
ICSM ISO19115-1 Metadata for Services Best Practices

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This document was compiled by OpenWork Ltd (OWL) on behalf of and with guidance and contributions from the ICSM Metadata Working Group (MDWG). The purpose of this document is to capture the consensus best practice guidance for the use of recommended ISO 19115-1 metadata elements for organisations in the Australia / New Zealand region when documenting geospatial service. Further, this guide will aid the migration from the retired ANZLIC Metadata Profile of ISO 19115:2003 to the currently endorsed ISO 19115-1:2014 (including Amd.1:2018).

This guidance is a point in time best practice guide and will be updated as requirement and capabilities evolve. This will be done in a structure version fashion. It is anticipated that new versions of this guidance will be released annually as a PDF document. Incremental changes, managed by the MDWG Technical group in biweekly meetings, will be versioned in a GitHub repository and reflected in the web pages view of this document.



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Introduction

Metadata is often defined as “Data about resources” - in this case, data about spatial service resources. This best practice guide represents a consensus about creating metadata for spatial services in Australia and New Zealand.

It may be useful to think of this metadata standard, ISO 19115-1, as a language - a vocabulary and a grammar - that even a machine can understand. We select from this language the words and structures we need to communicate what we need to about a spatial resource. Because it is highly structured, we can compare combine and contrast this with other similarly structured data. As with any language there exists dialects. Think of this as a guide to the Australian and New Zealand dialect of ISO 19115-1.

An external best practice pattern to which we should endeavour to adhere is the web built on linkages. These linkages are expressed as unique identifiers known as URLs or Resolvable URIs. Where identifiers exist, they should resolve to a location on the web. Two basic questions for us to keep in mind when creating metadata become, “Can I create an identifier and linkage to unambiguously describe this aspect of my resource?” and “To what should these identifiers resolve?” The answers depend on the situation. If we can answer the first question in the affirmative, then this strengthens the authority of our metadata and makes it easier to maintain - similar to normalising a database and providing a known one point of truth. In the second question, this often prompts the question of, “should this identifier link me to the resource or the metadata for that resource?” If it is for the resource, what should the endpoint of that link be?

Linking to documents vs data.

The web is called the web because it is built on linking documents. This ability should be used whenever possible. But linking human-readable documents like web pages and PDFs is different than linking to data and service resources. To what we link becomes much more nuanced. Do we really want to link to a spatial data resource that may be over a terabyte in size or a file, the contents of which is binary data that our browser knows not what to do with? Unless specifically told otherwise, web users expect links to deliver human-readable documents.

Consider the Audience

What do I need to say about this resource so that people understand what it is and how it may fit their needs?

What needs to be said and documented may vary by the audience to whom you are speaking. Keep your primary audience in mind. Usually, the audience is best thought of as those who are most likely to make use of your spatial service. These may likely be people in your same or similar domain. These are your high-value users. Make sure you support their needs.

Let the question, “what does my audience need to know about this spatial resource?” guide your selection of elements which to populate. This question should also be used to guide how one populates these elements. However, in such a structured language, most elements except abstract, purpose and a few others, the contents of particular metadata elements is less of an issue.

Do not forget that there are other unknown potential users of your service. Let software create simplified versions of what you are saying present this to the general audience as much as feasible. CSW will automatically create a simplified Dublin Core version of your metadata for a more general audience.

Finally, keep in mind that the most important audience may be yourself or your organisation. Write metadata that is useful to you when you find this service and need to use and fix it 5 or 10 years later or need to hand it off to a colleague.

ICSM Specific Recommendations for Service Metadata

When creating metadata for services, most of the data resource metadata best practice guidance applies. But there are notable differences. Most of these differences are contained in the *IdentificationInfo* section

New elements specific to Service Metadata are highlighted in **Bold**

Elements with specific guidance for Services are in ***Bold Italic***

- **Metadata for Metadata**
 - Metadata for Metadata
 - Metadata Identifier *Mandatory*.
 - Metadata Linkage *Highly Recommended*.
 - Metadata Date *Highly Recommended*.
 - Metadata Responsible Party *Mandatory*.
 - Metadata Default Locale *Highly Recommended*.
 - Metadata Legal Constraints *Recommended*.
 - Metadata Security Constraints *Recommended*.
 - Metadata Standard *Highly Recommended*.
 - ***MetadataScope*** *Mandatory*. For Service metadata, Resource Scope = *Service*
- **General Identification Metadata Applicable to Services**
 - Metadata for Resources
 - Abstract *Mandatory*.
 - Purpose *Highly Recommended*.
 - Status *Highly Recommended*.
 - Topic Category *Highly Recommended*.
 - Spatial resolution *Highly Recommended*.
 - Resource Point of Contact role = 'pointOfContact' *Highly Recommended*.
 - Additional Docs *Recommended*. If any
 - Spatial Representation Type *Recommended*.
 - **Service Citation** Sub-elements:
 - Title *Mandatory*.
 - Identifier (uri) *Highly Recommended*.
 - Date (creation) *Highly Recommended*.
 - Date (revision) *Highly Recommended*. If applicable
 - Date (issued) *Highly Recommended*.
 - Edition *Recommended*. If applicable
 - Series *Recommended*. If applicable
 - Cited Responsible party (author, creator, contributor, publisher) *Highly Recommended*.
 - ***OnlineResource*** Should provide the landing page for the service
- **Service Specific Metadata in Service Identification**
 - **serviceType** *Mandatory*. Plus at least one of:
 - **serviceTypeVersion**
 - **profile** CI_Citation
 - **serviceStandard** CI_Citation

- **couplingType** *Highly Recommended*. Options = `tight`, `loose`, `mixed`
- **coupledResource** *Highly Recommended* when *CouplingType* is `tight`. Includes:
 - `ScopedName` - *Mandatory*
 - `ResourceReference` - includes:
 - `Title` - *Mandatory*
 - `OnlineResource` - *Highly Recommended*. Metadata URL for related data
 - **ContainsOperations** class - `SV_ContainsOperation` Contains:
 - `operationName` *Mandatory*
 - `distributedComputingPlatform` codelist - `DCPLList`, *Mandatory*
 - `operationDescription` *Highly Recommended*
 - `connectPoint` class - `CI_OnlineResource` *Mandatory*
 - **parameter** class - `SV_Parameter`
 - `name` *Mandatory*
 - `direction` *Mandatory*
 - `description` *Recommended*
 - `optionality` *Mandatory*
 - `repeatability` *Mandatory*
- **Other Metadata Packages**
 - `AssociatedResource` class - `MD_AssociatedResource`
 - `BrowseGraphic` Class - `MD_BrowseGraphic` - Perhaps a logo for the service or organisation
 - **Keywords** *Mandatory*. Package - `MD_Keywords` including:
 - **Service Keywords** *Mandatory*. for service metadata
 - `ABS Field of Research`
 - Other keywords
 - `Maintenance` Package - `MD_MaintenanceInformation`
 - `Frequency of update` - of the service
 - `scope for maintenance`
 - `Resource Constraints` Consider what “Service Constraints” guidance is needed e.g.:
 - `Use Limitations`
 - `Legal and Reference for Legal`
 - `Security and Reference for Security`
 - `Releasability`
 - `Other Constraints`
 - `Extents` Package - `EX_Extent`
 - `GeoExtent` class - `EX_GeographicExtent`
 - `geographic description`
 - `bounding box`
 - `vertical extent` class - `EX_VerticalExtent`
 - `temporal extent` class - `EX_TemporalExtent`
 - `ReferenceSystemInfo` Package - `MD_ReferenceSystem`
 - **Distribution Information** Package - `MD_Distribution` - Option for service endpoint location
 - `Format` - What the Online resource provides e.g. API, Webmap
 - `Distributor` - could contain information about who hosts the service

- Online Resource - *Highly Recommended* when using *distributionInfo* for a service. The URL of the service

Outstanding Issues

Some issues remain unresolved and without clear consensus in the MDWG. Most of these are element specific and are discussed under those individual elements. But some are broader.

How to Best Capture Link to Service Resource Core to any metadata record is access to the described resource. The ISO 19115-1 standard provides somewhat different advice for data and services resources about how to best capture linkage to the resource described by a metadata record (as opposed to linkages to the metadata). There are several options where service linkage may be expressed in an ISO19115-1 metadata record. The MDWG has not agreed to a consistent approach. Inside the resource citation package, the `identifier` and `onlineResource` may both provide this functionality. The package `DistributionInfo` is, of course, a common way to capture such information - particularly for data resources, but is perhaps a less logical place when describing service resources. For service resources, `ContainsOperations` is another common location for resource access information. Further discussion and guidance are needed to resolve this issue to support machine readability and reduce confusion.

Link to Tightly Coupled Data There are numerous ways the related data resource may be captured in a service metadata record (e.g. `operatesOn`, `operatedDataset`, or even a sibling `MD_DataIdentification` package). The choice of `coupledResource` is made for the following reasons. ISO 19115-1 recommends `coupledResource` as minimum metadata required for the discovery of service resources. The options `operatesOn`, `SV_CoupledResource.resource` and a sibling `identificationInfo/MD_DataIdentification` all require a `MD_Identifier` package. This would create metadata records that identify more than one resource. ICSM guidance is that such a situation be avoided as it could confuse other catalogues that expect a one-to-one relationship between metadata resources and resources. It has been resolved that it will be best practice to use `CoupledResource>ResourceReference>onlineResource>Linkage` to hold linkage to metadata for tightly coupled resources.

Metadata required for the discovery of service resources

As described in ISO 19115-1 Table F.2

The guidance produced here is meant to be a flexible resource. The element discussions are stored as separate files in a git repository and as such can be incorporated into web documents as needed for a particular purpose. They also may be cloned or forked from the GitHub repository at <https://github.com/icsm-au/metadata-working-group> and modified for a particular communities purpose.

Below is an example of how one might use a particular collection of best practice guidance documents to support a particular purpose. In this case, is a list of elements as described in ISO 19115-1 Table F.2 of the minimum metadata required for the discovery of service resources

Element	Class
Metadata reference information:	(MD_Metadata.metadataIdentifier)
Service title:	(MD_Metadata.identificationInfo>SV_ServiceIdentification.citation>CI_Citation.title)
Reference date:	(MD_Metadata.identificationInfo>SV_ServiceIdentification.citation>CI_Citation.date)
Resource identifier:	(MD_Metadata.identificationInfo>SV_ServiceIdentification.citation>CI_Citation.identifier >MD_Identifier)
Responsible party:	(MD_Metadata.identificationInfo>SV_ServiceIdentification.pointOfContact>CI_Responsibility)
Geographic location:	(MD_Metadata.identificationInfo>SV_ServiceIdentification.extent>EX_Extent.geographicElement>EX_GeographicExtent>EX_GeographicBoundingBox –or- EX_GeographicDescription)
Service topic category:	(MD_Metadata.identificationInfo>SV_ServiceIdentification.topicCategory>MD_TopicCategoryCode)
Resource abstract:	(MD_Metadata.identificationInfo>SV_ServiceIdentification.abstract)
On-line Link:	(MD_Metadata.identificationInfo>SV_ServiceIdentification.citation>CI_Citation.onlineResource>CI_OnlineResource)
Keywords:	(MD_Metadata.identificationInfo>SV_ServiceIdentification>MD_Keywords)
Constraints on access and use:	(MD_Metadata>SV_ServiceIdentification>MD_Constraints.useLimitations and/or MD_LegalConstraints and or MD_SecurityConstraints)
Metadata date stamp:	(MD_Metadata.dateInfo)
Metadata point of contact:	(MD_Metadata.contact>CI_Responsibility)
Resource type:	(MD_Metadata.metadataScope>MD_Scope.resourceScope)
Coupled Resource:	(MD_Metadata>SV_ServiceIdentification.coupledResource>SV-CoupledResource)
Coupled resource type:	(MD_Metadata>SV_ServiceIdentification.couplingType>SV-CouplingType)

class - MD_Metadata

In order to create consistent structured metadata to describe spatial resources, we need a schema to provide a structure and a class to hold it. MD_Metadata provides this for ISO19115-1.

- **Governance** - ISO
- **Metadata Type** - structural
- **ICSM Level of Agreement** - ★★

Definition

Root entity which defines metadata about a resource or resources

Child packages

ICSM recommended

- **resourceLineage** - (class - *Li_Lineage*) [0..*]
- **referenceSystemInfo** - (class - *MD_ReferenceSystem*)
- **metadataConstraints** - (abstract class *MD_Constraints*) [0..*] see
 - **Metadata Security Constraints**
 - **Metadata Legal Constraints**
- **indentificationInfo** - (abstract class - *MD_Identification*) [1..*] see:
- **Data Identification** - (class *MD_DataIdentification*) > ?create Entry?
- **Service Identification** - (class *SV_ServiceIdentification*) > To Be Completed
- **distributionInfo** - (class - *MD_Distribution*) [0..*]

Other packages - not yet addressed by MDWG

- **metadataMaintenance** - (class *MD_MaintenanceInformation*) [0..1]
- **spatialRepresentationInfo** - (abstract class - *MD_SpatialRepresentation*) [0..*]
- **metadataExtensionInfo** - (class - *MD_MetadataExtensionInformation*) [0..*]
- **applicationSchemaInfo** - (class - *MD_ApplicationSchemaInformation*) [0..*]
- **portrayalCatalogInfo** - (class - *MD_ProtrayalCatalogueReference*) [0..*]
- **contentInfo** - (abstract class - *MD_ContentInformation*) [0..*]
- **dataQualityInfo** - (class - *DQ_DataQuality* (from ISO19157)) [0..*]

Attributes

MDWG Recomendated Attributes -

- **metadataIdentifier** - (class - *MD_Identifier*) [0..1]
- **dateInfo** - (class - *CI_Date*) [1..*]
- **contact** - (class - *CI_Responsibility*) [0..1]
- **defaultLocale** - (class - *PT_Locale*)[0..1]
- **metadataLinkage** - (class - *CI_OnlineResource*)[0..*]
- **parentMetadata** - (class - *CI_Citation* [0..1]

- **metadataScope** - (*class - MD_MetadataScope*)[0..*]
- **metadataStandard** - (*class - CI_Citation*) [0..*] AS/NZS ISO 19115-3 > recommended but not yet detailed by MDWG
- **metadataProfile** - (*class - CI_Citation*) [0..*] > recommended but not yet detailed by MDWG

Other attributes - not yet addressed by MDWG

- **otherLocale** - (*class - PT_Locale*)[0..*]
- **alternativeMetadataReference** - (*class - CI_Citation*) [0..*]

Discussion

The MD_Metadata package defines the schema for describing the complete metadata about a resource and metadata about the metadata itself. It is composed through an aggregate of 12 additional metadata classes as shown above. The MD_Metadata class also contains attributes providing information about the metadata record itself. Those recommended attributes are covered in other sections as cited above

Recommendations

Therefore - It is recommended that all spatial metadata utilise the structure provided by the ISO19115-1 MD_Metadata class and follow the guidance provided. While ISO 19115-1 allows for such a metadata to describe more than one spatial resource, in order to reduce confusion and ease the integration with other metadata systems, it is recommended that each metadata record describes one and only one resource and that each resource have one metadata record of class MD_Metadata.

UML diagrams

Recommended elements highlighted in Yellow

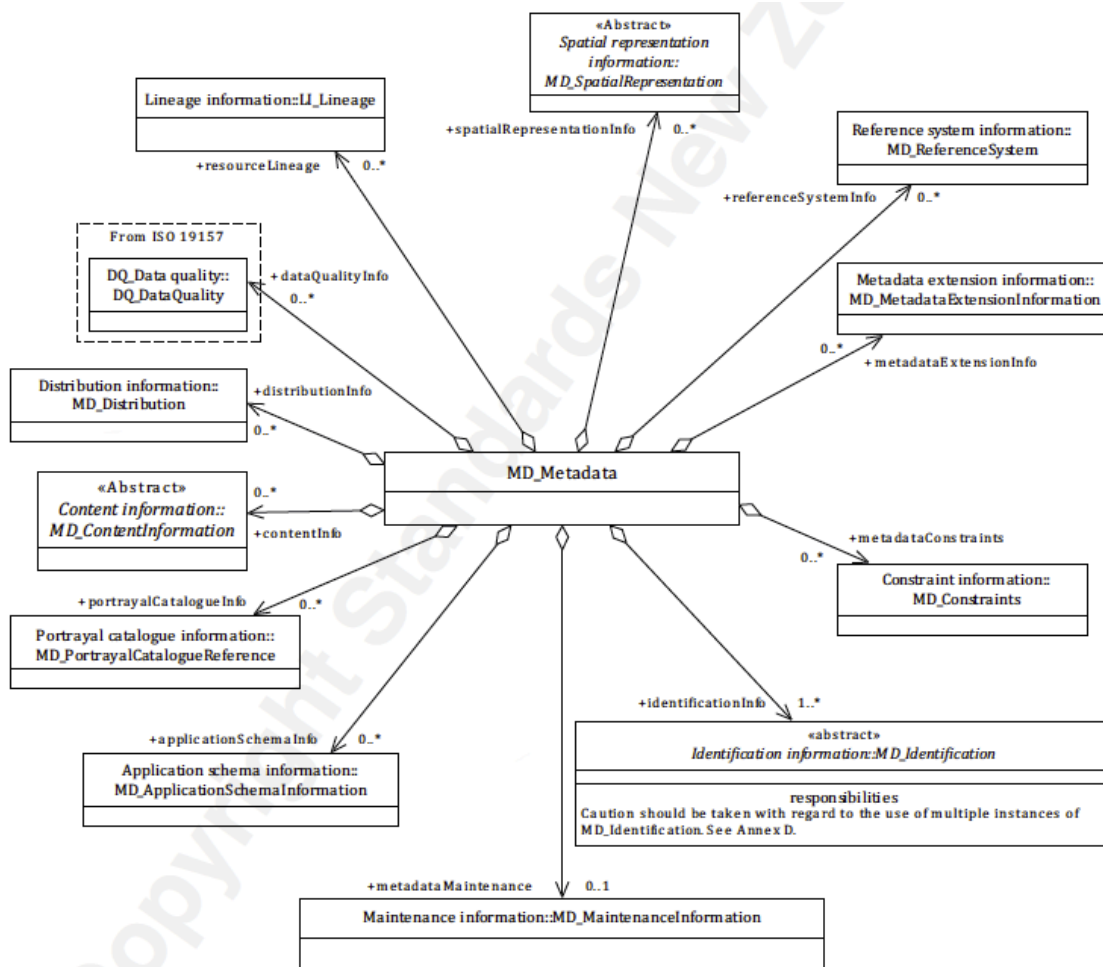


Figure 1: MD_Metadata.png

Metadata Identifier ★★★★★

In order for machines and people to distinguish a metadata record from all others a Metadata record MD_Metadata needs a unique identifier.

Element Name	<i>metadataIdentifier</i>
Parent	<i>MD_Metadata</i>
Class/Type	<i>MD_Identification</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Linkage, Identification</i>
Audience	machine resource - ★ ★ ★ general - ★ resource manager - ★ ★ ★ specialist - ★ ★
Metadata type	<i>administrative</i>
ICSM Level of Agreement	★ ★ ★ ★

Definition

The persistent unique alphanumeric identifier for the metadata record that describes a spatial resource.

ISO Obligation

- There should be zero or one [0..1] metadataIdentifier for the cited resource in the *MD_Metadata* package of class *MD_Identifier*.

ICSM Good Practice

- This element should be populated in all metadata records

Discussion

Every metadata record needs a unique identifier so as to provide certainty as to the identity of the record and to provide a primary key for linkages. This element should hold UUID, preferably in the form of a resolvable URI (either standalone or in combination with another element e.g. <mcc:codespace>). This provides the machine-readable (and human) ability to determine if this is the same or different to other metadata records. It is useful in machine to machine activities such as metadata harvesting. It is also at times useful to data managers and others to determine if a record is the same as another.

This identifier must never change, irrespective of where that metadata record is stored. This allows linkages to a metadata record to persist.

The equivalent of this field was recommended as mandatory in the previous ANZLIC Standard. Common practice is to record a UUID in this field.

ICSM Recommendations

Therefore - It is Highly Recommended that every metadata record should have one and only one metadata identifier (MD_Metadata > mdb:metadataIdentifier > MD_Identifier). The child element <mcc:code> should contain the persistent uuid for the metadata record. While the child element <mcc:codespace> should contain the reference URL path by which, when combined with the uuid, this metadata record can be retrieved. It is beneficial to populate other sibling elements as needed such as <mcc:authority> to indicated the authority that minted the uuid.

ICSM Recommended Sub-Elements

From class *MD_Identifier*

- **code** - (*type* - *charStr*) [1..1] a UUID, mandatory when identifier is provided
- **codespace** - (*type* - *charStr*) [0..1] ideally a URL path by which, when combined with the uuid, the full metadata can be retrieved.
- **authority** - (*class* - *CI_Citation*) [0..1] optional, the provider of the UUID

Also Consider

- **Resource Identifier** - provides unique identifier to the resource. This may be the same as the metadata identifier when the metadata resource in a catalogue serves as the landing page for a resource.
- **Metadata Linkage** - is most often used to provide a point of truth linkage (landing page) to the metadata record.
- **CI_Citation (Authority)** - Information authority responsible for minting the UUID, be it the software package or other mechanism, may be captured in the Authority subelement using the CI_Citation package general guidance.
- **MD_Identifier** General Guidance for the package used to hold the metadata identifier information. This package can be used to provide identity to a large number of other metadata elements.

Outstanding Issues

CORE ISSUE: In ISO the identifier for the Metadata can differ from that of the data. This is not necessarily the case in other metadata standards such as Dublin Core or DCAT.

Resolvable URIs Of note - the ISO conceptual reference model for ISO 19115-1 available at <https://www.isotc211.org/hmmg/HTML/ConceptualModels/EARoot/EA1/EA12/EA2/EA4095.htm>. This includes a description that differs slightly from previous description - “Unique Identifier and onlineResource for this metadata record” In many ways it would be preferable if this field were populated with a URI that ultimately resolved to a point of truth for the metadata record. Some issues remain in software that incorrectly prohibit characters needed by URIs. The nested tag that actually holds the UUID character string is mcc:code. This is noted in the UML for this element: “NOTE: avoid characters that are not legal in URLs”. This would suggest that URIs of type URL are to be allowed. While I would not currently recommend URIs in this field, due to software limitations, it is a practice that would likely be encouraged in the future when linked data is more prevalent. A recommended solution is to populate codespace with the path by which, when combined with the

uuid, the metadata can be retrieved. In practice metadataLinkage (Link) often contains the online linkage (to the point of truth metadata record).

Geonetwork usage By default GeoNetwork calculates a unique value for the subelement *code* and populates the *codespace* element with “urn::uuid”. These fields are not editable once generated.

Other Discussion

DCAT Notes DCAT 2 makes several recommendations about the use of identifiers. From the specification’s Dereferenceable identifiers section:

- “DCAT primarily relies on persistent HTTP URIs as an effective way of making identifiers actionable. Notably, quite a few identifier schemes can be encoded as dereferenceable HTTP URIs, and some of them are also returning machine-readable metadata (e.g., DOIs and ORCIDs).”
- The CrossRef and DataCite display guidelines recommend displaying DOIs as full URL link in the form <https://doi.org/10.xxxx/xxxxx/>.
- “...data providers still might need to refer to legacy identifiers, non-HTTP dereferenceable identifiers, locally minted or third-party-provided identifiers.”

DCAT 2 suggests some ways of improving non-HTTP dereferenceable identifiers:

- “Proxy dereferenceable URIs can be used when resources have not HTTP dereferenceable IDs. For example <https://example.org/proxyid> is a proxy for id.”
- DCAT uses `adms:schemaAgency` and `dct:creator` to represent the authority that defines the identifier scheme (e.g., the DOI foundation in the example), `adms:schemaAgency` is used when the authority has no URI associated.

The concept captured by DCAT 2 using `adms:schemaAgency` or `dct:creator` is the **authority** in this specification.

From data.gov.au The fileIdentifier for a metadata record must never change, irrespective of where that metadata record is stored. Should be system generated. In CKANs case the UUID is common to dataset and metadata record, and takes the UUID with it across new systems. Automatically generated unique ID. Decided against DOI as unique ID already generated in CKAN. DOI records created in ANDS can be leveraged for those who want them given data.gov.au metadata to be harvested by ANDS.

Crosswalk considerations

ISO19139

In iso19115-1 Data type `CI_ResponsibleParty` (iso19115:2004) changed to type `CI_Responsibility` such as in `MD_Metadata.contact`, `MD_DataIdentification.pointOfContact`, or `CI_Citation.citedResponsibleParty`

Dublin core / CKAN / data.gov.au

Maps to metadata URI

DCAT

Maps to `dct:identifier` or `adms:identifier`. From DCAT 2: “The property `adms:identifier` can express other locally minted identifiers or external identifiers, like DOI, ELI, arXiv for creative works and ORCID, VIAF, ISNI for actors such as authors and publishers, as long as the identifiers are globally unique and stable.” and “`adms:schemaAgency` is used when the authority has no URI associated.”

RIF-CS

Maps to Key Identifier

Examples

Other

data.govt.au <http://data.gov.au/dataset/559708e5-480e-4f94-8429-c49571e82761>

XML

```
<mdb:MD_Metadata>
....
  <mdb:metadataIdentifier>
    <mcc:MD_Identifier>
      <mcc:code>
        <gco:CharacterString>
          314eb989-3771-4c24-a399-d22631973279
        </gco:CharacterString>
      </mcc:code>
      <mcc:codeSpace>
        <gco:CharacterString>
          https://geodata.nz/geonetwork/srv/metadata/
        </gco:CharacterString>
      </mcc:codeSpace>
    </mcc:MD_Identifier>
  </mdb:metadataIdentifier>
....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

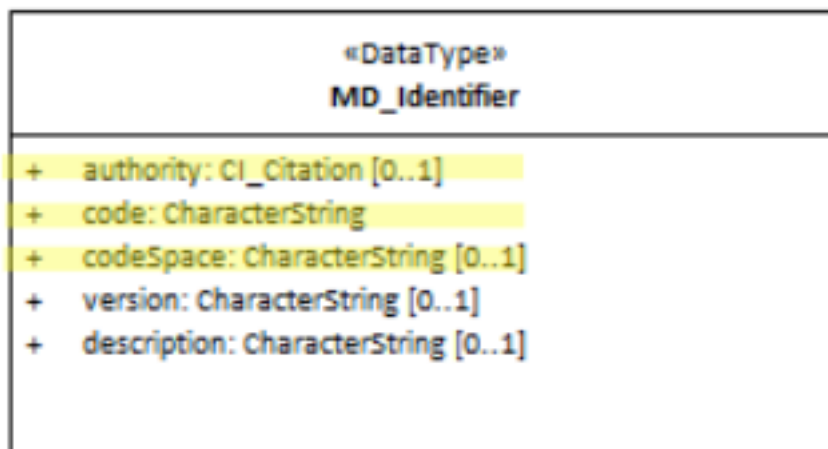


Figure 2: MDIdentifier

Metadata Linkage ★★★★★

Metadata records generally live in federated systems where metadata are harvested from catalogue to catalogue or collected from remote sources by other means. This can lead to confusion since through the harvesting and collection processes, different versions of the same metadata may co-exist. It is useful that a metadata record contains a link to the source metadata so that a point of truth version can be determined.

Element Name	<i>metadataLinkage</i>
Parent	<i>MD_Metadata</i>
Class/Type	<i>CI_OnlineResource</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Linkage, Identification</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>administrative</i>
ICSM Level of Agreement	★ ★ ★ ★

Definition

Allows unambiguous specification of the online location where the metadata is available.

ISO Obligation

- There should be zero to many [0..*] *metadataLinkage* elements for the cited resource in the *MD_Metadata* package of class *CI_OnlineResource* in a metadata record.

Discussion

The most common use of *metadataLinkage* is to record a “point of truth” location of the source authoritative metadata record. It is in the nature of metadata to be highly distributed. This is commonly done through federated systems that harvest (or otherwise collect) metadata from other sources. Sometimes this process gets out of sync. Sometimes the metadata is modified in the process. In order to retain an authoritative understanding of a metadata record, it is useful to provide a linkage to the source as a reference.

Alternatively, *metadataLiunkage* may be used to record the location of the metadata in its current catalogue. The *Description* field should be used to indicate if this differs from other instances of the metadata record that may reside elsewhere. However, if alternate versions are not in ISO19115 format, such locations should be captured in *alternativeMetadataReference*.

The use of this field to hold the local of the metadata record in the local catalogue could be better accomplished through the options provided in *metadataIdentifier*.

ICSM Recommendations

Therefore - there should be a “point of truth” url to a metadata record provided under `metadataLinkage`. Alternatively, this could be the full path to this metadata record. There may be multiple endpoints containing copies of this metadata record, one captured with the description of “Point of Truth URL for this metadata record” is recommended. All `metadataLinkage` elements should have a function code of “Complete Metadata”.

As for multiple locations for the same metadata, it is useful to look at `MD_Metadata/alternativeMetadataReference`. This allows pointers to metadata for the same resource that may be in multiple schemas. (ISO def - “reference to alternative metadata, e.g Dublin Core, FGDC, or metadata in a non-ISO standard for the same resource”) Of course, this does not suggest that it be used for different versions of the metadata in the same standard, but perhaps at least different profiles?

Recommended Sub-Elements

Follow the general guidance for class - `CI_OnlineResource` with the following additional guidance:

- **description** - (*type - charStr*) [0..1] when `metadataLinkage` is used as a “point of truth” location of the authoritative metadata, use this field to indicate this.
- **function** - (*codelist - CI_OnlineFunctionCode*) [0..1] This should be populated with the value “completeMetadata”.

Also Consider

- **onlineResource** - (`MD_Distribution.transferOptions>MD_DigitalTransferOptions.online`) is used to provide online lineage to the resource.
- **MetadataIdentifier** - is the preferred element to be used to provide linkage to the metadata record.
- **alternativeMetadataReference** - (*class - CI_Citation*)[0..*] *Page 37 - ISO 19115.1:2015* - reference to alternative metadata, e.g Dublin Core, FGDC, or metadata in a non-ISO standard for the same resource
- **class - CI_OnlineResource** - provides a standardised way of collecting links to online resources

Outstanding Issues

Point of Truth Issue: The use of a standardised term for “point of truth” has been suggested. While this could be applied to the `description` element it could be placed elsewhere such as an expanded `CI_OnlineFunctionCode` codelist

Crosswalk considerations

ISO19139

As this is a new element to allow unambiguous specification of the online location where the metadata is available, there are no reliable elements to crosswalk.

Dublin core / CKAN / data.gov.au

In Dublin Core, the identifier element is described as holding a reference to the resource (not the metadata). However, in the case of metadata records harvested by a higher level CKAN like catalogue, we view the complete

metadata record as the resource. It is also a standard practice that the DC Identifier field to be resolvable. For a Dublin core metadata harvested via CSW from an ISO 19115-1 record, it is important that that record links to something that can be dereferenced. That something is held in the identifier field and should be the location URL/URI for the metadata. IF the ISO 19115-1 identifier element is only an unresolvable UUID, the metadataLinkage element may be a better choice to populate the DC Identifier field.

DCAT

May map to `dct:identifier` if `metadataIdentifier` is unresolvable

RIF-CS

May map to Key Identifier if `metadataIdentifier` is unresolvable

Examples

XML

```
<mdb:MD_Metadata>
....
<mdb:metadataLinkage>
  <cit:CI_OnlineResource>
    <cit:linkage>
      <gco:CharacterString>
        http://geodata.nz/geonetwork/srv/eng/metadata/
        314eb989-3771-4c24-a399-d22631973279
      </gco:CharacterString>
    </cit:linkage>
    <cit:description>
      <gco:CharacterString>Point of truth URL of this metadata record
      </gco:CharacterString>
    </cit:description>
    <cit:function>
      <cit:CI_OnLineFunctionCode
        codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat
        /codelists.xml#CI_OnLineFunctionCode" codeListValue="completeMetadata"/>
      </cit:function>
    </cit:CI_OnlineResource>
  </mdb:metadataLinkage>
....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

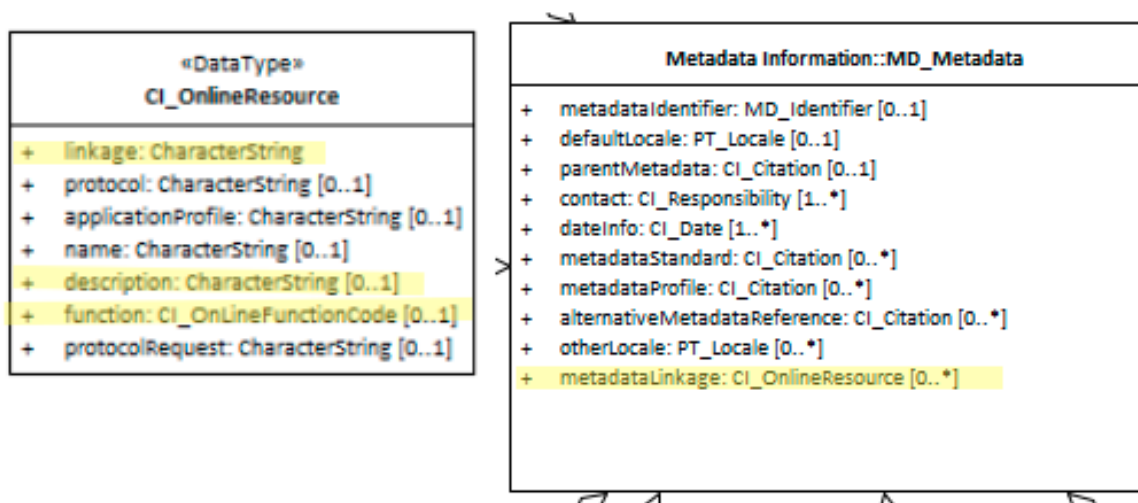


Figure 3: MDLinkage

Metadata Date Info ★★★★★

In order to manage metadata and harvesting mechanism as giving updates to users it is useful to include in our metadata temporal information relating to metadata creation, publication, revision, etc.

