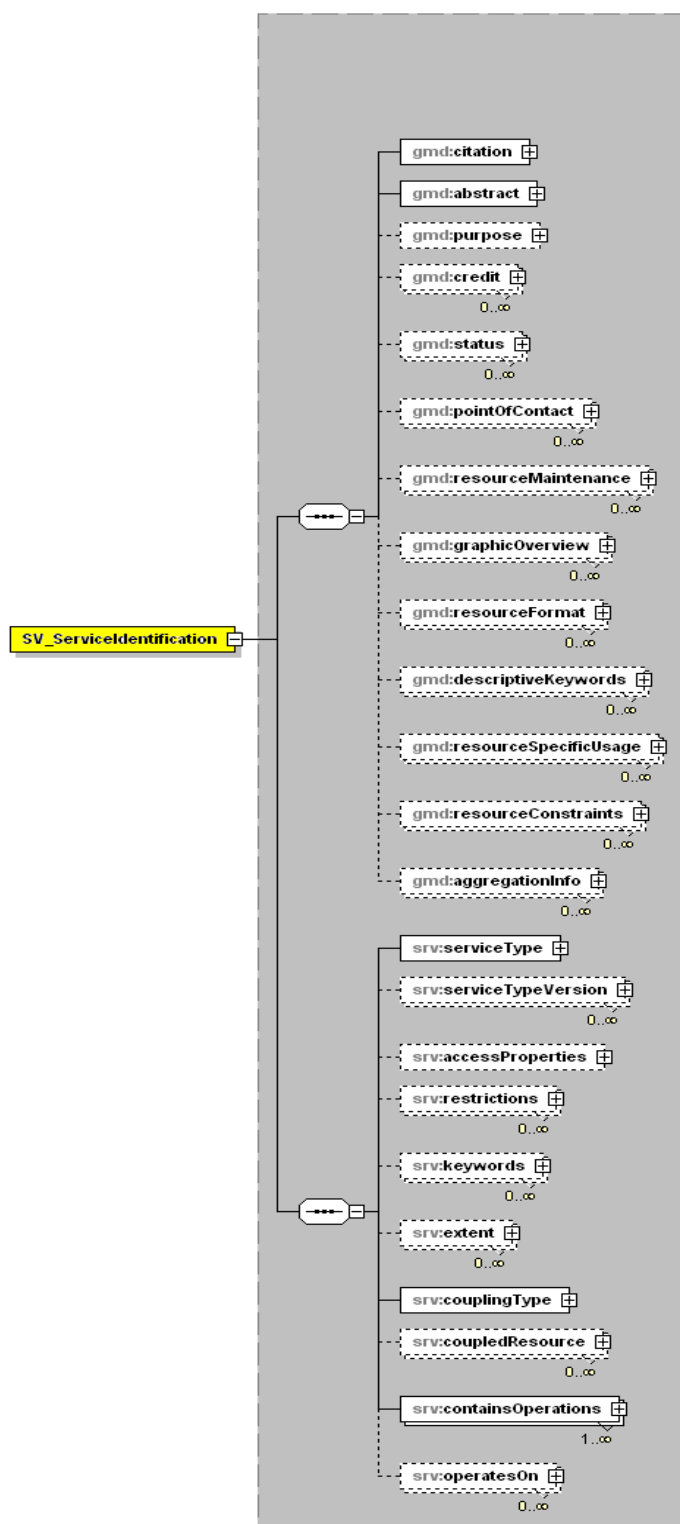
valueType – The class used for the value type.

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\\_SecurityConstraints](#)

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 19115-2 METADATA EXAMPLES

---

## XML View

```
<gmi:MI_Metadata xmlns:gmi="http://www.isotc211.org/2005/gmi" xmlns="http://www.isotc211.org/2005/gmi"
xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:gmw="http://www.isotc211.org/2005/gmw"
xmlns:gss="http://www.isotc211.org/2005/gss" xmlns:gss="http://www.isotc211.org/2005/gss"
xmlns:gts="http://www.isotc211.org/2005/gts" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.isotc211.org/2005/gmi
http://www.ngdc.noaa.gov/metadata/published/xsd/schema.xsd">
  <gmd:fileIdentifier>
    <gco:CharacterString>DWH_GG_Cruise01_processedCTD_NODC</gco:CharacterString>
  </gmd:fileIdentifier>
  <gmd:language>
    <gco:CharacterString>eng; USA</gco:CharacterString>
  </gmd:language>
  <gmd:characterSet>
    <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>
  </gmd:hierarchyLevel>
  <gmd:MD_ScopeCode codeList="http://www.isotc211.org/2005/resources/CodeList/gmxCodeLists.xml#MD_ScopeCode"
    codeListValue="dataset" codeSpace="005">dataset</gmd:MD_ScopeCode>
  </gmd:hierarchyLevel>
  <gmd:hierarchyLevelName>
    <gco:CharacterString>processed ctd level metadata</gco:CharacterString>
  </gmd:hierarchyLevelName>
  <gmd:contact xlink:title="DOC/NOAA/NESDIS/NODC/NCDDC&gt; National Coastal Data Development Center (pointOfContact)">
    <gmd:CI_ResponsibleParty uuid="7c7d17a0-4d66-11df-9879-0800200c9a66">
      <gmd:organisationName>
        <gco:CharacterString>DOC/NOAA/NESDIS/NODC/NCDDC&gt; National Coastal Data Development Center</gco:CharacterString>
      </gmd:organisationName>
      <gmd:contactInfo>
        <gmd:CI_Contact>
          <gmd:phone>
            <gmd:CI_Telephone>
              <gmd:voice>
                <gco:CharacterString>228-688-2936</gco:CharacterString>
              </gmd:voice>
              <gmd:voice>
                <gco:CharacterString>866-732-2382</gco:CharacterString>
              </gmd:voice>
              <gmd:facsimile>
                <gco:CharacterString>228-688-2010</gco:CharacterString>
              </gmd:facsimile>
            </gmd:CI_Telephone>
          </gmd:phone>
          <gmd:address>
            <gmd:CI_Address>
              <gmd:deliveryPoint>
                <gco:CharacterString>Bldg 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>ncddc@noaa.gov</gco:CharacterString>
              </gmd:electronicMailAddress>
            </gmd:CI_Address>
          </gmd:address>
          <gmd:hoursOfService>
            <gco:CharacterString>Monday - Friday 8:00am - 5:00pm</gco:CharacterString>
          </gmd:hoursOfService>
        </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>
  </gmd:contact>

```



```

</gmd:CI_ResponsibleParty>
</gmd:contact>
<gmd:dateStamp>
<gco:Date>2011-03-14</gco:Date>
</gmd:dateStamp>
<gmd:metadataStandardName>
<gco:CharacterString>ISO 19115-2 Geographic Information - Metadata - Part 2: Extensions for Imagery and Gridded
Data</gco:CharacterString>
</gmd:metadataStandardName>
<gmd:metadataStandardVersion>
<gco:CharacterString>ISO 19115-2:2009(E)</gco:CharacterString>
</gmd:metadataStandardVersion>
<gmd:dataSetURI>
<gco:CharacterString>http://www.ncddc.noaa.gov/approved_recs/dwh/ssm/Gordon_Gunter/Cruise_01/DWH_GG_Cruise01_proces
sedCTD_NODC.xml</gco:CharacterString>
</gmd:dataSetURI>
<gmd:spatialRepresentationInfo>
<gmd:MD_GridSpatialRepresentation>
<gmd:numberOfDimensions>
<gco:Integer>3</gco:Integer>
</gmd:numberOfDimensions>
<gmd:axisDimensionProperties>
<gmd:MD_Dimension>
<gmd:dimensionName>
<gmd:MD_DimensionNameTypeCode
codeList="http://www.isotc211.org/2005/resources/CodeList/gmxCodeLists.xml#MD_DimensionNameTypeCode"
codeListValue="row" codeSpace="001">row</gmd:MD_DimensionNameTypeCode>
</gmd:dimensionName>
<gmd:dimensionSize gco:nilReason="unknown"/>
<gmd:resolution>
<gco:Scale uom="decimalDegrees">0.000001</gco:Scale>
</gmd:resolution>
</gmd:MD_Dimension>
</gmd:axisDimensionProperties>
<gmd:axisDimensionProperties>
<gmd:MD_Dimension>
<gmd:dimensionName>
<gmd:MD_DimensionNameTypeCode
codeList="http://www.isotc211.org/2005/resources/CodeList/gmxCodeLists.xml#MD_DimensionNameTypeCode"
codeListValue="column" codeSpace="002">column</gmd:MD_DimensionNameTypeCode>
</gmd:dimensionName>
<gmd:dimensionSize gco:nilReason="unknown"/>
<gmd:resolution>
<gco:Scale uom="decimalDegrees">0.000001</gco:Scale>
</gmd:resolution>
</gmd:MD_Dimension>
</gmd:axisDimensionProperties>
<gmd:axisDimensionProperties>
<gmd:MD_Dimension>
<gmd:dimensionName>
<gmd:MD_DimensionNameTypeCode
codeList="http://www.isotc211.org/2005/resources/CodeList/gmxCodeLists.xml#MD_DimensionNameTypeCode"
codeListValue="vertical" codeSpace="003">vertical</gmd:MD_DimensionNameTypeCode>
</gmd:dimensionName>
<gmd:dimensionSize gco:nilReason="unknown"/>
<gmd:resolution>
<gco:Scale uom="meters">1</gco:Scale>
</gmd:resolution>
</gmd:MD_Dimension>
</gmd:axisDimensionProperties>
<gmd:cellGeometry>
<gmd:MD_CellGeometryCode
codeList="http://www.isotc211.org/2005/resources/CodeList/gmxCodeLists.xml#MD_CellGeometryCode" codeListValue="point"
codeSpace="001">point</gmd:MD_CellGeometryCode>
</gmd:cellGeometry>
<gmd:transformationParameterAvailability>
<gco:Boolean>>false</gco:Boolean>
</gmd:transformationParameterAvailability>
</gmd:MD_GridSpatialRepresentation>
</gmd:spatialRepresentationInfo>
<gmd:referenceSystemInfo>
<gmd:MD_ReferenceSystem>
<gmd:referenceSystemIdentifier>
<gmd:RS_Identifier>
<gmd:authority>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>Clarke 1866</gco:CharacterString>
</gmd:title>

```

```

<gmd:date>
<gmd:CI_Date>
<gmd:date>
<gco:Date>1995-06-02</gco:Date>
</gmd:date>
<gmd:dateType>
<gmd:CI_DateTypeCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodeLists.xml#CI_DateTypeCode"
codeListValue="revision" codeSpace="003">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/export.htm?gml=urn:ogc:def:ellipsoid:EPSG::7008</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>
<gco:CharacterString>urn:ogc:def:ellipsoid:EPSG::7008</gco:CharacterString>
</gmd:code>
</gmd:RS_Identifier>
</gmd:referenceSystemIdentifier>
</gmd:MD_ReferenceSystem>
</gmd:referenceSystemInfo>
<gmd:metadataExtensionInfo>
<gmd:MD_MetadataExtensionInformation>
<gmd:extensionOnLineResource>
<gmd:CI_OnlineResource>
<gmd:linkage>
<gmd:URL>http://www.fgdc.gov/standards/projects/FGDC-standards-
projects/csdgm_rs_ex/MetadataRemoteSensingExtens.pdf</gmd:URL>
</gmd:linkage>
<gmd:name>
<gco:CharacterString>Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing
Metadata</gco:CharacterString>
</gmd:name>
</gmd:CI_OnlineResource>
</gmd:extensionOnLineResource>
</gmd:MD_MetadataExtensionInformation>
</gmd:metadataExtensionInfo>
<gmd:identificationInfo>
<gmd:MD_DataIdentification>
<gmd:citation>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>Provisional Processed CTD Data from the R/V Gordon Gunter in the Gulf of Mexico Cruise 01 May 28, 2010 -
June 04, 2010</gco:CharacterString>
</gmd:title>
<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>
<gmd:identifier>
<gmd:MD_Identifier>
<gmd:code>
<gco:CharacterString>NODC Accession 0065140</gco:CharacterString>
</gmd:code>
</gmd:MD_Identifier>
</gmd:identifier>

```

```

<gmd:citedResponsibleParty>
<gmd:CI_ResponsibleParty>
<gmd:organisationName>
<gco:CharacterString>NOAA's Office of Response and Restoration (OR&R)</gco:CharacterString>
</gmd:organisationName>
<gmd:role>
<gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="originator" codeSpace="006">originator</gmd:CI_RoleCode>
</gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:citedResponsibleParty>
<gmd:citedResponsibleParty>
<gmd:CI_ResponsibleParty>
<gmd:organisationName>
<gco:CharacterString>EPA Emergency Response DATA Team</gco:CharacterString>
</gmd:organisationName>
<gmd:role>
<gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="originator" codeSpace="006">originator</gmd:CI_RoleCode>
</gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:citedResponsibleParty>
<gmd:citedResponsibleParty>
<gmd:CI_ResponsibleParty>
<gmd:organisationName>
<gco:CharacterString>NOAA NOS Center for Coastal Monitoring and Assessment (CCMA)</gco:CharacterString>
</gmd:organisationName>
<gmd:role>
<gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="originator" codeSpace="006">originator</gmd:CI_RoleCode>
</gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:citedResponsibleParty>
<gmd:citedResponsibleParty>
<gmd:CI_ResponsibleParty>
<gmd:organisationName>
<gco:CharacterString>NOAA NOS Integrated Ocean Observing System (IOOS)</gco:CharacterString>
</gmd:organisationName>
<gmd:role>
<gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="originator" codeSpace="006">originator</gmd:CI_RoleCode>
</gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:citedResponsibleParty>
<gmd:citedResponsibleParty>
<gmd:CI_ResponsibleParty>
<gmd:organisationName>
<gco:CharacterString>NOAA Natural Resource Damage Assessment (NRDA)</gco:CharacterString>
</gmd:organisationName>
<gmd:role>
<gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="originator" codeSpace="006">originator</gmd:CI_RoleCode>
</gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:citedResponsibleParty>
<gmd:citedResponsibleParty>
<gmd:CI_ResponsibleParty>
<gmd:organisationName>
<gco:CharacterString>British Petroleum (BP)</gco:CharacterString>
</gmd:organisationName>
<gmd:role>
<gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="originator" codeSpace="006">originator</gmd:CI_RoleCode>
</gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:citedResponsibleParty>
</gmd:CI_Citation>
</gmd:citation>
<gmd:abstract>
<gco:CharacterString>Initial Conductivity Temperature and Depth (CTD) was conducted aboard the R/V Gordon Gunter to
determine water column stratification or other physical oceanographic parameters that will help determine depth of samples
collected and further validate the model. Note this is provisional data.</gco:CharacterString>
</gmd:abstract>
<gmd:purpose>
<gco:CharacterString>Deepwater Horizon Incident, Gulf of Mexico As the nation's leading scientific resource for oil spills, NOAA has
been on the scene of the BP oil spill from the start, providing coordinated scientific weather and biological response services to
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free, errors do occur. We ask that you notify us immediately of any errors that you discover in our data. We will make every effort to
correct them. With respect to documents available from this server, neither the United States Government nor any of its employees,
makes any warranty, express or implied, including the warranties of merchantability and fitness for a particular purpose; nor
assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or
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depth (CTD) data available to the JAG are being reprocessed from raw instrument files. To date, all CTDs being used have been
manufactured by Seabird Electronics. Binary data files (hex or dat) and configuration files (con) were obtained for all casts and
reprocessed at NODC using Seabird Electronics Data Processing Software version 7.20d released May 27, 2010. Raw files (all
scans) were initially plotted and examined visually for instrument response issues. Following that examination, the SeaBird
processing routine Wildedit was used with the following recommended settings to remove spikes in the data based on statistics of
blocks of individual scans. [Standard deviation for pass one: 2; Standard deviation for pass two 20; Scans block: 100; Keep data
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review by the JAG members. Separate data files were created for comparing CTD observations to water-sample data collected
concurrently using Niskin sampling bottles. These bottle files contain CTD observations extracted for the known depths of the Niskin
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Global Temperature and Salinity Profile Program Real-Time Quality Control Manual (UNESCO, 2009). The following QC checks are
being conducted on the temperature and salinity profiles : 1.Spike 2.Top and Bottom Spike 3.Gradient 4.Density Inversion QC Flags
are being assigned to the individual temperature and salinity observations following the GTSP procedures and
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oxygen have not been quantitatively subjected to QC checks to date. The JAG is examining the instrument response, additional
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additional data assembly into flat files for use by GIS and visualization software including Fledermaus. Final plots of cast and
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<gco:CharacterString>The CTD data and available bottle data is being collated for archive at NOAA's National Oceanographic Data
Center (NODC). All preliminary CTD data is also being preserved at NODC. Profile data will be subjected to additional QC checks
as part of ingest into the World Ocean Database at NODC. Notes (1) Techniques for allowing calibration of temperature, salinity,

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and oxygen between research vessels and cruises relative to canonical profiles (e.g. from World Ocean Database) have been discussed but not implemented to date. (2) Responsible NODC Divisions: Ocean Climate Laboratory (OC5) and National Coastal Data Development Center (OC6)</gco:CharacterString>

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Values were flagged for quality control (QCd) as appropriate if the values were out of range. For the CDOM Fluorescence values,
for all Wetlabs sensors, the calibrated units are in parts per billion (ppb) reference to quinine sulfate dehydrate (ppb QSD or ppb
QSDE).The mg/m3 default in the Seabird processing software is equivalent to 1 ppb; however, this is not reflective of the calibration
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are calibrated against the fluorescence of these surrogate chemical concentration standards.</gco:CharacterString>
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<gmd:code>
<gco:CharacterString>WET Labs ECO Fluorometer</gco:CharacterString>
</gmd:code>
</gmd:MD_Identifier>
</gmi:identifier>
<gmi:type>
<gmx:Anchor xlink:href="http://www.rvdata.us/voc/devicetype/fluorometer">fluorometer</gmx:Anchor>
</gmi:type>
</gmi:MI_Instrument>
</gmi:instrument>
</gmi:MI_Platform>
</gmi:platform>
</gmi:MI_AcquisitionInformation>
</gmi:acquisitionInformation>
</gmi:MI_Metadata>

```

# Provisional Processed CTD Data from the R/V Gordon Gunter in the Gulf of Mexico Cruise 01 May 28, 2010 - June 04, 2010

[Spatial Representation Information](#)

[Reference System Information](#)

[Metadata Extension Information](#)

[Identification Information](#)

[Content Information](#)

[Distribution Information](#)

[Data Quality Information](#)

[Metadata Maintenance Information](#)

[Acquisition Information](#)

---

## Metadata:

### File identifier:

DWH\_GG\_Cruise01\_processedCTD\_NODC

### Language:

eng; USA

### Character set:

#### Character set code:

utf8

### Hierarchy level:

#### Scope code:

dataset

### Hierarchy level name:

processed ctd level metadata

**Metadata author:** title: DOC/NOAA/NESDIS/NODC/NCDDC> National Coastal Data Development Center (pointOfContact)

**Responsible party:** uuid: 7c7d17a0-4d66-11df-9879-0800200c9a66

#### Organisation name:

DOC/NOAA/NESDIS/NODC/NCDDC> National Coastal Data Development Center

### Contact info:

#### Contact:

##### Phone:

##### Telephone:

##### Voice:

228-688-2936

**Voice:**  
 866-732-2382  
**Facsimile:**  
 228-688-2010  
**Address:**  
**Address:**  
**Delivery point:**  
 Bldg 1100 Rm 101  
**City:**  
 Stennis Space Center  
**Administrative area:**  
 MS  
**Postal code:**  
 39529  
**Country:**  
 USA  
**Electronic mail address:**  
 ncddc@noaa.gov  
**Hours of service:**  
 Monday - Friday 8:00am - 5:00pm  
**Role:**  
**Role code:**  
 pointOfContact  
**Date stamp:**  
 2011-03-14  
**Metadata standard name:**  
 ISO 19115-2 Geographic Information - Metadata - Part 2: Extensions for  
 Imagery and Gridded Data  
**Metadata standard version:**  
 ISO 19115-2:2009(E)  
**Dataset URI:**  
 http://www.ncddc.noaa.gov/approved\_recs/dwh/ssm/Gordon\_Gunter/Cruise\_01/DWH\_G  
 G\_Cruise01\_processedCTD\_NODC.xml

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---

**Spatial representation info:**  
**Grid spatial representation:**  
**Number of dimensions:**  
 3  
**Axis Dimension Properties:**  
**Dimension:**  
**Dimension name:**  
**Dimension name type code:**  
 row  
**Dimension size:**  
 unknown  
**Resolution:**  
 uom: decimalDegrees 0.000001  
**Axis Dimension Properties:**  
**Dimension:**  
**Dimension name:**  
**Dimension name type code:**

column  
**Dimension size:**  
 unknown  
**Resolution:**  
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**Axis Dimension Properties:**  
**Dimension:**  
**Dimension name:**  
**Dimension name type code:**  
 vertical  
**Dimension size:**  
 unknown  
**Resolution:**  
 uom: meters 1  
**Cell geometry:**  
**Cell geometry code:**  
 point  
**Transformation parameter availability:**  
 false

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**Reference system info:**  
**Reference system:**  
**Reference system identifier:**  
**RS Identifier:**  
**Authority:**  
**Citation:**  
**Title:**  
 Clarke 1866  
**Date:**  
**Date:**  
 1995-06-02  
**Date type:**  
**Date type code:**  
 revision  
**Cited responsible party:**  
**Responsible party:**  
**Contact info:**  
**Contact:**  
**Online Resource:**  
**Online Resource:**  
**Linkage:**  
**URL:**  
 http://www.epsg-  
 registry.org/export.htm?gml=urn:ogc:def:ellipsoid:EPSG::7008  
**Role:**  
**Role code:**  
 resourceProvider  
**Code:**  
 urn:ogc:def:ellipsoid:EPSG::7008

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---

**Metadata extension info:**

**Metadata extension info:**

**Extension Online resource:**

**Online Resource:**

**Linkage:**

**URL:**

[http://www.fgdc.gov/standards/projects/FGDC-standards-projects/csdgm\\_rs\\_ex/MetadataRemoteSensingExtens.pdf](http://www.fgdc.gov/standards/projects/FGDC-standards-projects/csdgm_rs_ex/MetadataRemoteSensingExtens.pdf)

**Name:**

Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing Metadata

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**Identification info:**

**Data identification:**

**Citation:**

**Citation:**

**Title:**

Provisional Processed CTD Data from the R/V Gordon Gunter in the Gulf of Mexico Cruise 01 May 28, 2010 - June 04, 2010

**Date:**

**Date:**

**Date:**

unknown

**Date type:**

**Date type code:**

publication

**Identifier:**

**Identifier:**

**Code:**

NODC Accession 0065140

**Cited responsible party:**

**Responsible party:**

**Organisation name:**

NOAA's Office of Response and Restoration (OR&R)

**Role:**

**Role code:**

originator

**Cited responsible party:**

**Responsible party:**

**Organisation name:**

EPA Emergency Response DATA Team

**Role:**

**Role code:**

originator

**Cited responsible party:**

**Responsible party:**

**Organisation name:**

NOAA NOS Center for Coastal Monitoring and Assessment

(CCMA)

**Role:**  
**Role code:**  
 originator  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 NOAA NOS Integrated Ocean Observing System (IOOS)  
**Role:**  
**Role code:**  
 originator  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 NOAA Natural Resource Damage Assessment (NRDA)  
**Role:**  
**Role code:**  
 originator  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 British Petroleum (BP)  
**Role:**  
**Role code:**  
 originator

**Abstract:**  
 Initial Conductivity Temperature and Depth (CTD) was conducted aboard the R/V Gordon Gunter to determine water column stratification or other physical oceanographic parameters that will help determine depth of samples collected and further validate the model. Note this is provisional data.