Element Name	<i>dateInfo</i>
Parent	<i>MD_Metadata</i>
Class/Type	<i>CI_Date</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Discovery, Data Management</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ ★ ★ specialist - ★ ★ ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

A named and dated event associated with the metadata record. (In ISO 8601 format).

ISO Obligation

- There can be one to many [1..*] *dateInfo* entries for the cited resource in the *MD_Metadata* package of class *CI_Date* in a metadata record. One of these must be of *dateType creation*.

Discussion

According to ISO guidance, there must be at least one instance of *dateInfo* in a metadata record (creation), but there may be multiple.

The *CI_DateType* CodeList contains 16 values. Which values are of most import needs further discussion.

The ability to crosswalk easily with CKAN and DCAT is of high concern. These external catalogues commonly have a single date field. Which *dateType* we map to this field is of interest in discussions regarding the recommended *dateTypes* used.

Relation of Metadata *dateInfo* to Resource reference date needs to be discussed. The Resource reference date (*MD_Metadata.identificationInfo > MD_DataIdentification.citation > CI_Citation.date*) is documented as the date that should be used for discovery of resources other than services. (For services *MD_Metadata.identificationInfo > SV_ServiceIdentification.citation > CI_Citation.date* is used.)

When does the metadata *dateInfo* require updating? For instance, is it okay to not update the metadata *dateInfo* when the Resource reference date is updated if nothing else has changed? Our good practice guide should address these and related issues.

ICSM Recommendations

Therefore - In order to provide an idea of the age, validity and other time dependant properties of a metadata record, it is important to capture the important events that happened or will happen to a particular metadata record in the MD_Metadata.dateInfo element. One of these important events must be of dateType “creation”. This is often referred to as a “Metadata date stamp”.

This element should be updated in a consistent yet to be agreed upon manner. We recommend GeoNetwork’s current approach. GeoNetwork updates the **revision date** for the metadata record automatically on every save. This supports systems such as notifications and harvesting regimes that rely on the capture of the date that a metadata record was last modified.

Recommended Sub-Elements

Follow the general guidance for class - CI_Date with the following additional guidance:

- **date** - (Mandatory) the reference DateTime for the metadata record.
- **dateType** - One entry must be of this value *creation*.
- **dateType** - (Mandatory for Revision when a revision is made) the event type to which the date refers. Populated from the CI_DateTypeCode codelist.

Also Consider

- **Resource Date** - Dates associated with the resource
- **CI_Date** - the class by which dates are expressed

Other Discussion

Date and DateTime: When is it okay to use Date as opposed to DateTime?

DCAT: encoded using the relevant ISO 8601 Date and Time compliant string [DATETIME] and typed using the appropriate XML Schema datatype [XMLSCHEMA11-2]

Crosswalk considerations

ISO19139

The element dateStamp was replaced with dateInfo to allow other types of metadata date information to be recorded in addition to the creation date. The type and cardinality of this element were changed in order to allow associating more than one type of date with a metadata record.

Dublin core / CKAN / data.gov.au

Maps to publish and update date

DCAT

Maps to dct:issued and dct:modified

RIF-CS

Maps to @dateAccessioned

Examples

XML -

```
<mdb:MD_Metadata>
. . . .
<mdb:dateInfo>
  <cit:CI_Date>
    <cit:date>
      <gco:DateTime>2019-05-30T15:30:05</gco:DateTime>
    </cit:date>
    <cit:dateType>
      <cit:CI_DateTypeCode
        codeList="https://schemas.isotc211.org/19115/resources/Codelist
          /cat/codelists.xml#CI_DateTypeCode"
        codeListValue="revision"/>
      </cit:dateType>
    </cit:CI_Date>
  </mdb:dateInfo>
  <mdb:dateInfo>
    <cit:CI_Date>
      <cit:date>
        <gco:DateTime>2005-03-31T19:13:30</gco:DateTime>
      </cit:date>
      <cit:dateType>
        <cit:CI_DateTypeCode codeList="codeListLocation#CI_DateTypeCode"
          codeListValue="creation">creation</cit:CI_DateTypeCode>
        </cit:dateType>
      </cit:CI_Date>
    </mdb:dateInfo>
  . . . .
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

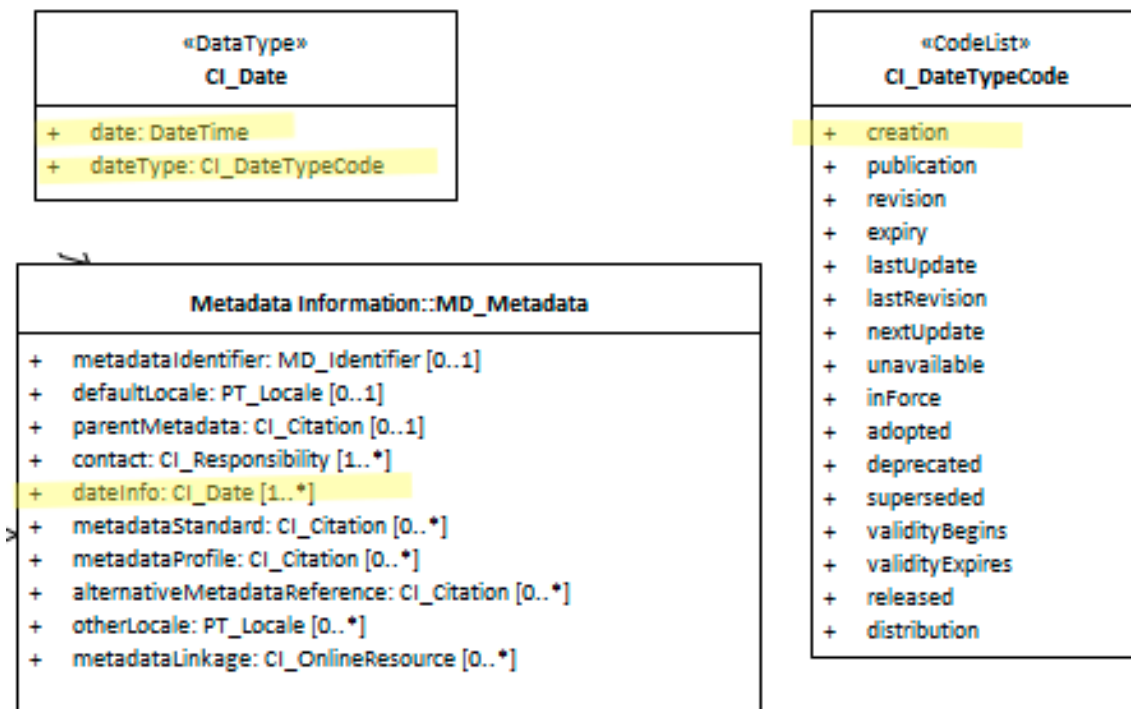


Figure 4: dateInfo

Metadata Responsible Party ★★★★★

A contact for the person responsible for a metadata record is useful to current and future users and managers of the resource and catalogue.

Element Name	<i>contact</i>
Parent	<i>MD_Metadata</i>
Class/Type	<i>CI_Responsibility</i>
Governance	<i>Common ICSM, Agency</i>
Purpose	<i>Discovery, Data Management, Communications</i>
Audience	machine resource - ★ ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>administrative</i>
ICSM Level of Agreement	★ ★ ★ ★

Definition

Name and contact information about the organisation, role and individual who is responsible for the metadata record.

ISO Obligation

- There must be one or more [1..*] *contact* packages for the cited resource in the *MD_Metadata* package provided in a metadata record for those responsible for the metadata itself. These will be of class *CI_Responsibility*.

Discussion

This element refers to the party responsible for the metadata record itself and the maintenance of this metadata record. It does not refer to the party responsible for the resource the metadata describes.

This is a compound element of type *CI_ResponsibleParty*. At least one must be present. Recommended role value - "PointOfContact" with attached email; other roles can be added as required

ICSM Recommendations

Therefore - In order to meet ICSM good practice, in all metadata records, at least one contact should be given for the party responsible for the metadata itself. One entry should be role code "Point of Contact". In addition, for minimal conformity, *name* (of organisation preferred), *positionName* and *electronicMailAddress* should also be populated. The use of the new *partyIdentifier* element added in the 2018 amendment to the standard is encouraged by all parties.

Recommended Sub-Elements Follow the general guidelines for CI_Responsibility.

- One value of role should be “Point of Contact”.

Also Consider

- **Resource Point of Contact** Contact information for the recommended party to contact about the resource
- **Resource Cited Responsible Party** contact information for the parties otherwise responsible for aspects of the resource creation and maintenance.
- **DistributionInfo** Includes Distributor contact information.

Crosswalk considerations

ISO19139

See discussion at CI_Responsibility

Dublin core / CKAN / data.gov.au

Maps to contact

DCAT

Maps to dcat:contactPoint

RIF-CS

Maps to Related Party

Examples

XML -

```
<mdb:MD_Metadata>
...
<mdb:contact>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode
        codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat
/codelists.xml#CI_RoleCode"
        codeListValue="pointOfContact"/>
      </cit:role>
    <cit:party>
      <cit:CI_Organisation>
        <cit:name>
          <gco:CharacterString>OpenWork Ltd</gco:CharacterString>
        </cit:name>
      </cit:CI_Organisation>
    </cit:party>
  </cit:CI_Responsibility>
</mdb:contact>
```

```

</cit:name>
<cit:contactInfo>
  <cit:CI_Contact>
    <cit:address>
      <cit:CI_Address>
        <cit:electronicMailAddress>
          <gco:CharacterString>name@email.org</gco:CharacterString>
        </cit:electronicMailAddress>
      </cit:CI_Address>
    </cit:address>
  </cit:CI_Contact>
</cit:contactInfo>
<cit:individual>
  <cit:CI_Individual>
    <cit:name>
      <gco:CharacterString>Metadata Bob</gco:CharacterString>
    </cit:name>
    <cit:positionName gco:nilReason="missing">
      <gco:CharacterString/>
    </cit:positionName>
  </cit:CI_Individual>
</cit:individual>
</cit:CI_Organisation>
</cit:party>
</cit:CI_Responsibility>
</mdb:contact>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

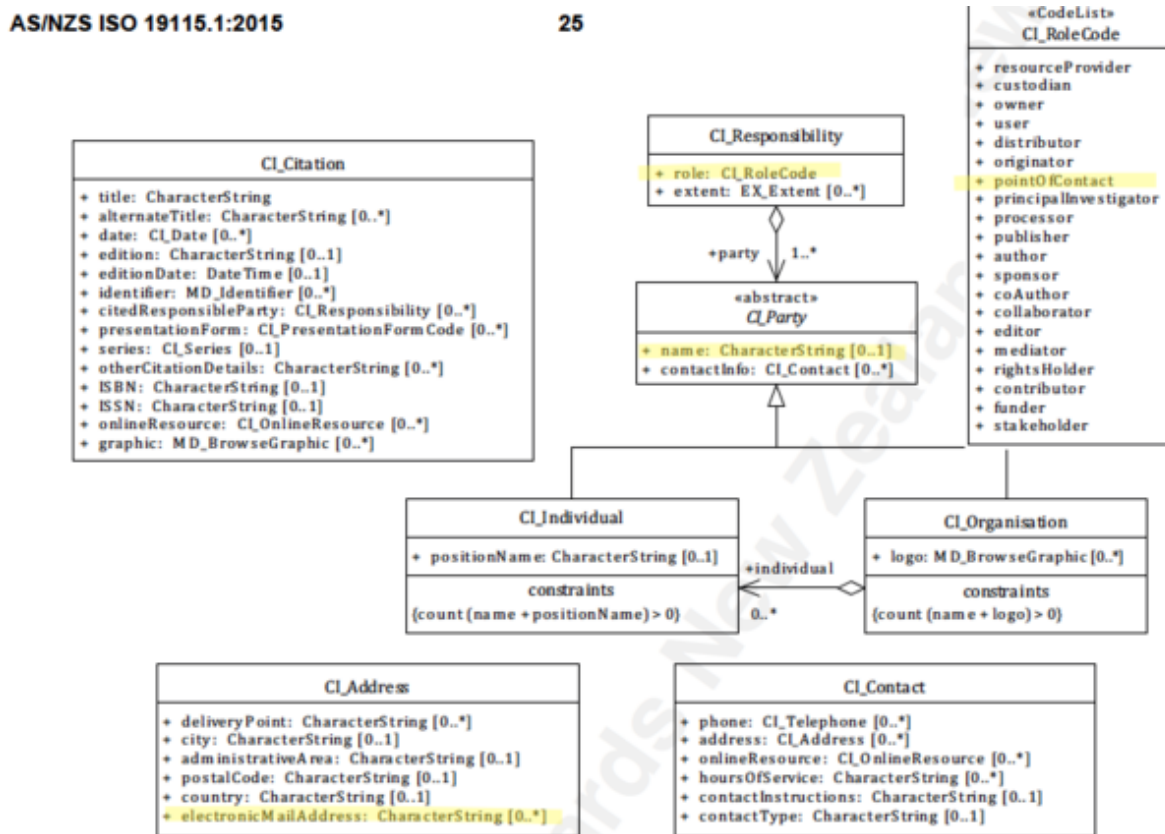


Figure 20 — Citation and responsible party information classes

Figure 5: Responsibility

Metadata Default Locale ★★★★★

Metadata may be captured in different languages in different locations. For users, it is important that the language of the metadata be known. *MD_Metadata.defaultLocale* provide a way to record the primary language of the metadata.

Element Name	<i>defaultLocale</i>
Parent	<i>MD_Metadata</i>
Class/Type	<i>PT_Locale</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Discovery, Data Management</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ ★ ★ specialist - ★ ★ ★ ★ ★
Metadata type	<i>Discovery</i>
ICSM Level of Agreement	★ ★ ★

Definition

Language and character set used for documenting metadata.

ISO Obligation

- There can be one and only one [1..1] *defaultLocale* entries for the cited resource in the *MD_Metadata* package in the metadata record of class *PT_Locale*.

Discussion

There may be only one default locale identified in one metadata record. This element only describes the default language of the metadata. Any language elements used in the described spatial resource may have a different default language and would be captured in the element *MD_Identification.defaultLocale*. The element “otherLocale” can be used to provide information about alternatively used localised character strings.

ICSM Recommendations

Therefore - In order to provide metadata in a consistent manner for the users in our region, it is recommended that English be chosen as the value for language using the ISO 639-2, 3-alphabetic digits code “eng”.

Recommended Sub-Elements

Follow the general guidance for class - *PT_Locale*

Recommended Sibling Elements -

- **otherLocale** - *[class - PT_Locale] [0..*]* when a metadata record has information in additional languages

Also Consider

- **MD_Metadata.otherLocale** - (*codelist - PT_Locale*) [0..*] provides information about alternatively used localised character strings provides information about alternatively used localised character strings
- **MD_DataIdentification.defaultLocale** (*codelist - PT_Locale*) [0..1] contains the language and character set used within the resource, such as map labels or other text.
- **MD_DataIdentification.otherLocale** - (*codelist - PT_Locale*) [0..*] alternate localised language(s) and character set (s) used within the resource

Crosswalk considerations

ISO19139

MD_Metadata/language moved to MD_Metadata/defaultLocale:PT_Locale - Make use of the newly added Language and character set localization package for defining local language and character set.

Dublin core / CKAN / data.gov.au

Maps to language CKAN has one field for language that maps to both Metadata and Resource language fields. ISO 19115 recommends 639-2 3 letter codes. Data.gov.au recommends IETF RFC4646 2 letter codes as primary. See <https://www.loc.gov/standards/iso639-2/faq.html#6> for discussion of the differences

DCAT

Maps to dct.language

RIF-CS

No identified mapping

Examples

XML -

```
<mdb:MD_Metadata>
....
  <mdb:defaultLocale>
    <lan:PT_Locale id="EN">
      <lan:language>
        <lan:LanguageCode
          codeList="http://www.loc.gov/standards/iso639-2/"
          codeListValue="eng"/>
      </lan:language>
      <lan:characterEncoding>
        <lan:MD_CharacterSetCode
          codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat
/codelists.xml#MD_CharacterSetCode" codeListValue="utf8"/>
      </lan:characterEncoding>
    </lan:PT_Locale>
  </mdb:defaultLocale>
</mdb:MD_Metadata>
```



```

    </lan:characterEncoding>
  </lan:PT_Locale>
</mdb:defaultLocale>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

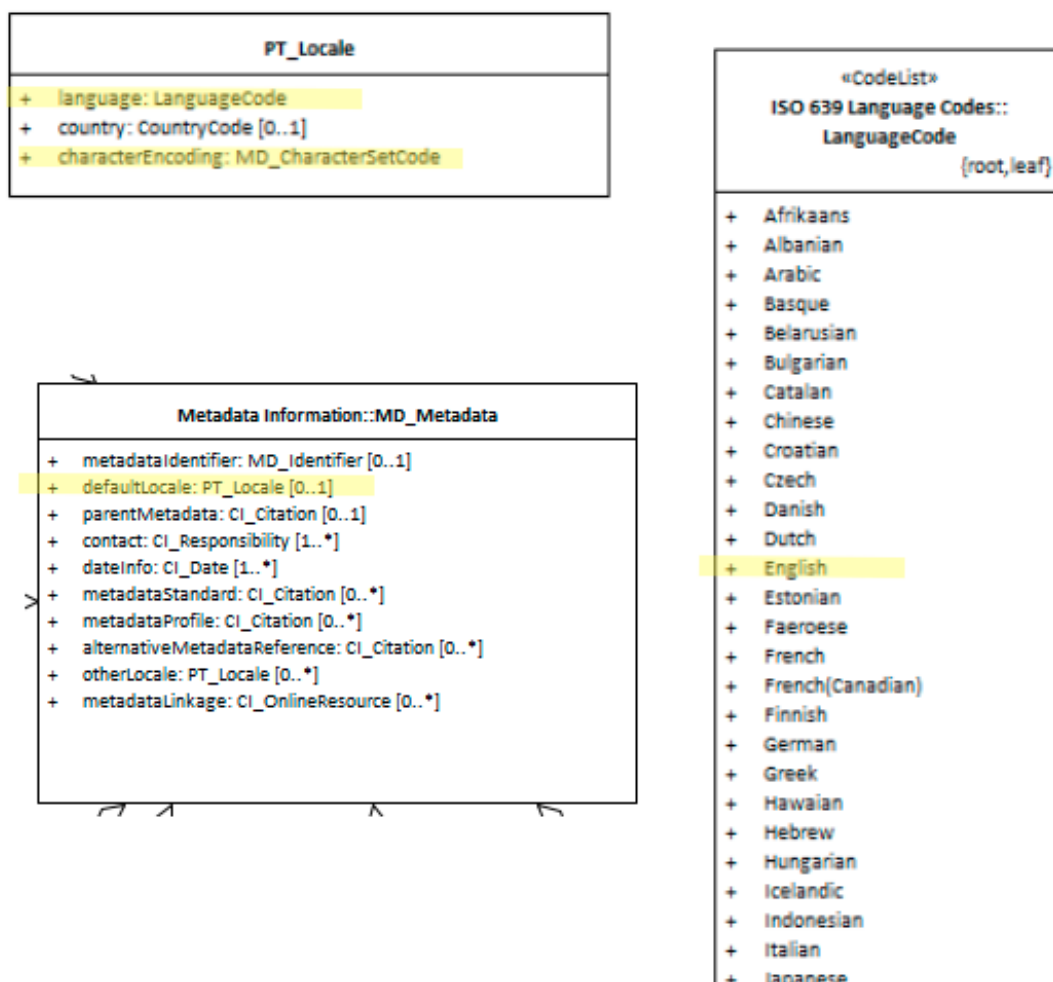


Figure 6: MDdefaultLocale

Metadata Legal Constraints ★★★

The presence (or absence) of legal restrictions such as copyright, on a metadata record is important to document. Potential users need to be informed of rights, restrictions and responsibilities that apply to the use of such metadata.

Element Name	<i>metadataConstraints>MD_LegalConstraints</i>
Parent	<i>MD_Metadata</i>
Class/Type	<i>MD_LegalConstraints</i>
Governance	<i>Agency</i>
Purpose	<i>Resource use</i>
Audience	machine resource - ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>Administrative</i>
IOCSM Level of Agreement	★ ★ ★

Definition

Legal restrictions on the access and use of this metadata record e.g. copyright.

ISO Obligation

- There may be zero to many [0..*] *metadataConstraints* entries for the cited resource in the *MD_Metadata* package of class *MD_LegalConstraints* applied to a metadata record,

Discussion

Information about constraints on the access and use of a resource or its metadata is of high importance to document as this information strongly impacts on the usability of the resource to the user. Constraints may be security (*MD_SecurityConstraints*), legal (*MD_LegalConstraints*) or other (*MD_Constraints*).

A restriction may be applicable to a particular aspect of the resource. In this case capture this scope in *constraintApplicationScope* using a value from *MD_Scope*

Almost all created resources (including metadata) carry some legal rights, restrictions and responsibility regarding their access and use. For instance, in most jurisdictions, copyright is automatically granted to the creator of creative work. Legal restrictions such as licences and end-user agreements need to be documented for users and resource managers along with the identity of the holder of these rights. Each agency needs to develop consistent guidance on the use of such a statement and share a clear understanding of its meaning. This is often done by reference to an external body that manages the definitions of the legal constraints applied.

There is often general confusion over the restraints fields and to what they apply; metadata, resource, distribution, etc. This is a topic needing further discussion and clarification. In ISO 19115-1 two types of constraints are recognised *metadataConstraints* (restrictions on the access and use of metadata) and *resourceConstraints* (information about constraints which apply to the resources). Here we are only addressing constraints on Metadata.

For more discussion on the types of common legal restrictions see Resource Legal Constraints.

ICSM Recommendations

Therefore - The MDWG recommends populating this element `metadataConstraints` with legal constraint information to sufficient level to determine the legal rights, responsibilities and restrictions on a metadata record. It is important to capture any legal constraints that may apply to a metadata record. This should include licences, end-user agreements, etc. If the resource is public domain, this should be cited appropriately. Many jurisdictions encourage the use of open data and Creative Commons license. This should be encouraged through the use of copyright licenses such as CC0 or CC By. Provide the user links to additional information about such constraints, their use and meaning. In addition, document the holder of such rights and how to contact for more information. As legal restrictions such as copyright are tied to the creator of an intellectual resource, make sure that users have access to their information.

Recommended Sub-Elements

Follow the general guidance for `MD_LegalConstraints`.

Also Consider

- **Resource Legal Constraints** contains legal restrictions that apply to the resource cited by the metadata
- **Metadata Security Constraints** A sibling to metadata legal constraints. Contains information regarding any security restriction on the metadata.

Outstanding Issues

Are legal restrictions on metadata useful? Some good legal advice on this would be very helpful! I am having some difficulty understanding the value of capturing legal restrictions on the metadata record itself. To restrict a metadata record in a catalogue largely defeats its purpose and if not open to being freely copied may be contrary to itself. What happens if a restricted metadata record is harvested? By putting a metadata record in a public catalogue are you not effectively negating any restriction on that metadata record? Boiler plate stating the openness of the metadata would be useful.

Note BC 5-7: The issue of automated harvesters gathering metadata that by legal restriction should not (a rare case I would hope) could possibly be addressed by recommending appropriate filters on the harvesters. This would need research.

Crosswalk considerations

ISO19139

See guidance provided in `MD_Constraints`

DCAT

Maps to `dct:rights` as does resource legal constraints. > Note BC 22-7: Does DCAT make a distinction?

RIF-CS

Aggregated into Description 'notes'

Examples

XML -

```
<mdb:MD_Metadata>
....
<mdb:metadataConstraints>
  <mco:MD_LegalConstraints>
    <mco:useLimitation>
      <gco:CharacterString>Public</gco:CharacterString>
    </mco:useLimitation>
    <mco:constraintApplicationScope>
      <mcc:MD_Scope>
        <mcc:level>
          <mcc:MD_ScopeCode
            codeList="https://schemas.isotc211.org/19115/resources/Codelist/
            cat/codelists.xml#MD_ScopeCode"
            codeListValue="metadata"/>
          </mcc:level>
        </mcc:MD_Scope>
      </mco:constraintApplicationScope>
      <mco:reference>
        <cit:CI_Citation>
          <cit:title>
            <gco:CharacterString>Creative Commons 4.0 International Licence
            </gco:CharacterString>
          </cit:title>
          <cit:alternateTitle>
            <gco:CharacterString>CC By</gco:CharacterString>
          </cit:alternateTitle>
          <cit:edition>
            <gco:CharacterString>4.0 International Licence</gco:CharacterString>
          </cit:edition>
          <cit:onlineResource>
            <cit:CI_OnlineResource>
              <cit:linkage>
                <gco:CharacterString>https://creativecommons.org/licenses/by/4.0/
                </gco:CharacterString>
              </cit:linkage>
              <cit:protocol gco:nilReason="missing">
                <gco:CharacterString/>
              </cit:protocol>
            </cit:CI_OnlineResource>
          </cit:onlineResource>
        </cit:CI_Citation>
      </mco:reference>
    </mco:constraintApplicationScope>
  </mco:MD_LegalConstraints>
</mdb:metadataConstraints>
</mdb:MD_Metadata>
```

```

</cit:protocol>
<cit:name gco:nilReason="missing">
  <gco:CharacterString/>
</cit:name>
<cit:description gco:nilReason="missing">
  <gco:CharacterString/>
</cit:description>
<cit:function>
  <cit:CI_OnLineFunctionCode
    codeList="https://schemas.isotc211.org/19115/resources/
    Codelist/cat/codelists.xml#CI_OnLineFunctionCode"
    codeListValue=""/>
  </cit:function>
</cit:CI_OnlineResource>
</cit:onlineResource>
<cit:graphic>
  <mcc:MD_BrowseGraphic>
    <mcc:fileName>
      <gco:CharacterString>cc_icon_white_x2.png</gco:CharacterString>
    </mcc:fileName>
    <mcc:linkage>
      <cit:CI_OnlineResource>
        <cit:linkage>
          <gco:CharacterString>https://creativecommons.org/images/
          deed/cc_icon_white_x2.png</gco:CharacterString>
        </cit:linkage>
        <cit:protocol gco:nilReason="missing">
          <gco:CharacterString/>
        </cit:protocol>
        <cit:name gco:nilReason="missing">
          <gco:CharacterString/>
        </cit:name>
        <cit:description gco:nilReason="missing">
          <gco:CharacterString/>
        </cit:description>
        <cit:function>
          <cit:CI_OnLineFunctionCode
            codeList="https://schemas.isotc211.org/19115/resources/Codelist/
            cat/codelists.xml#CI_OnLineFunctionCode"
            codeListValue=""/>
          </cit:function>
        </cit:CI_OnlineResource>
      </mcc:linkage>
    </mcc:linkage>
  </mcc:MD_BrowseGraphic>
</cit:graphic>

```

```

    </mcc:MD_BrowseGraphic>
  </cit:graphic>
</cit:CI_Citation>
</mco:reference>
<mco:responsibleParty>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode
        codeList="https://schemas.isotc211.org/19115/resources/Codelist/
          cat/codelists.xml#CI_RoleCode"
          codeListValue="owner"/>
    </cit:role>
    <cit:party>
      <cit:CI_Organisation>
        <cit:name>
          <gco:CharacterString>OpenWork Ltd</gco:CharacterString>
        </cit:name>
        <cit:contactInfo>
          <cit:CI_Contact>
            <cit:address>
              <cit:CI_Address>
                <cit:electronicMailAddress>
                  <gco:CharacterString>info@openwork.nz
                </gco:CharacterString>
                </cit:electronicMailAddress>
              </cit:CI_Address>
            </cit:address>
          </cit:CI_Contact>
        </cit:contactInfo>
      </cit:CI_Organisation>
    </cit:party>
  </cit:CI_Responsibility>
</mco:responsibleParty>
<mco:useConstraints>
  <mco:MD_RestrictionCode
    codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat
      /codelists.xml#MD_RestrictionCode" codeListValue="copyright"/>
</mco:useConstraints>
</mco:MD_LegalConstraints>
</mdb:metadataConstraints>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

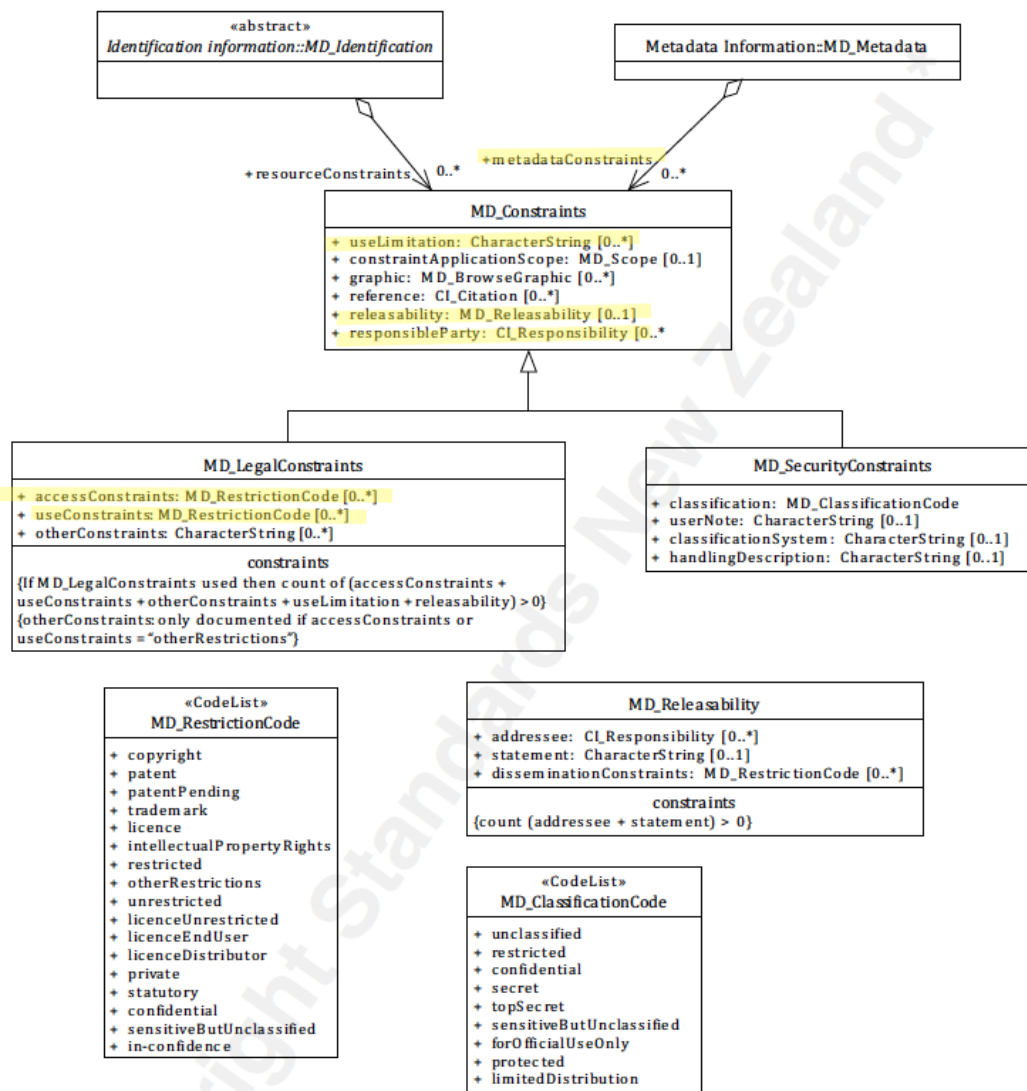


Figure 7: MetdataConstraints_Legal

Metadata Security Constraints ★★

The presence (or absence) of security restrictions on a metadata record may be important to document. Potential users need to be informed of any restrictions and responsibilities that apply to the use of such metadata.

Element Name	<i>metadataConstraints>MD_SecurityConstraints</i>
Parent	<i>MD_Metadata</i>
Class/Type	<i>MD_SecurityConstraints</i>
Governance	<i>National, Agency</i>
Purpose	<i>Resource use</i>
Audience	machine resource - ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>Administrative</i>
ICSM Level of Agreement	★ ★ ★

Definition

Handling restrictions imposed on this metadata record for national security or similar concerns e.g. commercial sensitivity, privacy considerations.

ISO Obligation

- There may be zero to many [0..*] *metadataConstraints* entries for the cited resource in the *MD_Metadata* package of class *MD_SecurityConstraints* applied to a metadata record,

Discussion

This field is about recording any security restrictions on the metadata record itself - not the resource that it documents. Security constraints on metadata records are uncommon. Security is more commonly an issue with the cited resource. Resource security should be captured in Resource Security Constraints. For some agencies, it may be important to capture under security constraints that there are no constraints. Reference for metadata security would include the name (primary and alternate) and version by which this security restriction on the access and use of this metadata record is known.

ICSM Recommendations

Therefore - when needed, it is important to capture any security constraints that apply to a metadata record. Provide the user links to additional information about such constraints, their use and meaning. Include the Name (primary and alternate) and version by which this security restriction on the access and use of this metadata record is known. For example, when using the Australian Protective Security Policy Framework, provide access to materials from this linked website to explain this framework. (<https://www.protectivesecurity.gov.au/Pages/default.aspx>). In addition, document the holder of such rights and how to contact for more information. If your agency has requirements for stating that the metadata has no security constraints, do so in this element.

Recommended Sub-Elements

Follow the general guidance for MD_SecurityConstraints.

Also Consider

- **Resource Security Constraints** contains security restriction information that applies to the resource cited by the metadata
- **Metadata Legal Constraints** A sibling to metadata security constraints. Contains information regarding any legal restriction on the metadata.
- **Protective Security Policy Framework** provides information about the new security policy framework for Australia.

Outstanding Issues

How common are security constraints on metadata? A strong use case need be cited for putting security restraints on metadata to inform readers of this document when it is important.

Other security frameworks support There will be cases where other security frameworks and classification systems need to be cited, such as for New Zealand Defence. Instructions for how to include these are needed. Should such guidance be prescriptive or general?

Crosswalk considerations

RIF-CS

Aggregated into Description 'notes'

Examples

XML - Geoscience Australia

Includes reference to the constraint document - Australia Protective Security Policy Framework

```
<mdb:metadataConstraints
xmlns:gmd="http://standards.iso.org/iso/19115/-3/gmd/1.0"
xmlns:geonet="http://www.fao.org/geonetwork">
  <mco:MD_SecurityConstraints>
    <mco:reference>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>
            The Protective Security Policy Framework
          </gco:CharacterString>
        </cit:title>
        <cit:editionDate>
          <gco:DateTime>2018-11-01T00:00:00</gco:DateTime>
        </cit:editionDate>
      </cit:CI_Citation>
    </mco:reference>
  </mco:MD_SecurityConstraints>
</mdb:metadataConstraints>
```

```

</cit:editionDate>
<cit:onlineResource>
  <cit:CI_OnlineResource>
    <cit:linkage>
      <gco:CharacterString>
        https://www.protectivesecurity.gov.au/Pages/default.aspx
      </gco:CharacterString>
    </cit:linkage>
    <cit:protocol>
      <gco:CharacterString
        xsi:type="gco:CodeType"
        codeSpace="http://pid.geoscience.gov.au/def/schema/ga
          /ISO19115-3-2016/codelist
          /ga_profile_codelists.xml#gapCI_ProtocolTypeCode">
        WWW:LINK-1.0-http--link
      </gco:CharacterString>
    </cit:protocol>
  </cit:CI_OnlineResource>
</cit:onlineResource>
</cit:CI_Citation>
</mco:reference>
<mco:classification>
  <mco:MD_ClassificationCode
    codeList="codeListLocation#MD_ClassificationCode"
    codeListValue="unclassified"/>
</mco:classification>
</mco:MD_SecurityConstraints>
</mdb:metadataConstraints>

```

UML diagrams

Recommended elements highlighted in Yellow

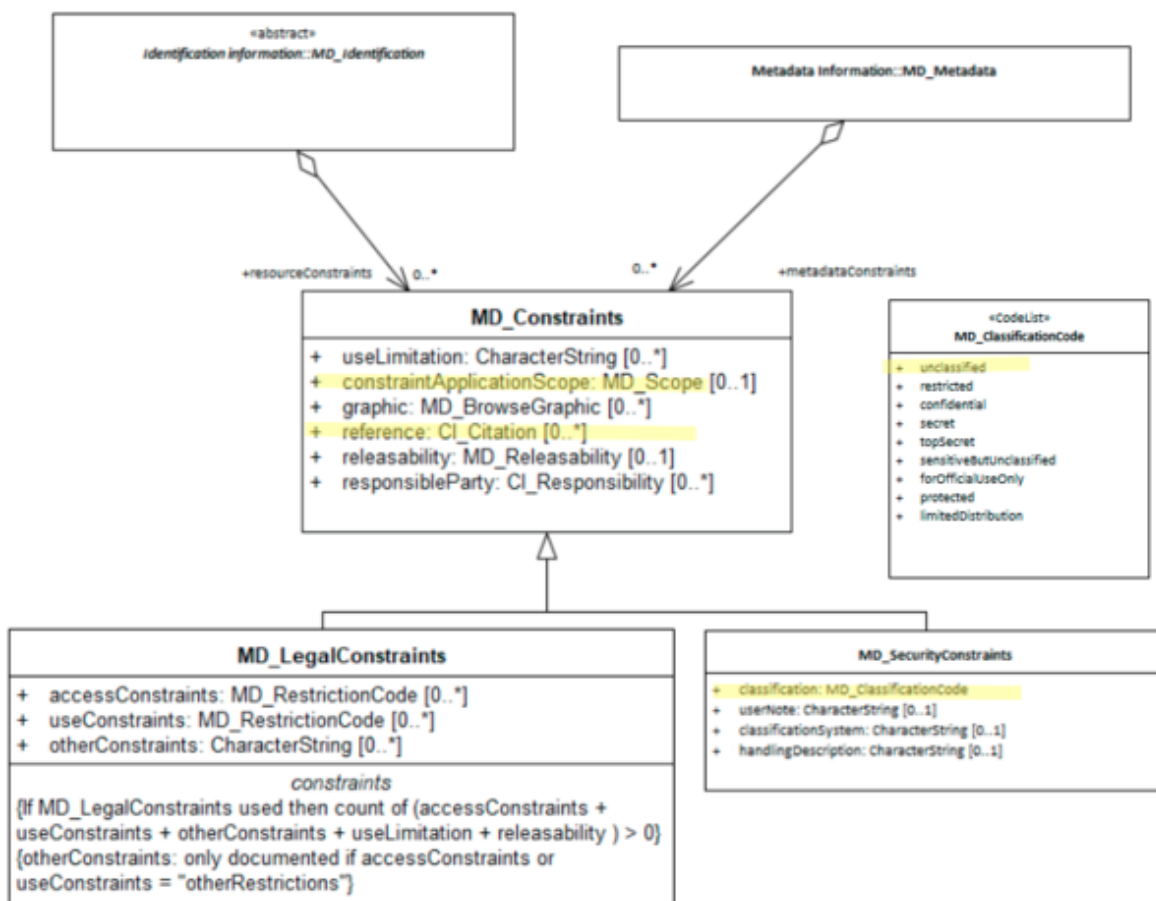


Figure 8: MetadataSecurityConstraints

Metadata Standard ★★★★★

Metadata records are captured to a particular standard. In our case that standard is ISO 19115-1. When exchanging metadata, it is important to know what standard the metadata uses in order to understand what it contains. ||| —
| — || **Element Name** | *serviceTypeVersion* || **Parent** | *MD_Metadata.identificationInfo>SV_ServiceIdentification* |
| **Class/Type** | *CI_Citation* || **Governance** | *Common ICSM* || **Purpose** | *Use* || **Audience** | *machine resource - ★★*
|| *general - ★★★* || *resource manager - ★★★* || *specialist - ★★★* || **Metadata type** | *structural* || **ICSM Level of Agreement** | *★★* |

Definition

The citation for the standard to which the metadata conforms

ISO Requirements

There may be zero to many [1-***] *MetadataStandard* entries cited for a metadata record of class **CI_Citation*. Each Metadata standard citation should include an identifier.

Discussion

Documenting the metadata standard to which the metadata adheres is essential good practice in that this information provides the user ways to find the essential information and guidance about how to read the metadata. This is also essential information for those who may need to map such information to their own systems.

There are options about how to cite the standard used even in the context of this narrow guidance for ISO 19115-1. One could equally cite a compliant profile of this standard used by their organisation or ISO 19115-3, the XML implementation standard for ISO 19115-1. It is very useful if the standard is cited to the year and amendment number (if any). As there are allowed multiple entries for this element, the base standard and any profiles thereof may be captured together.

ICSM Recommendations

Therefore - In order for users to have a better understanding of the metadata they receive, it is highly recommended that the *MetadataStandard* element be populated with at minimum “ISO 19115-1”. The year and amendment information should also be included. Currently, the approved standard and version of this standard in Australia and New Zealand is **AS/NZS ISO 19115.1:2015 (ISO 19115-1:2014 with ISO 19115-1:2014/Amd.1:2018, IDT)**. Any profile information of this standard should be included as a *MetadataProfile* entry.

Recommended Sub-Elements

From class **CI_Citation*:

- **title** - (*type - charStr*)[1..1] Strongly Recommended. Should be stated as AS/NZS ISO 19115.1:2015 with any amendments e.g. Amd. 1:2018
- **alternateTitle** - (*type - charStr*) [0..***] May include here other names by which this standard is known e.g. ISO 19115-3, ISO 19115-1:2014
- **date** - (*class - CI_Date*) [0..***] May include the base year for the standard e.g. 2014

- **edition** - (*type* - *charStr*) [0..1] version of the cited resource e.g. Amd.1:2018
- **editionDate** - (*type* - *DateTime*)[0..1] date of the edition e.g. 2018
- **identifier** - (*class* - *MD_Identifier*) [0..*] value uniquely identifying an object within a namespace
 - **code** - (*type* - *charStr*) [1..1] Strongly Recommended. Should be stated as AS/NZS ISO 19115.1:2015 (ISO 19115-1:2014 with ISO 19115-1:2014/Amd.1:2018, IDT) (TBC)
 - **authority** - (*class* *CI_Citation*) [0..1] the provider of the id AS/NZS
 - **version** - (*type* - *charStr*) [0..1] optional version identifier for the namespace
 - **description** - (*type* - *charStr*) [0..1] optional natural language description of the meaning of the code value

Also Consider

MetadataProfile - A sibling element to *MetadataStandard*. Also of class *CI_Citation*. Use the same guidance provided here to populate any profile information needed.

For Service resource metadata: **ServiceStandard** - to document the standard to which a spatial service conforms

ServiceProfile - to document the profile to which a spatial service may conform

Outstanding Issues

{

CORE ISSUE: ICSM Standardised agreement

There has as yet been little discussion as to what such information a *MetadataStandard* entry should contain. While the guidance here is correct, it has not been verified by a quorum of MDWG members. There may be other valid methods of capturing this information.

Multiplicity Should it be recommended that there be one and only one *MetadataStandard* entry in a metadata record? This could help avoid any unnecessary confusion to recipients of such metadata. Other names for the standard may be able to be captured in the *CI_Citation* elements.

Crosswalk considerations

ISO19139

MD_Metadata/metadataStandardName and **MD_Metadata/metadataStandardVersion** The Standard Name and StandardVersion were combined into a *CI_Citation* in order to allow more precise references to the particular standard being used. The *MD_MetadataStandardName* is replaced by *CI_Citation.title* and *MD_MetadataStandardVersion* is replaced by *CI_Citation.edition*.

Examples

XML -

```
<mdb:MD_Metadata>
...
<mdb:metadataStandard xmlns:gn="http://www.fao.org/geonetwork"
```

```

      xmlns:gmd="http://standards.iso.org/iso/19115/-3/mdb/1.0"
      xmlns:geonet="http://www.fao.org/geonetwork">
    <cit:CI_Citation>
      <cit:title>
        <gco:CharacterString>AU/NZS ISO 19115-1:2014</gco:CharacterString>
      </cit:title>
    </cit:CI_Citation>
  </mdb:metadataStandard>
  <mdb:metadataStandard xmlns:gn="http://www.fao.org/geonetwork"
    xmlns:gmd="http://standards.iso.org/iso/19115/-3/mdb/1.0"
    xmlns:geonet="http://www.fao.org/geonetwork">
    <cit:CI_Citation>
      <cit:title>
        <gco:CharacterString>ISO 19115-1:2014</gco:CharacterString>
      </cit:title>
    </cit:CI_Citation>
  </mdb:metadataStandard>
  <mdb:metadataStandard xmlns:gn="http://www.fao.org/geonetwork"
    xmlns:gmd="http://standards.iso.org/iso/19115/-3/mdb/1.0"
    xmlns:geonet="http://www.fao.org/geonetwork">
    <cit:CI_Citation>
      <cit:title>
        <gco:CharacterString>ISO 19115-3</gco:CharacterString>
      </cit:title>
    </cit:CI_Citation>
  </mdb:metadataStandard>
  <mdb:metadataProfile xmlns:gn="http://www.fao.org/geonetwork"
    xmlns:gmd="http://standards.iso.org/iso/19115/-3/mdb/1.0"
    xmlns:geonet="http://www.fao.org/geonetwork">
    <cit:CI_Citation>
      <cit:title>
        <gco:CharacterString>Geoscience Australia Community Metadata Profile of ISO 19115-1:2014</gco:CharacterString>
      </cit:title>
      <cit:edition>
        <gco:CharacterString>Version 2.0, September 2018</gco:CharacterString>
      </cit:edition>
      <cit:identifier>
        <mcc:MD_Identifier>
          <mcc:code>
            <gco:CharacterString>http://pid.geoscience.gov.au/dataset/ga/122551</gco:CharacterString>
          </mcc:code>
        </mcc:MD_Identifier>
      </cit:identifier>

```

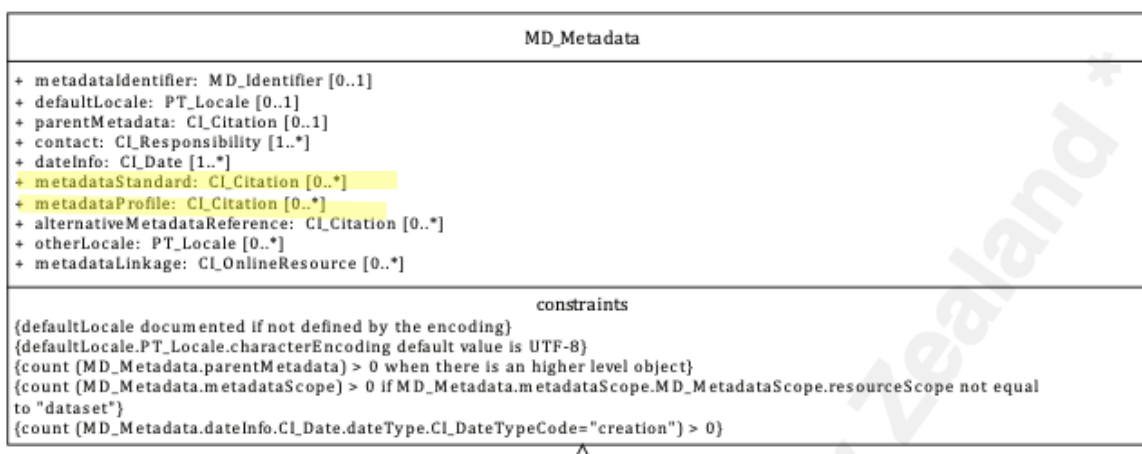
```

    </cit:CI_Citation>
  </mdb:metadataProfile>
  ....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow



Metadata Scope ★★★★★

In order to quickly find, categorise and evaluate the fitness of a resource to our needs it is useful to include in our metadata a high level description of the scope of the resource our metadata is describing.

- **Path** - *MD_Metadata.metadataScope*
- **Governance** - *Common ICSM*
- **Purpose** - *discovery*
- **Audience** -
 - machine resource - ★★★
 - general - ★★★★
 - data manager - ★★★★
 - specialist - ★★★
- **Metadata type** - *descriptive*
- **ICSM Level of Agreement** - ★★★

Definition

A resource code identifying the type of resource, e.g. service, a collection, an application which the metadata describes

ISO Obligation

- There can be zero to many [0..*] *metadataScope* entries for the cited resource in the *MD_Metadata* package of class *MD_MetadataScope* for the metadata record.

ICSM Good Practice

- At least one instance of this element should be populated in all metadata records.

Recommended Sub-Elements

From class - *MD_MetadataScope*

- **resourceScope** - (*codelist - MD_ScopeCode*) [1..1] Mandatory when using *MD_MetadataScope*. Default value “dataset”. See *MD_Scope* for more value options
- **name** - (*type - charStr*) [0..1] description of the scope. Mandatory if *resourceScope* not equal “dataset”

Discussion

MetadataScope contains information that describes the scope of the resource that this metadata record documents. The standard allows multiple scopes per metadata record, but we have no examples to date to illustrate this use. Current thought is that ICSM recommendation would be one and only one entry for *metadataScope*. *MetadataScope* replaces *hierarchyLevel* in the previous version of ISO19115. This was done to avoid ambiguity in cases where multiple scope codes and names are associated with a single record. The word *hierarchy* was dropped from the names because scopes can be used in non-hierarchical structures. This element, like a number of others, are

essentially keywords, albeit of a special type, and are generally treated as such when records are harvested to other non ISO 19115 based catalogues.

Outstanding Issues

Metadata for resources other than datasets: This element definition may warrant revision as we extend our work to cover metadata for services and other resources other than datasets.

ISO Comment: The values in the MD_ScopeCode list are intentionally general and details of their application are left to the data provider. In order to foster interoperability, the usage of the scope codes should be carefully documented in any community of practice. Clause E.5 (ISO 19115.1-2014) outlines possible applications of codes from the MD_ScopeCodeodelist and related codes included in ISO/TS 19139 as part of the MX_ScopeCode list. These examples are meant to provide reasonable starting points and are certainly not exhaustive.

DCAT advice: Typically, the subject will be represented using keywords, key phrases, or classification codes. Recommended best practice is to use a controlled vocabulary.

Recommendations

Therefore - In order to provide top level categorisation of entries in a catalogue, it is recommended that metadataScope be populated. The default value of MD_MetadataScope.resourceScope should be *dataset*. When the value of resourceScope is other than dataset, MD_MetadataScope.name must be populated.

Crosswalk considerations

ISO19139 MetadataScope replaces hierarchyLevel in the previous version of ISO19115. This was done to avoid ambiguity in cases where multiple scope codes and names are associated with a single record. The word hierarchy was dropped from the names because scopes can be used in non-hierarchical structures. Changed elements include

- MD_Metadata.hierarchyLevel changed to MD_Metadata.metadataScope>MD_MetadataScope.resourceScope
- MD_Metadata.hierarchyLevelName changed to MD_Metadata.metadataScope>MD_MetadataScope.name

These two elements were moved to the new MD_MetadataScope class to avoid ambiguity in cases where multiple scope codes and names are associated with a single record. The word hierarchy was dropped from the names because scopes can be used in non-hierarchical structures.

Dublin core / CKAN / data.gov.au In Dublin core the identifier element is described as holding a reference to the resource (not the metadata). However in the case of metadata records harvested by a higher level CKAN like catalogue, we view the complete metadata record as the resource. It is also standard practice that the DC Identifier field be resolvable. For a Dublin core metadata harvested via CSW from a ISO 19115-1 record, it is important that that record links to something that can be dereferenced. That something is held in the identifier field and should be the location URL/URI for the metadata. If the ISO 19115-1 identifier element is only a unresolvable UUID, the metadataLinkage element may be a better choice to populate the DC Identifier field.

DCAT May map to dct:identifier if metadataIdentifier is unresolvable

RIF-CS May map to Key Identifier if metadataIdentifier is unresolvable

Also Consider

- **keywords** - Words or phrases describing the resource to be indexed and searched by web crawlers
- **Topic Category** - is the preferred element to be used to provide linkage to the metadata record.

Examples

XML -

```
<mdb:MD_Metadata>
....
  <mdb:metadataScope>
    <mdb:MD_MetadataScope>
      <mdb:resourceScope>
        <mcc:MD_ScopeCode
          codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat
            /codelists.xml#MD_ScopeCode" codeListValue="dataset"/>
        </mdb:resourceScope>
        <mdb:name gco:nilReason="missing">
          <gco:CharacterString/>
        </mdb:name>
      </mdb:MD_MetadataScope>
    </mdb:metadataScope>
  ....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

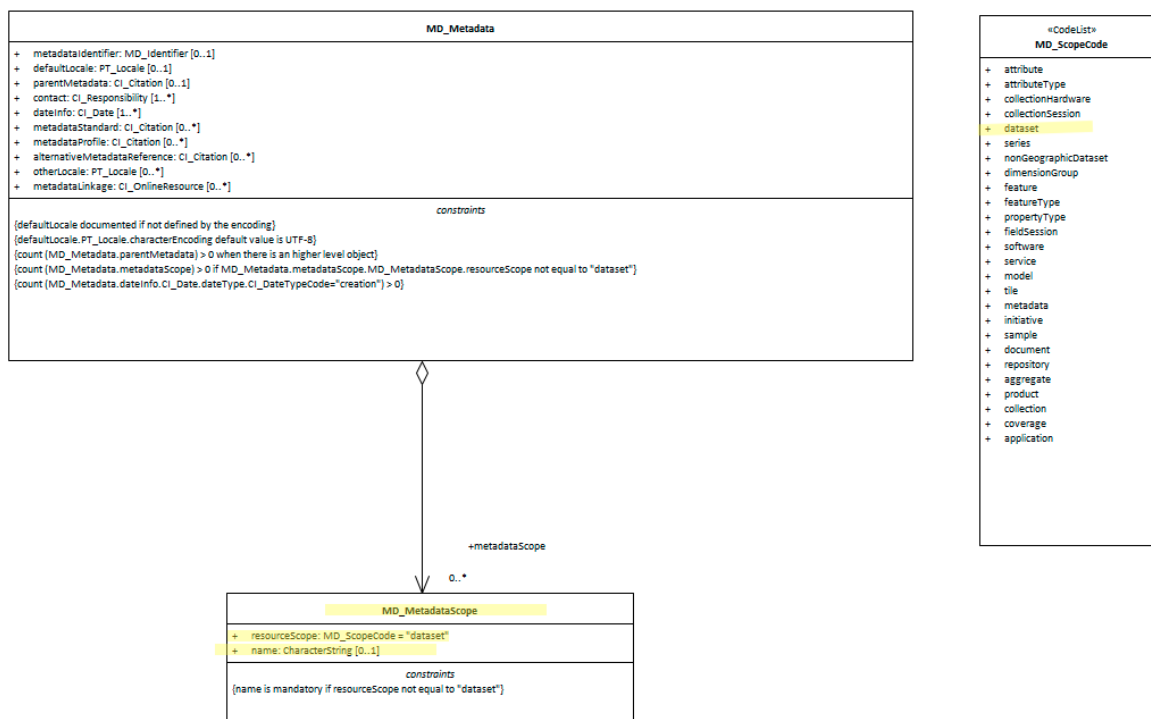


Figure 9: metadataScope

Class (abstract) - MD_Identification

When capturing information on a spatial resource, it is important to identify and categorise information as pertaining to the data or service resource and to distinguish these information from that which applies to the metadata itself. MD_Identification provide a abstract package, the properties of which can be expressed for data (MD_DataIdentification) or service SV_ServiceIdentification) resources.

- **Governance** - ISO
- **Metadata Type** - structural
- **ICSM Level of Agreement** - ★

Definition

basic information required to uniquely identify a resource or resources.

ISO Requirements

At least one [1..*] MD_Identification must be present in a metadata record. This must be instantiated as a MD_DataIdentification or SV_ServiceIdentification instance.

ISO Associations

MD_Identification is an abstract class that can be instantiated as either

- MD_DataIdentification
- SV_ServiceIdentification

It is a child of

- MD_Metadata.identificationInfo

Child packages -

Concrete subclasses of MD_Identification

- **Data Identification** - (class MD_DataIdentification) > ?create Entry?
- **Service Identification** - (class SV_ServiceIdentification) > To Be Completed at later date

MDWG recommended MD_Identification packages One of

- **Data Identification** - (class MD_DataIdentification)

or

- **Service Identification** - (class SV_ServiceIdentification)

Plus the following:

- **Extents** - (class - EX_Extent) [0..*] High-level thematic classifications to assist in the grouping and searching of data.

- **referenceSystemInfo** - (*class - MD_ReferenceSystem*)
- **resourceConstraints** - (*abstract class MD_Constraints*) [0..*] see
- **Resource Security Constraints**
- **Resource Legal Constraints**
- **Resource Other Constraints**
- **Spatial Resolution** - (*class - MD Resolution*) [0..*]
- **Resource Lineage** - (*class - Li_Lineage*) [0..*]

Other packages - not yet addressed by MDWG

- **resourceMaintenance** - (*class MD_MaintenanceInformation*) [0..1]
- **spatialRepresentationInfo** - (*abstract class - MD_SpatialRepresentation*) [0..*]
- **applicationSchemaInfo** - (*class - MD_ApplicationSchemaInformation*) [0..*]
- **portrayalCatalogInfo** - (*class - MD_PortrayalCatalogueReference*) [0..*]
- **contentInfo** - (*abstract class - MD_ContentInformation*) [0..*]
- **dataQualityInfo** - (*class - DQ_DataQuality (from ISO19157)*) [0..*]

Attributes and packages

MDWG Recommended Click on the attribute name for guidance.

- **Citation** - (*class - CI_Citation* [1..1] - Citation for the resource, includes name, publication date, identifiers, originators and publishers.
- **abstract** - (*type - charStr*) [1..*] - A brief narrative summary of the cited resource.
- **purpose** - (*type - charStr*) [0..1] - A brief summary of the intentions with which the resource was developed
- **status** - (*codelist - MD_ProgressCode*) [0..1] - The status of the resource populated from a domain of values
- **topicCategory** - (*enumeration - MD_TopicCategoryCode*) [0..*] - The main themes of the resource populated from a fixed domain of values
- **pointOfContact** - (*class - CI_Responsibility*) [0..1] - The name and contact information for the organisation, role and/or individual that serves as the point of contact for the cited resource.
- **spatialRepresentationType** - (*codelist - MD_SpatialRepresentationTypeCode*) [0..*] - The method used by the resource to spatially represent geographic information.
- **spatialResolution** - (*class - MD_Resolution*) [0..*] - The nominal scale and/or spatial resolution at which the resource is designed to be used.
- **graphicOverview** - (*class - MD_BrowseGraphic*) [0..*] - A graphic that provides an lightweight illustration pertaining a resource
- **additionalDocumentation** - (*class - CI_Citation*) [0..*] - Citation of other documentation associated with the resource, e.g. related articles, publications, user guides, data dictionaries.
- **associatedResource** - (*class - MD_AssociatedResource*) [0..*] - Used to indicate association between resources and records related to the resources

Others - not yet addressed by MDWG

- **credit** - (*type - charStr*) [0..*] Recognition of those who contributed to the dataset. Do not include URLs here. Provide full citations in MD_AssociatedResource section.

- **temporalResolution** - (*class - TM_PeriodDuration* [0..*]) The temporal resolution (level of temporal detail) of the dataset.
- **processingLevel** - (*class - MD_Identifier*) [0..*] An identifier code that identifies the level of processing in the producers coding system.
- **resourceSpecificUsage** - (*class - MD_Usage*) [0..*] Basic information about specific application(s) for which the resource(s) has been or is being used by different users.

Discussion

Identification information about a resource is of high importance to document as this information strongly impacts on the ability of a user to assess the resource fitness to use. The **identificationInfo** package must be of either type *data* (*MD_DataIdentification*) or *service* (*SV_ServiceIdentification*).

Recommendations

There must be at least one (and usually just one) **identificationInfo** packages in a metadata record that contains the substantive information about a cited resource.

Related Classes

- **MD_DataIdentification** An instantiation of the abstract class for data resource metadata

UML diagrams

Recommended elements highlighted in Yellow

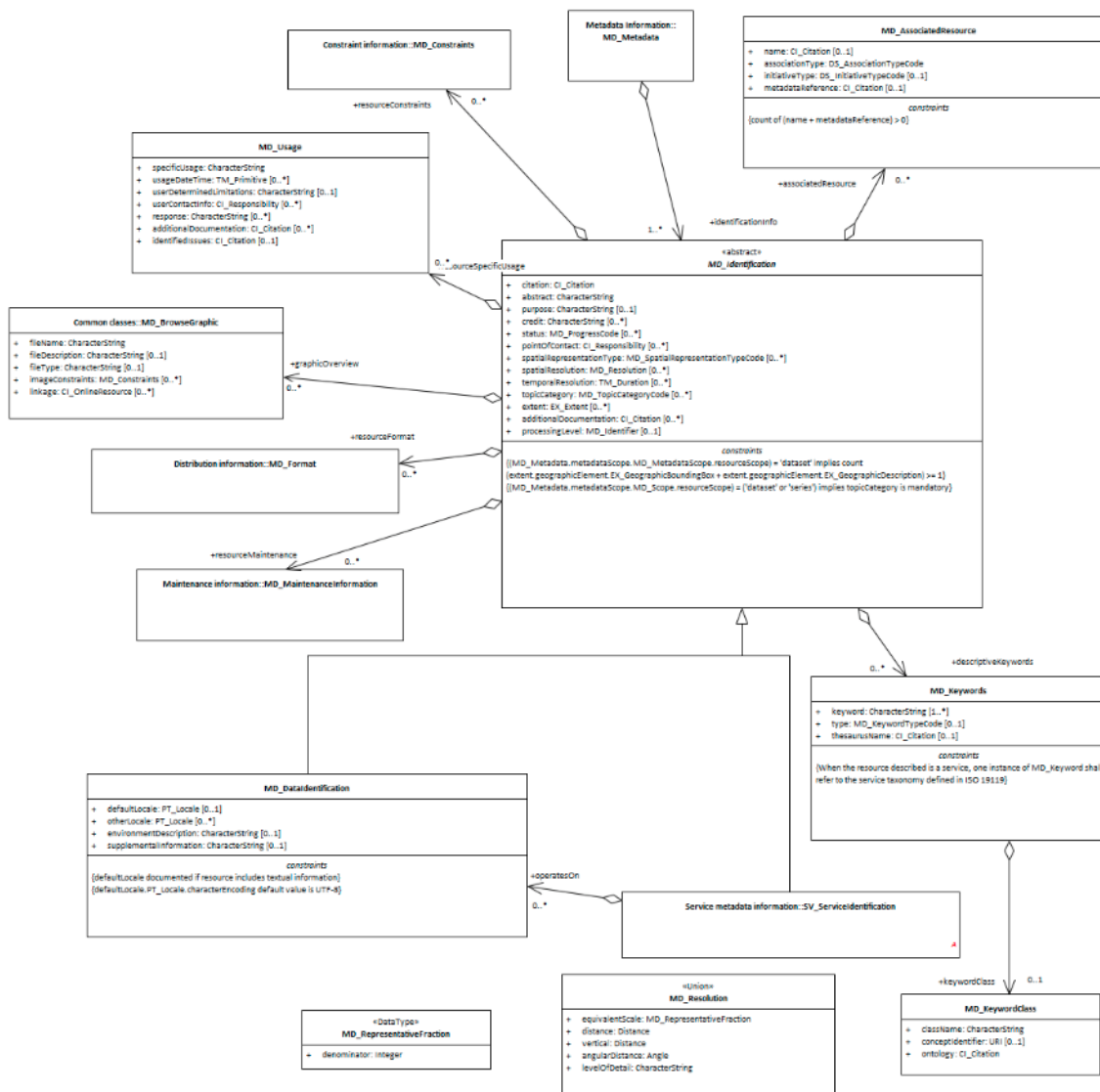


Figure 10: MD_Identification

Abstract ★★★★★

In order to quickly find, categorise and evaluate the fitness of a resource to our needs it is useful to include in our metadata a human-readable narrative description of the resource. This is often the most important tool for users for first-pass evaluation.