**Purpose:**  
 Deepwater Horizon Incident, Gulf of Mexico As the nation's leading scientific resource for oil spills, NOAA has been on the scene of the BP oil spill from the start, providing coordinated scientific weather and biological response services to federal, state and local organizations.

**Status:**  
**Progress code:**  
 completed  
**Resource maintenance:**  
**Maintenance information:**  
**Maintenance and update frequency:**  
**Maintenance frequency code:**  
 unknown

**Descriptive keywords:**  
**Keywords:**  
**Keyword:**  
 Deepwater Horizon  
**Keyword:**  
 DWH  
**Keyword:**  
 oil spill  
**Keyword:**

CTD

**Keyword:**  
oxygen

**Keyword:**  
conductivity

**Keyword:**  
salinity

**Keyword:**  
temperature

**Keyword:**  
fluorescence

**Keyword:**  
Sea-Bird CTD SBE 911 Plus

**Keyword:**  
Sea-Bird SBE 43 Dissolved Oxygen (DO) Sensor

**Keyword:**  
WET Labs ECO Fluorometer

**Type:**  
**Keyword type code:**  
theme

**Thesaurus name:**  
**Citation:**  
**Title:**  
None

**Date:**  
unknown

**Descriptive keywords:**  
**Keywords:**  
**Keyword:**  
Gulf of Mexico

**Keyword:**  
Gulf Coast

**Keyword:**  
Louisiana

**Keyword:**  
Mississippi

**Type:**  
**Keyword type code:**  
place

**Thesaurus name:**  
**Citation:**  
**Title:**  
Geographic Names Information System (GNIS)

**Date:**  
unknown

**Descriptive keywords:**  
**Keywords:**  
**Keyword:**  
Mississippi Canyon

**Type:**  
**Keyword type code:**  
place

**Thesaurus name:**  
**Citation:**  
**Title:**



None

**Date:**  
unknown

**Descriptive keywords:**

**Keywords:**

**Keyword:**  
Conductivity

**Keyword:**  
Temperature

**Keyword:**  
Depth

**Type:**

**Keyword type code:**  
theme

**Thesaurus name:**

**Citation:**

**Title:**  
None

**Date:**  
unknown

**Resource constraints:**

**Legal constraints:**

**Access constraints:**

**Restriction code:**  
otherRestrictions

**Use constraints:**

**Restriction code:**  
otherRestrictions

**Other constraints:**

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: While NODC makes every effort to ensure that its databases are error-free, errors do occur. We ask that you notify us immediately of any errors that you discover in our data. We will make every effort to correct them. With respect to documents available from this server, neither the United States Government nor any of its employees, makes any warranty, express or implied, including the warranties of merchantability and fitness for a particular purpose; nor assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed; nor represents that its use would not infringe privately owned rights.

**Aggregation Info:**

**AggregateInformation:**

**Aggregate Data Set Identifier:**

**Identifier:**

**Authority:**

**Citation:**

**Title:**  
Deepwater Horizon (DWH)

**Date:**

unknown

**Cited responsible party:**  
**Responsible party:**  
**Contact info:**  
**Contact:**  
**Online Resource:**  
**Online Resource:**  
**Linkage:**  
**URL:**

ftp://ftp.ncddc.noaa.gov/pub/Metadata//ISO/33cb3bb0-77e8-11e0-a1f0-0800200c9a66.xml

**Role:**  
**Role code:**  
resourceProvider

**Code:**  
Deepwater Horizon (DWH)

**Association Type:**  
**Association type code:**  
largerWorkCitation

**Initiative Type:**  
**Initiative type code:**  
program

**Aggregation Info:**  
**AggregateInformation:**  
**Aggregate Data Set Identifier:**  
**Identifier:**  
**Authority:**  
**Citation:**  
**Title:**  
Web pages and other documents created by the NOAA  
National Oceanographic Data Center in response  
to the Deepwater Horizon oil spill event of 2010-04-20  
(NODC Accession 0065140)

**Alternate title:**  
NODC Accession # 0065140

**Date:**  
inapplicable

**Cited responsible party:**  
**Responsible party:**  
**Individual name:**  
NODC User Services  
**Organisation name:**  
DOC/NOAA/NESDIS/NODC > National Oceanographic Data  
Center, NESDIS, NOAA, U.S. Department of  
Commerce;

**Contact info:**  
**Contact:**  
**Phone:**  
**Telephone:**  
**Voice:**  
(301) 713-3277  
**Facsimile:**  
(301) 713-3302  
**Address:**

**Address:**  
**Delivery point:**  
 1315 East-West Highway  
 NOAA/NESDIS/NODC E/OC1, SSMC3 4th Floor;  
**City:**  
 Silver Spring  
**Administrative area:**  
 MD  
**Postal code:**  
 20910-3282  
**Country:**  
 USA  
**Electronic mail address:**  
 NODC.Services@noaa.gov  
**Online Resource:**  
**Online Resource:**  
**Linkage:**  
**URL:**  
 http://www.nodc.noaa.gov/cgi-bin/search/prod/accessionsView.pl/details/0065140  
**Protocol:**  
 http  
**Name:**  
 NODC Ocean Archive System  
**Description:**  
 This is a documentation-only accession to  
 contain the various web pages, directories,  
 and documents providing information to the  
 responders to the Deepwater Horizon event.  
**Hours of service:**  
 9:00 - 5:00 EST  
**Contact instructions:**  
 Phone/E-mail/Letter  
**Role:**  
**Role code:**  
 custodian  
**Code:**  
 NODC Accession #0065140  
**Association Type:**  
**Association type code:**  
 largerWorkCitation  
**Initiative Type:**  
**Initiative type code:**  
 collection  
**Aggregation Info:**  
**AggregateInformation:**  
**Aggregate Data Set Identifier:**  
**Identifier:**  
**Authority:**  
**Citation:**  
**Title:**  
 Summary of data collected from the NOAA Ship Gordon  
 Gunter Cruise 01 from May 27, 2010 - June 04,  
 2010 for the subsurface response to the Deepwater  
 Horizon oil spill in the Gulf of Mexico

**Alternate title:**  
 DWH\_GG1001  
**Date:**  
 unknown  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 DOC/NOAA/NESDIS/NODC/NCDDC> National Coastal Data  
 Development Center  
**Contact info:**  
**Contact:**  
**Phone:**  
**Telephone:**  
**Voice:**  
 228-688-2936  
**Voice:**  
 866-732-2382  
**Facsimile:**  
 228-688-2010  
**Address:**  
**Address:**  
**Delivery point:**  
 Bldg 1100 Rm 101  
**City:**  
 Stennis Space Center  
**Administrative area:**  
 MS  
**Postal code:**  
 39529  
**Country:**  
 USA  
**Electronic mail address:**  
 ncddc@noaa.gov  
**Online Resource:**  
**Online Resource:**  
**Linkage:**  
**URL:**  
[http://www.ncddc.noaa.gov/approved\\_recs/dwh/ssm/cruise/cruise/DWH\\_GG1001.xml](http://www.ncddc.noaa.gov/approved_recs/dwh/ssm/cruise/cruise/DWH_GG1001.xml)  
**Hours of service:**  
 Monday - Friday 8:00am - 5:00pm  
**Role:**  
**Role code:**  
 pointOfContact  
**Code:**  
 DWH\_GG1001  
**Association Type:**  
**Association type code:**  
 largerWorkCitation  
**Initiative Type:**  
**Initiative type code:**  
 platform  
**Language:**  
 eng; USA  
**Topic category:**

**Topic category code:**  
biota  
**Topic category:**  
**Topic category code:**  
economy  
**Topic category:**  
**Topic category code:**  
environment  
**Topic category:**  
**Topic category code:**  
oceans  
**Extent:**  
**Extent:**  
**Geographic element:**  
**Geographic bounding box:**  
**West bound longitude:**  
-88.812  
**East bound longitude:**  
-87.924  
**South bound latitude:**  
28.523  
**North bound latitude:**  
29.127  
**Temporal element:**  
**Temporal extent:**  
**Extent:**  
**Time period:**  
**Description:**  
ground condition  
**Begin date:**  
2010-05-28  
**End date:**  
2010-06-04  
**Supplemental Information:**  
For more information and documentation related to the Deepwater  
Horizon oil spill event, see NODC Accession  
0065140.

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**Content info:**  
**Feature catalogue description:**  
**Included with dataset:**  
true  
**Feature types:**  
**Feature types:**  
**Feature catalogue citation:**  
**Citation:**  
**Title:**  
Feature Catalogue for Provisional Processed CTD Data from the  
Deepwater Horizon Incident Response in the  
Gulf of Mexico May 08, 2010 through November 15 ,2010  
**Date:**  
unknown

**Cited responsible party:**

**Responsible party:**

**Organisation name:**

DOC/NOAA/NESDIS/NODC/NCDDC> National Coastal Data  
Development Center

**Contact info:**

**Contact:**

**Phone:**

**Telephone:**

**Voice:**

228-688-2936

**Voice:**

866-732-2382

**Facsimile:**

228-688-2010

**Address:**

**Address:**

**Delivery point:**

Bldg 1100 Rm 101

**City:**

Stennis Space Center

**Administrative area:**

MS

**Postal code:**

39529

**Country:**

USA

**Electronic mail address:**

ncddc@noaa.gov

**Online Resource:**

**Online Resource:**

**Linkage:**

**URL:**

<ftp://ftp.ncddc.noaa.gov/pub/Metadata//ISO/87ffdfd0-775a-11e0-a1f0-0800200c9a66.xml>

**Protocol:**

ftp

**Hours of service:**

Monday - Friday 8:00am - 5:00pm

**Role:**

**Role code:**

pointOfContact

**Other citation details:**

Entity and Attribute Overview: The header should be in this  
order: t090C: Temperature [ITS-90, deg C],  
prDM: Pressure, Digiquartz [db], sbeox0V: Oxygen Voltage, SBE  
43flECO-AFL: Fluorescence, Wetlab  
ECO-AFL/FL [mg/m<sup>3</sup>], v1: Voltage 1, v2: Voltage 2, v3: Voltage  
3, c0S/m: Conductivity [S/m], depSM:  
Depth [salt water, m], lat = 29, sal00: Salinity, Practical  
[PSU], density00: Density [density, Kg/m<sup>3</sup>],  
svCM: Sound Velocity [Chen-Millero, m/s], sbeox0Mg/L: Oxygen,  
SBE 43 [mg/l], WS = 2, sbeox0ML/L: Oxygen,

SBE 43, [ml/1], WS = 2, flag: flag Entity and Attribute Detail  
Citation: Data Management Sampling Data  
Format and Transmission Guidance

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---

**Distribution info:**

**Distribution:**

**Distributor:**

**Distributor:**

**Distributor contact:**

**Responsible party:**

**Organisation name:**

NOAA/NESDIS/NODC - National Oceanographic Data Center

**Contact info:**

**Contact:**

**Phone:**

**Telephone:**

**Voice:**

301-713-3277

**Facsimile:**

301-713-3302

**Address:**

**Address:**

**Delivery point:**

National Oceanographic Data Center

**Delivery point:**

NOAA/NESDIS E/OC1

**Delivery point:**

SSMC3, 4th Floor

**Delivery point:**

1315 East-West Highway

**City:**

Silver Spring

**Administrative area:**

MD

**Postal code:**

20910-3282

**Country:**

USA

**Electronic mail address:**

NODC.Services@noaa.gov

**Hours of service:**

8am-5pm, Monday through Friday

**Role:**

**Role code:**

distributor

[Return To Index](#)

---

**Data quality info:**

**Data quality:**

**Scope:**

unknown

**Report:**

**Completeness commission:**

**Evaluation method description:**

NOAA's Office of Response & Restoration (OR&R) cannot provide any warranty as to the accuracy, reliability, or completeness of furnished data.

**Result:**

unknown

**Report:**

**Completeness omission:**

**Evaluation method description:**

NOAA's Office of Response & Restoration (OR&R) cannot provide any warranty as to the accuracy, reliability, or completeness of furnished data.

**Result:**

unknown

**Report:**

**Conceptual consistency:**

**Measure description:**

NOAA does not control and cannot guarantee the scope, accuracy or timeliness of this information.

**Result:**

unknown

**Lineage:**

**Lineage:**

**Process step:**

**Process step:**

**Description:**

In order to provide consistency across different ships, sensors, and personnel, conductivity-temperature-depth (CTD) data available to the JAG are being reprocessed from raw instrument files. To date, all CTDs being used have been manufactured by Seabird Electronics. Binary data files (hex or dat) and configuration files (con) were obtained for all casts and reprocessed at NODC using Seabird Electronics Data Processing Software version 7.20d released May 27, 2010. Raw files (all scans) were initially plotted and examined visually for instrument response issues. Following that examination, the SeaBird processing routine Wildedit was used with the following recommended settings to remove spikes in the data based on statistics of blocks of individual scans. [Standard deviation for pass one: 2; Standard deviation for pass two 20; Scans block: 100; Keep data within this distance of the mean: 0; Exclude scans marked bad: yes (check)]

**Processor:**

**Responsible party:**

**Organisation name:**

NOAA/NESDIS/NODC/NCDDC - National Coastal Data Development Center

**Contact info:**



**Contact:**

**Phone:**

**Telephone:**

**Voice:**

866-732-2382

**Facsimile:**

228-688-2968

**Address:**

**Address:**

**City:**

Stennis Space Center

**Administrative area:**

MS

**Postal code:**

39529

**Country:**

USA

**Electronic mail address:**

ncddc@noaa.gov

**Hours of service:**

8am-5pm, Monday through Friday

**Role:**

**Role code:**

processor

**Process step:**

**Process step:**

**Description:**

Data was then pressure averaged files (1 dbar) for the downcast were created and plotted for a quicklook review by the JAG members. Separate data files were created for comparing CTD observations to water-sample data collected concurrently using Niskin sampling bottles. These bottle files contain CTD observations extracted for the known depths of the Niskin bottle samples using both downcast and upcast data from the CTD. Because the water analyses are being done at different labs and require some time to complete, the bottle files are updated over time as laboratory results are received.

**Processor:**

**Responsible party:**

**Organisation name:**

NOAA/NESDIS/NODC/NCDDC - National Coastal Data Development Center

**Contact info:**

**Contact:**

**Phone:**

**Telephone:**

**Voice:**

866-732-2382

**Facsimile:**

228-688-2968

**Address:**

**Address:**

**City:**  
 Stennis Space Center  
**Administrative area:**  
 MS  
**Postal code:**  
 39529  
**Country:**  
 USA  
**Electronic mail address:**  
 ncddc@noaa.gov  
**Hours of service:**  
 8am-5pm, Monday through Friday  
**Role:**  
**Role code:**  
 processor  
**Process step:**  
**Process step:**  
**Description:**  
 Initial Quality Control (QC) of the CTD casts are being  
 conducted following a subset of checks  
 outlined in the Global Temperature and Salinity Profile  
 Program Real-Time Quality Control Manual  
 (UNESCO, 2009). The following QC checks are being conducted  
 on the temperature and salinity profiles  
 : 1.Spike 2.Top and Bottom Spike 3.Gradient 4.Density  
 Inversion QC Flags are being assigned to the  
 individual temperature and salinity observations following  
 the GTSP procedures and nomenclature  
**Processor:**  
**Responsible party:**  
**Organisation name:**  
 NOAA/NESDIS/NODC/NCDDC - National Coastal Data  
 Development Center  
**Contact info:**  
**Contact:**  
**Phone:**  
**Telephone:**  
**Voice:**  
 866-732-2382  
**Facsimile:**  
 228-688-2968  
**Address:**  
**Address:**  
**City:**  
 Stennis Space Center  
**Administrative area:**  
 MS  
**Postal code:**  
 39529  
**Country:**  
 USA  
**Electronic mail address:**  
 ncddc@noaa.gov  
**Hours of service:**  
 8am-5pm, Monday through Friday

**Role:**  
**Role code:**  
processor  
**Process step:**  
**Process step:**  
**Description:**  
The coincident CTD profiles of Chromophoric Dissolved Organic Matter (CDOM) fluorescence and dissolved oxygen have not been quantitatively subjected to QC checks to date. The JAG is examining the instrument response, additional sample verification, and calibration of these sensors relative to hydrocarbons dispersed in the water column.  
**Processor:**  
**Responsible party:**  
**Organisation name:**  
NOAA/NESDIS/NODC/NCDDC - National Coastal Data Development Center  
**Contact info:**  
**Contact:**  
**Phone:**  
**Telephone:**  
**Voice:**  
866-732-2382  
**Facsimile:**  
228-688-2968  
**Address:**  
**Address:**  
**City:**  
Stennis Space Center  
**Administrative area:**  
MS  
**Postal code:**  
39529  
**Country:**  
USA  
**Electronic mail address:**  
ncddc@noaa.gov  
**Hours of service:**  
8am-5pm, Monday through Friday  
**Role:**  
**Role code:**  
processor  
**Process step:**  
**Process step:**  
**Description:**  
All CTD data is being converted to a netCDF format (CF convention) for use by JAG members as well as additional data assembly into flat files for use by GIS and visualization software including Fledermaus. Final plots of cast and sample data are being produced for the JAG as requested.  
**Processor:**  
**Responsible party:**  
**Organisation name:**

NOAA/NESDIS/NODC/NCDDC - National Coastal Data

Development Center

**Contact info:**

**Contact:**

**Phone:**

**Telephone:**

**Voice:**

866-732-2382

**Facsimile:**

228-688-2968

**Address:**

**Address:**

**City:**

Stennis Space Center

**Administrative area:**

MS

**Postal code:**

39529

**Country:**

USA

**Electronic mail address:**

ncddc@noaa.gov

**Hours of service:**

8am-5pm, Monday through Friday

**Role:**

**Role code:**

processor

**Process step:**

**Process step:**

**Description:**

The CTD data and available bottle data is being collated for archive at NOAA's National Oceanographic

Data Center (NODC). All preliminary CTD data is also being preserved at NODC. Profile data will be

subjected to additional QC checks as part of ingest into the World Ocean Database at NODC. Notes (1)

Techniques for allowing calibration of temperature, salinity, and oxygen between research vessels

and cruises relative to canonical profiles (e.g. from World Ocean Database) have been discussed but

not implemented to date. (2) Responsible NODC Divisions: Ocean Climate Laboratory (OC5) and National

Coastal Data Development Center (OC6)

**Processor:**

**Responsible party:**

**Organisation name:**

NOAA/NESDIS/NODC/NCDDC - National Coastal Data

Development Center

**Contact info:**

**Contact:**

**Phone:**

**Telephone:**

**Voice:**

866-732-2382

**Facsimile:**

228-688-2968

**Address:**

**Address:**

**City:**

Stennis Space Center

**Administrative area:**

MS

**Postal code:**

39529

**Country:**

USA

**Electronic mail address:**

ncddc@noaa.gov

**Hours of service:**

8am-5pm, Monday through Friday

**Role:**

**Role code:**

processor

**Process step:**

**Process step:**

**Description:**

A Dissolved Oxygen valid range check for values > 0 and <= 8 mL/L was performed on all DO profiles.

Values were flagged for quality control (QCd) as appropriate if the values were out of range. For

the CDOM Fluorescence values, for all Wetlabs sensors, the calibrated units are in parts per billion

(ppb) reference to quinine sulfate dehydrate (ppb QSD or ppb QSDE). The mg/m3 default in the Seabird

processing software is equivalent to 1 ppb; however, this is not reflective of the calibration

standard and may confuse users. Sensors are not actually measuring or calibrated against mg/m3 of

CDOM or hydrocarbons but are calibrated against the fluorescence of these surrogate chemical concentration standards.