Element Name	<i>abstract</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>character string</i>
Governance	<i>Common ICSM, Agency, Domain</i>
Purpose	<i>Discovery, Evaluation</i>
Audience	machine resource - ★ ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ ★ specialist - ★ ★ ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

A brief narrative summary of the cited resource.

ISO Obligation

- There must be one and only one [1..1] *abstract* entries for the spatial resource in the metadata *MD_Identification* package of type *character String* in a metadata record.

Discussion

Abstract is a mandatory element. It contains a human-readable description of the resource that gives a user a first understanding of the resource. Typically, an abstract is several sentences long. The resource may be data or service, *MD_DataIdentification** or **SV_ServiceIdentification*

Consideration needs to be given to the audience and what they need to know about the resource to decide the utility for them.

The abstract should address the 5Ws What is it; Who generated it; When was it generated; Why was it generated; and Where is the place that it deals with. But in a general way with the most common language possible while still containing sufficient information to provide a good understanding of the resource to your most likely audience.

ICSM Recommendations

Therefore - An abstract should be written in a style that your human audience will easily comprehend. As this is a top-level field for harvested records to general-purpose catalogues, common language should be used that most people could understand. If there is a need for more technical language to describe the resource, this should be included at the end of the abstract.

The contents of an abstract should address the 5Ws What is it; Who generated it; When was it generated; Why was it generated; and Where is the place that it deals with (Time and Location). But in a general way with the most common language possible while still containing sufficient information.

Also Consider

- **Purpose** - provides A brief summary of the intentions with which the resource was developed. Some overlap of usage with abstract may exist. The MDWG should provide some guidance as to what belongs in abstract and what belongs in purpose
- **MD_DataIdentification.supplimentalInformation** - provides a description of the resource in the producer's processing environment, including items such as the software, the computer operating system, file name, and the dataset size.

Outstanding Issues

Dublin core / CKAN / data.gov.au Also defines this element as additional information describing or analysing the data. But while this can be static it also can be an editable wiki which anyone can contribute to instantly or via admin moderation. This latter approach is currently difficult to support in ISO 19115-1.

DCAT This element may also contain a table of contents, a graphical representation, or a free-text account of the resource.

element - Purpose Some guidance needs to be developed to guide users as to what belongs in abstract and what belongs in purpose.

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Maps to description

DCAT

Maps to dct.description

RIF-CS

Maps to Description 'full'

Examples

ABARES

*TOPO_2.5M is a national seamless data product aimed at regional or national applications. The data are suitable for location or distribution mapping at a small scale and can be readily combined with other data products. TOPO_2.5M is an intermediate product between AUS-LIGs TOPO_10M (data at 1:10 million scale) and TOPO_250K (data at 1:250 000 scale).

It has been specifically designed for map production and does not carry the additional attributes which support GIS analysis. TOPO_2.5M is topologically structured including closed polygons and properly intersecting lines and is comprised of the following themes Built-up Areas, Framework, Localities, Roads, Railways, Streams, Waterbodies and Reefs. The user guide can be accessed at a link provided below. Link to licence and licence conditions //Baldric/publicmetadata/data/glompr_gm_001/glompr_gm00111a00pdf____/licence_template.pdf. The licence allows the use of the data for any maps (including Internet applications) but the data itself must not be supplied to any third party. All products must include an appropriate copyright statement.*

GA

Publicly available bathymetry and geophysical data have been used to map geomorphic features of the Antarctic continental margin and adjoining ocean basins at scales of 1:1-2 million. The key bathymetry datasets used were GEBCO08 and ETOPO2 satellite bathymetry (Smith & Sandwell 1997), in addition to seismic lines in key areas. Twenty-seven geomorphic units were identified based on interpretation of the seafloor bathymetry with polygons digitised by hand in ArcGIS. Seafloor features were classified largely based on the International Hydrographic Organisation (2001) classification of undersea features and expanded to include additional features, including those likely to have specific substrate types and influence on oceanography. This approach improves the technique as a predictor of physical conditions that may influence seafloor communities. The geomorphic map has been used for developing a benthic bioregionalisation and for developing a representative system of Marine Protected Areas for East Antarctica. Slight modifications have been made since the original publication in O'Brien et al. 2009 and Post et al. 2014. These include: - updating of some feature names; - combining "wave affected banks" with "shelf banks" - Combining "coastal terrance" with "island coastal terrane" as "Coastal/Shelf Terrane" - replacing canyon vectors with polygons by using a buffer around the vectors Further details of the original mapping can be found in: O'Brien, P.E., Post, A.L., Romeyn, R., 2009. Antarctic-wide geomorphology as an aid to habitat mapping and locating Vulnerable Marine Ecosystems, Commission for the Conservation of Antarctic Marine Living Resources Vulnerable Marine Ecosystems Workshop, Paper WS-VME-09/10. CCAMLR, La Jolla, California, USA. Post, A.L., Meijers, A.J.S., Fraser, A.D., Meiners, K.M., Ayers, J., Bindoff, N.L., Griffiths, H.J., Van de Putte, A.P., O'Brien, P.E., Swadling, K.M., Raymond, B., 2014. Chapter 14. Environmental Setting, In: De Broyer, C., Koubbi, P., Griffiths, H.J., Raymond, B., d'Udekem d'Acoz, C., et al. (Eds.), Biogeographic Atlas of the Southern Ocean. Scientific Committee on Antarctic Research, Cambridge, pp. 46-64.

AAD

This dataset is a collection of aerial images taken from a camera mounted in the fuselage of the CASA-212 400 aircraft used to survey for pygmy blue whales. Line transect data from that survey are also available (but see Gill, P.C., Pirzl, R., Morrice, M.G. and Lawton, K. (2015). "Cetacean diversity of the continental shelf and slope off southern australia." The Journal of Wildlife Management 79(4): 672-681 for more details). The digital images were taken with a Nikon D200 camera, using a 35mm lens. The survey altitude was approximately 1500 ft. Images have full EXIF data attached. Image footprints are approximately 204 m along-track by 306 m across track, with some image overlap.

Aerial images; downward facing images along track from a line transect survey. There are ~41K jpeg images. Images taken with Nikon D200 camera, with 35 mm lens. Aerial survey altitude was approximately 1500 ft. Each image has a water-surface footprint of 204 m along-track by 306 m across track; there is some image overlap along-track. The EXIF data for each image is populated. Images taken in January 2012 along the Bonney Upwelling, along the south-east coast of Australia, an area known to be a summer (Nov-May) feeding ground for pygmy blue whales; the surveys focussed on the area bounded by 138.0-145.0°E and 36.6-40.3°S.

TERN

The Cumberland Plain flux station is located in a dry sclerophyll forest in the Hawkesbury Valley in central New South Wales. Operation commenced for the station in September 2012 and is managed by the Hawkesbury Institute for the Environment at Western Sydney University. The Cumberland Plain Woodland is now an endangered ecological community that encompasses distinct groupings of plants growing on clayey soils. The canopy is dominated by *Eucalyptus moluccana* and *Eucalyptus fibrosa*, which host an expanding population of mistletoe. Average canopy height is 23m, the elevation of the site is 20m and mean annual precipitation is 800mm. Fluxes of water vapour, carbon dioxide and heat are quantified with the open-path eddy flux technique from a 30 m tall mast. Additional measurements above the canopy include temperature, humidity, wind speed and direction, rainfall, incoming and reflected shortwave and longwave radiation and net, diffuse and direct radiation and the photochemical reflectance index. In addition, profiles of humidity and CO₂ are measured at eight levels within the canopy, as well as measurements of soil moisture content, soil heat fluxes, soil temperature, and 10-hr fuel moisture dynamics. In addition, regular monitoring of understory species abundance, mistletoe infection, leaf area index and litterfall are also performed.

data.gov.au

The Department of Human Services Service Centre locator contains information updated weekly, a search function and maps.

XML

```
<mdb:MD_Metadata>
```

```
....
```

```
<mdb:identificationInfo>
```

```
<mri:MD_DataIdentification>
```

```
....
```

```
<mri:abstract>
```

```
<gco:CharacterString>
```

This is an example dataset to demonstrate the use of ISO 19115-3. Below is a sample abstract reprinted from the document AS/NZS ISO 19115.1:2015. Location of all current mineral Exploration Licences issued under the Mining Act, 1971. Exploration Licences provide exclusive tenure rights to explore for mineral resources for up to a maximum of 5 years. Comment is sought on applications for

```

Exploration Licences from numerous sources before granting.
Exploration programs are subject to strict environmental and
heritage conditions. Exploitation of identified resources must be
made under separate mineral production leases.
</gco:CharacterString>
</mri:abstract>
....
</mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

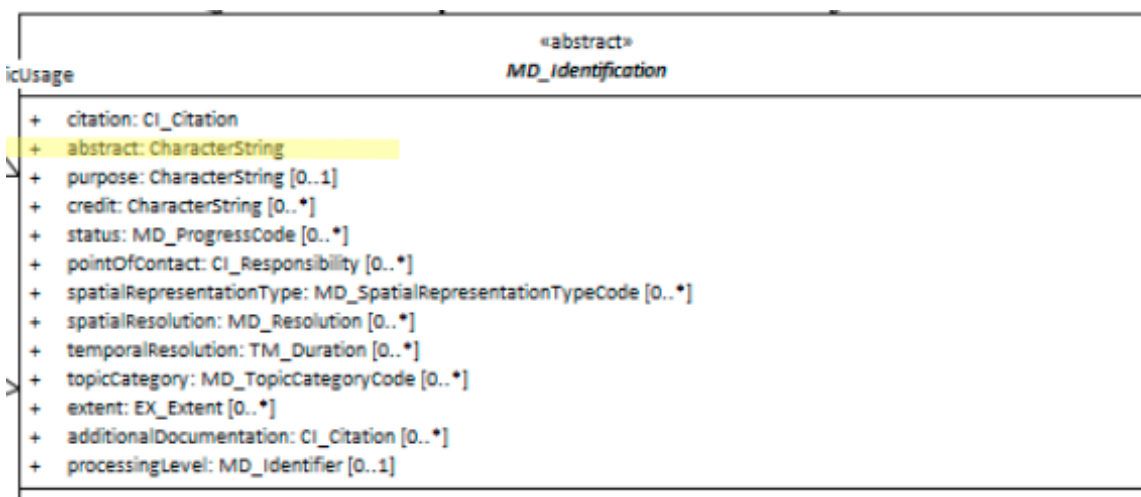


Figure 11: abstract

Purpose ★★★★★

One of the useful ways to evaluate the fitness of a resource to our needs is to examine the purpose for which the resource was created and how well it fulfilled its intended purpose. The MD_DataIdentification.purpose* element is designed to hold such information.*

Element Name	<i>purpose</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>characterString</i>
Governance	<i>Domain, Agency</i>
Purpose	<i>Discovery, Evaluation, Use</i>

Audience	- machine resource - ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ ★ specialist - ★ ★ ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★ ★ ★

Definition

A brief summary of the intentions with which the resource was developed

ISO Obligation

- There may be no more than one [0..1] *purpose* entries for the resource in the *MD_DataIdentification* package of type *character string* in a metadata record.

Discussion

A purpose statement provides a brief description of the reason a resource was created. Knowing this can give a good guide to the potential usefulness of a resource to other potential users. The resource may be data or service, *MD_DataIdentification** or **SV_ServiceIdentification*

Consideration needs to be given to the audience and what they need to know about the resource to decide the utility for them.

A purpose statement is generally shorter than an abstract and should be written in a style that your human audience will easily comprehend. The purpose should capture the “why” a dataset was created and to what end it is used. Common language should be used that most people could understand. If there is a need for more technical language to describe the resource, this should be included at the end of the purpose statement.

ICSM Recommendations

Therefore - Keep the purpose statement generally shorter than your abstract and write in a style that your human audience will easily comprehend. Capture the “why” a resource was created and to what end it is used. Use common language that most people could understand. If there is a need for more technical language to describe the resource, this should be included at the end of the purpose statement.

Populate the *purpose* element and provide enough narrative to give the reader a good understanding of the intent for which the resource was created. Use common language as far as possible as the readers may come from a different domain. The contents of a purpose should include as much information as would be useful to indicate the alignment of the original purpose and potential users’ requirements.

Also Consider

- **Abstract** provides a somewhat more lengthy verbal summary description of the resource. Some overlap of usage with purpose may exist. The MDWG should provide some guidance as to what belongs in abstract

and what belongs in purpose

- **MD_DataIdentification.supplementalInformation** - provides a description of the resource in the producer's processing environment, including items such as the software, the computer operating system, file name, and the dataset size.
- **Resource Lineage** may contain information related to purpose.

Outstanding Issues

DCAT The description may include but is not limited to: an abstract, a table of contents, a graphical representation, or a free-text account of the resource.

element - Purpose vs abstract Some guidance needs to be developed to guide users as to what belongs in abstract and what belongs in purpose.

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Maps to *description*?

DCAT

Maps to *dct.description* (as does *abstract*)

RIF-CS

Maps to *dct.description*

Examples

ABARES

The Australian Surveying and Land Information Group (AUSLIG) has the responsibility for providing topographic mapping information at a national scale. AUSLIG has undertaken the Australian Geographic Database program to enhance this topographic map information so it is suitable for use in Geographic Information Systems. The data resulting from this program are known as GEODATA. Each GEODATA product incorporates characteristics such as customer focus, national consistency, assured quality and comprehensive documentation.

TERN

The purpose of the Cumberland Plain flux station is: to quantify the exchanges of carbon dioxide, water vapour and energy in a dry sclerophyll forest. to characterize the functional behaviour and sensitivity of the different components contributing to the ecosystem carbon balance from sub-daily to multi-annual temporal scales and under climatic variability. to identify the role of hydraulic limitations on constraining ecosystem productivity. to quantify the impact of mistletoe on plant physiological processes and whole ecosystem water vapour and carbon dioxide exchange. to validate remote sensing

estimates of different radiation components to obtain accurate regional predictions of fuel moisture and to understand how wood traits and microbial diversity interact to determine rates of wood decay.

XML -

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
    <mri:purpose>
      <gco:CharacterString>
        This is a sample purpose statement reprinted from the document
        AS/NZS ISO 19115.1:2015:
        This dataset was developed to record information necessary for the
        administration of the Mining Act.
      </gco:CharacterString>
    </mri:purpose>
    ....
  </mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

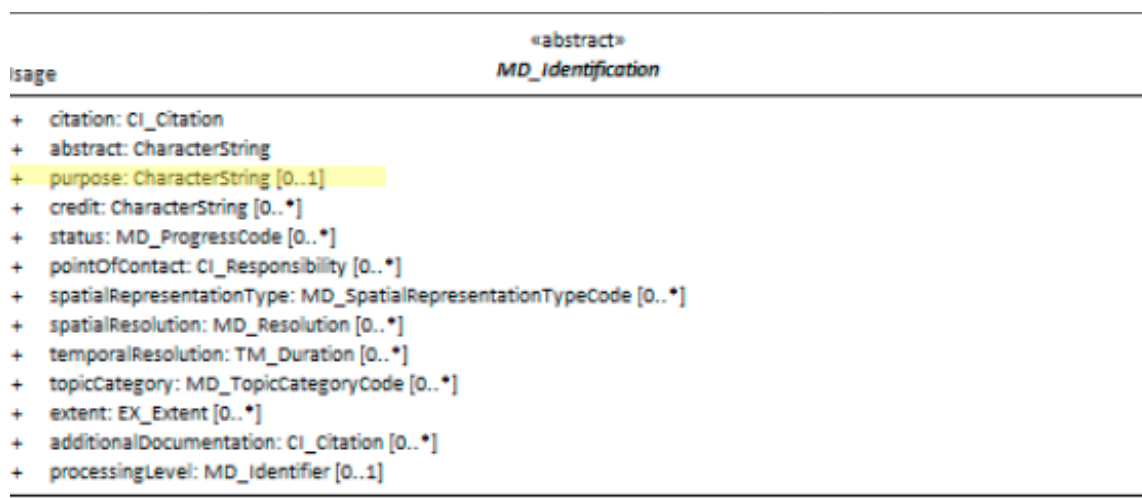


Figure 12: purpose

Resource Status ★★★★★

In order to quickly find, categorise and evaluate the fitness of a resource to our needs it is useful to include in our metadata a high-level description of the progress status of the resource our metadata describes.

Element Name	<i>status</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>MD_ProgressCode</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Discovery, Management</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>Descriptive, Administrative</i>
ICSM Level of Agreement	★ ★ ★

Definition

The status of the resource populated from a domain of values

ISO Obligation

- There can be zero to many [0..*] *status* entries for the cited resource in the *MD_DataIdentification* package selected from codelist *MD_ProgressCode*.

Discussion

According to the ISO model, a resource may exist in many states. Not all values are mutually exclusive. This element is optional and has only been lightly discussed. As it has been determined a valuable element we may want to increase these recommendations.

The resource may be data or service, *MD_DataIdentification** or **SV_ServiceIdentification*

Recommendations

Therefore - The status of a resource is valuable information to those who may want to use it. It is recommended that the status field be populated and regularly updated as needed. At least one instance of this element should be populated in all metadata records.

As the harvesting of metadata to more general-purpose catalogues is desirable, some thought need be given to crosswalk with boolean values (CKAN) or those that only accept one occurrence of this element. Values for this element must come from the *MD_ProgressCode* codelist.

Possible Values for status (*codelist - MD_ProgressCode*)

- *completed* - has been completed
- *historicalArchive* - stored in an offline storage facility
- *obsolete* - no longer relevant
- *onGoing* - continually being updated
- *planned* - fixed date has been established upon or by which the resource will be created or updated
- *required* - needs to be generated or updated
- *underDevelopment* - currently in the process of being created
- *final* - progress concluded and no changes will be accepted
- *pending* - committed to, but not yet addressed
- *retired* - item is no longer recommended for use. It has not been superseded by another item
- *superseded* - replaced by new
- *tentative* - provisional changes likely before resource becomes final or complete
- *valid* - acceptable under specific conditions
- *accepted* - agreed to by the sponsor
- *notAccepted* - rejected by sponsor
- *withdrawn* - removed from consideration
- *proposed* - suggested that development needs to be undertaken
- *deprecated* - resource superseded and will become obsolete, use only for historical purposes

Outstanding Issues

Abstract Class - MD_Identification SpatialRepresentationType is one of many elements belonging to the abstract class MD_Identification. MD_Identification is only instantiated as MD_DataIdentification or SV_ServiceIdentification. At this stage we are not addressing service metadata, We are assuming all metadata is for data resources. At a later time, when we include Service metadata guidance, a separate discussion of MD_Identifier should be made.

CKAN It has been indicated that CKAN records in its related field boolean values for this item. Boolean does not map well to ISO domain values. Some options in the MD_ProgressCode are non-compatible some are compatible. Clarification and validation would be useful.

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Maps to data status

Examples

XML -

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
```

```

<mri:MD_DataIdentification>
....
  <mri:status>
    <mri:status>
      <mcc:MD_ProgressCode
        codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat
          /codelists.xml#MD_ProgressCode"
        codeListValue="underDevelopment"/>
      </mri:status>
      <mri:status>
        <mcc:MD_ProgressCode
          codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat
            /codelists.xml#MD_ProgressCode"
          codeListValue="tentative"/>
        </mri:status>
      ....
    </mri:MD_DataIdentification>
  </mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

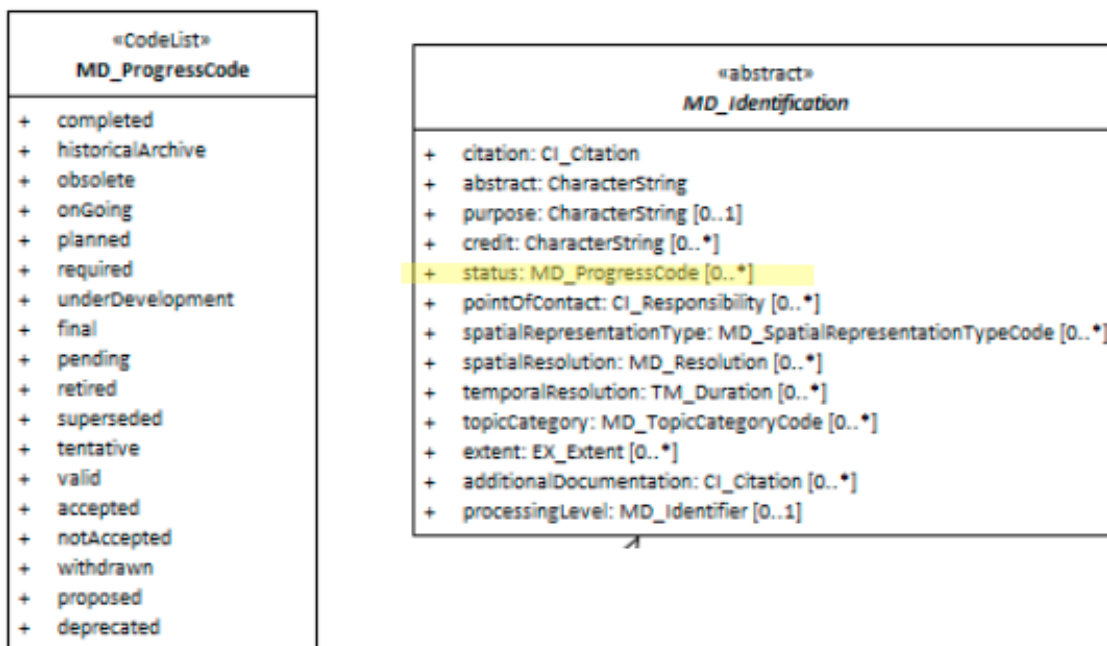


Figure 13: status

Topic Category ★★★★★

Categorisation of a resource against a standardised thematic keyword list provides a useful way to filter and discover resources.

Element Name	<i>topicCategory</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>MD_TopicCategoryCode</i>
Governance	<i>Common ICSM, Domain, Agency</i>
Purpose	<i>Discovery, Evaluation</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

The main themes of the resource populated from a fixed domain of values

ISO Obligation

- There may zero to many [0..*] *topicCategory* entries for the cited resource in the *MD_DataIdentification* package in a metadata record selected from the enumeration *MD_TopicCategoryCode*.

Discussion

The Resource Topic Category is recommended in ISO 19115.1-2015 as a metadata element to be used for discovery of geospatial resources. It provides high-level filtering of data using standardised terms from the enumeration *MD_TopicCategoryCode*. This enumeration cannot be extended and should not be as it is the fixed nature that makes this element of particular value. These values allow metadata aggregated from anywhere in the world to be sorted and filtered into like categories - such as is done in a faceted search interface. Search results can be easily sorted by humans and machines. If this list were extensible, this would not be as effective.

Many resources may fit into multiple categories. ISO19115-1 allows multiple instances of *topicCategory* to accommodate such instances. Discussions need to be made as to when an aspect of the resource is too minor to include an instance of the *MD_TopicCategoryCode* value.

Topic categories are essentially keywords but of a particular enumeration. Like other keywords, search engines and indices use these to provide search support. If a topic category code satisfies the need for a particular keyword, it is probably unbeneficial to include that value as part of your Keywords.

The resource to which the Topic Category applies may be data or service, *MD_DataIdentification** or **SV_ServiceIdentification*

ICSM Recommendations

Therefore - in order to comply with ICSM best guidance, include at least one instance of `topicCategory` in the metadata for your resource to provide high-level filtering and categorisation of data. Multiple values may be captured and this is encouraged to avoid the lack of discovery due to too narrow categorisations. This field is particularly useful in faceted search interfaces such as GeoNetwork.

It is not recommended that this list be extended as its value is in part due to the standardised values it contains. Extended values, if needed are better captured in other keyword fields.

Possible Values for *topicCategory*

Type enumeration - MD_TopicCategoryCode

- **farming** - rearing of animals and/or cultivation of plants
- Examples: agriculture, irrigation, aquaculture, plantations, herding, pests and diseases affecting crops and livestock
- **biota** - flora and/or fauna in the natural environment
- Examples: wildlife, vegetation, biological sciences, ecology, wilderness, sealife, wetlands, habitat
- **boundaries** - legal land descriptions
- Examples: political and administrative boundaries
- **climatologyMeteorologyAtmosphere** - processes and phenomena of the atmosphere
- Examples: cloud cover, weather, climate, atmospheric conditions, climate change, precipitation
- **economy** - economic activities, conditions and employment
- Examples: production, labour, revenue, commerce, industry, tourism and ecotourism, forestry, fisheries, commercial or subsistence hunting, exploration and exploitation of resources such as minerals, oil and gas
- **elevation** - height above or below a vertical datum
- Examples: altitude, bathymetry, digital elevation models, slope, derived products
- **environment** - environmental resources, protection and conservation
- Examples: environmental pollution, waste storage and treatment, environmental impact assessment, monitoring environmental risk, nature reserves, landscape
- **geoscientificInformation** - information pertaining to earth sciences
- Examples: geophysical features and processes, geology, minerals, sciences dealing with the composition, structure and origin of the earth's rocks, risks of earthquakes, volcanic activity, landslides, gravity information, soils, permafrost, hydrogeology, erosion
- **imageryBaseMapsEarthCover** - base maps
- Examples: land cover, topographic maps, imagery, unclassified images, annotations
- **intelligenceMilitary** - military bases, structures, activities
- Examples: barracks, training grounds, military transportation, information collection
- **inlandWaters** - inland water features, drainage systems and their characteristics
- Examples: rivers and glaciers, salt lakes, water utilisation plans, dams, currents, floods, water quality, hydrographic charts
- **location** - positional information and services
- Examples: addresses, geodetic networks, control points, postal zones and services, place names
- **oceans** - features and characteristics of saltwater bodies (excluding inland waters)

- Examples: tides, tidal waves, coastal information, reefs
- **planningCadastre** - information used for appropriate actions for future use of the land
- Examples: land use maps, zoning maps, cadastral surveys, land ownership
- **society** - characteristics of society and cultures
- Examples: settlements, anthropology, archaeology, education, traditional beliefs, manners and customs, demographic data, recreational areas and activities, social impact assessments, crime and justice, census information
- **structure** - man-made construction Examples: buildings, museums, churches, factories, housing, monuments, shops, towers
- **transportation** - means and aids for conveying persons and/or goods
- Examples: roads, airports/airstrips, shipping routes, tunnels, nautical charts, vehicle or vessel location, aeronautical charts, railways
- **utilitiesCommunication** - energy, water and waste systems and communications infrastructure and services
- Examples: hydroelectricity, geothermal, solar and nuclear sources of energy, water purification and distribution, sewage collection and disposal, electricity and gas distribution, data communication, telecommunication, radio, communication networks
- **extraTerrestrial** - region more than 100 km above the surface of the Earth
- **disaster** - Information related to disasters
- Examples: site of the disaster, evacuation zone, disaster-prevention facility, disaster relief activities

Also Consider

- **Keywords** provides a more lengthy flexible system to attach keywords - including from custom thesauri and free text.
- **Metadata Scope** holds keyword identifying the type of resource, e.g. service, a collection, an application which the metadata describes
- **Spatial Representation Type** holds keywords related to the spatial type of the resource, such as vector, grid, tin, etc.

Crosswalk considerations

ISO19139

This element, along with `spatialRepresentationType` and `spatialResolution`, were moved from `MD_DataIdentification` to `MD_Identification` in order to allow their use for service identification. Two new values were added to this enumeration: *extraTerrestrial* and *disaster* from the ISO19139 version.

Dublin core / CKAN / data.gov.au

Maps to *ISO 19115 topic*

DCAT

Maps to *dcat:keyword*

RIF-CS

Maps to *Subject*

Examples**XML**

```
<mdb:MD_Metadata>
....
  <mdb:identificationInfo>
    <mri:MD_DataIdentification>
      ....
      <mri:topicCategory>
        <mri:MD_TopicCategoryCode>environment</mri:MD_TopicCategoryCode>
      </mri:topicCategory>
      <mri:topicCategory>
        <mri:MD_TopicCategoryCode>biota</mri:MD_TopicCategoryCode>
      </mri:topicCategory>
      <mri:topicCategory>
        <mri:MD_TopicCategoryCode>inlandWaters</mri:MD_TopicCategoryCode>
      </mri:topicCategory>
      ....
    </mri:MD_DataIdentification>
  </mdb:identificationInfo>
....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

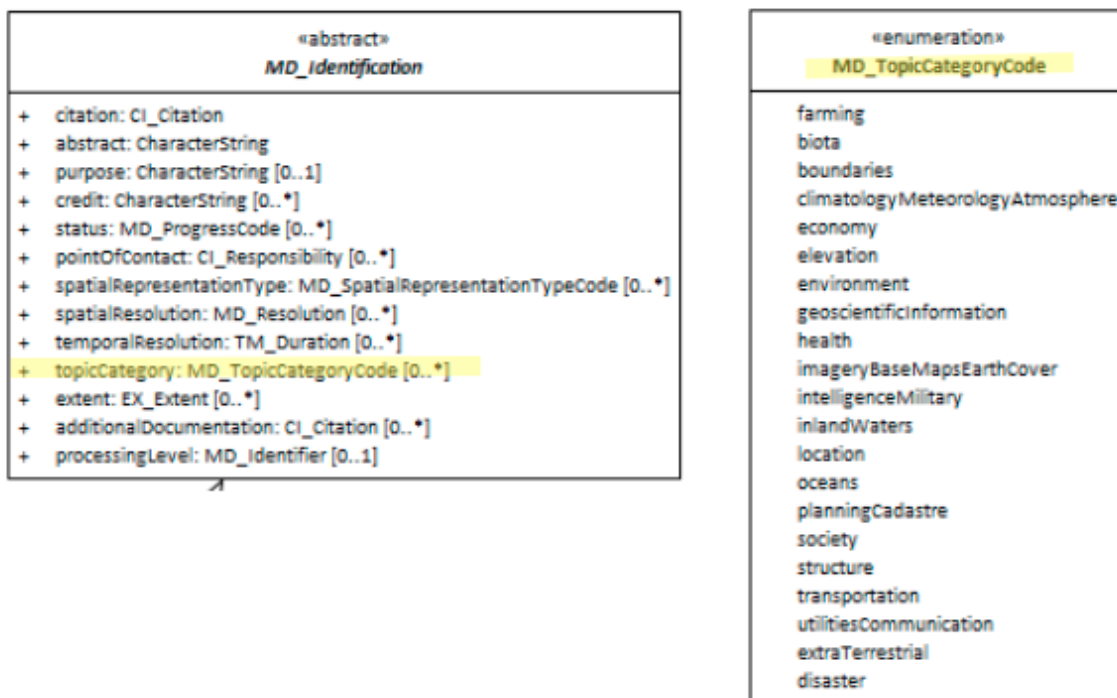


Figure 14: topicCategory

Spatial Resolution ★★★★★

To be useful for its given purpose geospatial data is recorded at an appropriate level of generalisation. This helps reduce overhead and can give a more useful product for the scale it is designed to be used. Too much data can be as much a problem as too little. Providing users with this information allows better judgement as to the fitness of the resource to their purpose.

Element Name	<i>spatialResolution</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>MD_Resolution</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Discovery, Evaluation</i>
Audience	machine resource - ★ ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ specialist - ★ ★ ★ ★
Metadata type	<i>structural</i>
ICSM Level of Agreement	★ ★ ★

Definition

The nominal scale and/or spatial resolution of the resource.

ISO Obligation

- There may zero to many [0..*] *spatialResolution* entries for the cited resource in the *MD_DataIdentification* package of class *MD_Resolution* in a metadata record.

Discussion

Scale is a fundamental concept of spatial resource be they data or service (*MD_DataIdentification** or *SV_ServiceIdentification*). *SpatialResolution** is the element that captures this.

SpatialResolution is most commonly represented as a factor which provides a general understanding of the density of spatial data in the resource or describes the range of resolutions in which a digital resource may be used. This element should be repeated when describing the upper and lower range.

SpatialResolution is recommended in ISO 19115.1-2015 as a metadata element to be used for discovery of geospatial resources.

SpatialResolution has no value of its own. The *spatialResolution* type are selectable from the class *MD_Resolution*.

Outstanding Issues

Scale has little meaning in digital context The most common way of capturing spatial resolution is as a denominator value using *equivalentScale*. While this made intuitive sense in the days of paper

maps printed at a particular size, scales such as 1 :20,000 have little real meaning when the size of a map is totally dependent on the display screen. Will younger spatial professionals who may only have a passing knowledge of fixed scale maps relate to this value? Will it have meaning to the young neo-geo? It would be useful to work towards expressing scale, a fundamental concept in geospatial data, in a more digitally friendly way. Perhaps something like standardised zoom levels? Would “distance”, sampling size be of greater use? Most relatable would be something like “zoom level” which could be captured in “level of detail” but there is currently a lack of standardisation as to what terms like “zoom level” mean. Also, the levelOfDetail option lacks citation to support that would be needed to make this usable in such a manner. Work on Discrete Global Grid Systems (DGGS) may provide some guidance to this topic.

Recommendations

Therefore - The *spatialResolution* package should be populated with enough information to give the reader a good understanding of the spatial scale at which the resource was designed to be used. Capture the spatial resolution of a resource is useful information for determining the fitness to the purpose of geospatial data. Data gathered at too high or too low a resolution may make it unfit to your needs. Mixing data of different resolutions can give uncertain results. The spatial resolution provides a rough guide to the precision and accuracy of a resource. (Data quality elements should be used to document precision and accuracy more fully.)

Spatial resolution can be documented in many ways. For ISO19115-1, these are limited to the methods itemised in the class MD_Resolution and documented above. Equivalent scale is the default of many systems, including supplied templates in GeoNetwork. It is captured with a single denominator value such as “20,000” as in a 1:20,000 map.

Note BC 19-7: Do we recommend equivalent scale as default?

Recommended Sub-Elements

MD_Resolution [1..1] is a class of type *Union* (meaning only one attribute from the available list can be used) that provides level of detail expressed as a scale factor, a distance or an angle. Similar to codelist, one and only one [1..1] must be chosen per *spatialResolution* instance. Possible attribute choice include:

- **equivalentScale** - (class - *MD_RepresentativeFraction*)
- level of detail expressed as the scale of a comparable hardcopy map or chart
- MD_RepresentativeFraction derived from ISO/TS 19103 Scale where MD_RepresentativeFraction.denominator = 1 / Scale.measure And Scale.targetUnits = Scale.sourceUnits
- denominator - integer - the number below the line in a vulgar fraction
- **distance** - (type - *Distance*)
 - horizontal ground sample distance
 - Distance: This class is documented in full in ISO/TS 19103. Includes unitOfMeasure attribute
 - UnitOfMeasure: This class is documented in full in ISO/TS 19103.
- **vertical** - (type - *Distance*)
 - vertical sampling distance
 - Distance: This class is documented in full in ISO/TS 19103. Includes unitOfMeasure attribute
 - UnitOfMeasure: This class is documented in full in ISO/TS 19103.

- **angularDistance** - (*type* - *Angle*)
 - angular sampling measure
 - Angle: Amount of rotation needed to bring one line or plane into coincidence with another, generally measured in radians or degrees. This class is documented in full in ISO/TS 19103.
 - UnitOfMeasure: This class is documented in full in ISO/TS 19103.
 - **levelOfDetail** - (*type* - *charStr*)
 - brief textual description of the spatial resolution of the resource

Also Consider

- **Spatial Representation Type** Documents the method used to spatially represent geographic information
- **dataQualityInfo>MD_DataQuality** - TBD - From ISO19157 - quality information for the data specified by a data quality scope

Examples

ABARES

```
<mri:spatialResolution><mri:MD_Resolution>
  <mri:distance><gco:Distance uom="metre">123</gco:Distance>
</mri:distance>
</mri:MD_Resolution></mri:spatialResolution>
<mri:spatialResolution><mri:MD_Resolution>
  <mri:angularDistance>
    <gco:Angle uom="degreeLatitude">0.1</gco:Angle>
  </mri:angularDistance>
</mri:MD_Resolution></mri:spatialResolution>
<mri:spatialResolution>
  <mri:MD_Resolution>
    <mri:angularDistance>
      <gco:Angle uom="degreeLongitude">0.05</gco:Angle>
    </mri:angularDistance>
  </mri:MD_Resolution>
</mri:spatialResolution>
<mri:spatialResolution>
  <mri:MD_Resolution>
    <mri:vertical>
      <gco:Distance uom="metre">123</gco:Distance>
    </mri:vertical>
  </mri:MD_Resolution>
</mri:spatialResolution>
```

GA

```
<mri:spatialResolution>
```

```

<mri:MD_Resolution>
  <mri:levelOfDetail>
    <gco:CharacterString>1:1000000 to 1:2000000</gco:CharacterString>
  </mri:levelOfDetail>
</mri:MD_Resolution>
</mri:spatialResolution>

```

Note BC 11-6: This example from GA, shown here as levelOfDetail, would more appropriately be captured as equivalentScale. But interestingly, this information is sharing the range in which the data are useful. This is a useful approach, but is this standard sufficiently able to support this?

XML -

```

<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
    <mri:spatialResolution>
      <mri:MD_Resolution>
        <mri:distance>
          <gco:Distance uom="m">1</gco:Distance>
        </mri:distance>
      </mri:MD_Resolution>
    </mri:spatialResolution>
    ....
  </mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

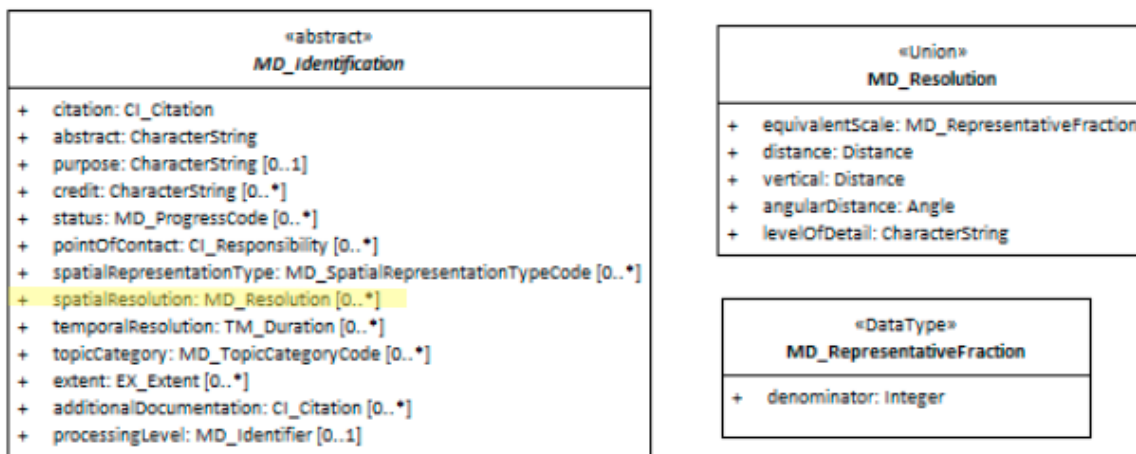


Figure 15: spatialResolution

Resource Point of Contact ★★★★★

One of the most important pieces of information that can be shared in a metadata record is the resource Point of Contact. By retrieving the means to access the party responsible for questions about the resource, all other information should be able to be obtained even if it is not in the metadata.

Element Name	<i>pointOfContact</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>CI_Responsibility</i>
Governance	<i>Agency</i>
Purpose	<i>Discovery, Evaluation, Communications</i>
Audience	machine resource - ★ ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★ ★

Definition

The name and contact information for the organisation, role and/or individual that serves as the point of contact for the cited resource.

ISO Obligation

- There may be one or more [0..*] *pointOfContact* packages for the cited resource in the *MD_DataIdentification* package for those responsible for the resource. These will be of class *CI_Responsibility*.

Discussion

This element exists for the provision of a set of attributes for identification of, and means of communication with, person(s) and organisation(s) associated with the resource be they data or service (*MD_DataIdentification** or **SV_ServiceIdentification*). This element refers to the party responsible for the resource itself and the maintenance of this resource. It does not refer to the party responsible for the metadata or the distribution of the resource.

This is a compound element of type *CI_ResponsibleParty*. At least one should be present. Recommended role value - “PointOfContact” with attached email. Other contacts can be added as required. Other role values are acceptable.

Recommendations

Therefore - To meet ICSM good practice, in all metadata records, at least one point of contact should be given for the party responsible for the cited resource. These should default to role code “Point of Contact”. In addition, for minimal conformity, name (of organisation preferred), *positionName* and *electronicMailAddress* should also be populated. The use of the new *partyIdentifier* element added in the 2018 amendment to the standard is encouraged by all parties.

Recommended Sub-Elements

Follow the general guidelines for CI_Responsibility.

- One value of `role` should be “Point of Contact”, but may be another depending on agency guidance, e.g. if a custodian is also the primary point of contact, *custodian* may be the most appropriate choice for `role`.
- **partyIdentifier** - (*class* - *MD_Identifier*) [0..*] identifier for the party, usual a URI such as an ORCID. Use of this package is recommended when the option exist. > Note BC 30-7: Do we have some regional alternatives to ORCID to recommend?

Also Consider

- **Metadata Responsible Party** Contact information for the recommended party to contact about the metadata
- **Resource Cited Responsible Party** contact information for the parties otherwise responsible for aspects of the the resource creation and maintenance.
- **DistributionInfo** Includes Distributor contact information.

Crosswalk considerations

ISO19139

See discussion at CI_Responsibility

Dublin core / CKAN / data.gov.au

Maps to contact > Note BC 19-7: These map to the same elements as Metadata Contact. Is this a problem?

DCAT

Maps to `dcate:contactPoint`

RIF-CS

Maps to Related Party

Examples

XML

```
<mdb:MD_Metadata>
....
  <mdb:identificationInfo>
    <mri:MD_DataIdentification>
      ....
      <mri:pointOfContact>
        <cit:CI_Responsibility>
          <cit:role>
            <cit:CI_RoleCode
```

```

    codeList="https://schemas.isotc211.org/19115/resources
    /CodeList/cat/codelists.xml#CI_RoleCode"
    codeListValue="custodian"/>
  </cit:role>
  <cit:party>
    <cit:CI_Organisation>
      <cit:name>
        <gco:CharacterString>OpenWork Ltd</gco:CharacterString>
      </cit:name>
      <cit:contactInfo>
        <cit:CI_Contact>
          <cit:address>
            <cit:CI_Address>
              <cit:electronicMailAddress>
                <gco:CharacterString>email@mail.com
                </gco:CharacterString>
              </cit:electronicMailAddress>
            </cit:CI_Address>
          </cit:address>
        </cit:CI_Contact>
      </cit:contactInfo>
    </cit:individual>
    <cit:CI_Individual>
      <cit:name>
        <gco:CharacterString>Metadata Bob
        </gco:CharacterString>
      </cit:name>
      <cit:positionName>
        <gco:CharacterString>GIS Guru
        </gco:CharacterString>
      </cit:positionName>
    </cit:CI_Individual>
  </cit:individual>
</cit:CI_Organisation>
</cit:party>
</cit:CI_Responsibility>
</mri:pointOfContact>
....
  </mri:MD_DataIdentification>
  </mdb:identificationInfo>
....
</mdb:MD_Metadata>

```


UML diagrams

Recommended elements highlighted in Yellow

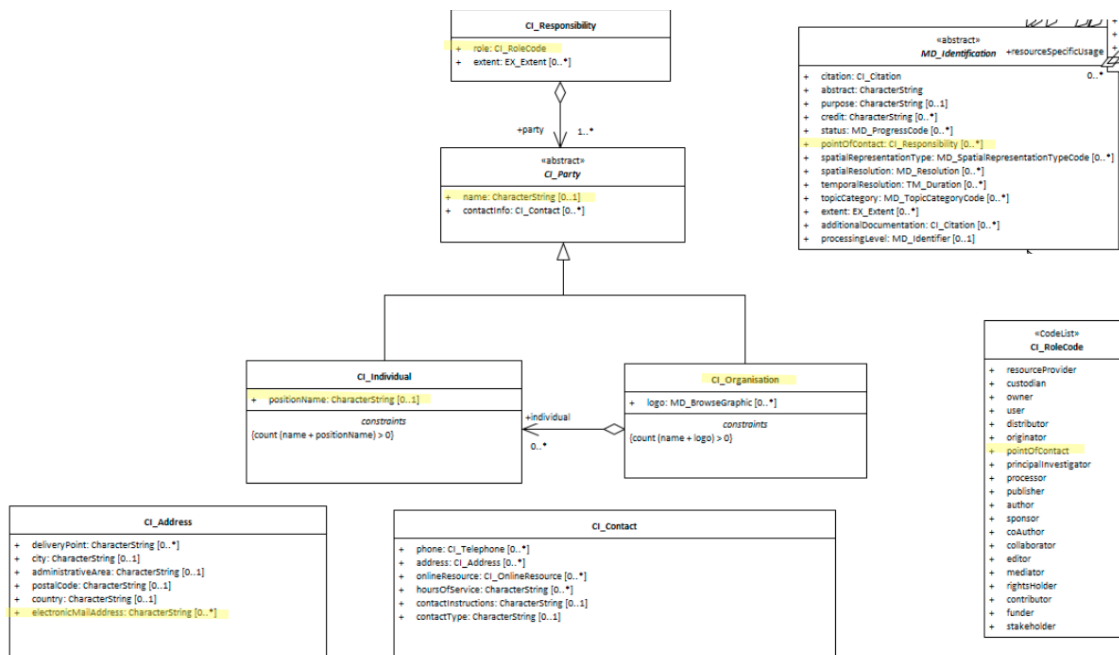


Figure 16: Responsibility

Additional Documentation ★★ ★

A cited resource may have any number of related documents such as articles, publications, user guides, data dictionaries that are useful in applying the resource to desired purposes. Often these are difficult to discover and manage. Capturing these in the metadata is recommended.

Element Name	<i>additionalDocumentation</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>CI_Citation</i>
Governance	<i>Domain, Agency</i>
Purpose	<i>Data Management, Resource Use</i>
Audience	machine resource - ★ general - ★ ★ ★ resource manager - ★ ★ ★ ★ ★ specialist - ★ ★ ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

Citation of other documentation associated with the resource, e.g. related articles, publications, user guides, data dictionaries.

ISO Obligation

There may be zero to many [0..*] *additionalDocumentation* packages for the cited resource in the *MD_DataIdentification* package of class *CI_Citation* in the metadata record.

Discussion

To make the best use of a given resource, additional documentation may be useful or required. Providing instructions for accessing these documents can greatly enhance the value of a resource to its users and providers. Capturing these additional documents in the metadata is also helpful to resource managers who need to properly track the linkages between a resource and its documentation. The resource may be data or service, *MD_DataIdentification** or **SV_ServiceIdentification*

ICSM Recommendations

Therefore - to make the best use of a given resource capturing the links to additional documentation related to this resource is highly recommended. Capture those documents of the highest value to your most likely community of users. If possible, include some reference to documentation or its metadata that can be easily understood by laypeople and label this accordingly.

This element should be populated in all metadata records with a minimum of *title*, *identifier*, *date* and *citedResponsibleParty*. If possible, use the link to the metadata for the cited additional documentation as the

resource landing page.

Recommended Sub-Elements

- **title** - (*type - charStr*) [1..1] mandatory for citations, the name by which the cited resource is known
- **date** - (*class - CI_Date*) recommended, the reference date for the cited resource. In addition, some direction should be given about how to access the cited additional resource.
- **onlineResource** - (*class CI_OnlineResource*) [0..*] a description of how to access the cited additional resource online
- **citedResponsibleParty** - (*class CI_Responsibility*) [0..*] contact information for someone who can give guidance about accessing the cited additional resource

Also Consider

- **MD_DataIdentification.supplementalInformation** - is defined as “any other descriptive information about the resource”.
- **MD_AssociatedResource** - contains information about resources of which this resource is a piece. Association types are taken from the DS_AssociationTypeCode.

Outstanding Issues

DCAT Previously captured DCAT related documentation on these elements calls what is considered the equivalent “A free-text account of the catalog.” Mapping seems incorrect.

Crosswalk considerations

DCAT

Maps to dct.description free-text

RIF-CS

Maps to Description 'notes'

Examples

XML

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
    <mri:additionalDocumentation>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>Usage guide</gco:CharacterString>
```

```

</cit:title>
<cit:date>
  <cit:CI_Date>
    <cit:date>
      <gco>Date>2019-07-01</gco>Date>
    </cit:date>
    <cit:dateType>
      <cit:CI_DateTypeCode
        codeList="https://schemas.isotc211.org/19115/resources/Codelist/
        cat/codelists.xml#CI_DateTypeCode"
        codeListValue="creation"/>
      </cit:dateType>
    </cit:CI_Date>
  </cit:date>
  <cit:citedResponsibleParty>
    <cit:CI_Responsibility>
      <cit:role>
        <cit:CI_RoleCode
          codeList="https://schemas.isotc211.org/19115/resources
          /Codelist/cat/codelists.xml#CI_RoleCode"
          codeListValue="custodian"/>
        </cit:role>
      <cit:party>
        <cit:CI_Organisation>
          <cit:name>
            <gco:CharacterString>OpenWork Ltd</gco:CharacterString>
          </cit:name>
          <cit:contactInfo>
            <cit:CI_Contact>
              <cit:address>
                <cit:CI_Address>
                  <cit:electronicMailAddress>
                    <gco:CharacterString>info@openwork.nz
                    </gco:CharacterString>
                  </cit:electronicMailAddress>
                </cit:CI_Address>
              </cit:address>
            </cit:CI_Contact>
          </cit:contactInfo>
          <cit:individual>
            <cit:CI_Individual>
              <cit:name>
                <gco:CharacterString>Byron Cochrane

```

```

        </gco:CharacterString>
      </cit:name>
    </cit:CI_Individual>
  </cit:individual>
</cit:CI_Organisation>
</cit:party>
</cit:CI_Responsibility>
</cit:citedResponsibleParty>
<cit:onlineResource>
  <cit:CI_OnlineResource>
    <cit:linkage>
      <gco:CharacterString>https://openwork-nz.github.io
      /Resources/2019/04/25/gn-plugins.html
    </gco:CharacterString>
    </cit:linkage>
    <cit:protocol gco:nilReason="missing">
      <gco:CharacterString/>
    </cit:protocol>
    <cit:name gco:nilReason="missing">
      <gco:CharacterString/>
    </cit:name>
    <cit:description gco:nilReason="missing">
      <gco:CharacterString/>
    </cit:description>
    <cit:function>
      <cit:CI_OnLineFunctionCode codeList=
      "https://schemas.isotc211.org/19115/resources/Codelist
      /cat/codelists.xml#CI_OnLineFunctionCode"
      codeListValue=""/>
    </cit:function>
    </cit:CI_OnlineResource>
  </cit:onlineResource>
</cit:CI_Citation>
</mri:additionalDocumentation>
....
</mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

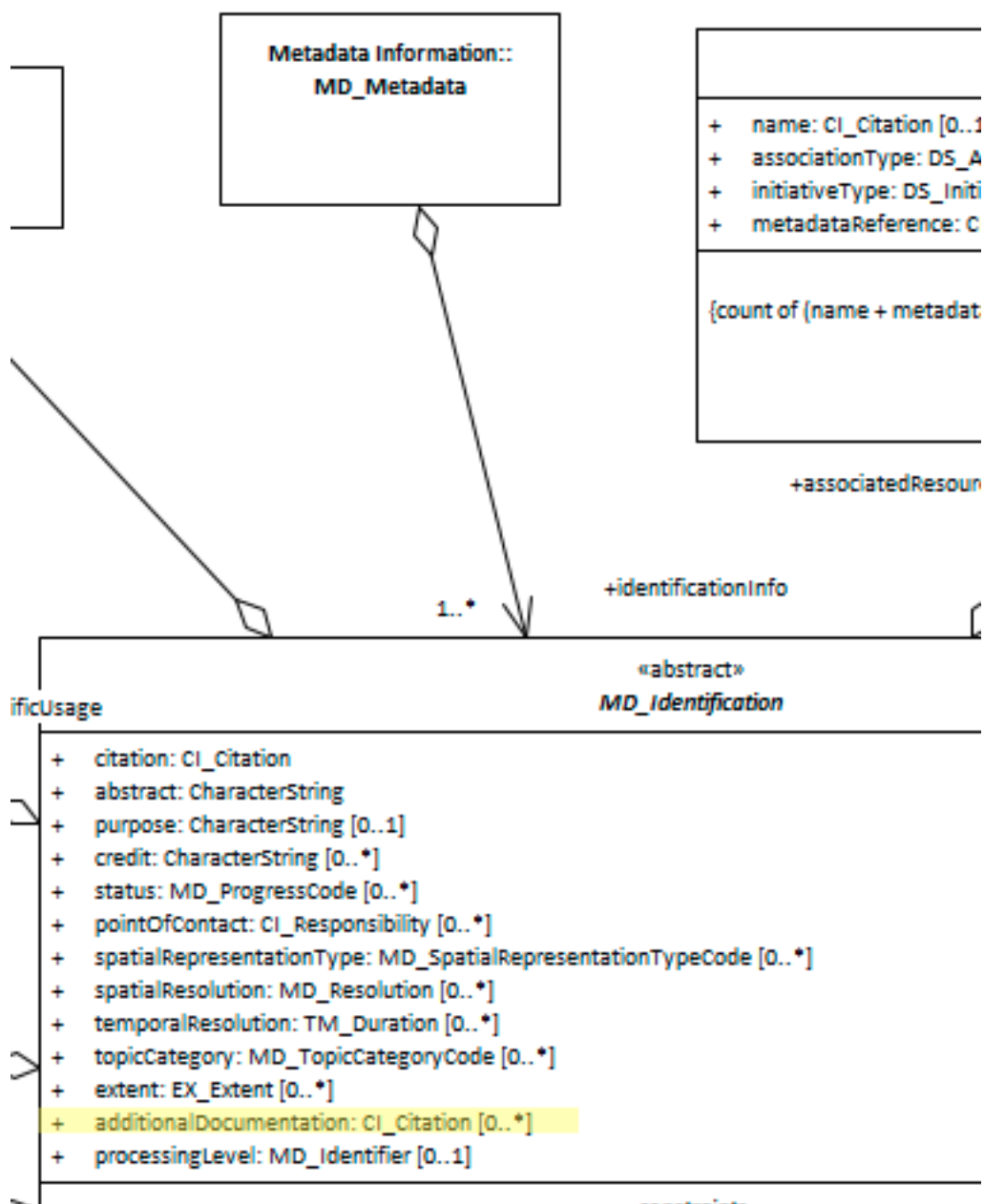


Figure 17: additionalDoc

Spatial Representation Type ★★★★★

In order to quickly find, categorise and evaluate the fitness of a resource to our needs it is useful to include in our metadata a high-level description of the type or format of spatial data the resource contains.

Element Name	<i>spatialRepresentationType</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>characterString</i>
Governance	<i>Common ICSM, Domain</i>
Purpose	<i>Discovery</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>Structural</i>
ICSM Level of Agreement	★ ★ ★

Definition

The method used by the resource to spatially represent geographic information.

ISO Obligation

- There can be zero to many [0..*] *spatialRepresentationType* entries for the cited resource in the *MD_DataIdentification* package selected from codelist *MD_SpatialRepresentationTypeCode*.

Discussion

A resource may consist of many spatial representation types. It may also contain no spatial representation types. Most commonly, a geospatial resource will consist of a single representation type. The resource may be data or service, *MD_DataIdentification** or **SV_ServiceIdentification*

ICSM Recommendations

Therefore - If a resource contains spatial representations, to provide guidance to users, the type of spatial representation(s) should be captured using this element. Further Spatial representation details could be captured in the optional *spatialRepresentationInfo* package. At least one instance of this element should be populated in all metadata records describing spatial resources.

Values for this element must come from the *MD_SpatialRepresentationTypeCode* codelist.

Possible Values for *spatialRepresentationType*

From codelist - *MD_SpatialRepresentationTypeCode*

- *vector* - vector data is used to represent geographic data

- *grid* - grid data is used to represent geographic data
- *textTable* - textual or tabular data is used to represent geographic data
- *tin* - triangulated irregular network
- *stereoModel* - three-dimensional view formed by the intersecting homologous rays of an overlapping pair of images
- *video* - scene from a video recording

Also Consider

- **MD_Metadata.spatialRepresentationInfo** - Abstract class that describes the digital mechanism used to represent spatial information. Not detailed by MDWG

Crosswalk considerations

ISO19139

MD_DataIdentification/spatialRepresentationType moved from MD_DataIdentification to MD_Identification in order to allow their use for service identification. In practice, when creating metadata for data, this change is not noticeable.

Examples

XML -

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
    <mri:spatialRepresentationType>
      <mcc:MD_SpatialRepresentationTypeCode
        codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat
          /codelists.xml#MD_SpatialRepresentationTypeCode"
        codeListValue="vector"/>
      </mri:spatialRepresentationType>
    ....
  </mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

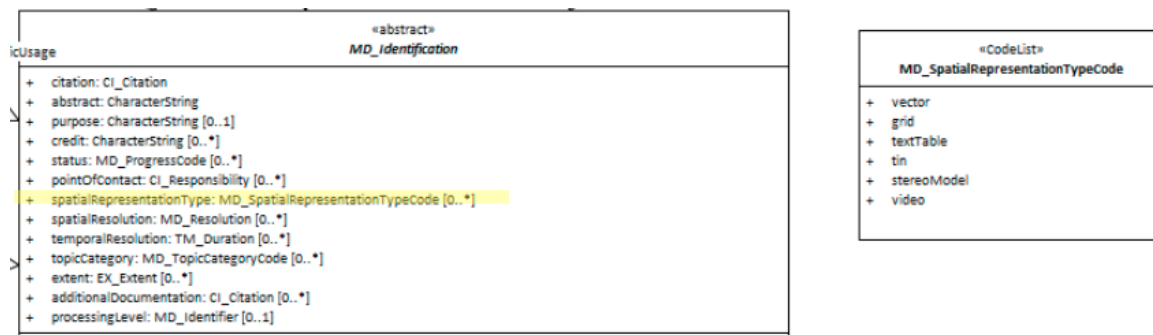


Figure 18: spatialRepresentationType

Resource Citation ★★★★★

Some of the most basic needs of users of a resource is citation information. This basic information includes title, edition, identifier, dates, responsible parties, etc. In ISO 19115-1 we capture this information in *MD_identification.citation*.

Element Name	<i>citation</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>CI_Citation</i>
Governance	<i>Common ICSM, Agency, Domain</i>
Purpose	<i>Discovery, Identification</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★ ★

Definition

Citation information for the spatial resource.

ISO Obligation

There must be one and only one [1..1] *MD_Metadata.identificationInfo>MD_Identification.citation* package for the cited resource in a metadata record. This must be of of class *CI_Citation*. The resource may be of type Data *MD_DataIdentification* or of type Service *[SV_ServiceIdentification].

Discussion

The citation package contains multiple elements from *CI_Citation*. Only child elements contain content. Follow the links on the child elements recommendations for further instruction. Aspects of the contents of this package may be governed at different levels.

ICSM Recommendations

Therefore - For potential users to find and identify spatial resources, these must be well-cited with information that includes a minimum of title, identifier, date (of type creation, plus revision and issued when appropriate) and citedResponsibleParty (for author or creator, plus publisher and contributor when appropriate).

Because many of the elements of *MD_Identification.citation* are mandatory and are important for identification and harvesting of metadata, it is recommended that the guidance provided in each of these six sub-elements (title, date, edition, identifier, citedResponsibleParty, and series) be followed. Other available *CI_Citation* elements

should be used if needed to properly document your resource. Consult your metadata governance team on such use.

This element should be populated in all service metadata records.

Recommended Sub-Elements

Follow the general guidance for **CI_Citation** with emphasis on the following elements: - **title** - (*type - charStr*)[1..1] Mandatory - name by which the cited resource is known - **date** - (*class - CI_Date*) [0..*] reference date for the cited resource. Should include at a minimum, the creation date for the resource. - **edition** - (*type - charStr*) [0..1] version of the cited resource if appropriate - **identifier** - (*class - MD_Identifier*) [0..*] value uniquely identifying an object within a namespace. Recommend provision of a resolvable URI following the MD_Identifier guidance. - **citedResponsibleParty** - (*class - CI_Responsibility*)[0..*] roles, name, contact, and position information for an individual or organisation that is responsible for the resource. It is recommended that a party with the role “Point of Contact” be provided as well as an entry for “author” or “publisher”. - **series** - (*class - CI_Series*) [0..1] If needed, information about the series, or aggregate resource, of which the resource is a part should be included. - **onlineResource** - *class - CI_OnlineResource* [0..*] Highly Recommended for Service Resources. Should contain the URL Link for the landing page of the service. May also be recorded in *DistributionInfo* or *ResourceIdentifier*

Other Sub-Elements

- **alternateTitle** - (*type - charStr*) [0..*] short name or other language name by which the cited service is known. Example: DCW as an alternative title for Digital Chart of the World. Recommended whenever there are alternate names commonly in use.
- **series** - (*class - CI_Series*) [0..1] If needed, information about the series, or aggregate resource, of which the resource is a part should be included.
- See

Also Consider

- **DistributionInfo** - Can contain information about how the resource is distributed. like *onlineResource* should contain landing page linkages to the resource but can also store additional information.
- **metadataLinkage** - for links that provide a download of the metadata
- **browseGraphic** - associates to a large number of packages to provide linkage to associated image files, such as business or product icons and logos
- **ContainsOperations** - For Service resources, this element can provide online access instructions.
- **CI_Citation** - the class guidance for more options.

Outstanding Issues

CORE ISSUE:

Core to any metadata record is access to the described resource. There are several options where this may be expressed in an ISO19115-1 metadata record. The MDWG has not agreed as to a consistent approach. Inside the resource citation package, the *identifier* and *onlineResource* may provide this functionality. The package *DistributionInfo* is, of course, a common way to capture such

information - particularly for data resources. For service resources, `ContainsOperations` is another common location for resource access information. Further discussion and guidance are needed to resolve this issue to support machine readability and reduce confusion.

Examples

XML

Data Resource example

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
    <mri:citation>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>OpenWork geographical data
        </gco:CharacterString>
        </cit:title>
        <cit:date>
          <cit:CI_Date>
            <cit:date>
              <gco>Date>2019-07-18</gco>Date>
            </cit:date>
            <cit:dateType>
              <cit:CI_DateTypeCode
                codeList="https://schemas.isotc211.org/19115/resources
                  /Codelist/cat/codelists.xml#CI_DateTypeCode"
                codeListValue="creation"/>
              </cit:dateType>
            </cit:CI_Date>
          </cit:date>
          <cit:date>
            <cit:CI_Date>
              <cit:date>
                <gco>Date>2019-07-18</gco>Date>
              </cit:date>
              <cit:dateType>
                <cit:CI_DateTypeCode
                  codeList="https://schemas.isotc211.org/19115/resources
                    /Codelist/cat/codelists.xml#CI_DateTypeCode"
                  codeListValue="publication"/>
                </cit:dateType>
              </cit:CI_Date>
            </cit:date>
          </cit:date>
        </cit:CI_Citation>
      </mri:citation>
    </mri:MD_DataIdentification>
  </mdb:identificationInfo>
</mdb:MD_Metadata>
```

```

    </cit:CI_Date>
  </cit:date>
  <cit:edition>
    <gco:CharacterString>Version 0.1</gco:CharacterString>
  </cit:edition>
  <cit:editionDate>
    <gco:Date>2019-07-18</gco:Date>
  </cit:editionDate>
  <cit:identifier>
    <mcc:MD_Identifier>
      <mcc:code>
        <gco:CharacterString>
          9547e07e-6a15-403b-8b19-488778fe0cf0
        </gco:CharacterString>
      </mcc:code>
      <mcc:codeSpace>
        <gco:CharacterString>
          http://202.49.243.69:8080/geonetwork/srv/eng/metadata/
        </gco:CharacterString>
      </mcc:codeSpace>
    </mcc:MD_Identifier>
  </cit:identifier>
  <cit:citedResponsibleParty>
    <cit:CI_Responsibility>
      <cit:role>
        <cit:CI_RoleCode
          codeList="https://schemas.isotc211.org/19115/resources
            /Codelist/cat/codelists.xml#CI_RoleCode"
          codeListValue="author"/>
      </cit:role>
      <cit:party>
        <cit:CI_Organisation>
          <cit:name>
            <gco:CharacterString>OpenWork Ltd
          </gco:CharacterString>
          </cit:name>
          <cit:contactInfo>
            <cit:CI_Contact>
              <cit:address>
                <cit:CI_Address>
                  <cit:electronicMailAddress>
                    <gco:CharacterString>info@openwork.nz
                  </gco:CharacterString>