**Processor:**

**Responsible party:**

**Organisation name:**

NOAA/NESDIS/NODC/NCDDC - National Coastal Data Development Center

**Contact info:**

**Contact:**

**Phone:**

**Telephone:**

**Voice:**

866-732-2382

**Facsimile:**

228-688-2968

**Address:**

**Address:**

**City:**

Stennis Space Center

**Administrative area:**

MS

**Postal code:**  
 39529  
**Country:**  
 USA  
**Electronic mail address:**  
 ncddc@noaa.gov  
**Hours of service:**  
 8am-5pm, Monday through Friday  
**Role:**  
**Role code:**  
 processor  
**Source:**  
**Source:**  
**Description:**  
 Source Contribution: Onboard CTD Sampling raw data files  
 are processed. online  
**Source citation:**  
**Citation:**  
**Title:**  
 Guidance for Shipboard Data Management Coordinator -  
 Shipboard Sampling Data Format and  
 Transmission Specifications  
**Alternate title:**  
 Guidance for Shipboard Data Management Coordinator -  
 Shipboard Sampling Data Format and  
 Transmission Specifications, 2010  
**Date:**  
**Date:**  
**Date:**  
 2010-06-11  
**Date type:**  
**Date type code:**  
 publication  
**Edition:**  
 Version 2  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 NOAA's Office of Response and Restoration (OR&R)  
**Role:**  
**Role code:**  
 resourceProvider  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 EPA Emergency Response DATA Team  
**Role:**  
**Role code:**  
 resourceProvider  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 NOAA NOS Center for Coastal Monitoring and  
 Assessment (CCMA)  
**Role:**

**Role code:**  
 resourceProvider  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 NOAA NOS Integrated Ocean Observing System (IOOS)  
**Role:**  
**Role code:**  
 resourceProvider  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 NOAA Natural Resource Damage Assessment (NRDA)  
**Role:**  
**Role code:**  
 resourceProvider  
**Cited responsible party:**  
**Responsible party:**  
**Organisation name:**  
 British Petroleum (BP)  
**Role:**  
**Role code:**  
 resourceProvider  
**Presentation form:**  
**Presentation form code:**  
 documentDigital  
**Source extent:**  
**Extent:**  
**Temporal element:**  
**Temporal extent:**  
**Extent:**  
**Time period:**  
**Description:**  
 ground condition  
**Begin date:**  
 2010-05-28  
**End date:**  
 2010-06-04

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---

**Metadata maintenance:**  
**Maintenance information:**  
**Maintenance and update frequency:**  
 unknown  
**Maintenance note:**  
 This metadata was automatically generated from the FGDC Content  
 Standard for Digital Geospatial Metadata  
 standard version FGDC-STD-001-1998 using the April 19th, 2011  
 version of the FGDC RSE to ISO 19115-2  
 transform.  
**Metadata author:**  
**Responsible party:**  
**Organisation name:**

Center

**Contact info:****Contact:****Phone:****Telephone:****Voice:**

866-732-2382

**Facsimile:**

228-688-2968

**Address:****Address:****City:**

Stennis Space Center

**Administrative area:**

MS

**Postal code:**

39529

**Country:**

USA

**Electronic mail address:**

ncddcmetadata@noaa.gov

**Hours of service:**

8am-5pm, Monday through Friday

**Role:****Role code:**

custodian

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---

**Acquisition:****Acquisition Information:****operation:****Operation:****Identifier:****Identifier:****Authority:****Citation:****Title:**

Deepwater Horizon Incident

**Date:**

unknown

**Cited responsible party:****Responsible party:****Organisation name:**

Deepwater Horizon Subsurface Monitoring Unit (SMU)

**Role:****Role code:**

pointOfContact

**Code:**

DWH

**Status:****Progress code:**

completed



**Parent Operation:**  
 inapplicable  
**Significant Event:**  
**Event:**  
     **Identifier:**  
         Identifier:  
         Code:  
             DWH response start  
     **Trigger:**  
         Trigger Code:  
             manual  
     **Context:**  
         Context Code:  
             pass  
     **Sequence:**  
         Sequence Code:  
             start  
     **Time:**  
         2010-05-08T00:00:00  
**Significant Event:**  
**Event:**  
     **Identifier:**  
         Identifier:  
         Code:  
             DWH response end  
     **Trigger:**  
         Trigger Code:  
             manual  
     **Context:**  
         Context Code:  
             pass  
     **Sequence:**  
         Sequence Code:  
             end  
     **Time:**  
         2010-11-15T00:00:00  
**Platform:**  
     **Platform:**  
         Identifier:  
         Identifier:  
         Authority:  
         Citation:  
             Title:  
                 R/V Gordon Gunter  
             Alternate title:  
                 GG  
             Alternate title:  
                 WTEO  
         Date:  
             Date:  
                 2010-05-27  
             Date type:  
                 Date type code:  
                     creation

**Code:**

WTEO

**Description:**

The R/V Gordon Gunter (GG) is a NOAA operated vessel (call sign: WTEO). For more information, please see <http://www.moc.noaa.gov/gu/index.html>

**Sponsor:**

**Responsible party:**

**Organisation name:**

NOAA's Office of Response and Restoration (OR&R)

**Role:**

**Role code:**

owner

**Sponsor:**

**Responsible party:**

**Organisation name:**

EPA Emergency Response DATA Team

**Role:**

**Role code:**

owner

**Sponsor:**

**Responsible party:**

**Organisation name:**

NOAA NOS Center for Coastal Monitoring and Assessment

(CCMA)

**Role:**

**Role code:**

owner

**Sponsor:**

**Responsible party:**

**Organisation name:**

NOAA NOS Integrated Ocean Observing System (IOOS)

**Role:**

**Role code:**

owner

**Sponsor:**

**Responsible party:**

**Organisation name:**

NOAA Natural Resource Damage Assessment (NRDA)

**Role:**

**Role code:**

owner

**Sponsor:**

**Responsible party:**

**Organisation name:**

British Petroleum (BP)

**Role:**

**Role code:**

owner

**Sponsor:**

**Responsible party:**

**Organisation name:**

Halter Marine, Inc.

**Role:**

**Role code:**

owner  
**Instrument:** title: Sea-Bird Sealogger CTD, SBE 25  
**Instrument:** uuid: b4bc1c50-7818-11e0-alf0-0800200c9a66  
**Citation:**

**Citation:**

**Title:**

Sea-Bird Sealogger CTD, SBE 25

**Date:**

unknown

**Cited responsible party:**

**Responsible party:**

**Organisation name:**

Sea-Bird Electronics, Inc.

**Contact info:**

**Contact:**

**Phone:**

**Telephone:**

**Voice:**

425-643-9866

**Facsimile:**

425-643-9954

**Address:**

**Address:**

**Delivery point:**

13431 NE 20th Street

**City:**

Bellevue

**Administrative area:**

WA

**Postal code:**

98005

**Country:**

USA

**Electronic mail address:**

seabird@seabird.com

**Online Resource:**

**Online Resource:**

**Linkage:**

**URL:**

[http://www.seabird.com/pdf\\_documents/datasheets/25brochureJan10.pdf](http://www.seabird.com/pdf_documents/datasheets/25brochureJan10.pdf)

**Role:**

**Role code:**

resourceProvider

**Identifier:**

**Identifier:**

**Code:**

Sea-Bird Sealogger CTD, SBE 25

**Type:**

**Anchor:** xlink: <http://www.rvdata.us/voc/devicetype/ctd>

ctd

**Instrument:** title: Sea-Bird Electronics 43 Dissolved Oxygen Sensor

**Instrument:** uuid: 43aeca90-702e-11e0-alf0-0800200c9a66

**Citation:**

**Citation:**

**Title:**  
Sea-Bird Electronics 43 Dissolved Oxygen Sensor

**Date:**  
unknown

**Identifier:**  
**Identifier:**  
**Code:**  
SBE 43

**Cited responsible party:**

**Responsible party:**  
**Organisation name:**  
Sea-Bird Electronics, Inc.

**Contact info:**

**Contact:**  
**Phone:**  
**Telephone:**  
**Voice:**  
425-643-9866  
**Facsimile:**  
425-643-9954

**Address:**  
**Address:**  
**Delivery point:**  
13431 NE 20th Street  
**City:**  
Bellevue  
**Administrative area:**  
WA  
**Postal code:**  
98005  
**Country:**  
USA  
**Electronic mail address:**  
seabird@seabird.com

**Online Resource:**  
**Online Resource:**  
**Linkage:**  
**URL:**

[http://www.seabird.com/products/spec\\_sheets/43data.htm](http://www.seabird.com/products/spec_sheets/43data.htm)

**Role:**  
**Role code:**  
resourceProvider

**Identifier:**  
**Identifier:**  
**Code:**  
SBE 43

**Type:**  
**Anchor:** xlink: <http://www.rvdata.us/voc/devicetype/ctd>  
ctd

**Description:**  
The SBE 43 sets the oxygen measurement standard for oceanographic research. The SBE 43 sensor is a complete redesign of the Clark polarographic membrane type in which careful choices of materials,

geometry, and sensor chemistry are combined with superior electronics interfacing and calibration

methodology to yield major gains in performance.

**Instrument:** title: Sea-Bird SBE 9

**Instrument:** uuid: 689d7520-7819-11e0-a1f0-0800200c9a66

**Citation:**

**Citation:**

**Title:**

Sea-Bird SBE 9

**Date:**

unknown

**Cited responsible party:**

**Responsible party:**

**Organisation name:**

Sea-Bird Electronics, Inc.

**Contact info:**

**Contact:**

**Phone:**

**Telephone:**

**Voice:**

425-643-9866

**Facsimile:**

425-643-9954

**Address:**

**Address:**

**Delivery point:**

13431 NE 20th Street

**City:**

Bellevue

**Administrative area:**

WA

**Postal code:**

98005

**Country:**

USA

**Electronic mail address:**

seabird@seabird.com

**Online Resource:**

**Online Resource:**

**Linkage:**

**URL:**

<http://www.comm->

[tec.com/prods/mfgs/SBE/manuals\\_pdf/SBE9PLUS\\_005.pdf](http://www.commtec.com/prods/mfgs/SBE/manuals_pdf/SBE9PLUS_005.pdf)

**Role:**

**Role code:**

resourceProvider

**Identifier:**

**Identifier:**

**Code:**

Sea-Bird SBE 9

**Type:**

**Anchor:** xlink: <http://www.rvdata.us/voc/devicetype/ctd>

ctd

**Instrument:** title: WET Labs ECO Fluorometer

**Instrument:** uuid: 80601c20-781a-11e0-a1f0-0800200c9a66

**Citation:**

**Citation:**

**Title:**

WET Labs ECO Fluorometer

**Date:**

unknown

**Cited responsible party:**

**Responsible party:**

**Organisation name:**

WET Labs, Inc.

**Contact info:**

**Contact:**

**Phone:**

**Telephone:**

**Voice:**

541-929-5650

**Address:**

**Address:**

**Delivery point:**

PO Box 518

**City:**

Philmath

**Administrative area:**

OR

**Postal code:**

97370-0518

**Country:**

USA

**Online Resource:**

**Online Resource:**

**Linkage:**

**URL:**

<http://www.wetlabs.com/products/pub/specsheets/flssw.pdf>

**Role:**

**Role code:**

resourceProvider

**Identifier:**

**Identifier:**

**Code:**

WET Labs ECO Fluorometer

**Type:**

**Anchor: xlink:**

<http://www.rvdata.us/voc/devicetype/fluorometer>  
fluorometer

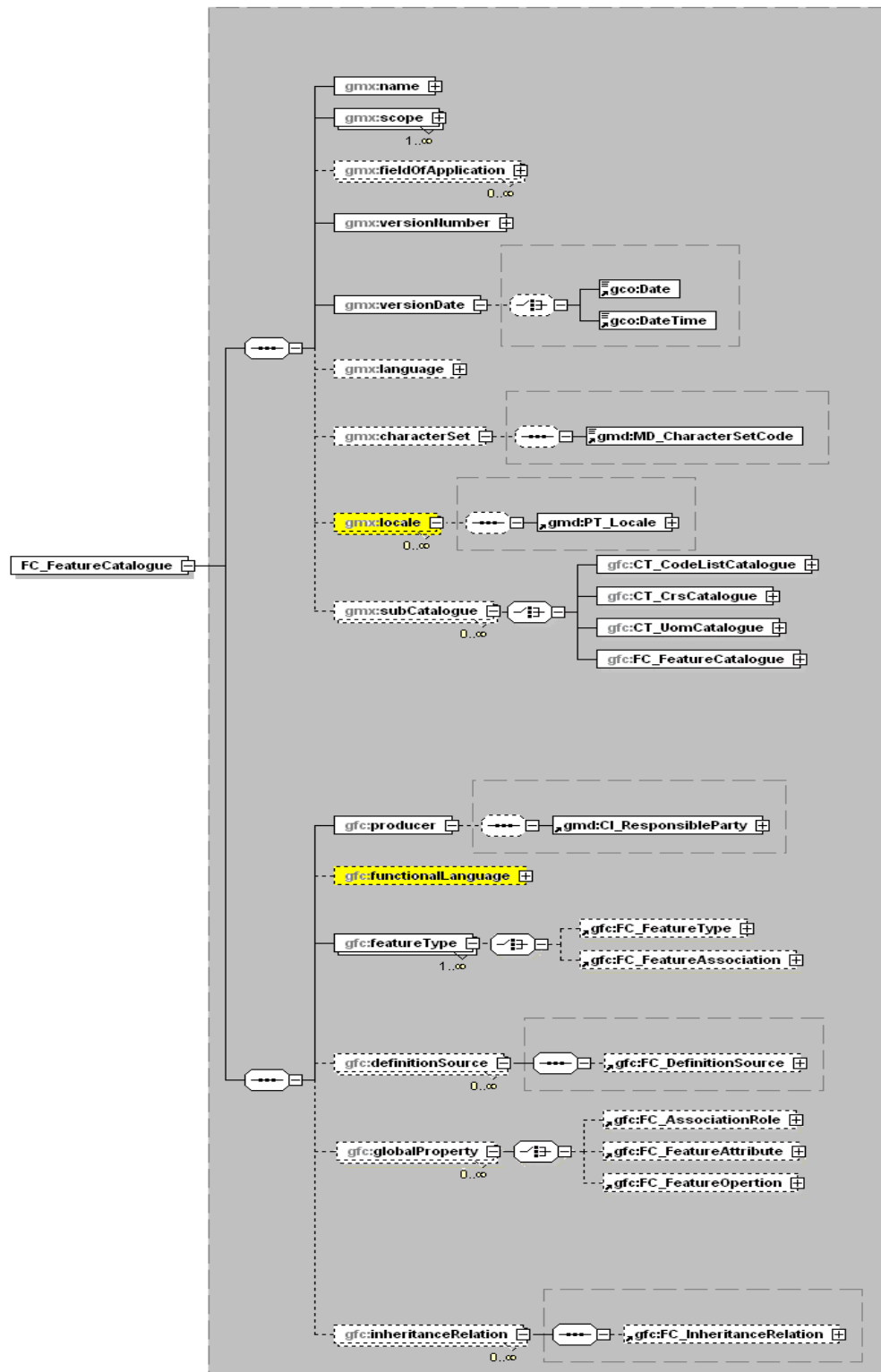
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## FC PACKAGE

---

## 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  
Best Practices: versionNumber may include both 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

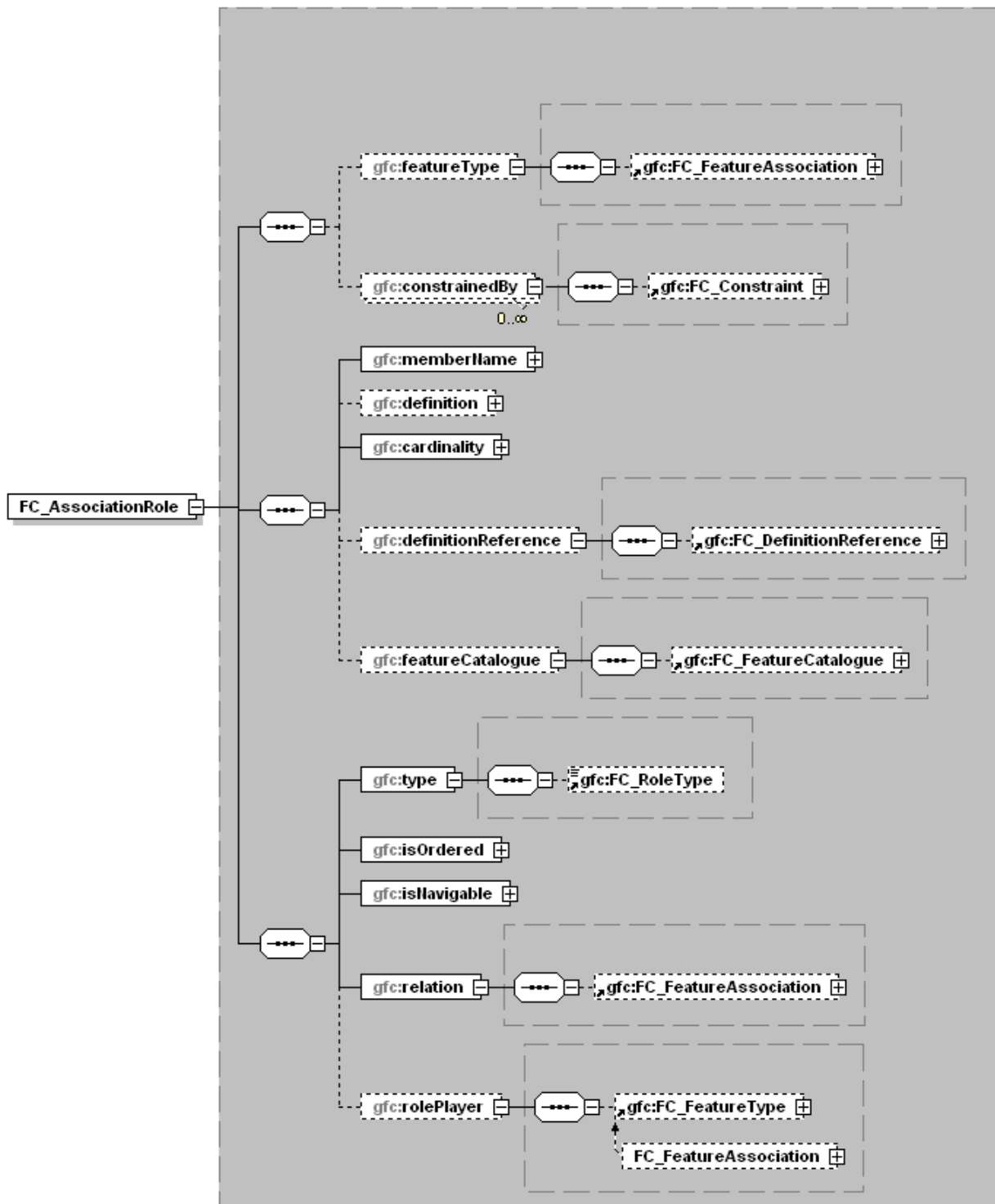
inheritanceRelation – Relationships that link a more generalized feature type (supertype) with a more specialized feature type (subtype).

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

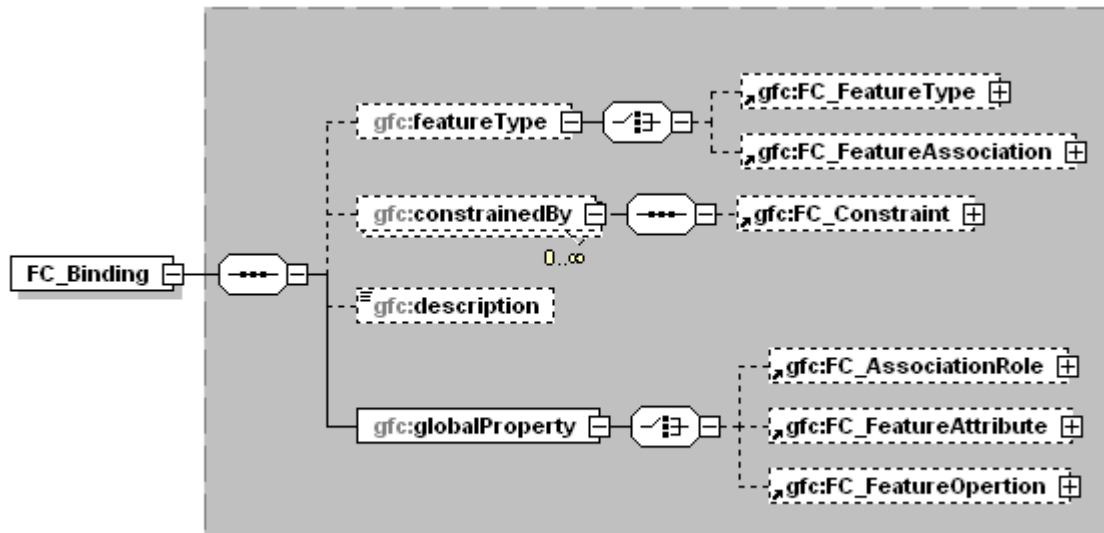
rolePlayer – Type of the target value of this association role.

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

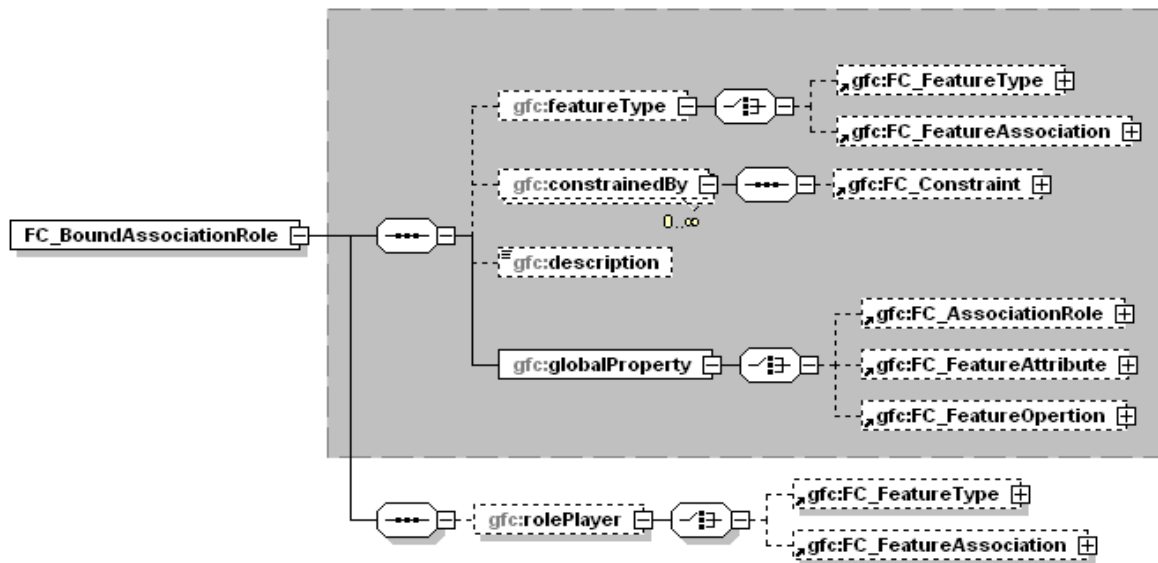
description – Description of how a property is bound to a particular feature type.