```

```

    </cit:electronicMailAddress>
  </cit:CI_Address>
</cit:address>
</cit:CI_Contact>
</cit:contactInfo>
</cit:CI_Organisation>
</cit:party>
</cit:CI_Responsibility>
</cit:citedResponsibleParty>
<cit:citedResponsibleParty>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode
        codeList="https://schemas.isotc211.org/19115/resources
          /Codelist/cat/codelists.xml#CI_RoleCode"
        codeListValue="publisher"/>
    </cit:role>
  </cit:party>
    <cit:CI_Individual>
      <cit:name>
        <gco:CharacterString>Byron Cochrane
        </gco:CharacterString>
      </cit:name>
      <cit:contactInfo>
        <cit:CI_Contact>
          <cit:address>
            <cit:CI_Address>
              <cit:electronicMailAddress>
                <gco:CharacterString>byron@openwork.nz
                </gco:CharacterString>
              </cit:electronicMailAddress>
            </cit:CI_Address>
          </cit:address>
        </cit:CI_Contact>
      </cit:contactInfo>
    </cit:CI_Individual>
  </cit:party>
</cit:CI_Responsibility>
</cit:citedResponsibleParty>
</cit:CI_Citation>
</mri:citation>
....
</mri:MD_DataIdentification>

```

```
</mdb:identificationInfo>
```

```
....
```

```
</mdb:MD_Metadata>
```

Service Resource example

```
<mdb:MD_Metadata>
```

```
....
```

```
<mdb:identificationInfo>
```

```
<srv:SV_ServiceIdentification>
```

```
<mri:citation>
```

```
<cit:CI_Citation>
```

```
<cit:title>
```

```
<gco:CharacterString>Sample service metadata 2020-05-28</gco:CharacterString>
```

```
</cit:title>
```

```
<cit:date>
```

```
<cit:CI_Date>
```

```
<cit:date>
```

```
<gco:DateTime>2019-09-01T00:00:00</gco:DateTime>
```

```
</cit:date>
```

```
<cit:dateType>
```

```
<cit:CI_DateTypeCode codeList="http://standards.iso.org/iso/19115/resources/Codelists/cat
codeListValue="creation"/>
```

```
</cit:dateType>
```

```
</cit:CI_Date>
```

```
</cit:date>
```

```
<cit:date>
```

```
<cit:CI_Date>
```

```
<cit:date>
```

```
<gco:DateTime>2019-12-01T00:00:00</gco:DateTime>
```

```
</cit:date>
```

```
<cit:dateType>
```

```
<cit:CI_DateTypeCode codeList="http://standards.iso.org/iso/19115/resources/Codelists/cat
codeListValue="revision"/>
```

```
</cit:dateType>
```

```
</cit:CI_Date>
```

```
</cit:date>
```

```
<cit:edition>
```

```
<gco:CharacterString>2nd Revision</gco:CharacterString>
```

```
</cit:edition>
```

```
<cit:editionDate>
```

```
<gco:DateTime>2019-12-01T00:00:00</gco:DateTime>
```

```
</cit:editionDate>
```

```
<cit:identifier>
```

```

<mcc:MD_Identifier>
  <mcc:code>
    <gcx:Anchor xlink:href="https://my.webite.io/cgi-bin/wfs-map-site" xlink:type="simple">ht
  </mcc:code>
</mcc:MD_Identifier>
</cit:identifier>
<cit:citedResponsibleParty>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode codeList="http://standards.iso.org/iso/19115/resources/Codelists/cat/cod
        codeListValue="contributor"/>
    </cit:role>
    <cit:party>
      <cit:CI_Organisation>
        <cit:name>
          <gco:CharacterString>OpenWork Ltd</gco:CharacterString>
        </cit:name>
        <cit:contactInfo>
          <cit:CI_Contact>
            <cit:address>
              <cit:CI_Address>
                <cit:electronicMailAddress>
                  <gco:CharacterString>info@openwork.nz</gco:CharacterString>
                </cit:electronicMailAddress>
              </cit:CI_Address>
            </cit:address>
          </cit:CI_Contact>
        </cit:contactInfo>
      </cit:CI_Organisation>
    </cit:party>
  </cit:CI_Responsibility>
</cit:citedResponsibleParty>
<cit:citedResponsibleParty>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode codeList="http://standards.iso.org/iso/19115/resources/Codelists/cat/cod
        codeListValue="publisher"/>
    </cit:role>
    <cit:party>
      <cit:CI_Organisation>
        <cit:name>
          <gco:CharacterString>IOCSM MDWG</gco:CharacterString>
        </cit:name>

```



```

    <cit:contactInfo>
      <cit:CI_Contact>
        <cit:address>
          <cit:CI_Address>
            <cit:electronicMailAddress>
              <gco:CharacterString>mdwg@icsm-au.org</gco:CharacterString>
            </cit:electronicMailAddress>
          </cit:CI_Address>
        </cit:address>
      </cit:CI_Contact>
    </cit:contactInfo>
  </cit:CI_Organisation>
</cit:party>
</cit:CI_Responsibility>
</cit:citedResponsibleParty>
<cit:onlineResource>
  <cit:CI_OnlineResource>
    <cit:linkage>
      <gco:CharacterString>https://my.webite.io/</gco:CharacterString>
    </cit:linkage>
    <cit:protocol gco:nilReason="missing">
      <gco:CharacterString/>
    </cit:protocol>
    <cit:name>
      <gco:CharacterString>OWL WFS Sample site</gco:CharacterString>
    </cit:name>
    <cit:description>
      <gco:CharacterString>Landing page for Spatial Service</gco:CharacterString>
    </cit:description>
    <cit:function>
      <cit:CI_OnLineFunctionCode codeList="http://standards.iso.org/iso/19115/resources/Codelis
        codeListValue=""/>
    </cit:function>
  </cit:CI_OnlineResource>
</cit:onlineResource>
</cit:CI_Citation>
</mri:citation>
....
</mri:SV_ServiceIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

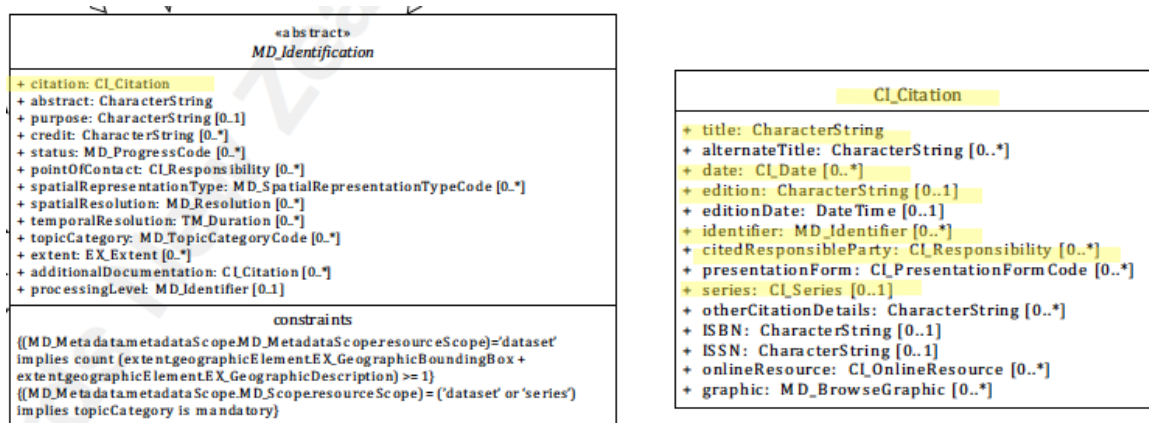


Figure 19: ResourceCitation

Resource Title ★★★★★

The most important component of the Resource Citation is the **title** element. To easily communicate about a resource and at least locally differentiate it from others, it is useful that the resource has a common name. This name is captured in the Resource Citation **title** element.

Element Name	<i>title</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identificationcitation>CI_Citation</i>
Class/Type	<i>characterString</i>
Governance	<i>Common ICSM, Agency, Domain</i>
Purpose	<i>Discovery, Identification</i>
Audience	machine resource - ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★★★★

Definition

The most common useful name by which the resource is known.

ISO Obligation

- There must be one and only one [1..1] *title* element for the cited resource in the *MD_Identification.citation* package in a metadata record of type *character string*. The resource may be of type Data *MD_DataIdentification* or of type Service *[SV_ServiceIdentification].

Discussion

The value of the title field should be the most common name by which the resource is known by your largest perceived audience. It should be relatively unique or made so by the inclusion of expanded title elements such as edition numbers or agency name.

There can be multiple alternate titles captured for a resource in the sibling element *alternateTitle*. These should be populated with other known names or variations of the name.

ICSM Recommendations

Therefore - there must be one title given for a resource. The value of the title field should be the most common name by which the resource is known by your largest perceived audience. It should be relatively unique or made so by the inclusion of expanded title elements such as edition numbers or agency name.

Use the sibling element *alternateTitle* to capture other names by which the resource may be known. Index both *title* and *alternateTitle* in the same index to increase the likelihood that the resource may be found by the title that others may know it.

If the title is not a common language name, at least one alternate title should be common language title such as a layperson may identify it.

ICS Good Practice

- All metadata records must have the element *MD_Metadata,indentificationInfo>MD_Identification.citation>CI_Citation.title* populated with the most common useful name by which the resource is known.

Also Consider

- **alternateTitle** - (*type - charStr*) [0..*] Sibling to **title**. A short name or another language name by which the cited information is known. Example: DCW as an alternative title for Digital Chart of the World. Recommended whenever there are alternate names commonly in use.
- **ResourceCitation** - parent to this element

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Maps to **title**

DCAT

Maps to **dct.title**

RIF-CS

Maps to **Title**

Examples

Example Current Use

ABARES “2.5M Topographical Series 1998 MAPDATA TOPO_2.5M Scale 1:2.5 Million”

GA “Geomorphic features of the Antarctic and Southern Ocean 2012”

Data.govt.au Location of Medicare Offices

XML

```
<mdb:MD_Metadata>
....
  <mdb:identificationInfo>
    <mri:MD_DataIdentification>
      <mri:citation>
        <cit:CI_Citation>
```

```

<cit:title>
  <gco:CharacterString>OpenWork geographical data<
    /gco:CharacterString>
</cit:title>
<cit:alternateTitle>
  <gco:CharacterString>geodata by OpenWork</gco:CharacterString>
</cit:alternateTitle>
  ....
</cit:CI_Citation>
</mri:citation>
  ....
</mri:MD_DataIdentification>
</mdb:identificationInfo>
  ....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

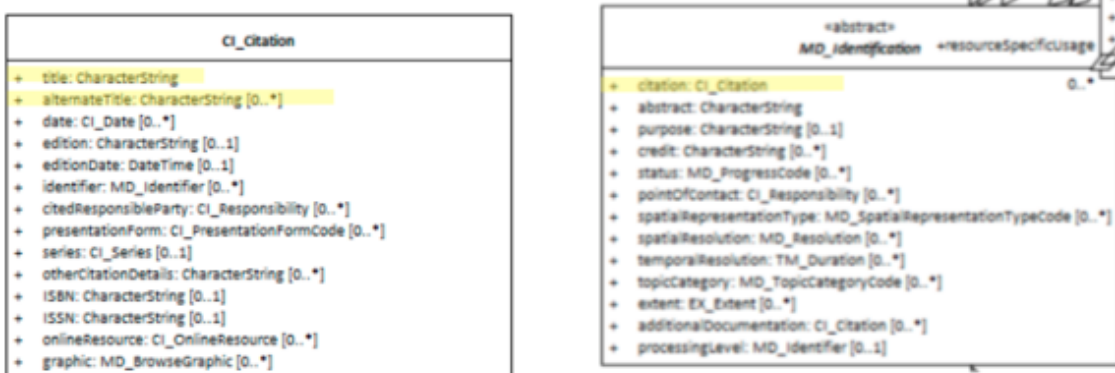


Figure 20: title

Resource Identifier ★★★★★

An important component of the Resource Citation is the resource identification element. Similar to the Metadata Identifier, this element holds a code that uniquely identifies the resource and differentiates it from all others. With this, machines and humans can differentiate, reference and link to the resource without ambiguity

Element Name	<i>identifier</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identifiercitation>CI_Citation</i>
Class/Type	<i>MD_Identifier</i>
Governance	<i>Common ICSM, Agency, Domain</i>
Purpose	<i>Linkage, Identification</i>
Audience	machine resource - ★ ★ ★ ★ general - ★ resource manager - ★ ★ ★ specialist - ★ ★
Metadata type	<i>administrative</i>
ICSM Level of Agreement	★★★★

Definition

Alphanumeric identifier uniquely identifying this cited resource.

ISO Obligation

- This is an ISO optional element. There may be zero or many [0..*] *identifier* entries for the cited resource in the *MD_DataIdentification.citation* package of class *MD_Identifier* in a metadata record. The resource may be of type Data *MD_DataIdentification* or of type Service *[SV_ServiceIdentification]

Discussion

The Resource Identifier is an identifier for the dataset, not the metadata record. The Metadata Identifier provides an identifier for the metadata. A failure to distinguish between these two elements - especially as they apply to crosswalk between standards such as Dublin Core leads to a great deal of confusion and misunderstanding.

Commonly, standards like Dublin Core do not make a distinction between the metadata identifier and the resource identifier. Emerging practice, such as Google data search beta, suggests that the distinction is useful. Harvested metadata should point to a source metadata record - a 'point of truth' or the resource from which the record was harvested. Using this logic, the resource identifier URI would not need to be harvested by a high-level catalogue such as data.gov.au.

A common practice in GA and ABARES is for this identifier to be the same as the metadata identifier. In these cases, it can be said the authoritative metadata serves as the landing page for the data resource.

In the case where a resource may have multiple identifiers, additional instances of this element can be created. The *discription* element must be populated in such situations to distinguish the meaning of the different identifiers.

ICSM Recommendations

Therefore - It is recommended that this element be populated, preferably once, but more often if there are multiple identifier systems for the same resource. In the case of multiple identifiers, the `description` element must be populated in such situations to distinguish the meaning of the different identifiers. Code must be populated in all records and it is recommended that `codeSpace` be populated as well.

Common practice has been to populate this field that is the same as or resolves to the metadata record itself. In this case, the metadata can be said to be the landing page for the resource.

If the metadata record is for a resource that contains more than one dataset, a best practice way to document that in the metadata needs be developed. This case may better be addressed through related metadata records.

Development of URI naming conventions to describe how the reference to the resource and the reference to metadata for that resource would be useful. This would allow easy discovery of not only the data from the metadata but solve the often more difficult problem of discovery of the metadata for a given dataset.

Recommended Sub-Elements

Follow the general guidance for **MD_Identifier** with emphasis on the following elements:

- **code** - (*type - charstr*) [1..1] **Mandatory** An alphanumeric value identifying an instance in the namespace,
- **codespace** - (*type - charstr*) [0..1] An optional but recommended namespace in which the code is valid. Ideally a URL path by which, when combined with the UUID, the full path to the resource landing page is provided.
- **description** - (*type - charstr*) [0..1] An optional but recommended natural language description of the meaning of the code value. Usually prepopulated in the metadata template.

Also Consider

- **onlineResource** - (`MD_Distribution.transferOptions>MD_DigitalTransferOptions.online`) is used to provide online lineage to the resource.
- **MetadataIdentifier** - is the preferred element to be used to provide linkage to the metadata record.
- **Resource Citation** - parent to this element

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Maps to `identifier` > Note BC 18-7 - may relate to issues involving confusion between metadata identifiers and resource identifiers in DC and other metadata systems.

DCAT

Maps to `dcate:identifier`

RIF-CS

Maps to `Identifier`

Examples

ABARES

MD_Identifier > code : 942d6f4e-17b0-41fd-a623-c2c78d107e6d **MD_Identifier > codespace :** UUID
MD_Identifier > description : The UUID for this resource, its citation and its metadata

GA

MD_Identifier > code : http://pid.geoscience.gov.au/dataset/ga/102441 **MD_Identifier > codespace :** Geoscience Australia Persistent Identifier

data.gov.au

URN:UUID (example 559708e5-480e-4f94-8429-c49571e82761)

XML

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
    <mri:citation>
      <cit:CI_Citation>
        ....
        <cit:identifier>
          <mcc:MD_Identifier>
            <mcc:code>
              <gco:CharacterString>9547e07e-6a15-403b-8b19-488778fe0cf0
            </gco:CharacterString>
          </mcc:code>
          <mcc:codeSpace>
            <gco:CharacterString>
              http://202.49.243.69:8080/geonetwork/srv/eng/metadata/
            </gco:CharacterString>
          </mcc:codeSpace>
        </mcc:MD_Identifier>
      </cit:identifier>
      ....
    </cit:CI_Citation>
  </mri:citation>
  ....
</mri:MD_DataIdentification>
</mdb:identificationInfo>
....
```


</mdb:MD_Metadata>

UML diagrams

Recommended elements highlighted in Yellow

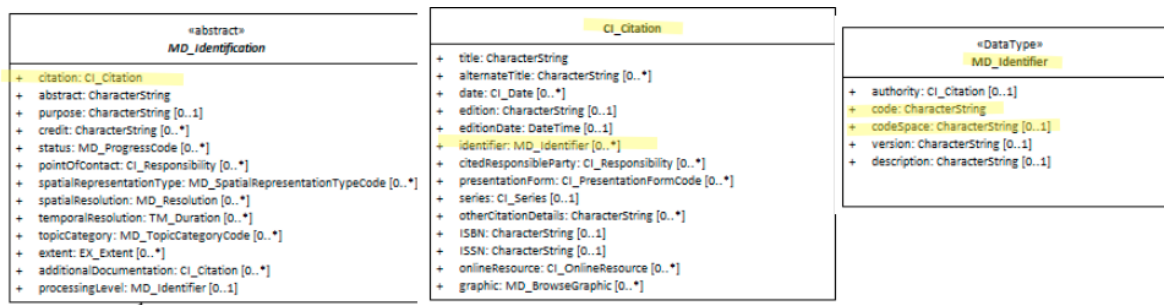


Figure 21: resourceIdentifier

Resource Reference Date ★★★★★

To manage resource and notification systems such as giving updates to users it is useful to include in our metadata temporal information relating to resource creation, publication, revision, etc.

Element Name	<i>date</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identificationcitation>CI_Citation</i>
Class/Type	<i>CI_Date</i>
Governance	<i>Agency, Domain</i>
Purpose	<i>Discovery, Identification</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ ★ ★ specialist - ★ ★ ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★★★

Definition

A named and dated event associated with the cited resource (in ISO 8601 format).

ISO Obligation

- There can be zero to many [0..*] *Resource reference date* entries for the cited resource in the *MD_Identification.citation* package of class *CI_Date* in a metadata record. One of these must be of *dateType creation*. The resource may be of type Data *MD_DataIdentification* or of type Service **[SV_ServiceIdentification]*.

Discussion

There should be at least one instance of a resource reference date in a metadata record (*dateType - creation*), but there should be multiple - including *publication* and as many *lastUpdate* entries as needed

The *CI_DateType* CodeList contains 16 values. Which values are of most import needs further discussion. The ability to crosswalk easily with CKAN and DCAT is of high concern. These external catalogues commonly have a single date field. Which *dateType* we map to this field is of interest in discussions regarding the recommended *dateTypes* used.

Relation of Metadata *dateInfo* to Resource reference date needs to be discussed. The Resource reference date is documented as the date that should be used for the discovery of resources other than services. (For services *MD_Metadata.identificationInfo>SV_ServiceIdentification.citation>CI_Citation.date* is used.)

When does the metadata *dateInfo* require updating? For instance, is it okay to not update the metadata *dateInfo* when the Resource reference date is updated if nothing else has changed? Our good practice guide should address these and related issues.

Recommendations

Therefore - To provide an idea of the age, validity and other time dependant properties of a resource, it is important to capture the important events that happened or will happen to a particular resource in the Resource Reference Date element. One of these important events must be of `dateType` “creation”. Creation is a significant date in regards to copyright. Other important date types are “publication” and “lastUpdate”.

Recommended Sub-Elements

It is recommended that `Resource Date` include -

- **date** - (Mandatory) the reference `DateTime` for the metadata record.
- **dateType** - Highly recommended. There should be multiple entries for the Resource reference date in a metadata record. These should include `dateType` entries for:
 - **Creation date** - This is important for intellectual property and other reasons
 - **Publication date** - Is the most common date type captured by an agency
 - **Update date** - Allows notifications and resource management. All updates to metadata should also include the date of last revision to the metadata. This can be an automated process.

This element should be updated in a consistent yet to be agreed upon manner. We recommend GeoNetwork’s current approach. GeoNetwork updates the **revision date** for the metadata record automatically on every save. This supports systems such as notifications and harvesting regimes that rely on the capture of the date that a metadata record was last modified.

Also Consider

- **Metadata Date** - for dates related to the metadata record itself and not the cited resource
- **CI_Date** - for general information about the class `CI_Date`
- **Resource Citation** - parent to this element

Other discussion

Date and DateTime: When is it okay to use `Date` as opposed to `DateTime`?

DCAT: encoded using the relevant ISO 8601 Date and Time compliant string [DATETIME] and typed using the appropriate XML Schema datatype [XMLSCHEMA11-2]

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Maps to `date` (publication, update)

DCAT

Maps to `dct:issued*` and `*dct:modified`

RIF-CS

Maps to Date

Examples

XML

```

</mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    <mri:citation>
      <cit:CI_Citation>
        ....
        <cit:date>
          <cit:CI_Date>
            <cit:date>
              <gco>Date>2018-06-11</gco>Date>
            </cit:date>
            <cit:dateType>
              <cit:CI_DateTypeCode
                codeList="https://schemas.isotc211.org/19115/resources
                  /Codelist/cat/codelists.xml#CI_DateTypeCode"
                codeListValue="creation"/>
              </cit:dateType>
            </cit:CI_Date>
          </cit:date>
          <cit:date>
            <cit:CI_Date>
              <cit:date>
                <gco>Date>2019-06-11</gco>Date>
              </cit:date>
              <cit:dateType>
                <cit:CI_DateTypeCode
                  codeList="https://schemas.isotc211.org/19115/resources
                    /Codelist/cat/codelists.xml#CI_DateTypeCode"
                  codeListValue="lastUpdate"/>
                </cit:dateType>
              </cit:CI_Date>
            </cit:date>
          ....
        </cit:CI_Citation>
      </mri:citation>
    ....
  
```

```

    </mri:MD_DataIdentification>
  </mdb:identificationInfo>
  . . . .
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

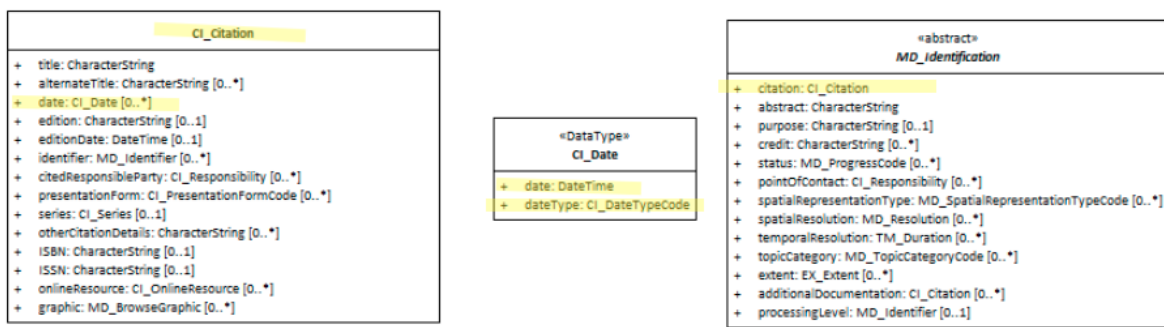


Figure 22: resourceDate

Resource Edition ★★★★★

For resources that change over time, it is important to users and resource managers that the edition changes be tracked in the metadata. This informs the user if they have the particular edition they need for their purpose.

Element Name	<i>edition</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identificationcitation>CI_Citation</i>
Class/Type	<i>characterString</i>
Governance	<i>Common ICSM, Agency, Domain</i>
Purpose	<i>Discovery, Identification</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive, administrative</i>
ICSM Level of Agreement	★★★★

- **Path** - *MD_Metadata.identificationInfo>MD_DataIdentification.citation>CI_Citation.edition*
- **Governance** - *Agency, Domain*
- **Purpose** - *Discovery, identification*
- **Audience** -
 - machine resource - ★★
 - general - ★★★★★
 - data manager - ★★★★★
 - specialist - ★★
- **Metadata type** - *descriptive, administrative*
- **ICSM Level of Agreement** - ★★★★★

Definition

Version of the cited resource.

ISO Obligation

- There can be at most one [0..1] *edition* entries for the cited resource in the *MD_Identification.citation* package in a metadata record. These are of type *characterString*. The resource may be of type Data *MD_DataIdentification* or of type Service *[SV_ServiceIdentification]

Discussion

The [0..1] cardinality of *edition* and *editionDate* means that release of a new edition of a resource requires the creation of a new metadata record. When such is the case, these two elements should be populated. The population of the *edition* element mandates the population of the *editionDate* element.

This element should be used wherever there's a usable edition/version as it is invaluable to know where this resource

fits into a sequence. As “version” is often synonymous with “edition”, it is advised that this field also be used for new tracked versions of resources.

Recommendations

Therefore - When a new edition of a resource is created, a new metadata record needs to be created. This new metadata record needs the *resource edition* element populated with the edition name or identifier. When such is the case, the sibling *CI_Citation.editionDate* field should also be populated.

The *edition* element should be populated with the edition name.

This element should be updated in a consistent yet to be agreed upon manner within an agency.

Recommended Sibling Elements

- **editionDate** - (*type - DateTime*)[0..1] date of the edition. Should be populated with the date of the publication of the new edition.

Also Consider

- **Resource Date** - and *dateType* field.
- **Metadata Date** - and *dateType* field.
- **Resource Citation** - parent to this element

Outstanding Issues

Updates vs. Editions As discussed, new editions require a new metadata record. Updates to an existing resource do not. Do we need some guidance on when some change warrants a new edition rather than an update? Or should this be at the discretion of the agency or domain?

Crosswalk considerations

DCAT

Maps to *dct:confirmsTo*

RIF-CS

Maps to *Version*

Examples

XML

```
</mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
```

```

<mri:citation>
  <cit:CI_Citation>
    ....
    <cit:edition>
      <gco:CharacterString>2nd new and improved edition
    </gco:CharacterString>
    </cit:edition>
    <cit:editionDate>
      <gco:Date>2019-06-11</gco:Date>
    </cit:editionDate>
    ....
  </cit:CI_Citation>
</mri:citation>
....
</mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

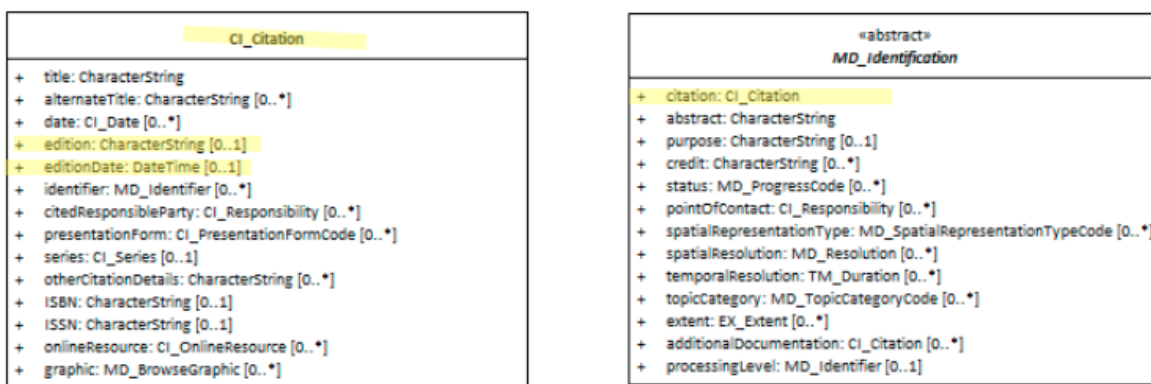


Figure 23: edition

Resource Series ★★★

Very often, resources identified in a catalogue are part of a larger body of work. When this is the case it is useful to document such a relation in the metadata. The resource metadata element **series** is designed for this purpose.

- **Path** - `MD_Metadata.identificationInfo>MD_DataIdentification.citation>CI_Citation.series`
- **Governance** - Agency, Domain
- **Purpose** - Discovery, identification
- **Audience** -
 - machine resource - ★★★
 - general - ★★★★★
 - data manager - ★★★★★
 - specialist - ★★★
- **Metadata type** - descriptive
- **ICSM Level of Agreement** - ★★

Definition

Information about the series, or aggregate resource, of which the resource is a part.

ISO Obligation

- There may be one [0..1] *series* package for the cited resource in the *MD_DataIdentification.citation* package of class *CI_Series* in a metadata record.

ICSM Good Practice

- This element should be populated in all metadata records where the resource is one part of a series.

Recommended Sub Elements From class *CI_Series*

- **name** - (type - *charStr*) [0..1] name of the series, or aggregate resource, of which the resource is a part
- **issueIdentification** - (type - *charStr*) [0..1] information identifying the issue of the series
- **page** - (type - *charStr*) [0..1] Mostly not recommended as not common. Details on which pages of the publication the article was published

Discussion

The content of all three *CI_Series* elements are free text and optional. How one would link back to the Series metadata is unclear. It could be captured in “Name” as a resolvable URI. Perhaps through the Parent Metadata element? What is the relation between “Series” and “Parent Metadata”

It Is conceivable that there may be more than one series to which a dataset may belong. The dataset may be part of a time series while also part of a thematic series. But, by the standard, a resource may only belong to one cited series. Guidance needs to be developed for users on this topic.

Recommendations

Series has proven to be a difficult element to pin down for a number of reasons. Below is a list of issues that should be included in good practice guidance on this element:

- Definition of this element needs to be expanded to include a definition of “Series” in our context.
- Which a cardinality of zero to one, we need this well defined since it is conceivable that a resource may be part of multiple series depending on the definition and post of view.
- Good practices of how one captures links to series metadata needs development.
- The relation (if any) between series and parent metadata needs discussion.
- The use of the three CI_Series elements are not well defined for the spatial context in which they reside. Further discussion is recommended.

Until these topics are resolved I would not recommend the inclusion of Series as recommended elements. If series information is to be captured, the minimum information needed would be CI_Series > name.

It may be better to use other elements such as parentMetadata or associatedResource to capture series type relationships.

Crosswalk considerations

DCAT Maps to prov:wasMemberOf

RIF-CS Maps to Context

Also Consider

- **Parent Metadata** - hierarchical relations of metadata records
- **AssociatedResource** information about aggregate data and related resources
- **Resource Citation** - parent to this element

Examples

XML

```
<mdb:MD_Metadata>
....
  <mdb:identificationInfo>
    <mri:MD_DataIdentification>
      ....
      <mri:citation>
        <cit:CI_Citation>
          ....
          <cit:series>
            <cit:CI_Series>
              <cit:name>
                <gco:CharacterString>OpenWork GeoData Series
```

```

        </gco:CharacterString>
    </cit:name>
    <cit:issueIdentification gco:nilReason="missing">
        <gco:CharacterString/>
    </cit:issueIdentification>
</cit:CI_Series>
</cit:series>
.....
</cit:CI_Citation>
</mri:citation>
....
</mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

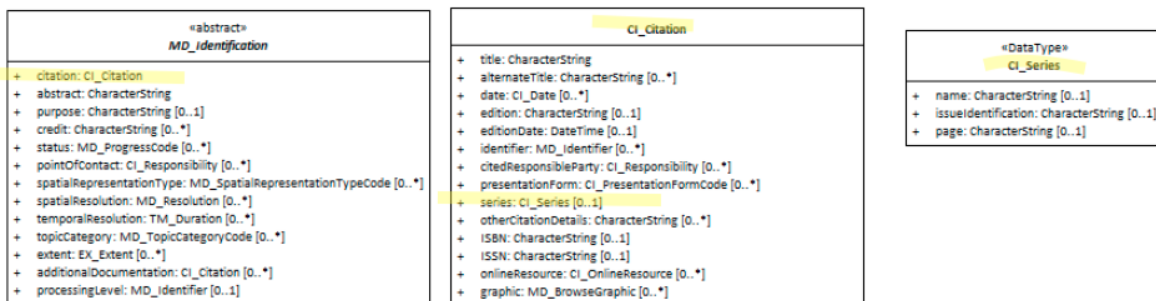


Figure 24: dataCitationSeries

Resource Responsible Party ★★★★★

Contact information for the parties responsible for various aspects of a resource is useful to users and managers of the resource and improves the ability of these parties to communicate. Some of the most basic users needs of a cited resource are to know who to contact for more information for information about different aspects of the resource. In ISO 19115-1 we capture this information in *MD_identification.citation*.

Element Name	<i>citedResponsibleParties</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identificationcitation>CI_Citation</i>
Class/Type	<i>CI_Responsibility</i>
Governance	<i>Common ICSM, Agency, Domain</i>
Purpose	<i>Discovery, Identification, Communication</i>
Audience	machine resource - ★ ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive, administrative</i>
ICSM Level of Agreement	★★★★

Definition

Name, role, and instructions for contacting the organisation, role and/or individual responsible for the cited resource.

ISO Obligation

- There may be zero or more [0..*] *citedResponsibleParties* provided for the cited resource in the *MD_Identification.citation* package. These will be of class *CI_Responsibility*. The resource may be of type Data *MD_DataIdentification* or of type Service *[SV_ServiceIdentification]

Discussion

This element captures contact information for those parties responsible for various aspects of the cited resource. It does not refer to the party responsible for the metadata record itself. General contact information for the resource should be captured in Resource Point of Contact.

There may be multiple responsible parties who hold different responsibilities. The responsibility of each party is captured in the element *CI_Responsibility* > role. Entries for “author” and “publisher” are recommended.

ICSM Recommendations

Therefore - To meet ICSM good practice, in all metadata records, contact information should be given for the parties responsible for different aspects of the creation, management and maintenance of the resource. Entries for “author” and “publisher” should be provided. In addition, for minimal conformity, name (of organisation

preferred), `positionName` and `electrronicMailAddress` should also be populated. The use of the new `partyIdentifier` element added in the 2018 amendment to the standard is encouraged by all parties.

This element should be populated in all metadata records with a minimum of `role`, `name` (of organisation preferred), `positionName` and `electronicMailAddress`.

Recommended Sub-Elements

Follow the general guidelines for `CI_Responsibility`.

- Recommended `role` values should include (but not be limited to) include “Point of Contact” as well as an entry for “publisher”. “author” or “publisher”.

Also Consider

- **Resource Point of Contact** Contact information for the recommended party to contact about the resource
- **Metadata Responsible Party** Contact information for the recommended party to contact about the metadata
- **DistributionInfo** Includes Distributor contact information.
- **Citation** the parent package of which resouce responsible party is a part
- **Resource Citation** - parent to this element

Crosswalk considerations

ISO19139

See discussion at `CI_Responsibility`

Dublin core / CKAN / data.gov.au

Maps to publisher

DCAT

Maps to `dct:publisher`

RIF-CS

Maps to Publisher

Examples

XML

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
```

```

<mri:citation>
  <cit:CI_Citation>
    <cit:title>
      <gco:CharacterString>OpenWork geographical data
    </gco:CharacterString>
    </cit:title>
    <cit:date>
      <cit:CI_Date>
        <cit:date>
          <gco>Date>2019-07-18</gco>Date>
        </cit:date>
        <cit:dateType>
          <cit:CI_DateTypeCode
            codeList="https://schemas.isotc211.org/19115/resources
              /Codelist/cat/codelists.xml#CI_DateTypeCode"
            codeListValue="creation"/>
          </cit:dateType>
        </cit:CI_Date>
      </cit:date>
      <cit:date>
        <cit:CI_Date>
          <cit:date>
            <gco>Date>2019-07-18</gco>Date>
          </cit:date>
          <cit:dateType>
            <cit:CI_DateTypeCode
              codeList="https://schemas.isotc211.org/19115/resources
                /Codelist/cat/codelists.xml#CI_DateTypeCode"
              codeListValue="publication"/>
            </cit:dateType>
          </cit:CI_Date>
        </cit:date>
      <cit:edition>
        <gco:CharacterString>Version 0.1</gco:CharacterString>
      </cit:edition>
      <cit:editionDate>
        <gco>Date>2019-07-18</gco>Date>
      </cit:editionDate>
      <cit:identifier>
        <mcc:MD_Identifier>
          <mcc:code>
            <gco:CharacterString>9547e07e-6a15-403b-8b19-488778fe0cf0
          </gco:CharacterString>

```

```

</mcc:code>
<mcc:codeSpace>
  <gco:CharacterString>
    http://202.49.243.69:8080/geonetwork/srv/eng/metadata/
  </gco:CharacterString>
</mcc:codeSpace>
</mcc:MD_Identifier>
</cit:identifier>
<cit:citedResponsibleParty>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode
        codeList="https://schemas.isotc211.org/19115/resources
          /Codelist/cat/codelists.xml#CI_RoleCode"
        codeListValue="author"/>
    </cit:role>
    <cit:party>
      <cit:CI_Organisation>
        <cit:name>
          <gco:CharacterString>OpenWork Ltd
        </gco:CharacterString>
        </cit:name>
        <cit:contactInfo>
          <cit:CI_Contact>
            <cit:address>
              <cit:CI_Address>
                <cit:electronicMailAddress>
                  <gco:CharacterString>info@openwork.nz
                </gco:CharacterString>
                </cit:electronicMailAddress>
              </cit:CI_Address>
            </cit:address>
          </cit:CI_Contact>
        </cit:contactInfo>
      </cit:CI_Organisation>
    </cit:party>
  </cit:CI_Responsibility>
</cit:citedResponsibleParty>
<cit:citedResponsibleParty>
  <cit:CI_Responsibility>
    <cit:role>
      <cit:CI_RoleCode
        codeList="https://schemas.isotc211.org/19115/resources

```

```

    /Codelist/cat/codelists.xml#CI_RoleCode"
    codeListValue="publisher"/>
  </cit:role>
  <ci
t:party>
    <cit:CI_Individual>
      <cit:name>
        <gco:CharacterString>Byron Cochrane
        </gco:CharacterString>
      </cit:name>
      <cit:contactInfo>
        <cit:CI_Contact>
          <cit:address>
            <cit:CI_Address>
              <cit:electronicMailAddress>
                <gco:CharacterString>byron@openwork.nz
                </gco:CharacterString>
              </cit:electronicMailAddress>
            </cit:CI_Address>
          </cit:address>
        </cit:CI_Contact>
      </cit:contactInfo>
    </cit:CI_Individual>
  </cit:party>
</cit:CI_Responsibility>
</cit:citedResponsibleParty>
</cit:CI_Citation>
</mri:citation>
....
</mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

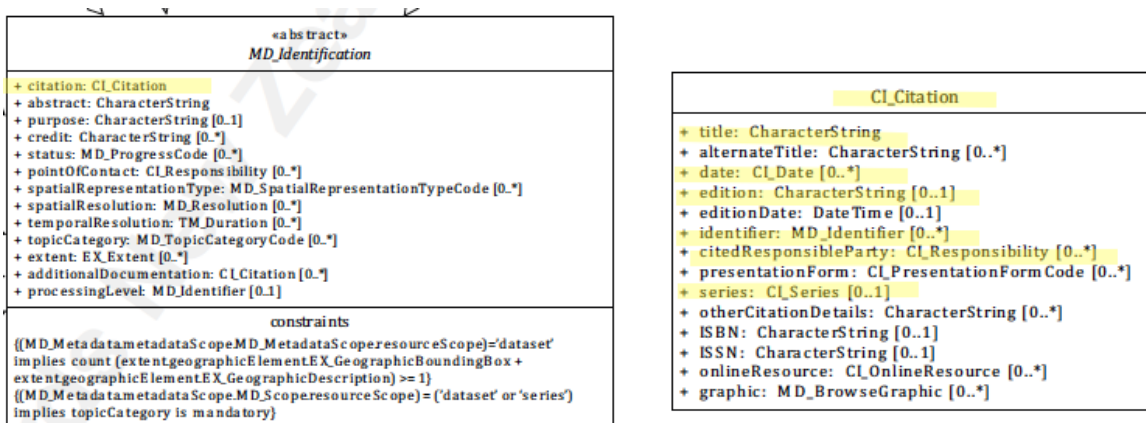


Figure 25: ResourceCitation

class - CI_OnlineResource

Most metadata contains information about resources that are available online. In order for machines and people to retrieve such resources cited in a Metadata record MD_Metadata, a method of access must be provided. CI_OnlineResources provides a standard way of describing such access wherever such is documented in a metadata record.

- **Governance** - ISO
- **Metadata type** - administrative
- **ICSM Level of Agreement** - **

Definition

information about on-line sources from which the resource, specification, or community profile name and extended metadata elements can be obtained

ISO Associations

- MD_Metadata.metadataLinkage
- MD_DigitalTransferOptions.online
- MD_MetadataExtensionInformation.extensionOnLineResource
- MD_ApplicationSchemaInformation.graphicsFile
- MD_ApplicationSchemaInformation.softwareDevelopmentFile
- SV_OperationMetadata.connectPoint
- CI_Citation.onlineResource
- CI_Contact.onlineResource
- MD_BrowseGraphic.linkage

ICSM Recommended Sub Element for class CI_OnlineResource

- **linkage** - (type - charStr) [1..1] Mandatory for class - location (address) for on-line access using a Uniform Resource Locator/Uniform Resource Identifier address or similar addressing scheme
- **protocol** - (type - charstr) [0..1] recommended to document the connection type used.
- **function** - (codelist - CI_OnlineFunctionCode) [0..1] (optional) code for function performed by the online resource. Options are:
 - download - online instructions for transferring data from one storage device or system to another
 - information - online information about the resource
 - offlineAccess - online instructions for requesting the resource from the provider
 - order - online order process for obtaining the resource
 - search - online search interface for seeking out information about the resource
 - completeMetadata - complete metadata provided
 - browseGraphic - browse graphic provided
 - upload - online resource upload capability provided
 - emailService - online email service provided
 - browsing - online browsing provided

- fileAccess - online file access provided

Other sub elements

- **applicationProfile** - (type - *charstr*) [0..1] name of an application profile that can be used with the online resource
- **name** - (type - *charstr*) [0..1] name of the online resource
- **description** - (type - *charstr*) [0..1] detailed text description of what the online resource is/does
- **protocolRequest** - (type - *charstr*) [0..1] protocol used by the accessed resource(to be used mainly for POST requests).

Recommendations

It is recommended that the MDWG further develop general advise on the use of CI_OnlineResource - particularly concerning the use of the “Other sub elements” The function element, while optional, can usually be populated through automated means according to the parent element.β

UML diagrams

Recommended elements highlighted in Yellow

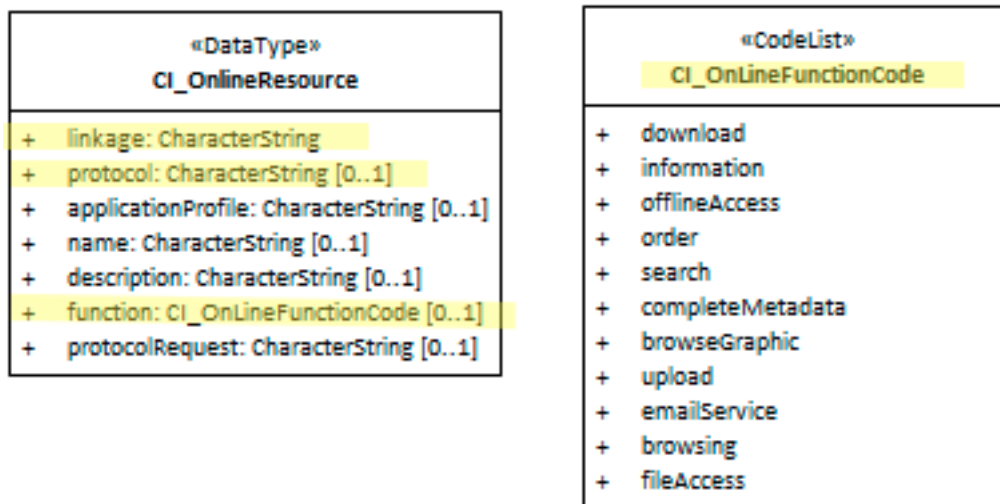


Figure 26: CI_OnlineResource

Service Identification

When capturing information on a spatial service, it is important to identify and categorise information as pertaining to the service resource and to distinguish these information from that which applies to the metadata itself or data resources. *SV_ServiceIdentification* extends the abstract class *MD_Identification* to document a spatial service resource.

Element Name	<i>SV_ServiceIdentification</i>
Parent	<i>MD_Metadata.identificationInfo</i>
Class/Type	<i>MD_Identification</i>
Governance	<i>ISO</i>
Purpose	<i>Discovery, Evaluation, Use</i>
Audience	machine resource - * * * general - * * * resource manager - * * * specialist - * * *
Metadata type	<i>descriptive</i>
ISCM Level of Agreement	**

Definition -

Identification of capabilities which a service provider makes available to a service user through a set of interfaces that define a behaviour.

ISO Requirements

At least one [1..*] *MD_Identification* must be present in a metadata record. This must be instantiated as an *SV_ServiceIdentification* for metadata about service resources.

ISO Associations

MD_Identification is an abstract class that is parent to

- **SV_ServiceIdentification** and
- **MD_DataIdentification**

Is a child of: - **MD_Metadata.identificationInfo**

Discussion

The class, *SV_ServiceIdentification*, contains all metadata related to the identification of a service resource. The provision of this information strongly impacts on the ability of a user to assess the resource fitness to use. Like *MD_DataIdentification*, *SV_ServiceIdentification* instantiates the abstract class *MD_Identification* for use with service resources. As such it inherits all the properties of that class.

The relation of a geospatial service to the data on which it operates is varied. This relation impacts the decisions one may make regarding the capture of useful metadata for such a service. These services fall into three categories depending on how tightly coupled the data is to the service.

An example of a *tightly coupled* service would be a WFS service delivering a particular dataset. In the tightly coupled case, the service metadata shall describe both the service and the geographic dataset. The permitted values for the description of operations shall be constrained by the values defined by the datasets associated with the service.

An example of a *loosely coupled* service could be a reprojection service with user-selected input datasets. Loosely coupled services may have an association with data types through the service type definition (SV_ServiceIdentification.serviceType). Dataset metadata need not be provided in the service metadata for the loosely coupled case.

A *mixed coupling* might be a WMS service into which add additional data sources of your choice. In a mixed coupling situation, a single service instance may be associated with both kinds of data associated, loosely and tightly coupled.

ICSM Recommendations

Therefore - To clearly understand what resource a metadata record is describing, there should be one and only one [1..1] *MD_Identification* package in a metadata record. For service metadata, this must be expressed as an *SV_ServiceIdentification* instance. The *Service Identification* package contains several sub-packages and sub-elements. To ease the common use of such metadata, it is important that the use of these sub-packages and sub-elements be standardised.

Recommended Service Sub-Elements

In addition the recommended attributes of *MD_Identification* detailed below, the following *SV_ServiceIdentification* subpackages and sub-elements are recommended.

Note -Service Types and Standards descriptors - There are multiple methods of describing the type of service being provided. Of these *ServiceType* is mandatory. Also, there should be at least one entry in *Keywords* of type *Service* that also describes the service. The following others are recommended when appropriate.

- **Service Type** - (*class* - *GenericName*) [1..1] Mandatory. A Service metadata record must provide a name for the service type, e.g. 'discovery', 'view', 'download', 'transformation', or 'invoke'. Note - A *GenericName* (see ISO 19103:2015) shall indicate the meaning of the named value. Its value should be taken from a well-governed source if possible.
- **Service Type Version** - (*type* - *charStr*) [0..*]* The version of the service. Provided to enhance searchability based on the version of serviceType. Could be a shorthand handle like WMS 1.4.1
- **Service Profile** - (*class* - *CI_Citation*) [0..*] When a service conforms to a particular profile of a service standard, the profile to which the service adheres should be cited with details. (May be used instead of service standard)
- **Service Standard** - (*class* - *CI_Citation*) [0..*] When a service conforms to a particular service standard the standard to which the service adheres should be cited with details.

- **couplingType** - (*codeList* - *SV_CouplingType*) [0..1] Highly Recommended. Describes the type of coupling between service and associated data (if exists). Available values for *SV_CouplingType* are:
 - *loose* - service instance is loosely coupled with a data instance, i.e. no *MD_DataIdentification* class has to be described
 - *mixed* - service instance is mixed coupled with a data instance, i.e. *MD_DataIdentification* describes the associated data instance and additionally the service instance might work with other external data instance
 - *tight* - service instance is tightly coupled with a data instance, i.e. *MD_DataIdentification* class **MUST** be described
- **coupledResource** - (*class* - *SV_CoupledResource*) [0..*] Highly Recommended in the case of tightly coupled services. Provides access to the description of the coupled data resources and enables the description of the link between an operation, and the data on which it is based. It is recommended that this provides URLs that resolve to metadata for the data resources.
- **Contains Operations** - (*class* - *SV_OperationsMetadata*) [0..*]

Other Recommended Sub-Elements

The following provides additional guidance to *MD_Identification* inherited element recommendations.

- **Resource Citation** - (*class* - *CI_Citation*) [1..1] - Mandatory. Citation information providing the name, publication date, identifiers, originators and publishers of the service.
- **abstract** - (*type* - *charStr*) [1..1] - Mandatory. A brief narrative summary of the cited service resource and its functions.
- **purpose** - (*type* - *charStr*) [0..1] - Recommended. A brief summary of the intentions and intended users with which the service resource was developed
- **status** - (*codelist* - *MD_ProgressCode*) [0..1] - Recommended. The status of the service resource populated from a domain of values
- **topicCategory** - (*enumeration* - *MD_TopicCategoryCode*) [0..*] - Recommended. The main themes of the service resource populated from a fixed domain of values
- **pointOfContact** - (*class* - *CI_Responsibility*) [0..1] - Highly Recommended. The name and contact information for the organisation, role and/or individual that provides a point of contact for the cited service.
- **spatialRepresentationType** - (*codelist* - *MD_SpatialRepresentationTypeCode*) [0..*] - Optional. The method used by the service to spatially represent geographic information.
- **spatialResolution** - (*class* - *MD_Resolution*) [0..*] - Recommended. The nominal scale and/or spatial resolution at which the service is designed to be used.
- **graphicOverview** - (*class* - *MD_BrowseGraphic*) [0..*] - Optional. Graphics that provide lightweight illustrations pertaining to a service
- **additionalDocumentation** - (*class* - *CI_Citation*) [0..*] - Recommended. Citation of other documentation associated with the service, e.g. related articles, publications, user guides, data dictionaries.
- **associatedResource** - (*class* - *MD_AssociatedResource*) [0..*] - Highly recommended when part of a larger work. Used to indicate association between resources and records related to the service of which the service is a part.
- **Extents** - (*class* - *EX_Extent*) [0..*] Recommended when the Service has extent limitations. High-level thematic classifications to assist in the grouping and searching of data.

- **referenceSystemInfo** - (*class* - *MD_ReferenceSystem*) [0..*] Highly Recommended. The information about the reference systems that define the system use to describe spatial position descriptions in a service.
- **resourceConstraints** - (*abstract class* *MD_Constraints*) [0..*] Highly Recommended. See:
- **Resource Security Constraints**
- **Resource Legal Constraints**
- **Resource Other Constraints**

Additional optional attributes

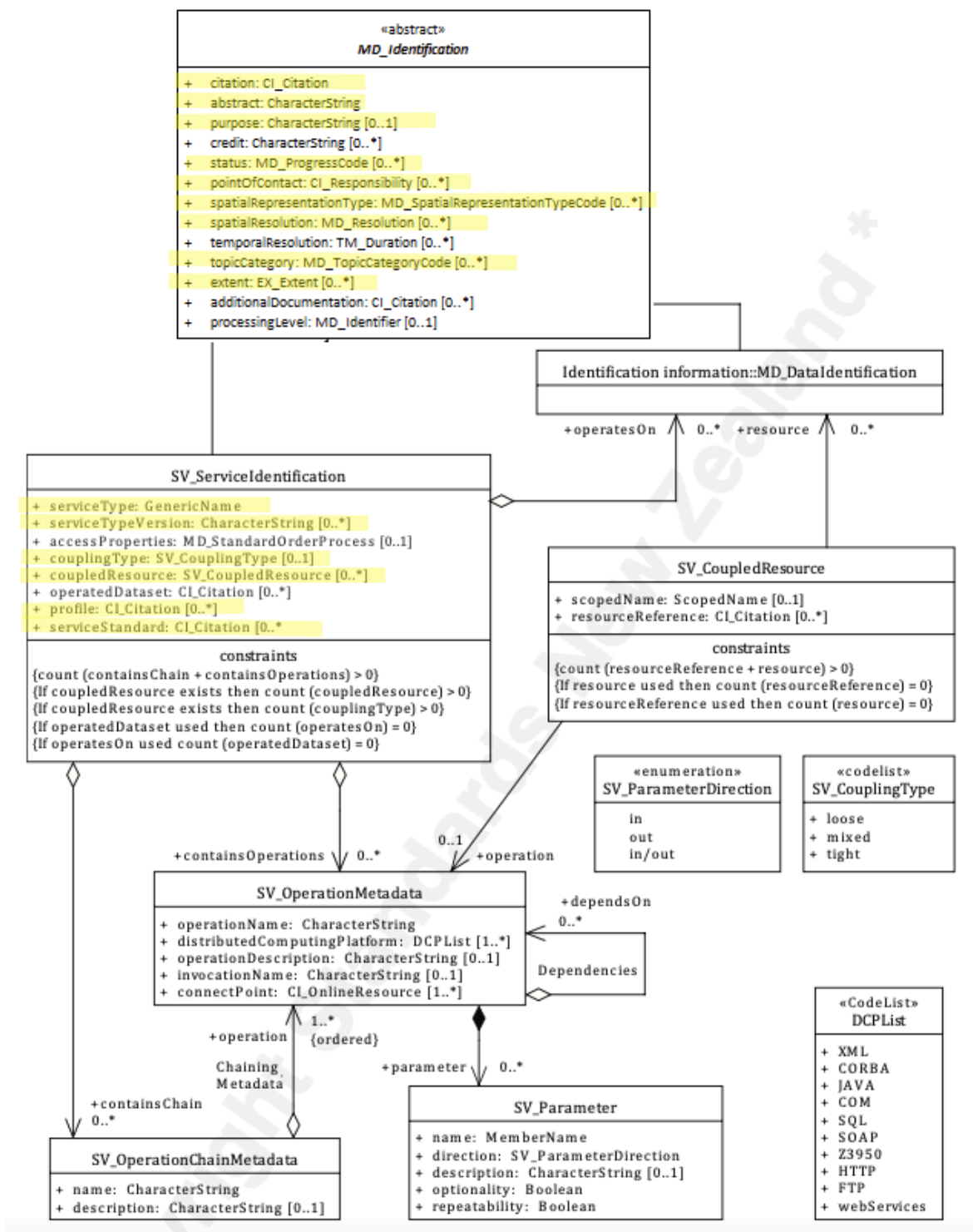
- **Access Properties** (*class* - *MD_StandardOrderProcess*) [0..*]* information about the availability of the service, including,
 - fees
 - planned available date and time
 - ordering instructions
 - turnaround
- **operatedDataset** (*class* - *CI_Citation*) [0..*] NOT Recommended. Provides a reference to the resource on which the service operates. Should reference existing metadata for the data resource. NOTE - For one resource either *operatedDataset* or *operatesOn* may be used (not both for the same resource)
- **operatesOn** - (*class* - *MD_DataIdentification*) [0..*] NOT Recommended. Alternative to *operatedDataset*. Contains full Data Identification metadata for the resource and thus not recommended. May be useful in cases where dataset metadata is unavailable. NOTE - For one resource either *operatedDataset* or *operatesOn* may be used (not both for the same resource)

Related Classes

- **MD_Identification** the abstract parent class to *SV_ServiceIdentification* and *MD_DataIdentification*. See guidances for the composite elements.
- **MD_DataIdentification** the sibling class to *SV_ServiceIdentification* used to describe data resources

UML diagrams

Recommended elements highlighted in Yellow



Service Type ★★★★★

When documenting a service, it is important that the service type be described as a simple generic type so that searches can be so filtered and the use of such service can be categorised.

Element Name	<i>serviceType</i>
Parent	<i>MD_Metadata.identificationInfo>SV_ServiceIdentification</i>
Class/Type	<i>genericName</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Discovery, Evaluation, Use</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★

Definition

A simple name describing a generic service type, e.g. ‘discovery’, ‘view’, ‘download’, ‘transformation’, or ‘invoke’.
Note - A *GenericName* (see ISO 19103:2015) shall indicate the meaning of the named value. Its value should be taken from a well-governed source if possible.

ISO Requirements

There must be one and only one [1..1] *serviceType* entries for the cited resource for a *SV_ServiceIdentification* package of type *genericName* in a metadata record.

Discussion

The *serviceType* is useful both as a search filter and for categorisation of the service. It should hold what is considered the primary use of the service in generic terms. The value of this field is of type *genericName* which is described in ISO 19103. While *genericName* values are essentially character strings, the possible values should be selected by a centrally managed controlled vocabulary. Listed values as described in the ISO 19115-1 standard include ‘discovery’, ‘view’, ‘download’, ‘transformation’, or ‘invoke’. However, in practice, more specific terms are often used. In GeoNetwork, the initial suggested values include *OGC Web Map Service*, *OGC Web Map Tile Service*, *OGC Web Feature Service*, *OGC Web Coverage Service*, *OGC Web Processing Service*, and *Atom feed*.

Recommendations

Therefore - The mandatory *serviceType* element should be populated with a value from a managed controlled vocabulary containing names for generic types of services. While ISO 19115-1 describes these values as very specific (e.g. ‘discovery’, ‘view’, ‘download’, ‘transformation’, or ‘invoke’) in practice, somewhat generic terms for spatial service standards are often used (e.g. *OGC Web Map Service*, *OGC Web Coverage Service*, *Atom feed*)

Also Consider

There are many locations where service type and version information may be captured. Choose appropriately.

Service Type Version The version of the service. Provided to enhance searchability based on the version of serviceType. Could be a shorthand handle like WMS 1.4.1

Service Standard When a service conforms to a particular service standard that standard to which the service adheres should be cited

Service Profile When a service conforms to a particular profile of a service standard, the profile to which the service adheres should be cited (instead of the Service Standard)

Keywords (services)- To enable ease of discovery, a service metadata record should contain at least one keyword of type *service*. The value of such keywords should refer to the service taxonomy defined in ISO 19119.

Outstanding Issues

CORE ISSUE:

There is an apparent incongruity in the definition of ServiceType and ServiceTypeVersion. While ServiceType is described as containing values of a very general nature, download, view, etc., ServiceTypeVersion is defined as a refinement of ServiceType. But generic terms like “download” do not have versions. In practice, ServiceType is often populated with more specific terms like “OGC WMS” and ServiceTypeVersion may be “OGC WMS 1.4”.

Managed vocabulary for Service Type More clarity on the use of this mandatory service metadata element is needed and being sought. An ICSM agreed-upon controlled vocabulary of acceptable values would improve the usability of this field. Until then, agreement of use should be sought at the domain level. It is yet to be decided who at a higher level should host such a service and what values it should contain.