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.

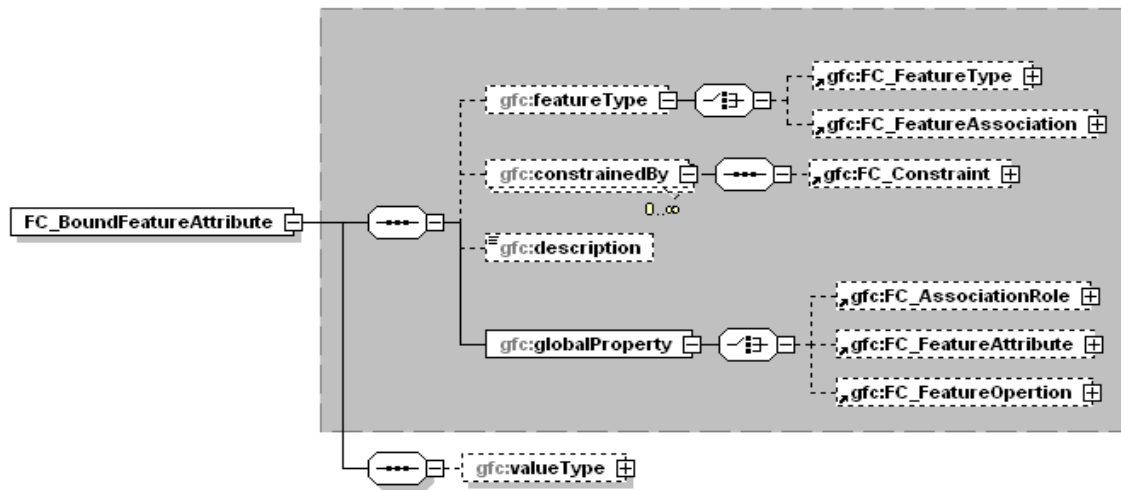
Type: [FC\\_AssociationRole](#) or [FC\\_FeatureAttribute](#) or [FC\\_FeatureOperation](#)  
 Multiplicity: mandatory  
 Attributes: type, href, role, arcrole, title, show, actuate, uuidref, nilReason

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

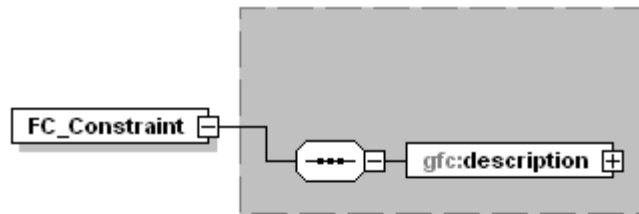
**globalProperty** – Role that links this to feature properties.

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.

|                                                    |                                                                                                                 |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Class FC_FeatureAttribute</b> (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                   | <b>FC_FeatureType</b> (identity = 3)                                                                            |
|                                                    | <b>FC_Binding</b> (identity = 6)                                                                                |
| Role FC_PropertyType.constrainedBy                 | <b>FC_Constraint</b> (identity = 5)                                                                             |
| Attribute FC_FeatureAttribute.code                 | DEP                                                                                                             |
| Attribute FC_FeatureAttribute.valueMeasurementUnit | Meter                                                                                                           |
| Attribute FC_FeatureAttribute.valueType            | Real                                                                                                            |

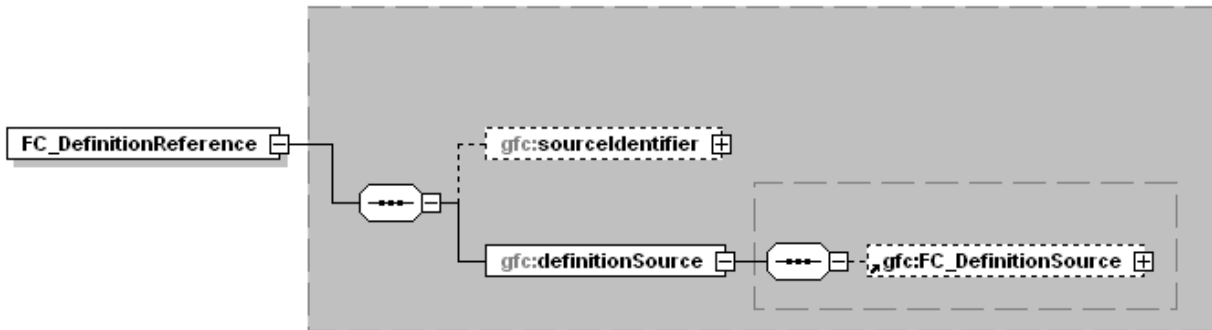
|                                           |                                                                                                  |
|-------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>Class FC_Constraint</b> (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

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

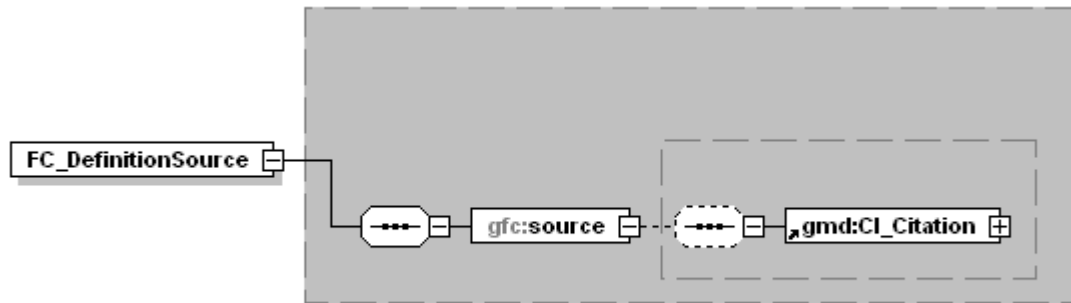
Type: gco:CharacterString  
 Domain: free text  
 Multiplicity: optional  
 Attributes: nilReason

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

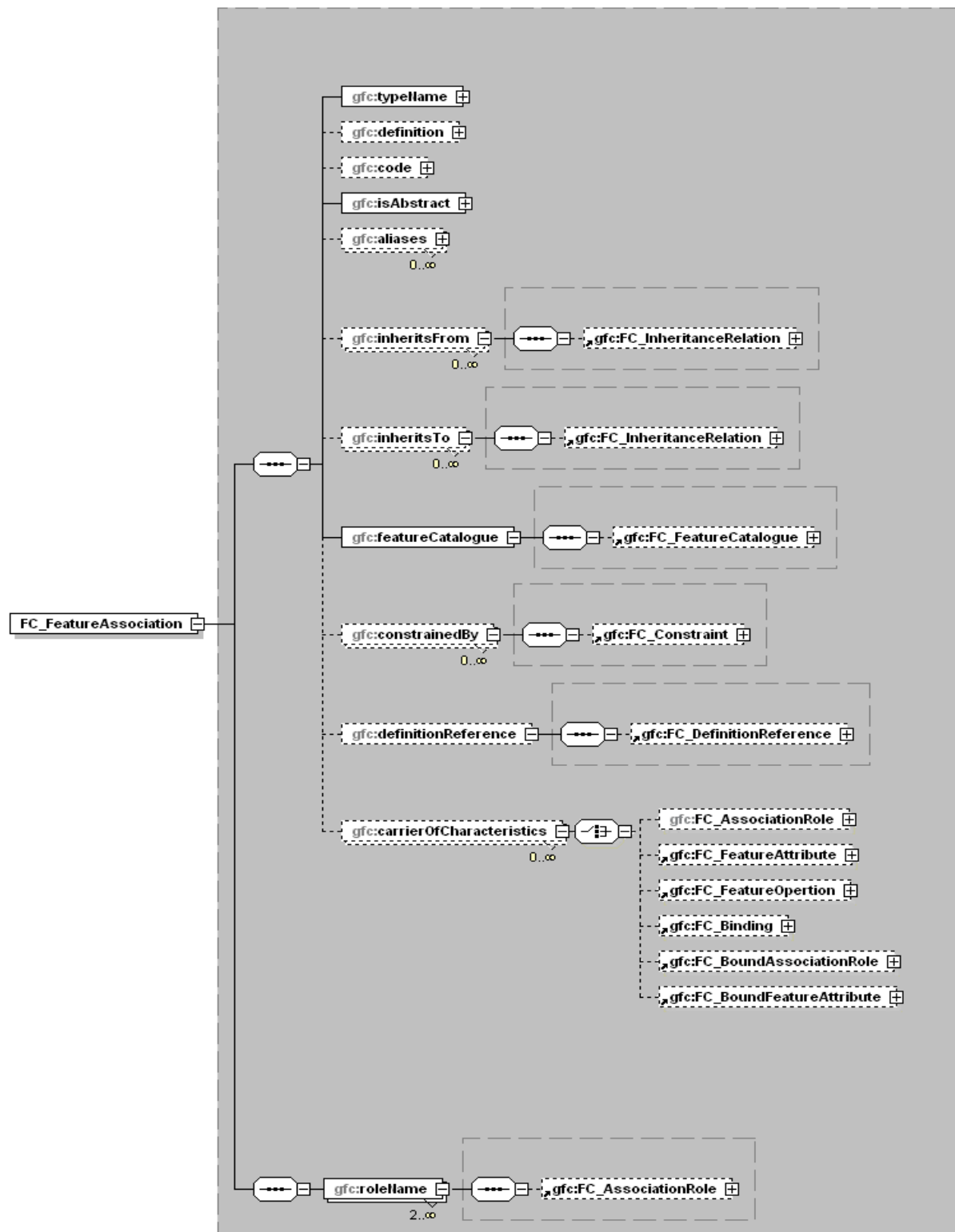
source – Actual citation of the source, sufficient to identify the document and how to obtain it.

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

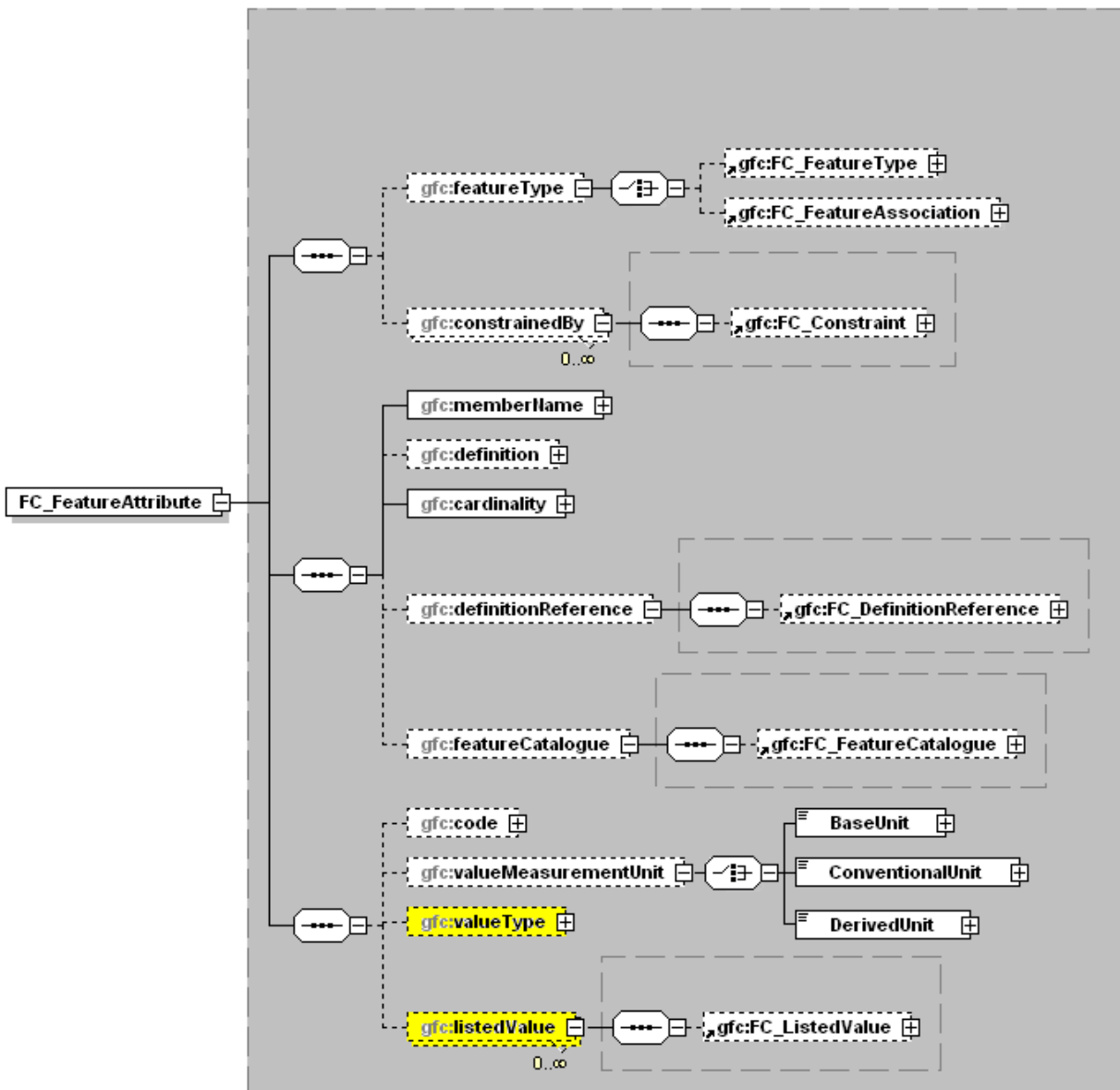
roleName – Roles that are a part of this association.

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 or 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.

---

```

classDiagram
    class FC_FeatureOperation {
        gfc:featureType
        gfc:constrainedBy
        gfc:memberName
        gfc:definition
        gfc:cardinality
        gfc:definitionReference
        gfc:featureCatalogue
        gfc:signature
        gfc:formalDefinition
        gfc:triggeredByValuesOf
        gfc:affectsValuesOf
        gfc:observesValuesOf
    }
    class gfc_FC_FeatureAssociation {
    }
    class gfc_FC_Constraint {
    }
    class gfc_FC_DefinitionReference {
    }
    class gfc_FC_FeatureCatalogue {
    }

    FC_FeatureOperation --> gfc_FC_FeatureAssociation : gfc:featureType
    FC_FeatureOperation --> gfc_FC_FeatureAssociation : gfc:constrainedBy
    FC_FeatureOperation --> gfc_FC_DefinitionReference : gfc:memberName
    FC_FeatureOperation --> gfc_FC_DefinitionReference : gfc:definition
    FC_FeatureOperation --> gfc_FC_DefinitionReference : gfc:cardinality
    FC_FeatureOperation --> gfc_FC_FeatureCatalogue : gfc:definitionReference
    FC_FeatureOperation --> gfc_FC_FeatureCatalogue : gfc:featureCatalogue
    FC_FeatureOperation --> gfc_FC_FeatureCatalogue : gfc:signature
    FC_FeatureOperation --> gfc_FC_FeatureCatalogue : gfc:formalDefinition
    FC_FeatureOperation --> gfc_FC_FeatureCatalogue : gfc:triggeredByValuesOf
    FC_FeatureOperation --> gfc_FC_FeatureCatalogue : gfc:affectsValuesOf
    FC_FeatureOperation --> gfc_FC_FeatureCatalogue : gfc:observesValuesOf
    
```

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

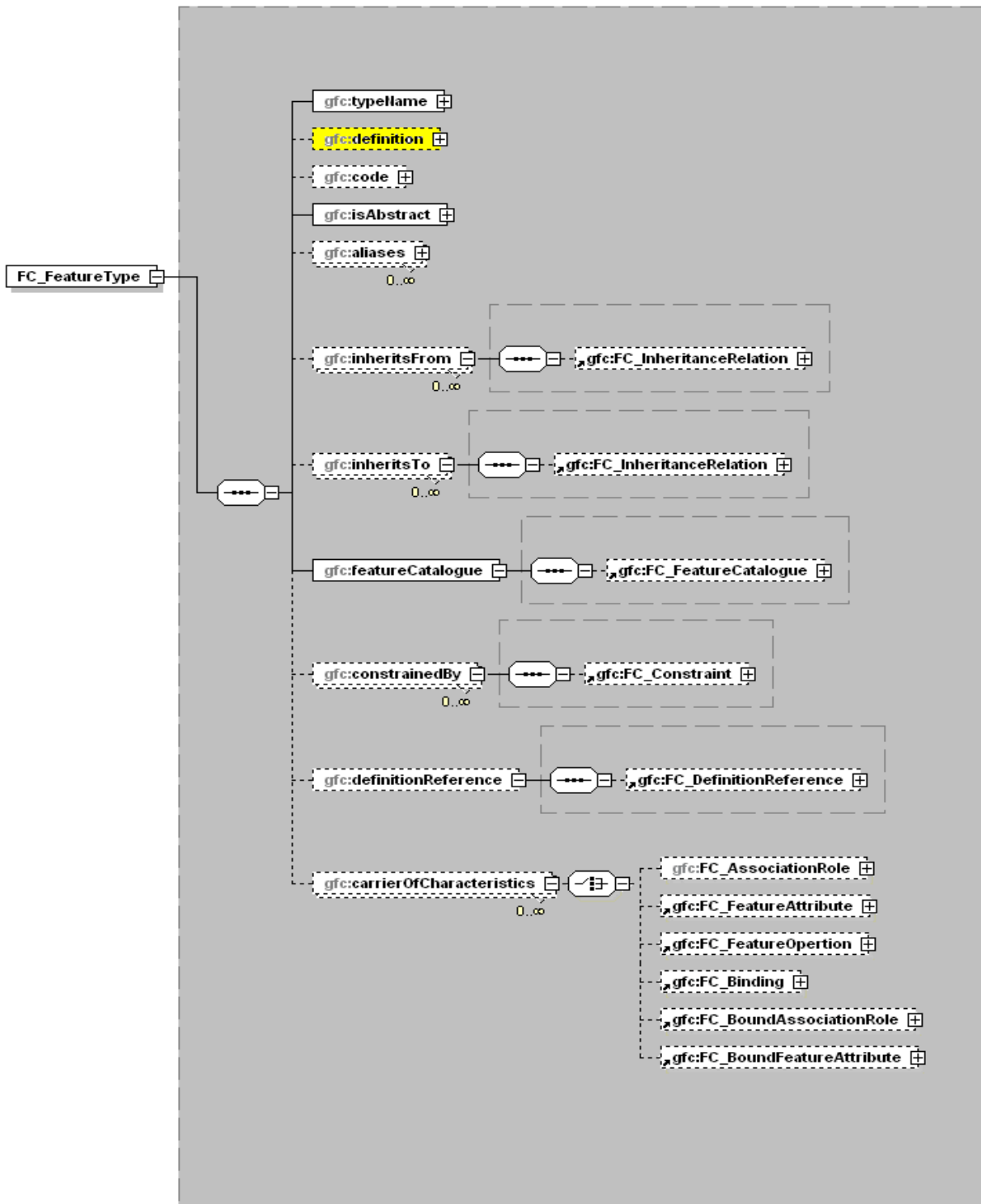
observesValuesOf – Specifies attributes that may be used as input to perform an operation.

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

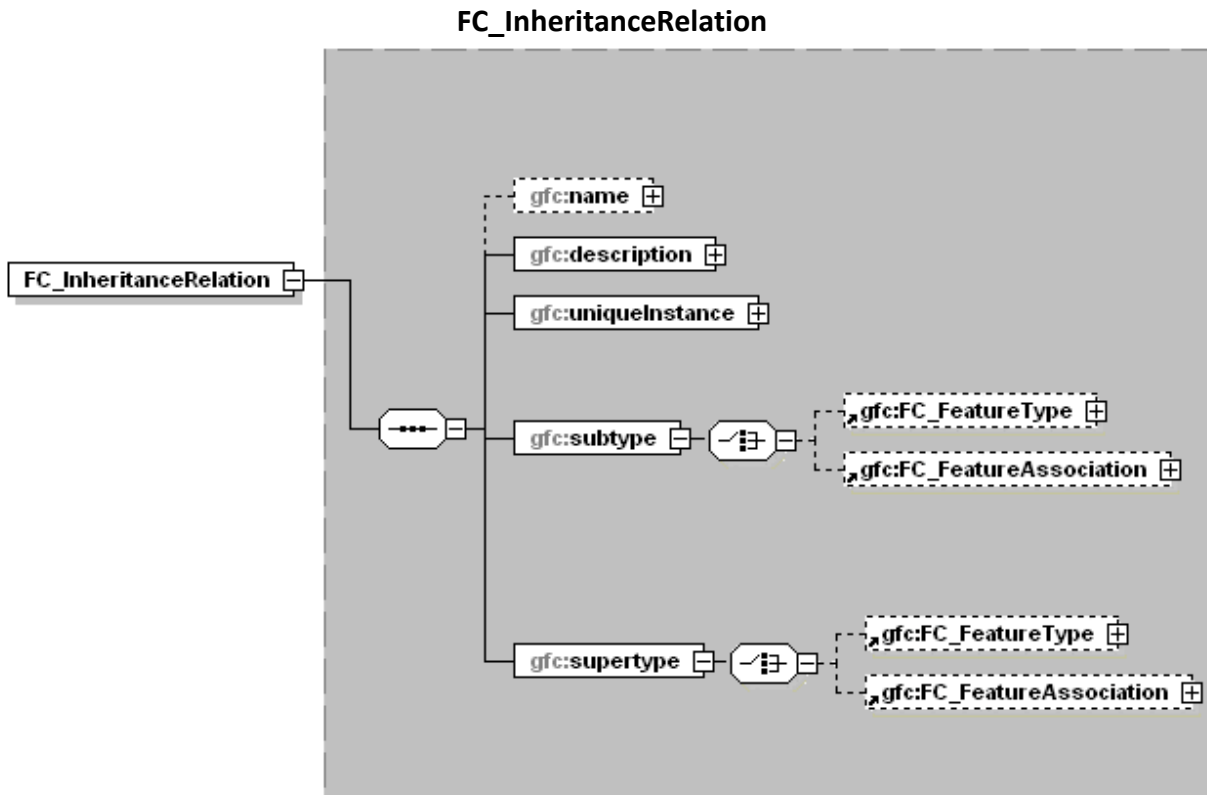
carrierOfCharacteristics – Property types that the feature type contains.

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** – 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 inheritance 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?

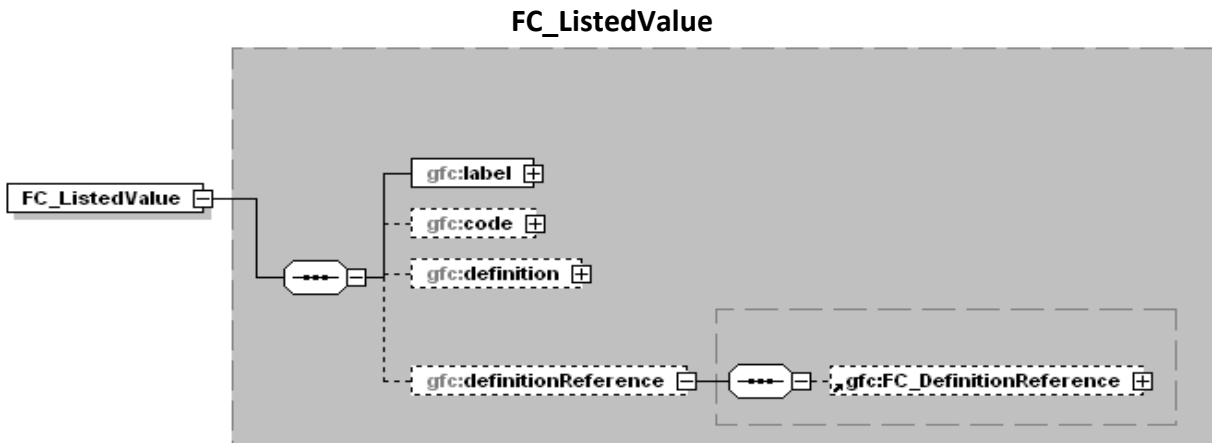
Below is an example of a feature catalogue that contains the 'is a' inheritance relation relating the two feature types 'building' and 'lighthouse'. An instance of a 'lighthouse' feature type is also an instance of a 'building' feature type; feature properties, feature associations, and feature operations to the 'building' feature type in the example feature catalogue also apply to the 'lighthouse' feature type. Pay special attention to the identities.

| Class <b>FC_FeatureType</b> (identity = 25) |                                                                                                   |
|---------------------------------------------|---------------------------------------------------------------------------------------------------|
| Attribute <b>FC_FeatureType.typeName</b>    | Building                                                                                          |
| Attribute <b>FC_FeatureType.definition</b>  | A relatively permanent structure, roofed and usually walled and designed for some particular use. |
| Attribute <b>FC_FeatureType.code</b>        | AL015                                                                                             |
| Attribute <b>FC_FeatureType.isAbstract</b>  | FALSE                                                                                             |
| Role <b>FC_FeatureType.inheritsTo</b>       | <b>FC_FeatureInheritanceRelation</b> (identity = 27)                                              |
| Role <b>FC_FeatureType.featureCatalogue</b> | <b>FC_FeatureCatalogue</b> (identity = 1)                                                         |

| Class <b>FC_FeatureType</b> (identity = 26) |                                                                                        |
|---------------------------------------------|----------------------------------------------------------------------------------------|
| Attribute <b>FC_FeatureType.typeName</b>    | Lighthouse                                                                             |
| Attribute <b>FC_FeatureType.definition</b>  | A distinctive structure exhibiting light(s) designed to serve as an aid to navigation. |
| Attribute <b>FC_FeatureType.code</b>        | BC050                                                                                  |
| Attribute <b>FC_FeatureType.isAbstract</b>  | FALSE                                                                                  |
| Role <b>FC_FeatureType.inheritsFrom</b>     | <b>FC_FeatureInheritanceRelation</b> (identity = 27)                                   |
| Role <b>FC_FeatureType.featureCatalogue</b> | <b>FC_FeatureCatalogue</b> (identity = 1)                                              |

| Class <b>FC_InheritanceRelation</b> (identity = 27)    |                                                                |
|--------------------------------------------------------|----------------------------------------------------------------|
| Attribute <b>FC_InheritanceRelation.name</b>           | Is a                                                           |
| Attribute <b>FC_InheritanceRelation.description</b>    | An object is classified as a specialization of another object. |
| Attribute <b>FC_InheritanceRelation.uniqueInstance</b> | TRUE                                                           |
| Role <b>FC_InheritanceRelation.subtype</b>             | <b>FC_FeatureType</b> (identity = 26)                          |
| Role <b>FC_InheritanceRelation.supertype</b>           | <b>FC_FeatureType</b> (identity = 25)                          |

---



**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 CATALOGUE EXAMPLE

### Feature CatalogueExample – Transportation96

| Feature Catalogue <i>id=_1</i> |                                                                                                                               |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 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<br>10 Main St.<br>Urbana, IL 61801<br>Telephone: +1 217 488-3331<br>Fax: +1 217 482-9331<br>Email: landuse96@urbana.net |

| Feature CatalogueExample – Transportation96 |                                                                                                                                                                                                                                                                 |              |             |        |     |          |     |      |     |         |     |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------|--------|-----|----------|-----|------|-----|---------|-----|
| Feature Type <i>id=_2</i>                   |                                                                                                                                                                                                                                                                 |              |             |        |     |          |     |      |     |         |     |
| Name:                                       | Roads                                                                                                                                                                                                                                                           |              |             |        |     |          |     |      |     |         |     |
| Definition:                                 | Open way for the movement of motor vehicles on land                                                                                                                                                                                                             |              |             |        |     |          |     |      |     |         |     |
| Code:                                       | TR96-02                                                                                                                                                                                                                                                         |              |             |        |     |          |     |      |     |         |     |
| Feature Attribute Names:                    | Number of lanes ( <i>id=_3</i> ), Road Surface ( <i>id=_4</i> )                                                                                                                                                                                                 |              |             |        |     |          |     |      |     |         |     |
| Feature Attribute <i>id=_3</i>              |                                                                                                                                                                                                                                                                 |              |             |        |     |          |     |      |     |         |     |
| 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 <i>id=_4</i>              |                                                                                                                                                                                                                                                                 |              |             |        |     |          |     |      |     |         |     |
| Name:                                       | Road Surface                                                                                                                                                                                                                                                    |              |             |        |     |          |     |      |     |         |     |
| Definition:                                 | Road surface material                                                                                                                                                                                                                                           |              |             |        |     |          |     |      |     |         |     |
| Code:                                       | 19586                                                                                                                                                                                                                                                           |              |             |        |     |          |     |      |     |         |     |
| Value Data Type:                            | text                                                                                                                                                                                                                                                            |              |             |        |     |          |     |      |     |         |     |
| Value Domain Type:                          | 1 = “enumerated”                                                                                                                                                                                                                                                |              |             |        |     |          |     |      |     |         |     |
| Value Domain:                               | <table> <thead> <tr> <th><u>Label</u></th><th><u>Code</u></th></tr> </thead> <tbody> <tr> <td>gravel</td><td>001</td></tr> <tr> <td>concrete</td><td>002</td></tr> <tr> <td>dirt</td><td>003</td></tr> <tr> <td>asphalt</td><td>004</td></tr> </tbody> </table> | <u>Label</u> | <u>Code</u> | gravel | 001 | concrete | 002 | dirt | 003 | asphalt | 004 |
| <u>Label</u>                                | <u>Code</u>                                                                                                                                                                                                                                                     |              |             |        |     |          |     |      |     |         |     |
| 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:gmw="http://www.isotc211.org/2005/gmw" xsi:schemaLocation="http://www.isotc211.org/2005/gfc
Q:\users\mize.jacqueline\ISO\gfc\gfc.xsd">
  <gmw:name>
    <gco:CharacterString>Transportation96</gco:CharacterString>
  </gmw:name>
  <gmw:scope>
    <gco:CharacterString>Road network in Urbana-Champaign surveyed in 1996 for all transportation facilities within the twin
cities.</gco:CharacterString>
  </gmw:scope>
  <gmw:fieldOfApplication>
    <gco:CharacterString>Transportation planning, Land use planning</gco:CharacterString>
  </gmw:fieldOfApplication>
  <gmw:versionNumber>
    <gco:CharacterString>1.1</gco:CharacterString>
  </gmw:versionNumber>
  <gmw:versionDate>
    <gco:Date>1996-10-01</gco:Date>
  </gmw:versionDate>
  <gmw:language>
    <gco:CharacterString>eng; US</gco:CharacterString>
  </gmw:language>
  <gmw:characterSet>
    <gmd:MD_CharacterSetCode codeList="http://www.isotc211.org/2005/resources/Codelist/gmwCodelists.xml#MD_CharacterSetCodeType"
codeListValue="utf8"/>
  </gmw: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:CI_Address>
          </gmd:address>
          <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: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>
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            <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>
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    <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 or 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 month, 6 days, 12 hours, and 35 minutes is represented by P5Y1M6DT10H35M. Any subset of this representation is allowed as 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 can be 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](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, photo-graphic 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/IEC 8859-9, 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.26 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<br>Examples: agriculture, irrigation, aquaculture, plantations, herding, pests and diseases affecting crops and livestock |
| biota      | 002         | flora and/or fauna in natural environment<br>Examples: wildlife, vegetation, biological sciences, ecology, wilderness, sealife, wetlands, habitat                         |
| boundaries | 003         | legal land descriptions<br>Examples: political and administrative boundaries                                                                                              |

|                                  |     |                                                                                                                                                                                                                                                                                                                   |
|----------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| climatologyMeteorologyAtmosphere | 004 | processes and phenomena of the atmosphere<br>Examples: cloud cover, weather, climate, atmospheric conditions, climate change, precipitation                                                                                                                                                                       |
| economy                          | 005 | economic activities, conditions and employment<br>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<br>Examples: altitude, bathymetry, digital elevation models, slope, derived products                                                                                                                                                                                              |
| environment                      | 007 | environmental resources, protection and conservation<br>Examples: environmental pollution, waste storage and treatment, environmental impact assessment, monitoring environmental risk, nature reserves, landscape                                                                                                |
| geoscientificInformation         | 008 | information pertaining to earth sciences<br>Examples: geophysical features and processes, geology, minerals, sciences dealing with the composition, structure and origin of the earth's rocks, risks of earthquakes, volcanic activity, landslides, gravity information, soils, permafrost, hydrogeology, erosion |
| health                           | 009 | health, health services, human ecology, and safety<br>Examples: disease and illness, factors affecting health, hygiene, substance abuse, mental and physical health, health services                                                                                                                              |
| imageryBaseMapsEarthCover        | 010 | base maps<br>Examples: land cover, topographic maps, imagery, unclassified images, annotations                                                                                                                                                                                                                    |
| intelligenceMilitary             | 011 | military bases, structures, activities<br>Examples: barracks, training grounds, military transportation, information collection                                                                                                                                                                                   |
| inlandWaters                     | 012 | inland water features, drainage systems and their characteristics<br>Examples: rivers and glaciers, salt lakes, water utilization plans, dams, currents, floods, water quality, hydrographic charts                                                                                                               |
| location                         | 013 | positional information and services<br>Examples: addresses, geodetic networks, control points, postal zones and services, place names                                                                                                                                                                             |
| oceans                           | 014 | features and characteristics of salt water bodies (excluding inland waters)<br>Examples: tides, tidal waves, coastal information, reefs                                                                                                                                                                           |
| planningCadastre                 | 015 | information used for appropriate actions for future use of the land<br>Examples: land use maps, zoning maps, cadastral surveys, land ownership                                                                                                                                                                    |
| society                          | 016 | characteristics of society and cultures<br>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<br>Examples: buildings, museums, churches, factories, housing, monuments, shops, towers                                                                                                                                                                                                                              |
| transportation         | 018 | means and aids for conveying persons and/or goods<br>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<br>Examples: hydroelectricity, geothermal, solar and nuclear sources of energy, water purification and distribution, sewage collection and disposal, electricity and gas distribution, data communication, telecommunication, radio, communication networks |

**C.27 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                                                                                                                                                                                        |

**C.28 MI\_BandDefinition** – designation of criterion for defining maximum and minimum wavelengths for a spectral band

| Name | Domain code | Definition                                                                                                                                 |
|------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 3dB  | 001         | width of a distribution equal to the distance between the outer two points on the distribution having power level half of that at the peak |

|                 |     |                                                                                                                                                 |
|-----------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| halfMaximum     | 002 | width of a distribution equal to the distance between the outer two points on the distribution having power level half of that at the peak      |
| fiftyPercent    | 003 | full spectral width of a spectral power density measured at 50% of its peak height                                                              |
| oneOverE        | 004 | width of a distribution equal to the distance between the outer two points on the distribution having power level 1/e that of the peak          |
| equivalentWidth | 005 | width of a band with full sensitivity or absorption at every wavelength that detects or absorbs the same amount of energy as the band described |

**C.29 MI\_ContextCode** – designation of criterion for defining the context of the scanning process event

| Name        | Domain code | Definition                                 |
|-------------|-------------|--------------------------------------------|
| acquisition | 001         | event related to a specific collection     |
| pass        | 002         | event related to a sequence of collections |
| wayPoint    | 003         | event related to a navigational manoeuvre  |

**C.30 MI\_GeometryTypeCode** – geometric description of the collection

| Name   | Domain code | Definition                                                      |
|--------|-------------|-----------------------------------------------------------------|
| point  | 001         | single geographic point of interest                             |
| linear | 002         | extended collection in a single vector                          |
| areal  | 003         | collection of a geographic area defined by a polygon (coverage) |
| strip  | 004         | series of linear collections grouped by way points              |

**C.31 MI\_ObjectiveTypeCode** – temporal persistence of collection objective

| Name                    | Domain code | Definition                       |
|-------------------------|-------------|----------------------------------|
| instantaneousCollection | 001         | single instance of collection    |
| persistentView          | 002         | multiple instances of collection |
| survey                  | 003         | collection over specified domain |

**C.32 MI\_OperationTypeCode** – code indicating whether the data contained in this packet is real (originates from live-fly or other non-simulated operational sources), simulated (originates from target simulator sources), or synthesized (a mix of real and simulated data).

| Name        | Domain code | Definition                                                         |
|-------------|-------------|--------------------------------------------------------------------|
| real        | 001         | originates from live-fly or other non-simulated operational source |
| simulated   | 002         | originates from target simulator sources                           |
| synthesized | 003         | mix of real and simulated data                                     |

**C.33 MI\_PolarisationOrientationCode** – polarization of the antenna relative to the waveform

| Name          | Domain code | Definition                                                                                         |
|---------------|-------------|----------------------------------------------------------------------------------------------------|
| horizontal    | 001         | polarization of the sensor oriented in the horizontal plane in relation to swath direction         |
| vertical      | 002         | polarization of the sensor oriented in the vertical plane in relation to swath direction           |
| leftCircular  | 003         | polarization of the sensor oriented in the left circular plane in relation to swath direction      |
| rightCircular | 004         | polarization of the sensor oriented in the right circular plane in relation to swath direction     |
| theta         | 005         | polarization of the sensor oriented in the angle between +90 ° and 0 ° parallel to swath direction |
| phi           | 006         | polarization of the sensor oriented in the +90 ° and 0 ° perpendicular to swath direction          |

**C.34 MI\_PriorityCode** – ordered list of priorities

| Name             | Domain code | Definition                                   |
|------------------|-------------|----------------------------------------------|
| critical         | 001         | decisive importance                          |
| highImportance   | 002         | requires resources to be made available      |
| mediumImportance | 003         | normal operation priority                    |
| lowImportance    | 004         | to be completed when resources are available |

**C.35 MI\_SequenceCode** – temporal relation of activation

| Name          | Domain code | Definition                                |
|---------------|-------------|-------------------------------------------|
| start         | 001         | beginning of a collection                 |
| end           | 002         | end of a collection                       |
| instantaneous | 003         | collection without a significant duration |

**C.36 MI\_TransferFunctionTypeCode** – transform function to be used when scaling a physical value for a given element

| Name        | Domain code | Definition                                                 |
|-------------|-------------|------------------------------------------------------------|
| linear      | 001         | function used for transformation is first order polynomial |
| logarithmic | 002         | function used for transformation is logarithmic            |
| exponential | 003         | function used for transformation is exponential            |

**C.37 MI\_TriggerCode** – mechanism of activation

| Name          | Domain code | Definition                                   |
|---------------|-------------|----------------------------------------------|
| automatic     | 001         | event due to external stimuli                |
| manual        | 002         | event manually instigated                    |
| preProgrammed | 003         | event instigated by planned internal stimuli |

## 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 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              | $\Omega \text{ (m}^2\text{*kg*s}^{-3}\text{*A}^{-2}\text{)}$ | 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<sup>3</sup>?**

```
<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 one 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 (meter).

---

formula – Formula for the conversion.

Type: compound

Multiplicity: conditional

Best Practices: There must be one 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:formula>
  </gml:conversionToPreferredUnit>
</gml:ConventionalUnit>
```

```

        <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:

$$K = 273.15 + C$$

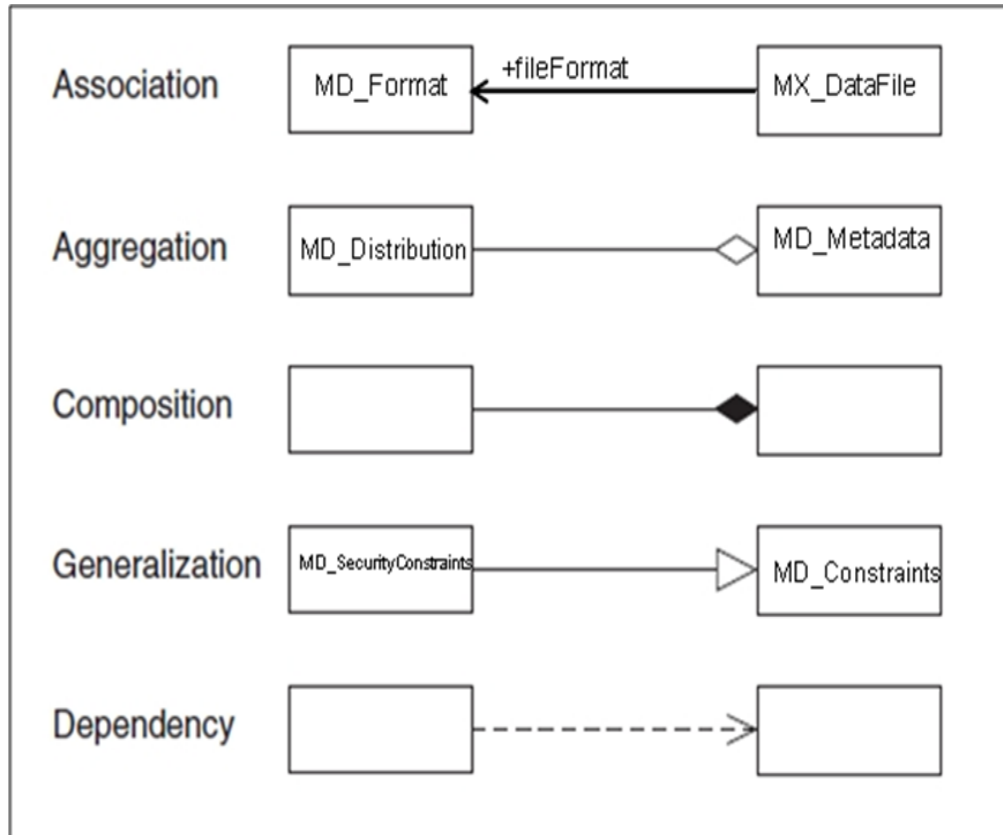

---

## 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.)

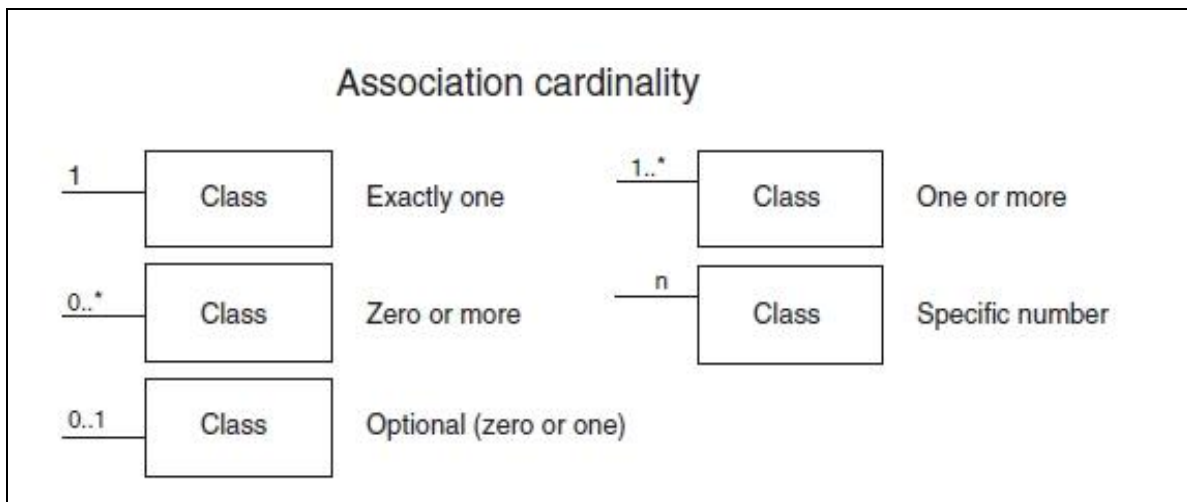
### Dependency

Dependencies are also known as instantiation. Dependencies are kind of like an 'IF' statement.

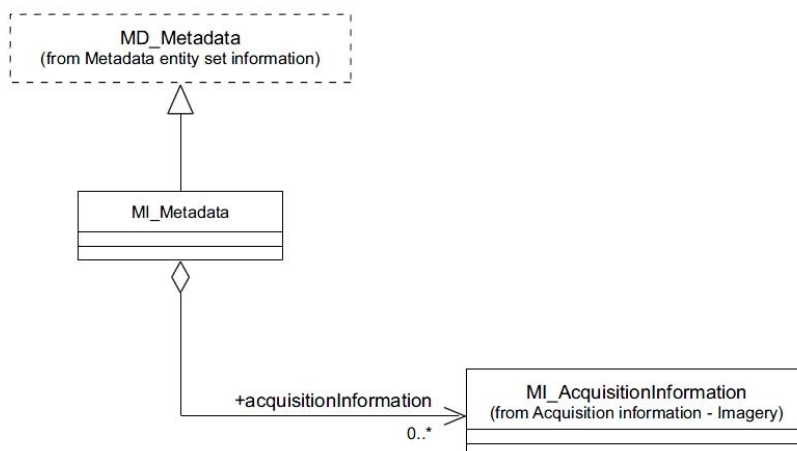
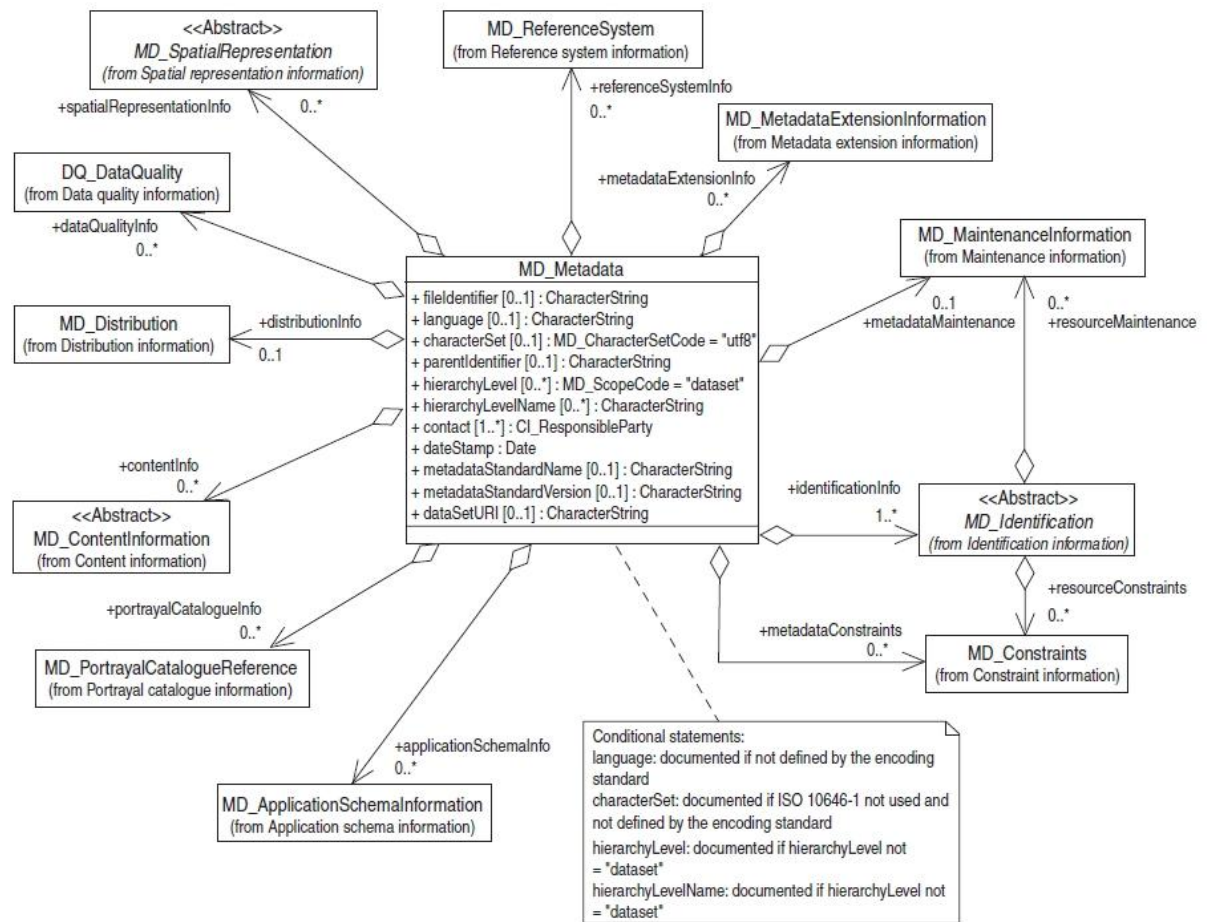
Ex: If accessConstraints or useConstraints = "otherRestrictions" then "otherConstraints" must be used.

### **E.2 UML Cardinality**

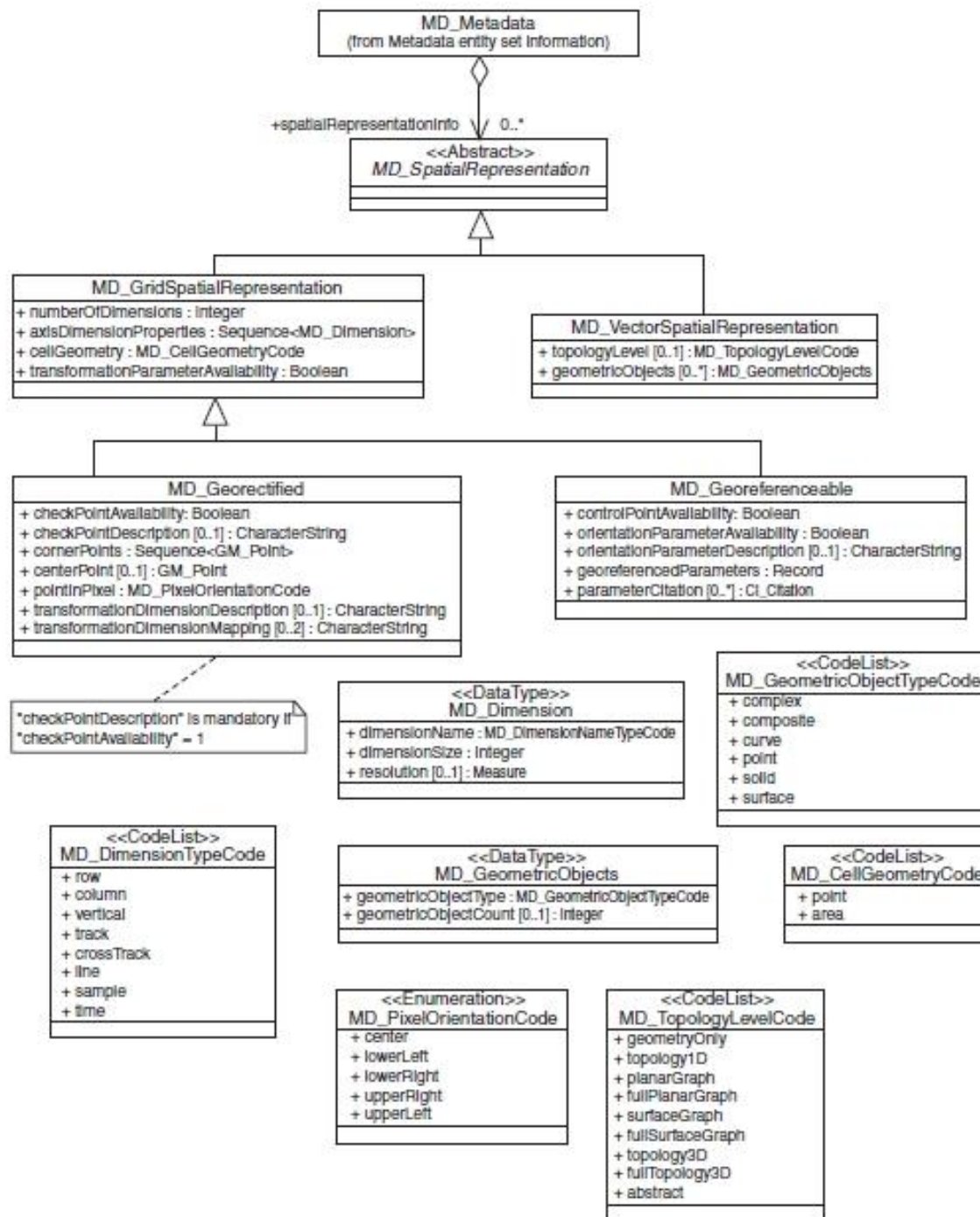
Multiplicity and cardinality are denoted on the UML associations to depict if classes are mandatory, optional, and how many times they may repeat as noted in the table below.

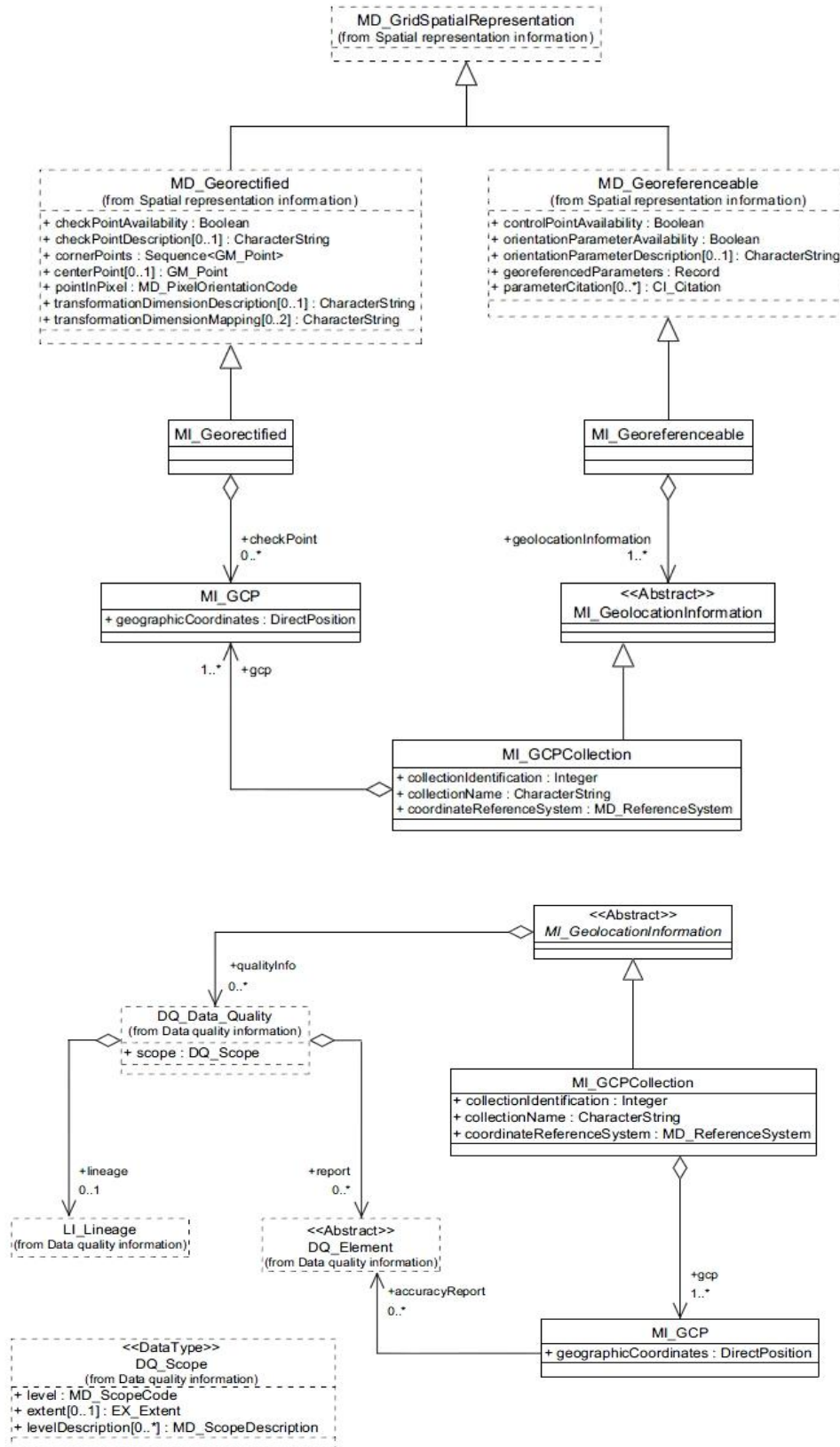


### E.3 Metadata Entity UML

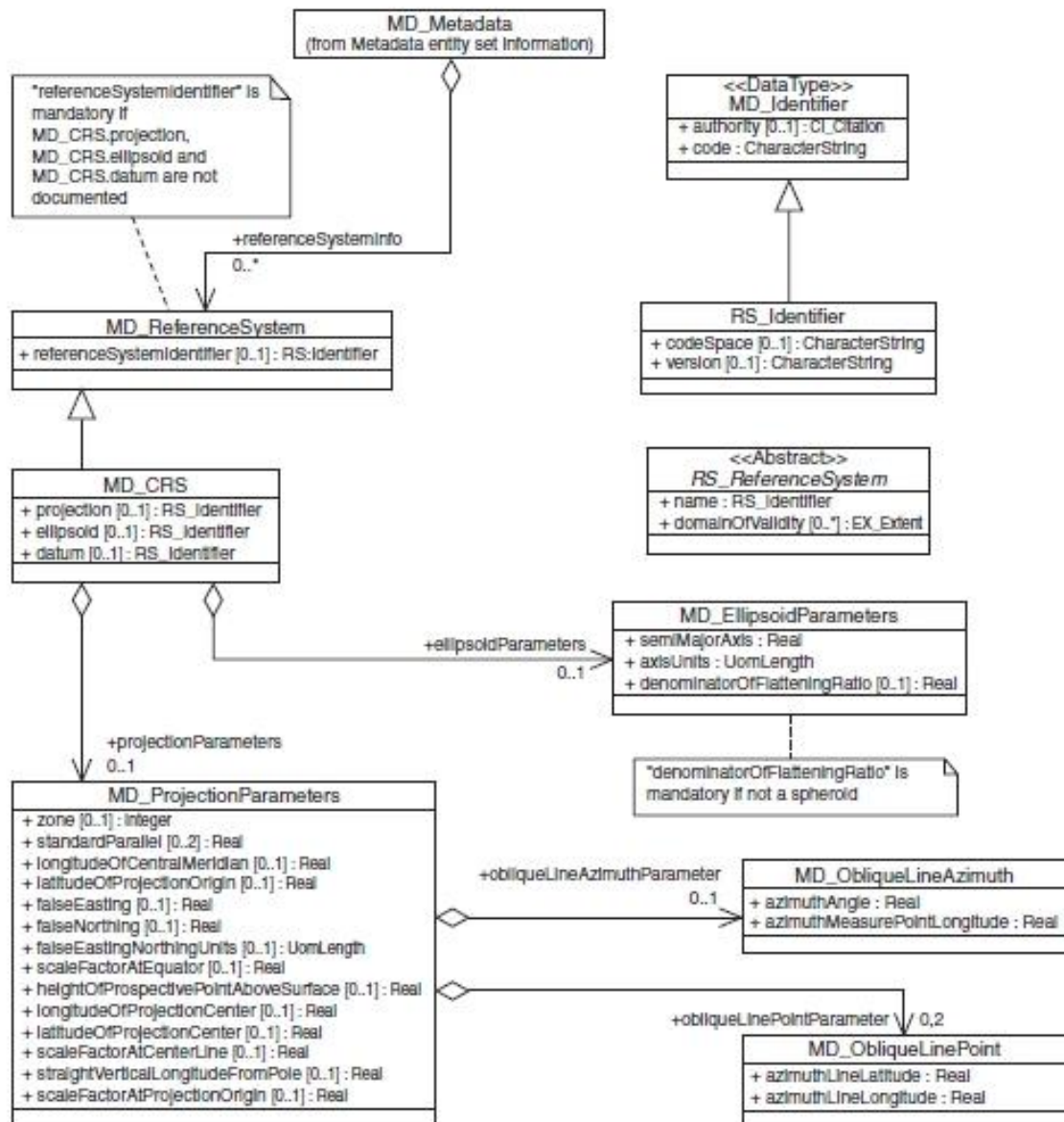


## E.4 Spatial Representation UML

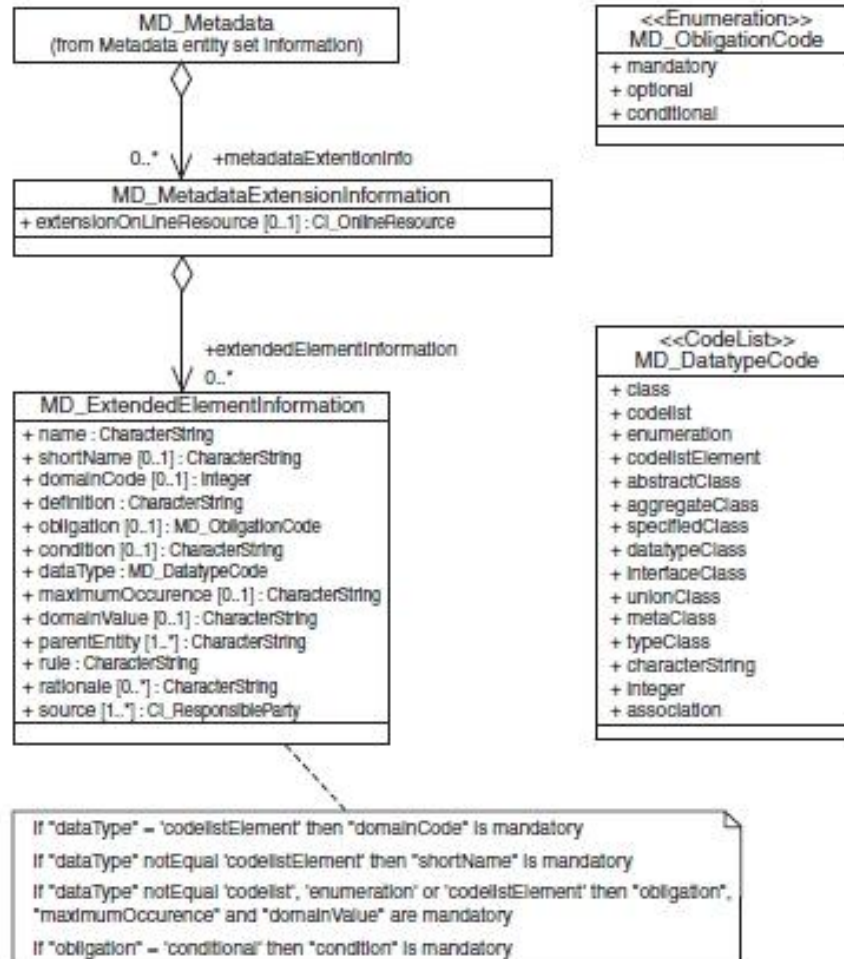




## E.5 Reference System UML

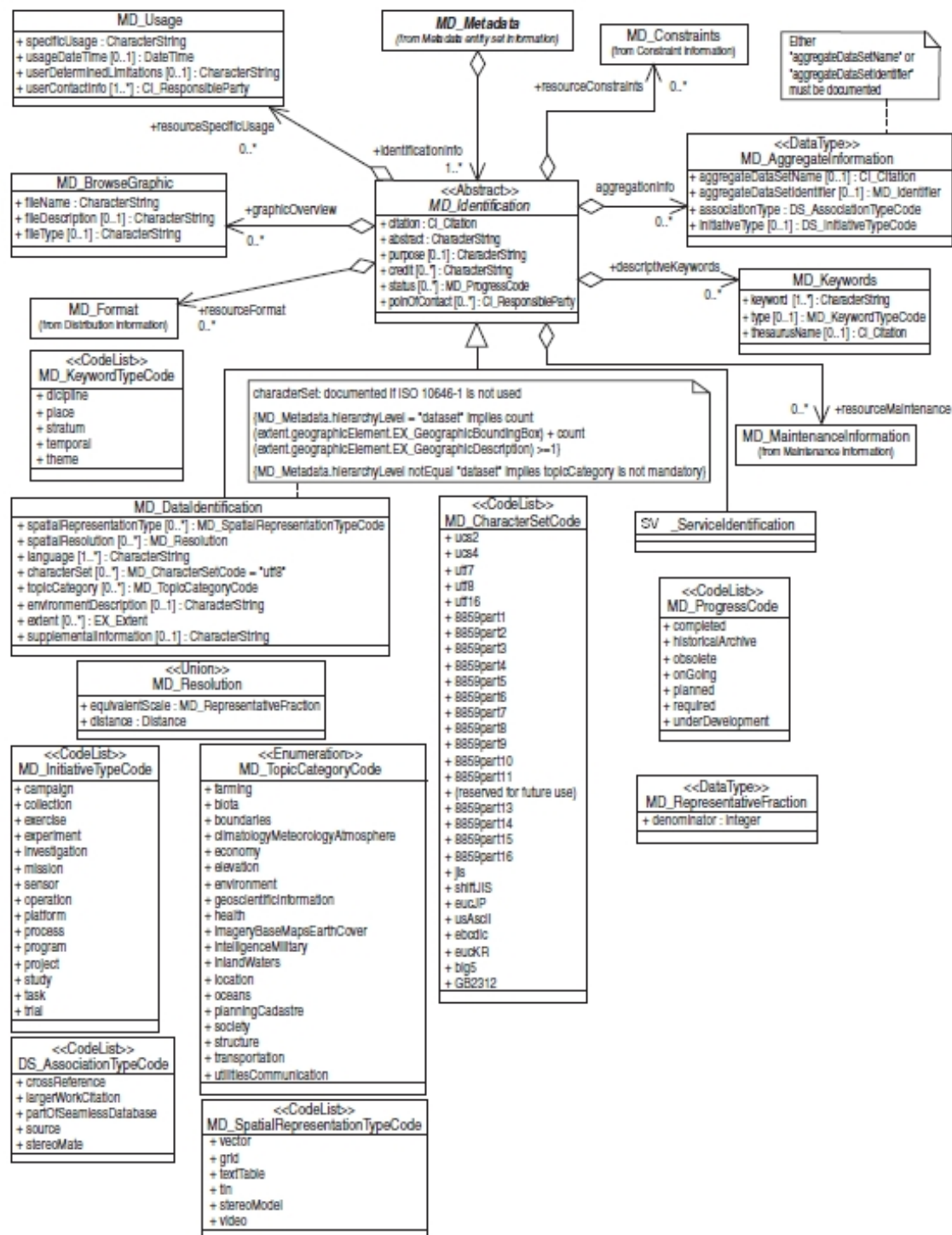


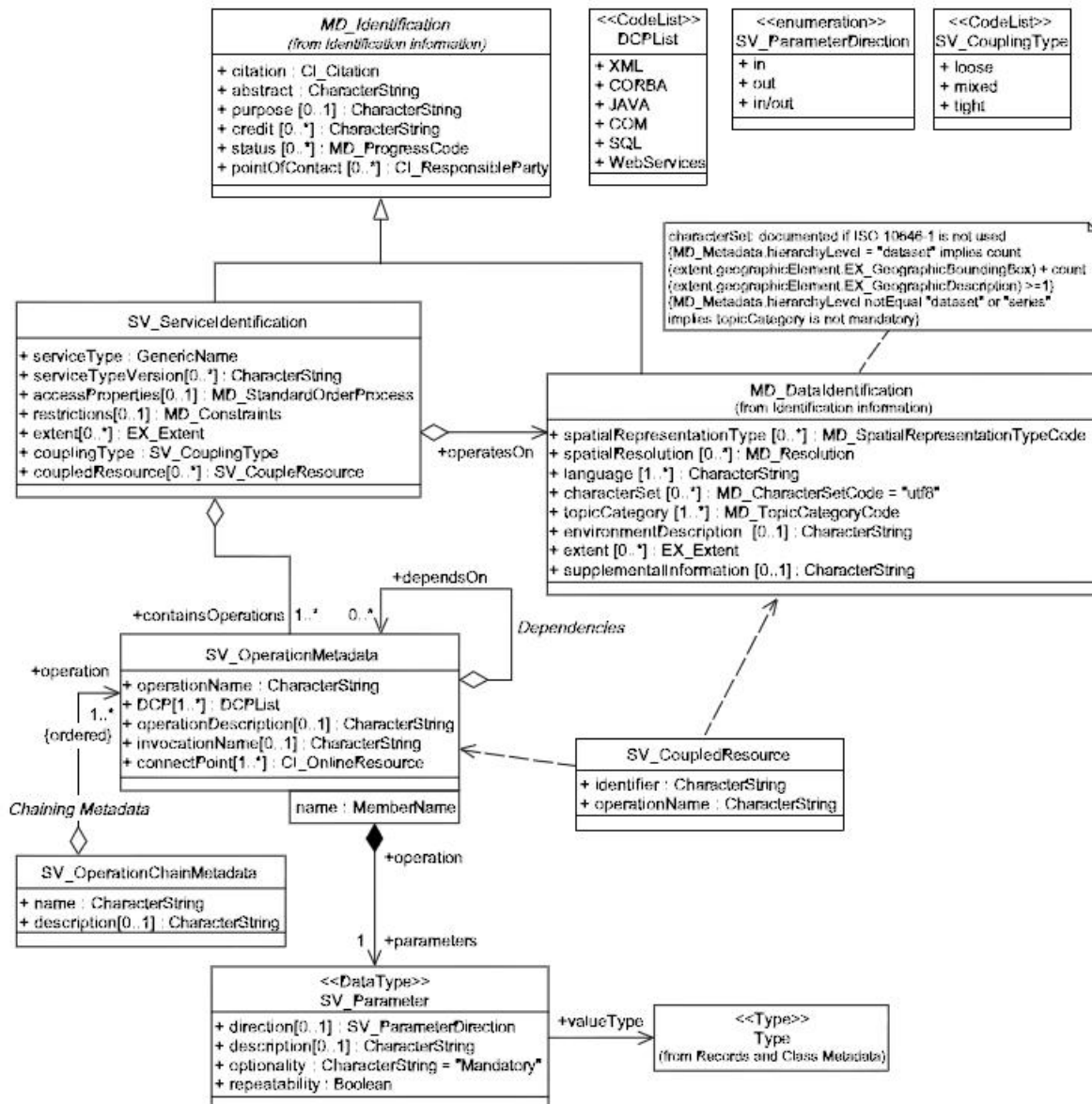
## E.6 Metadata Extension UML





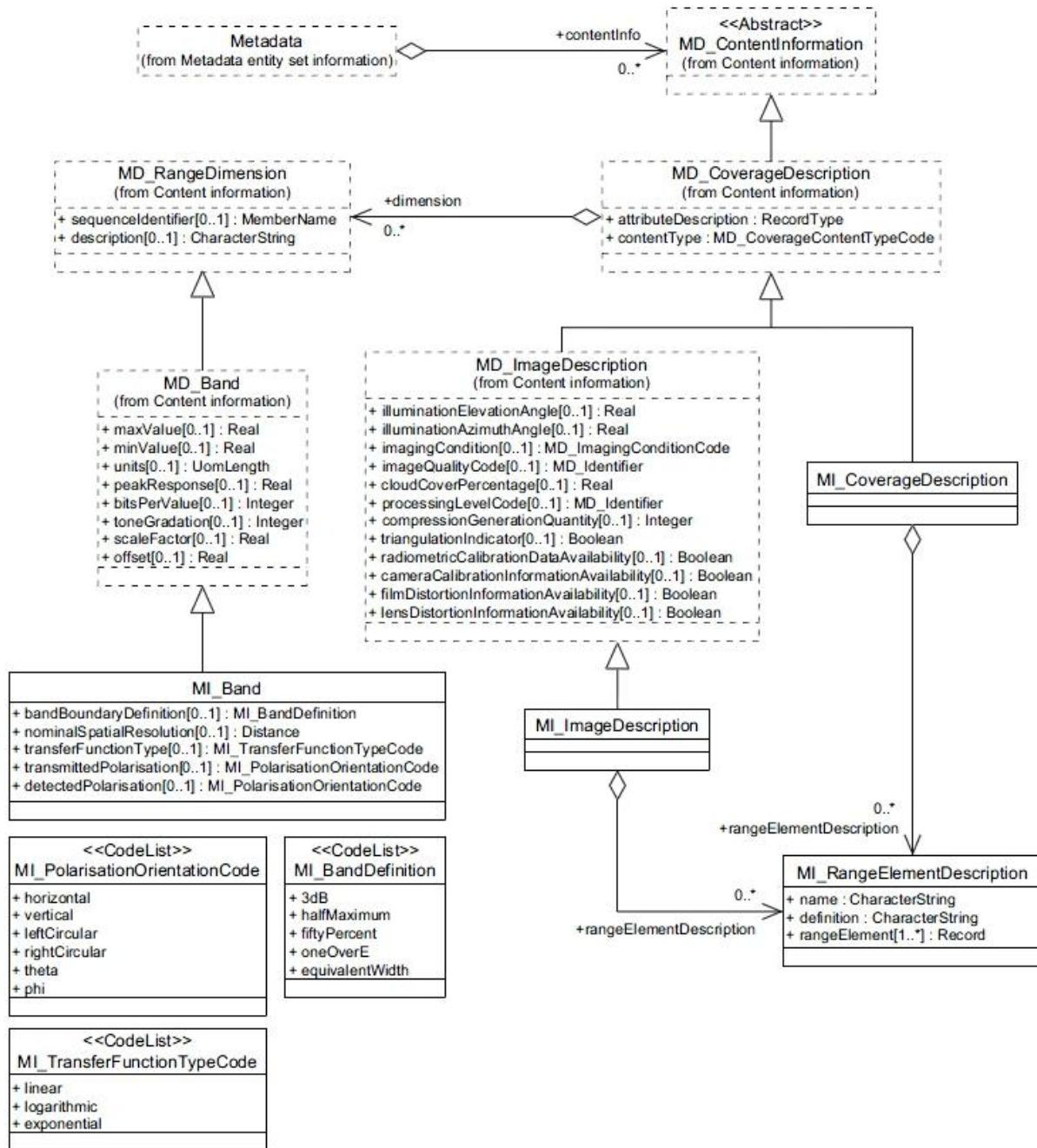
## E.7 Identification (Data and Services) UML



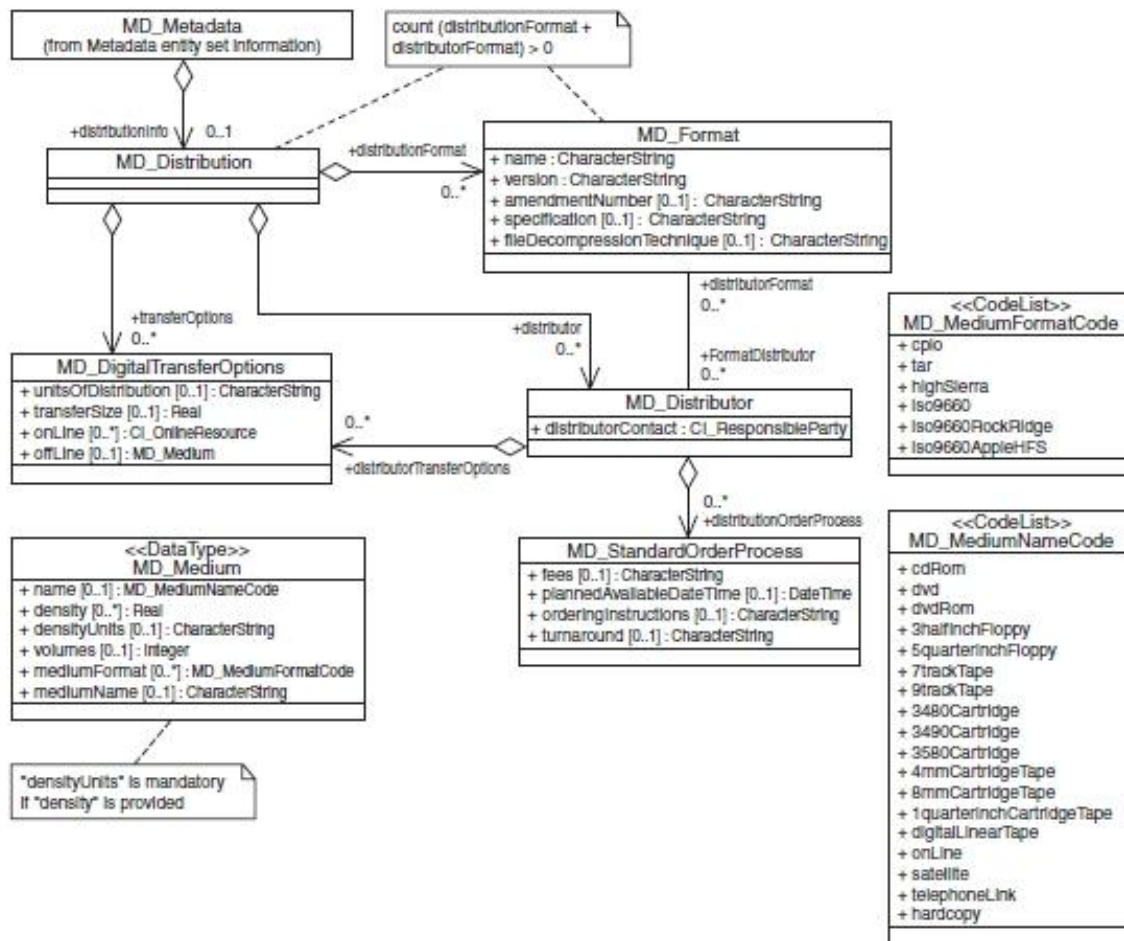




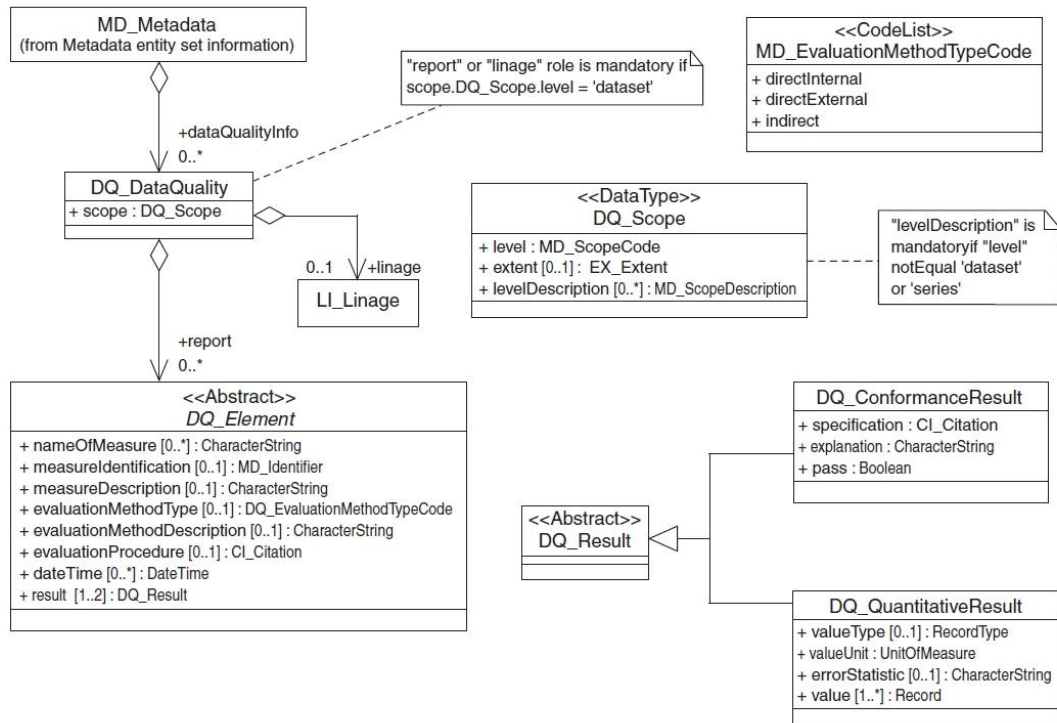
## E.8 Content UML

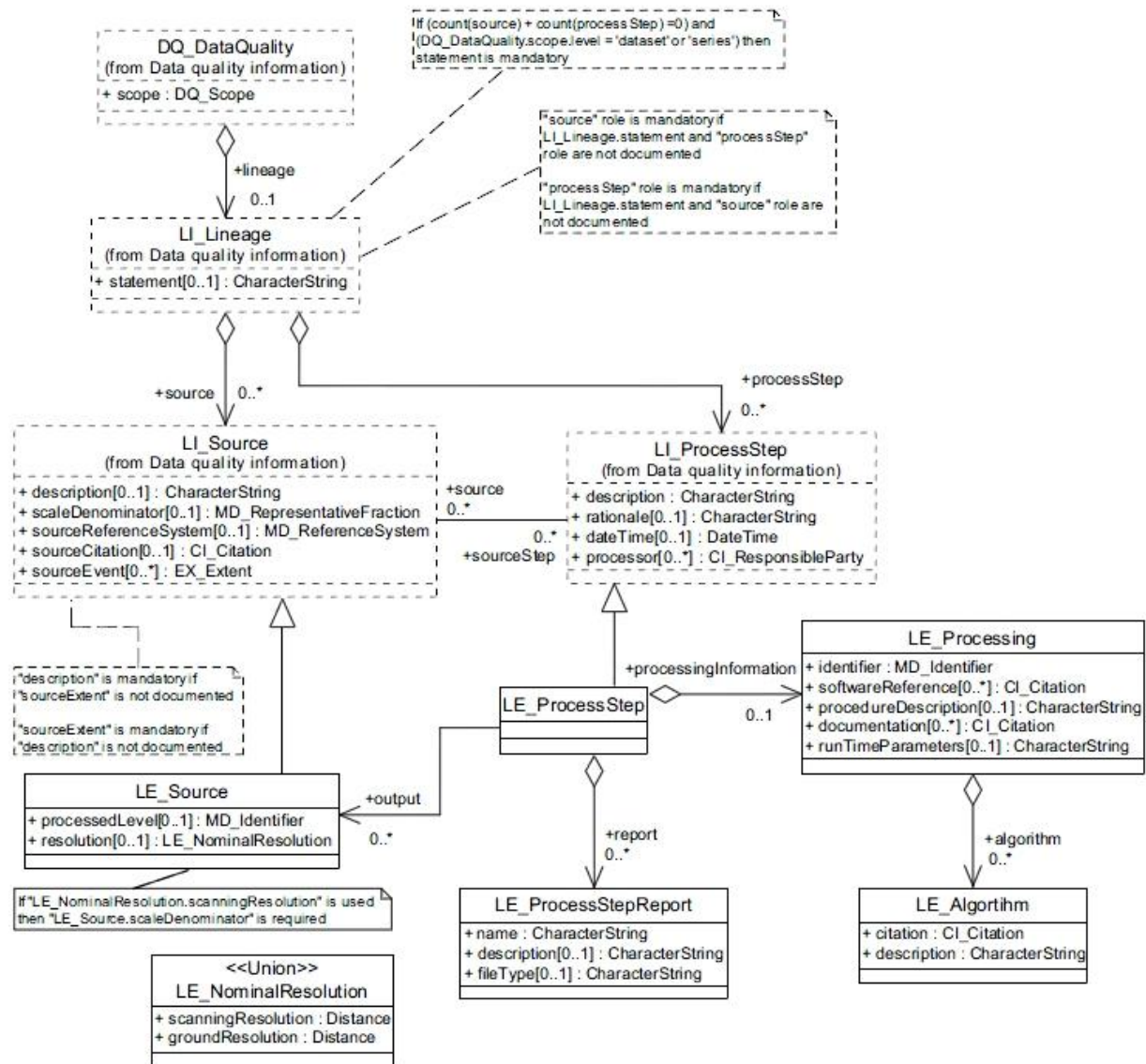


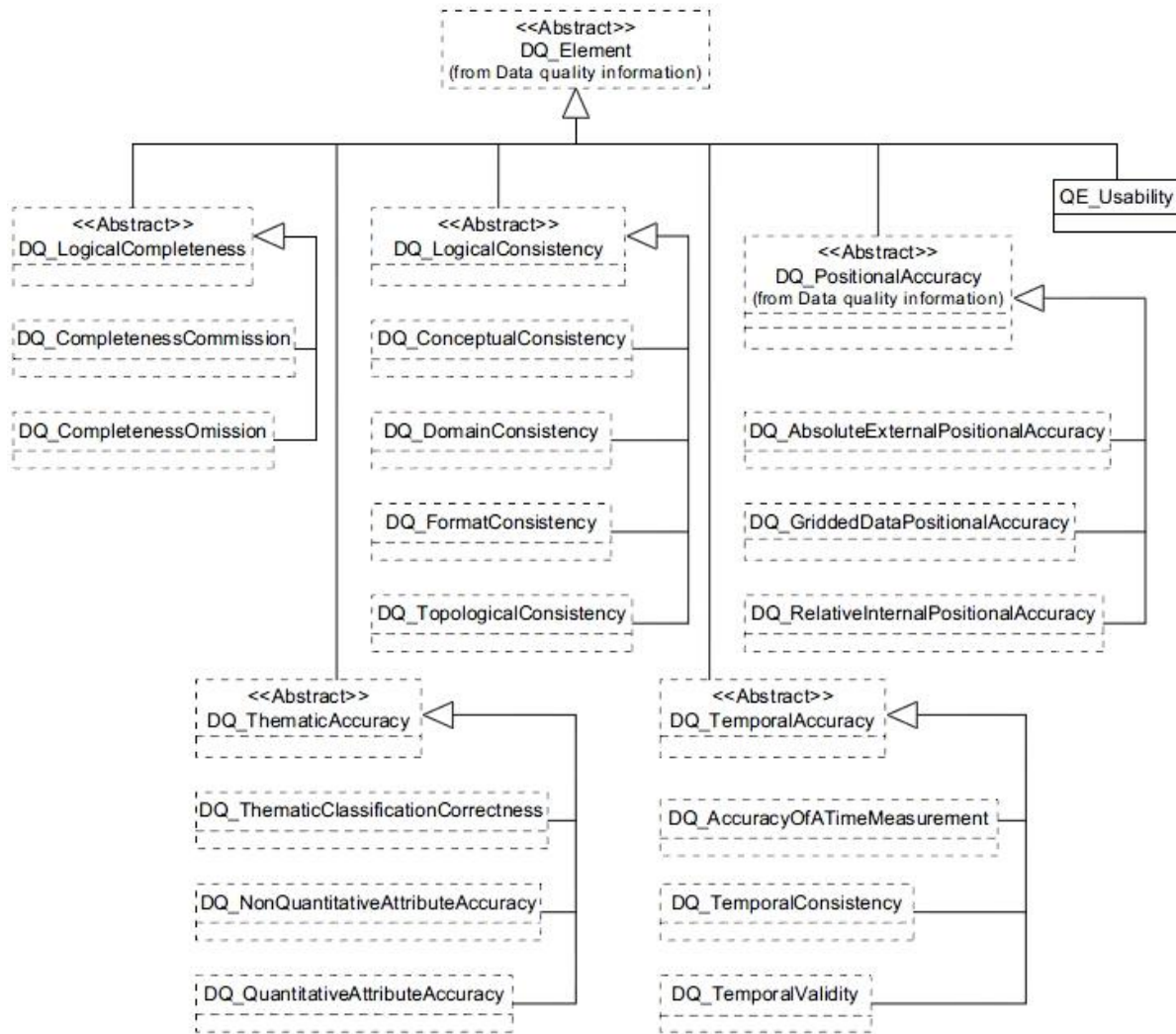
## E.9 Distribution UML



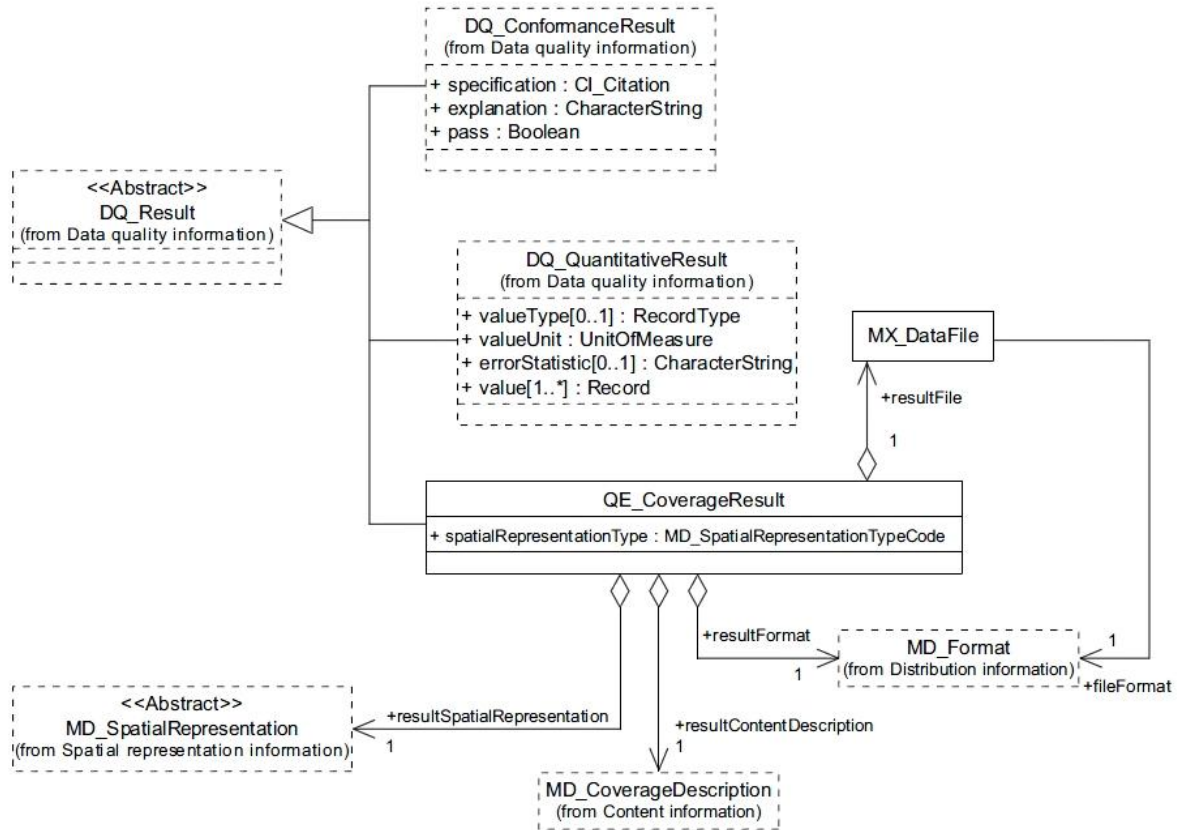
## E.10 Data Quality UML



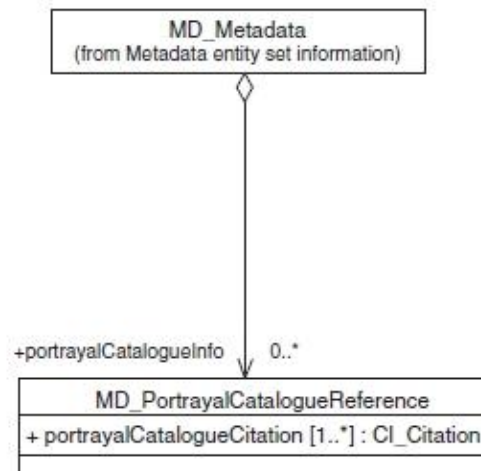




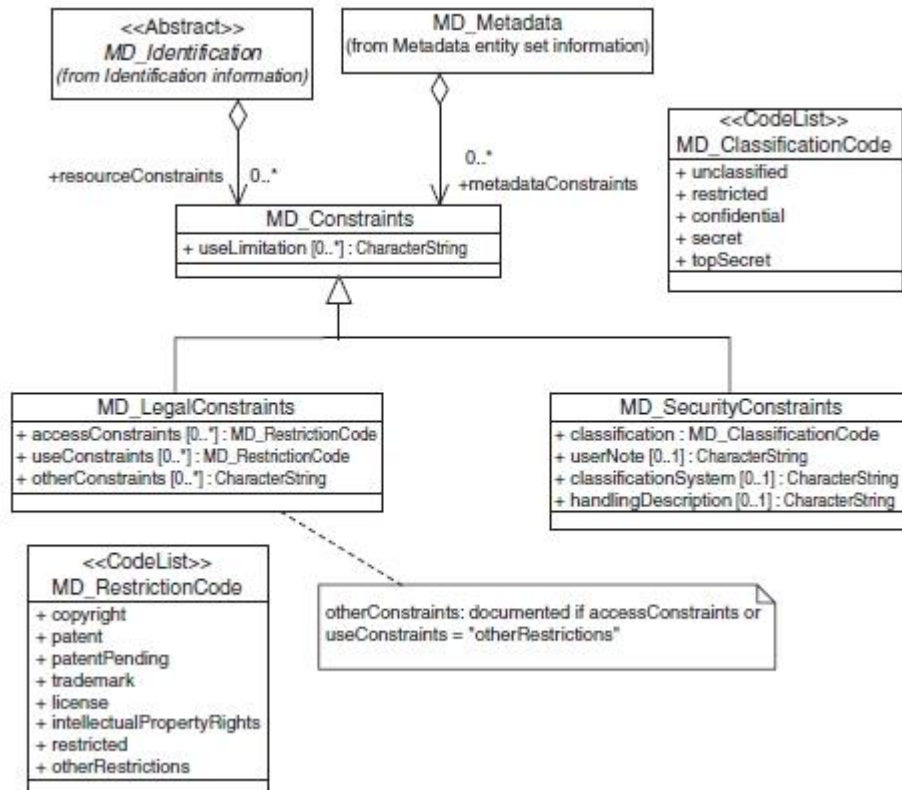




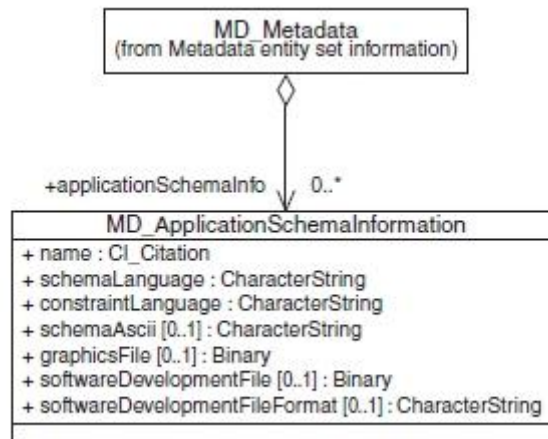
## E.11 Portrayal Catalogue UML



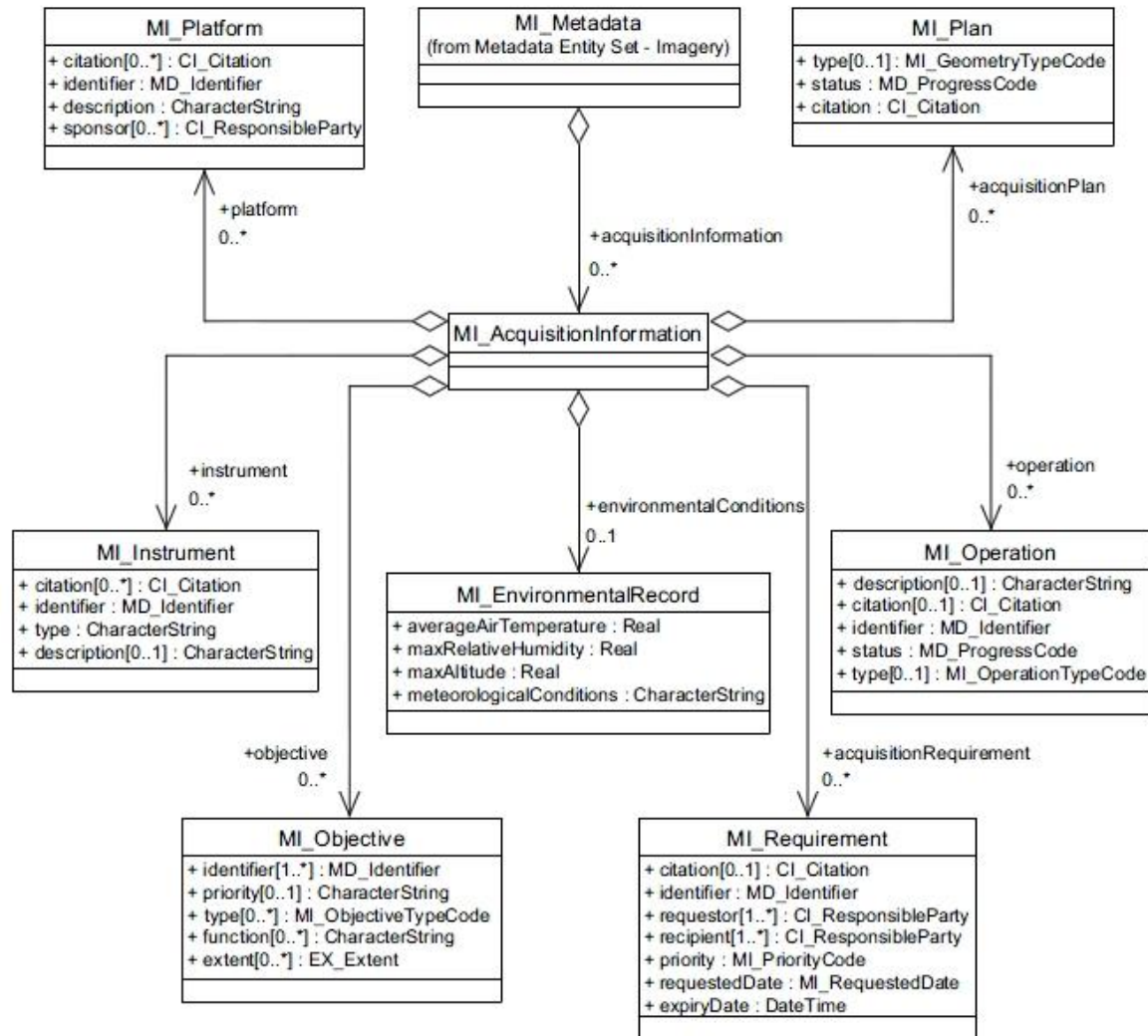
## E.12 Constraint UML



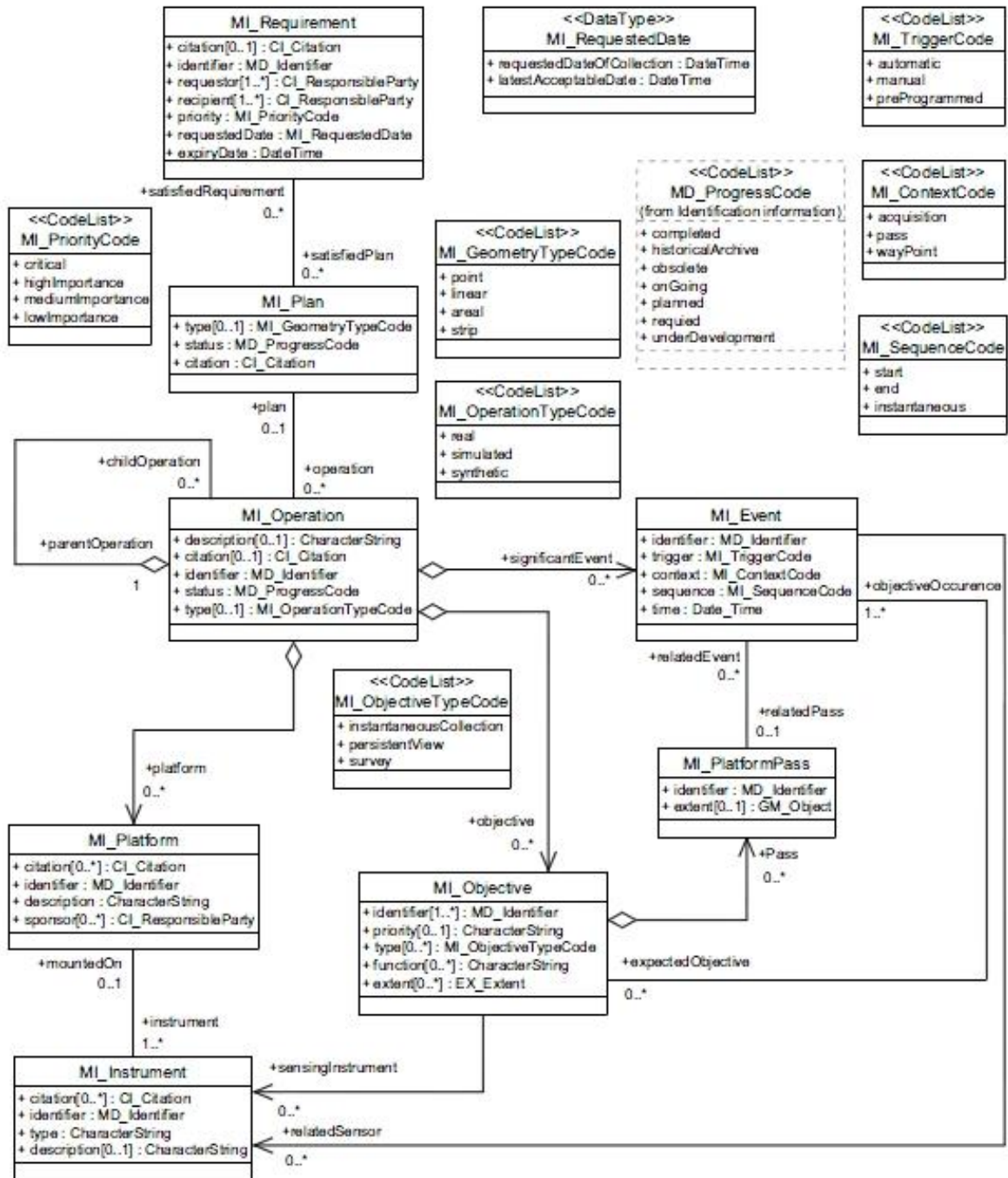
## E.13 Application Schema UML



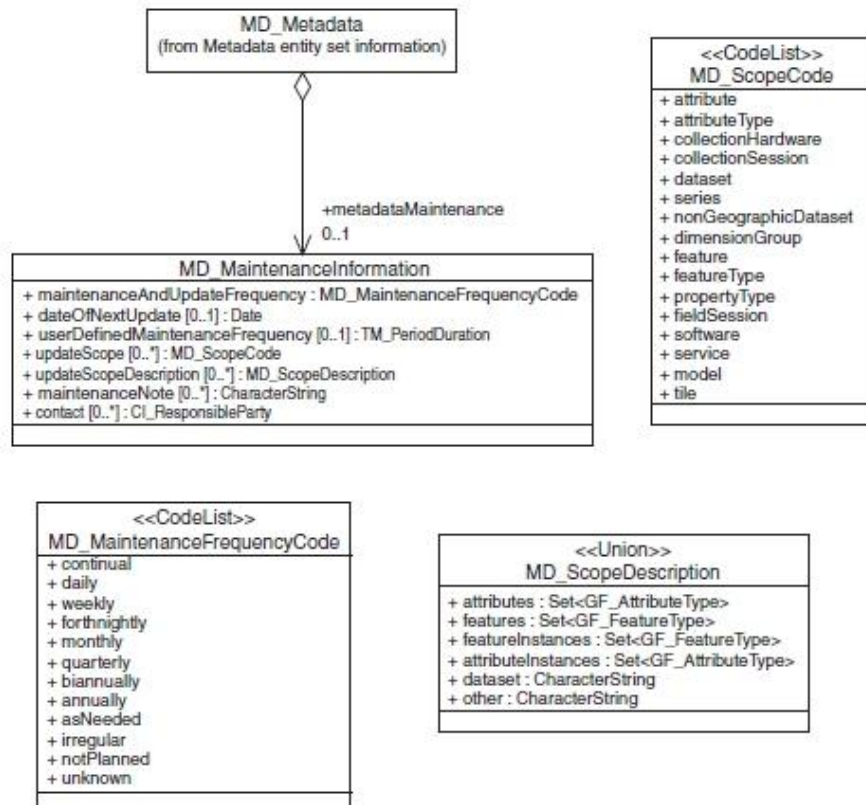
## E.14 Acquisition UML



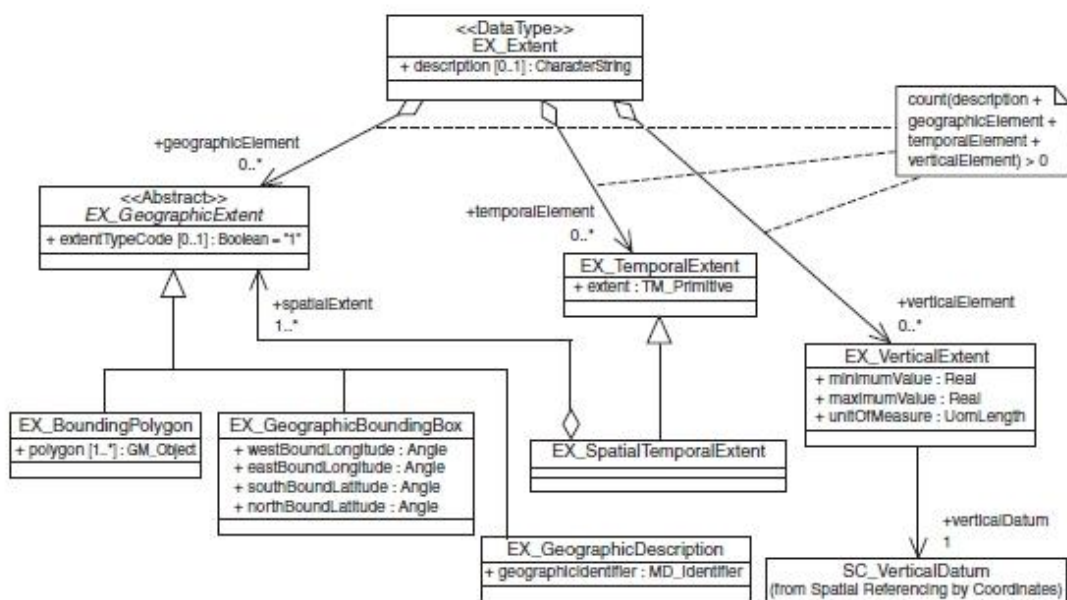




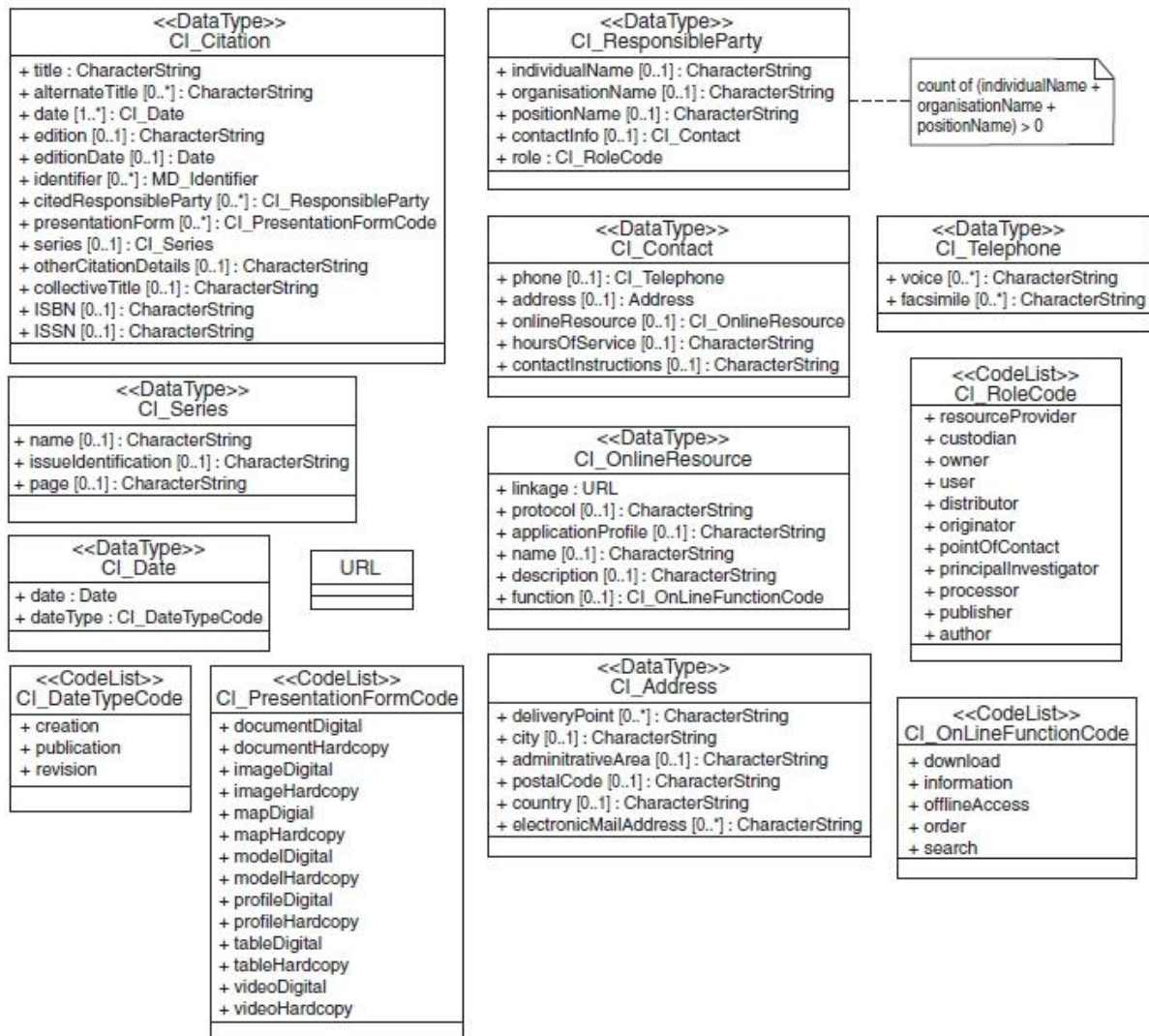
## E.15 Maintenance UML



## E.16 Extent UML



## E.17 Citation UML



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