Crosswalk Considerations

ISO 19139/19119 None known

Dublin core / CKAN / data.gov.au None known

DCAT Maps to dct:type >Note - may conflict with mapping of serviceTypeVersion

RIF-CS {mapping to RIF-CS element and discussion, if any}

Examples

GA

{example - if any useful}

ABARES

{example - if any useful}

Others

{### who - example - if any useful} }

XML -

```

<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <srv:SV_ServiceIdentification>
    <mri:citation>
      ....
    </mri:citation>
    <mri:abstract/>
    <srv:serviceType>
      <gco:ScopedName>view</gco:ScopedName>
    </srv:serviceType>
    <srv:serviceTypeVersion>
      <gco:CharacterString>WFS 2.0.0</gco:CharacterString>
    </srv:serviceTypeVersion>
    <srv:serviceTypeVersion>
      <gco:CharacterString>WFS 1.1.0</gco:CharacterString>
    </srv:serviceTypeVersion>
    <srv:serviceTypeVersion>
      <gco:CharacterString>WFS 1.0.0</gco:CharacterString>
    </srv:serviceTypeVersion>
    ....
  </srv:SV_ServiceIdentification>
  ....
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

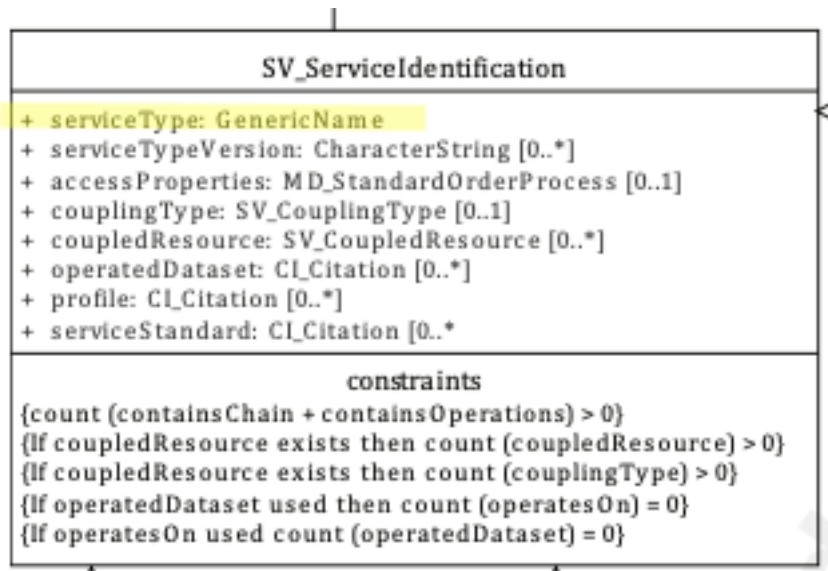


Figure 28: Service Type

Service Type Version ★★

When describing Spatial Services in a metadata record, it is useful to capture the type and version of the service in its commonly known name so as those who may wish to use the service can determine its compatibility to the desired purpose.

Element Name	<i>serviceTypeVersion</i>
Parent	<i>MD_Metadata.identificationInfo>SV_ServiceIdentification</i>
Class/Type	<i>characterString</i>
Governance	<i>Domain, Agency</i>
Purpose	<i>Discovery, Evaluation, Use</i>
Audience	machine resource - ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★★★

Definition

The version of the service, supports searching based on the version of serviceType

ISO Requirements

There may be zero to many [0..*] *serviceTypeVersion* entries for the cited resource for a *SV_ServiceIdentification* package of type *characterString* in a metadata record.

Discussion

Many tools may be able to connect to and make use of only particular versions of a spatial service. For instance, some GIS tools may be able to consume WFS 1.1.0 but not WFS 2.0.0. Or the reverse may be true. Or the service may support multiple versions of the service type and standard. Providers of services should provide this information to those who may want to connect to such.

Detailed citation of such services, including linkages to the service standard itself or profile of such, should be captured in *SV_ServiceIdentification.serviceStandard* or *SV_ServiceIdentification.profile*.

ICSM Recommendations

Therefore - It is recommended that the *ServiceTypeVersion* be populated in service metadata records in such a way that discovery of services that adhere to a specific service type version can be found and filtered. It is particularly useful to capture here the multiple versions of a standard that the service may support.

Outstanding Issues

Vocabularies for Service Type Version The version names available for a particular service type is limited. It would be useful if vocabularies were available that makes the selection of appropriate services, types and versions available to those populating and validating these service metadata records

Also Consider

There are many locations where service type and version information may be captured. Choose appropriately.

Service Type The mandatory *serviceType* element should be populated with a value from managed controlled vocabulary containing names for generic types of services. While ISO 19115-1 describes these values as very specific (e.g. ‘discovery’, ‘view’, ‘download’, ‘transformation’, or ‘invoke’) in practice, somewhat generic terms for spatial service standards are often used (e.g. OGC Web Map Service, OGC Web Coverage Service, Atom feed)

Service Standard When a service conforms to a particular service standard that standard to which the service adheres should be cited

Service Profile When a service conforms to a particular profile of a service standard, the profile to which the service adheres should be cited (instead of the Service Standard)

Keywords (services)- To enable ease of discovery, a service metadata record should contain at least one keyword of type *service*. The value of such keywords should refer to the service taxonomy defined in ISO 19119.

Outstanding Issues

CORE ISSUE:

There is an apparent incongruity in the definition of *ServiceType* and *ServiceTypeVersion*. While *ServiceType* is described as containing values of a very general nature, download, view, etc., *ServiceTypeVersion* is defined as a refinement of *ServiceType*. But generic terms like “download” do not have versions. In practice, *ServiceType* is often populated with more specific terms like “OGC WMS” and *ServiceTypeVersion* may be “OGC WMS 1.4”.

Crosswalk Considerations

ISO 19139/19119 None known

Dublin core / CKAN / data.gov.au None known

DCAT None known

RIF-CS {mapping to RIF-CS element and discussion, if any}

Examples

GA

{example - if any useful}

ABARES

{example - if any useful}

Others

{### who - example - if any useful} }

XML -

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <srv:SV_ServiceIdentification>
    <mri:citation>
      ....
    </mri:citation>
    <mri:abstract/>
    <srv:serviceType>
      <gco:ScopedName>view</gco:ScopedName>
    </srv:serviceType>
    <srv:serviceTypeVersion>
      <gco:CharacterString>WFS 2.0.0</gco:CharacterString>
    </srv:serviceTypeVersion>
    <srv:serviceTypeVersion>
      <gco:CharacterString>WFS 1.1.0</gco:CharacterString>
    </srv:serviceTypeVersion>
    <srv:serviceTypeVersion>
      <gco:CharacterString>WFS 1.0.0</gco:CharacterString>
    </srv:serviceTypeVersion>
    ....
  </srv:SV_ServiceIdentification>
  ....
</mdb:identificationInfo>
....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

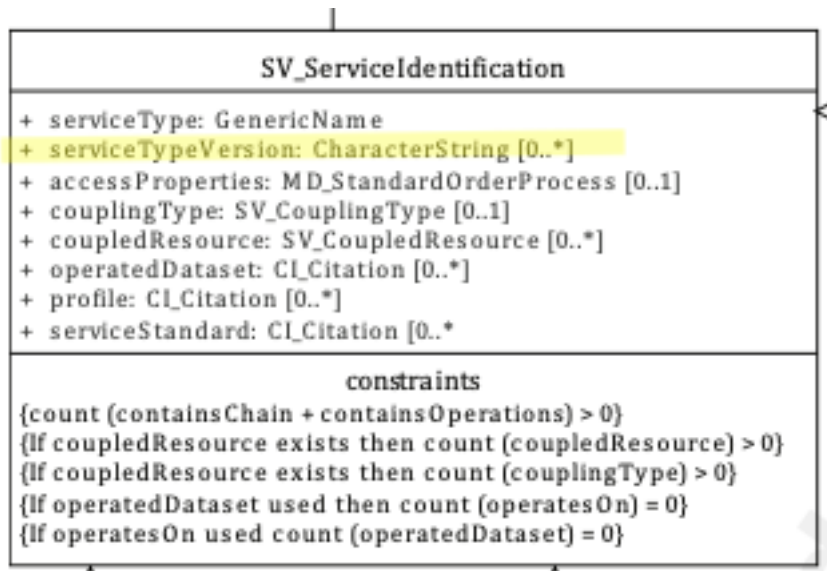


Figure 29: Service Type Version

Service Profile ★★ ★

When documenting a spatial service the details of the standard to which a service adheres should be provided so that once discovered potential users may find further authoritative information about such standard.

Element Name	<i>profile</i>
Parent	<i>MD_Metadata.identificationInfo>SV_ServiceIdentification</i>
Class/Type	<i>CI_Citation</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Evaluation, Use</i>
Audience	- machine resource - ★ ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★

Definition

The standard to which the service adheres

ISO Requirements

There may be zero or more [0-∗] *profile* entries for the cited resource for a *SV_ServiceIdentification* package of class *CI_Citation* in a service metadata record.

Discussion

To be complete in the description of the standards to which a spatial service adheres, citations, including linkages to official websites and documentation, of such standards should be provided. This will aid potential users in the use of such services or troubleshoot when the use of such services do not behave as expected.

When the service complies to a particular profile of a standard, it will suffice to complete the sibling *profile* element to the same degree.

ICSM Recommendations

Therefore - When a service adheres to particular service standard profiles such profiles should be cited in this package. If a service adheres to a standard and not a profile of such it is preferable to document this in *SV_ServiceIdentification.serviceStandard*. If the service may support multiple profiles of the service standard, multiple entries of *Service Profile* can document such.

Recommended Sub-Elements Follow the guidance in *CI_Citation* noting the following element usage:

- **Title** - (*type* - *charStr*)[1..1] Mandatory - The well known name of the service standard

- **onlineResource** - (*class* - *CI_OnlineResource*) [0..*] online reference to the cited resource
- **linkage** - (*type* - *charStr*) [1..1] Mandatory for *class* - *CI_OnlineResource* - usually the web address to the authoritative documentation for the service profile

Also Consider

There are many locations where service type and version information may be captured. Choose appropriately.

Service Type The mandatory *serviceType* element should be populated with a value from managed controlled vocabulary containing names for generic types of services. While ISO 19115-1 describes these values as very specific (e.g. 'discovery', 'view', 'download', 'transformation', or 'invoke') in practice, somewhat generic terms for spatial service standards are often used (e.g. OGC Web Map Service, OGC Web Coverage Service, Atom feed)

Service Type Version The version of the service. Provided to enhance searchability based on the version of *serviceType*. Could be a shorthand handle like WMS 1.4.1

Service Standard When a service conforms to a particular service standard that standard to which the service adheres should be cited

Keywords (services)- To enable ease of discovery, a service metadata record should contain at least one keyword of type *service*. The value of such keywords should refer to the service taxonomy defined in ISO 19119.

Outstanding Issues

CORE ISSUE:

As there are several methods of capturing the service standard type, profile and version in a service metadata record, it would be useful for the MDWG to come to a strong agreement on which approach is best under what circumstances.

Crosswalk considerations

ISO 19139/19119 None known

Dublin core / CKAN / data.gov.au {if any} {mapping to DC element and discussion}

DCAT {mapping to DCAT element and discussion, if any}

RIF-CS {mapping to RIF-CS element and discussion, if any}

Examples

GA

{example - if any useful}

ABARES

{example - if any useful}

Others

```
{### who - example - if any useful }
```

XML -

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <srv:SV_ServiceIdentification>
    <mri:citation>
      ....
    </mri:citation>
    <mri:abstract/>
    <srv:profile>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>WFS 2.0.0 OWL Profile</gco:CharacterString>
        </cit:title>
        <cit:onlineResource>
          <cit:CI_OnlineResource>
            <cit:linkage>
              <gco:CharacterString>http://registry.openwork.nz/wfs2/owlProfile</gco:CharacterString>
            </cit:linkage>
            <cit:protocol gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:protocol>
            <cit:name gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:name>
            <cit:description gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:description>
            <cit:function>
              <cit:CI_OnLineFunctionCode codeList="http://standards.iso.org/iso/19115/resources/Codelist
                codeListValue=""/>
            </cit:function>
          </cit:CI_OnlineResource>
        </cit:onlineResource>
      </cit:CI_Citation>
    </srv:profile>
    ....
  </srv:SV_ServiceIdentification>
  ....
</mdb:MD_Metadata>
```

```
</mdb:identificationInfo>
```

```
....
```

```
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

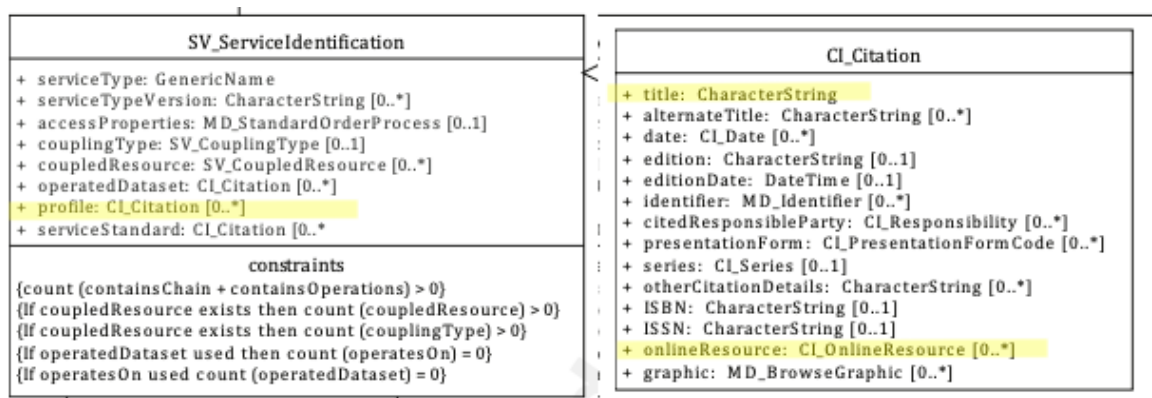


Figure 30: Service Profile

Service Standard ★★ ★

When documenting a spatial service the details of the standard to which a service adheres should be provided so that once discovered potential users may find further authoritative information about such standard.

Element Name	<i>serviceStandard</i>
Parent	<i>MD_Metadata.identificationInfo>SV_ServiceIdentification</i>
Class/Type	<i>CI_Citation</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Evaluation, Use</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★

Definition

The standard to which the service adheres

ISO Requirements

There may be zero or more [0-∗] *serviceStandard* entries for the cited resource for a *SV_ServiceIdentification* package of class *CI_Citation* in a service metadata record.

Discussion

To be complete in the description of the standards to which a spatial service adheres, citations, including linkages to official websites and documentation, of such standards should be provided. This will aid potential users in the use of such services or troubleshoot when the use of such services do not behave as expected.

When the service complies to a particular profile of a standard, it will suffice to complete the sibling *profile* element to the same degree.

ICSM Recommendations

Therefore - When a service adheres to particular service standards such standards should be cited in this package. If a particular profile of such standard is implemented it is sufficient to document this in *SV_ServiceIdentification.profile*. If the service may support multiple versions of the service standard, multiple entries of *Service Standard* can document such.

Recommended Sub-Elements Follow the guidance in *CI_Citation* noting the following element usage:

- **Title** - (*type* - *charStr*)[1..1] Mandatory - The well known name of the service standard

- **onlineResource** - (*class* - *CI_OnlineResource*) [0..*] online reference to the cited resource
- **linkage** - (*type* - *charStr*) [1..1] Mandatory for *class* - *CI_OnlineResource* - usually the web address to the authoritative documentation for the service standard

Also Consider

There are many locations where service type and version information may be captured. Choose appropriately.

Service Type The mandatory *serviceType* element should be populated with a value from a managed controlled vocabulary containing names for generic types of services. While ISO 19115-1 describes these values as very specific (e.g. 'discovery', 'view', 'download', 'transformation', or 'invoke') in practice, somewhat generic terms for spatial service standards are often used (e.g. OGC Web Map Service, OGC Web Coverage Service, Atom feed)

Service Type Version The version of the service. Provided to enhance searchability based on the version of *serviceType*. Could be a shorthand handle like WMS 1.4.1

Service Profile When a service conforms to a particular profile of a service standard, the profile to which the service adheres should be cited (instead of the Service Standard)

Keywords (services)- To enable ease of discovery, a service metadata record should contain at least one keyword of type *service*. The value of such keywords should refer to the service taxonomy defined in ISO 19119.

Outstanding Issues

CORE ISSUE:

As there are several methods of capturing the service standard type, profile and version in a service metadata record, it would be useful for the MDWG to come to a strong agreement on which approach is best under what circumstances.

Crosswalk Considerations

ISO 19139 /19119 None Known

Dublin core / CKAN / data.gov.au None known

DCAT {mapping to DCAT element and discussion, if any}

RIF-CS {mapping to RIF-CS element and discussion, if any}

Examples

GA

{example - if any useful}

ABARES

{example - if any useful}

Others

```
{### who - example - if any useful }
```

XML -

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <srv:SV_ServiceIdentification>
    <mri:citation>
      ....
    </mri:citation>
    <mri:abstract/>
    <srv:serviceStandard>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>OGC WFS 2.0.0</gco:CharacterString>
        </cit:title>
        <cit:onlineResource>
          <cit:CI_OnlineResource>
            <cit:linkage>
              <gco:CharacterString>https://www.ogc.org/standards/wfs%20</gco:CharacterString>
            </cit:linkage>
            <cit:protocol gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:protocol>
            <cit:name gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:name>
            <cit:description gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:description>
            <cit:function>
              <cit:CI_OnLineFunctionCode codeList="http://standards.iso.org/iso/19115/resources/Codelists
                codeListValue=""/>
            </cit:function>
          </cit:CI_OnlineResource>
        </cit:onlineResource>
      </cit:CI_Citation>
    </srv:serviceStandard>
    ....
  </srv:SV_ServiceIdentification>
  ....
</mdb:MD_Metadata>
```

```
</mdb:identificationInfo>
```

```
....
```

```
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

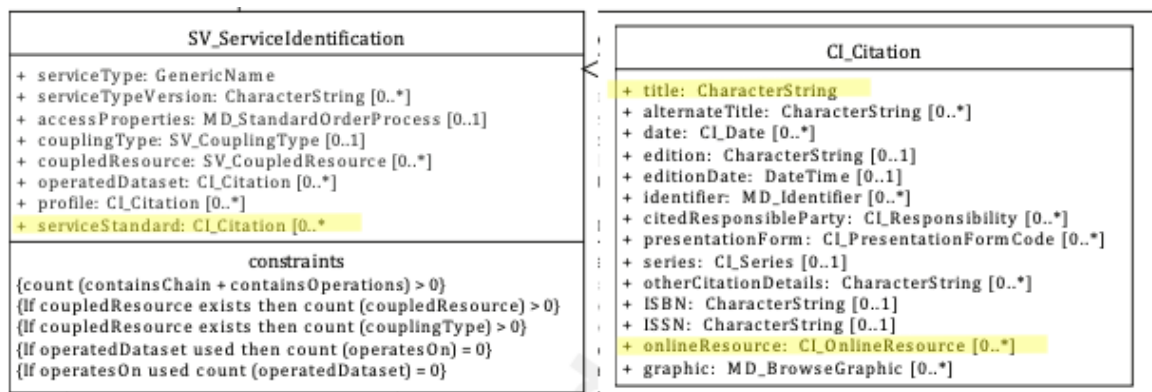


Figure 31: Service Standard

Coupling Type ★★★★★

When documenting a service, the nature of the relationship of the service to the data resources on which it interacts is important to capture to provide potential users with an understanding of the applicability of such service to their needs. A service may be highly dependant on particular data, independent of the data or a mixture.

Element Name	<i>couplingType</i>
Parent	<i>MD_Metadata.identificationInfo>SV_ServiceIdentification</i>
Class/Type	<i>codelist - SV_CouplingType</i>
Governance	<i>Domain, Agency</i>
Purpose	<i>Evaluation, Use</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>structural</i>
ICSM Level of Agreement	★ ★

Definition

The type of coupling between service and associated data (if exists)

ISO Requirements

There must be zero or one [0-1] *couplingType* entries for the cited resource for a *SV_ServiceIdentification* package selected from the codelist *SV_CouplingType* in a metadata record. If a *coupled resource* exists, this element must be populated.

Discussion

The relation of a geospatial service to the data on which it operates is varied. This relation impacts the decisions one may make regarding the capture of useful metadata for such a service. These services fall into three categories depending on how tightly coupled the data is to the service: *tightly*, *loosely*, or *mixed*.

An example of a tightly coupled service would be a WFS service delivering a particular dataset. In the tightly coupled case, the service metadata shall describe both the service and the geographic dataset. The permitted values for the description of operations shall be constrained by the values defined by the datasets associated with the service.

An example of a loosely coupled service could be a reprojection service with user-selected input datasets. Loosely coupled services may have an association with data types through the service type definition (*SV_ServiceIdentification.serviceType*). Dataset metadata need not be provided in the service metadata for the loosely coupled case.

A mixed coupling might be a WMS service into which you may add additional data sources of your choice. In a mixed coupling situation a single service instance may be associated with both kinds of data associated, loosely and

tightly coupled.

ICSM Recommendations

Therefore - The element *couplingType* should be populated in all service metadata records. If the Coupling Type is *tight* then the *coupled resource* element must be populated for all coupled resources.

Values for Codelist *SV_CouplingType*

From codelist - **SV_CouplingType**. Available values for *SV_CouplingType* are:

- *loose* - service instance is loosely coupled with a data instance, i.e. no MD_DataIdentification class has to be described
- *mixed* - service instance is mixed coupled with a data instance, i.e. MD_DataIdentification describes the associated data instance and additionally the service instance might work with other external data instances
- *tight* - service instance is tightly coupled with a data instance, i.e. MD_DataIdentification class **MUST** be described

Examples

GA

{example - if any useful}

ABARES

{example - if any useful}

Others

{### who - example - if any useful} }

XML -

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <srv:SV_ServiceIdentification>
    <mri:citation>
      ...
    </mri:citation>
    <mri:abstract/>
    <srv:serviceType>
      <gco:ScopedName>view</gco:ScopedName>
    </srv:serviceType>
    <srv:couplingType>
      <srv:SV_CouplingType codeList="http://standards.iso.org/iso/19115/resources/Codelists/cat/codel
```

```

        codeListValue="tight"/>
    </srv:couplingType>
    <srv:coupledResource>
        ....
        </srv:SV_CoupledResource>
    </srv:coupledResource>
    <srv:containsOperations>
        ....
    </srv:containsOperations>
    </srv:SV_ServiceIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

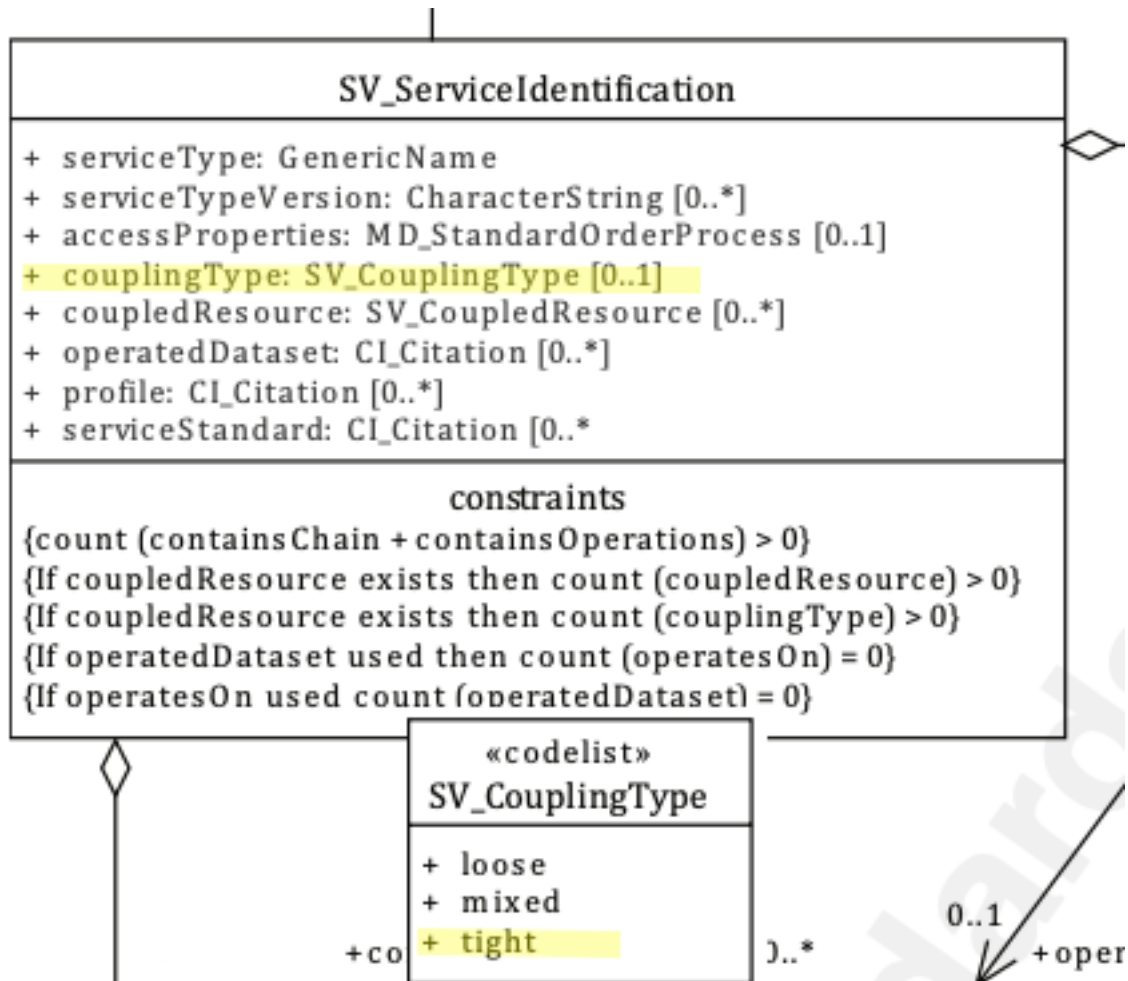


Figure 32: Coupling Type

Coupled Resource ★★★★★

When documenting a service, the nature of the relationship of the service to the data resources on which it interacts is important to capture so as to provide potential users an understanding of the applicability of such service to their needs. When a service is highly dependant on particular data, these data needs need to be documented in the service metadata.

Element Name	<i>coupledResource</i>
Parent	<i>MD_Metadata.identificationInfo>SV_ServiceIdentification</i>
Class/Type	<i>SV_CoupledResources</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Evaluation, Use</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★
Metadata type	<i>structural</i>
ICSM Level of Agreement	★ ★

Definition

Further description of the data coupling in the case of tightly coupled services

ISO Requirements

There must be zero or many [0-∗] *coupledResource* entries for the cited resource for a *SV_ServiceIdentification* package of class *SV_CoupledResource* in a metadata record. If a *Coupling Type* is tight, at least one instance of this element must be populated.

Discussion

The relation of a geospatial service to the data on which it operates is varied. This relation impacts the decisions one may make regarding the capture of useful metadata for such a service. These services fall into three categories depending on how tightly coupled the data is to the service: *tightly*, *loosely*, or *mixed*.

An example of a tightly coupled service would be a WFS service delivering a particular dataset. In the tightly coupled case, the service metadata shall describe both the service and the geographic dataset. The permitted values for the description of operations shall be constrained by the values defined by the datasets associated with the service.

An example of a loosely coupled service could be a reprojection service with user selected input datasets. Loosely coupled services may have an association with data types through the service type definition (*SV_ServiceIdentification.serviceType*). Dataset metadata need not be provided in the service metadata for the loosely coupled case.

A mixed coupling might be a WMS service into which you may add additional data sources of your choice. In a mixed coupling situation a single service instance may be associated to both kinds of data associated, loosely and tightly coupled.

Coupled resource information must be provided when the *couplingType* is *tightly* or *mixed*.

While there are numerous ways the related data resource may be captured in a service metadata record (e.g. *operatesOn*, *operatedDataset*, or even a sibling *MD_DataIdentification* package), ISO 19115-1 recommends *coupledResource* as minimum metadata required for the discovery of service resources.

ICSM Recommendations

Therefore - The element *coupledResource* should be populated in all service metadata records where the Coupling Type is *tight*. One instance for each coupled resource should be populated. This should be done using the *SV_CoupledResource.resourceReference* citing the name and online location of the metadata for the coupled resources.

Recommended Sub-Elements ICSM recommends population of *SV_CoupledResources* sub-elements as follows:

- **scopedName** (*type* - *scopedName*) [0..1] Scoped identifier of the resource in the context of the given service instance. This ScopedName is the name of the resources as it is used by a service instance (e.g. feature type name in a WFS or layer name in a WMS).
- **resourceReference** - (*class* - *CI_Citation*) [0..*] reference to the resource on which the service operates. Recommended *CI_Citation* elements to include:
 - **title** - (*type* - *charStr*)*[1..1] Mandatory - the name by which the cited data resource is known as described in its metadata. May be different than the scoped name
 - **onlineResource** - (*class* - *CI_OnlineResource*) [0..*] Highly Recommended. The online reference to the cited resource metadata (or landing page). Recommended *CI_OnlineResource* sub-elements include:
 - **linkage** - Mandatory for (*class* - *CI_OnlineResource*). A URL link to the metadata for the data resource.
 - **description** - E.g. "Metadata for dataset in OWL GeoNetwork Catalogue"

Also Consider

There are numerous alternate ways to document related dataset to a service. We recommend *coupledDataset* in line with ISO 19115-1 advice in section F.2 *Metadata for the discovery of non-service geographic resources*. Here we list some of the alternatives and why we do not recommend them.

- **Coupling Type** If not *tight* or *mixed*, *CoupledResources* need not be populated.
- **operatesOn** - *SV_ServiceIdentification.operatesOn* - Not Recommended. This element is of class - *MD_DataIdentification* and thus creates a metadata record with multiple *MD_Identifier* elements. This creates confusion within a metadata record and upon harvesting to other metadata systems, thus should be avoided.
- **resource** - *SV_ServiceIdentification.coupledResource.resource* - Not Recommended. This element is of class - *MD_DataIdentification* and thus creates a metadata record with multiple *MD_Identifier* elements. This

creates confusion within a metadata record and upon harvesting to other metadata systems and thus should be avoided. Note - When *resource* is used, *resourceReference* cannot be used. When *resourceReference* is used, *resource* cannot be used.

- **operatedDataset** - *SV_ServiceIdentification.operatedDataset* - As this is of class - *CI_Citation*, its use does not suffer the same issues as the above option. However, the lack of the *ScopedName* provided in the *CoupledResource* option means that one cannot include both the resource name and the name by which the service presents it.

Outstanding Issues

CORE ISSUE: Choice of Element to Hold Related Data Resource Reference

There are numerous ways the related data resource may be captured in a service metadata record (e.g. *operatesOn*, *operatedDataset*, or even a sibling *MD_DataIdentification* package. The choice of *coupledResource* is made for the following reasons. ISO 19115-1 recommends *coupledResource* as minimum metadata required for the discovery of service resources. The options *operatesOn*, *SV_CoupledResource.resource* and a sibling *identificationInfo/MD_DataIdentification* all require a *MD_Identifier* package. This would create metadata records that identify more than one resource. ICSM guidance is that such a situation be avoided as it could confuse other catalogues that expect a one-to-one relationship between metadata resources and resources.

Examples

GA

{example - if any useful}

ABARES

{example - if any useful}

Others

{### who - example - if any useful}}

XML -

```
<mdb:MD_Metadata>
....
  <mdb:identificationInfo>
    <srv:SV_ServiceIdentification>
      <mri:citation>
        <cit:CI_Citation>
          ....
        </cit:CI_Citation>
      </mri:citation>
      <mri:abstract/>
```

```

<srv:serviceType>
  <gco:ScopedName>view</gco:ScopedName>
</srv:serviceType>
<srv:couplingType>
  <srv:SV_CouplingType codeList="http://standards.iso.org/iso/19115/resources/Codelists/cat/
    codeListValue="tight"/>
</srv:couplingType>
<srv:coupledResource>
  <srv:SV_CoupledResource>
    <srv:scopedName>
      <gco:ScopedName>MyLayerName</gco:ScopedName>
    </srv:scopedName>
    <srv:resourceReference>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>MyDataSet</gco:CharacterString>
        </cit:title>
        <cit:onlineResource>
          <cit:CI_OnlineResource>
            <cit:linkage>
              <gco:CharacterString>https://dev.geodata.nz/geonetwork/srv/eng/catalog.s
            </cit:linkage>
            <cit:protocol gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:protocol>
            <cit:name gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:name>
            <cit:description>
              <gco:CharacterString>Metadata for dataset in OWL GeoNetwork Catalogue</g
            </cit:description>
            <cit:function>
              <cit:CI_OnLineFunctionCode codeList="http://standards.iso.org/iso/19115/
                codeListValue=""/>
            </cit:function>
          </cit:CI_OnlineResource>
        </cit:onlineResource>
      </cit:CI_Citation>
    </srv:resourceReference>
  </srv:SV_CoupledResource>
</srv:coupledResource>
<srv:containsOperations>
  ....

```



```

    </srv:containsOperations>
  </srv:SV_ServiceIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

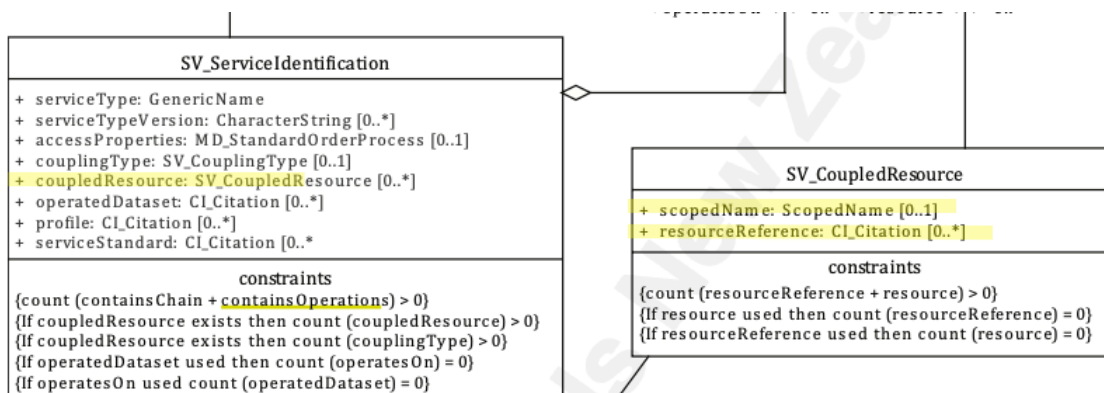


Figure 33: Coupled Resource

Contains Operations ★★★★★

Once a service is discovered, potential users need to know what operations the service provides and on what resources it operates. Provision of the specifics of the operations allows such evaluation and use.

Element Name	<i>containsOperations</i>
Parent	<i>MD_Metadata.identificationInfo>SV_ServiceIdentification</i>
Class/Type	<i>SV_OperationMetadata</i>
Governance	<i>Common ICSM</i>
Purpose	<i>Evaluation, Use</i>
Audience	machine resource - ★ ★ ★ ★ general - ★ ★ ★ resource manager - ★ ★ specialist - ★ ★ ★ ★
Metadata type	<i>structural</i>

- *ICSM Level of Agreement* - ★ ★

Definition

provides information about the operations that comprise the service

ISO Requirements

This is an ISO optional element. There may be zero or many [0..*] *containsOperations* entries for the cited resource in the *SV_ServiceIdentification* package of class *SV_OperationMetadata* in a metadata record for a service resource.

Discussion

It is useful when documenting a service to document the particular operations that the service can be called upon to do. As many of the services we may call will have operations that summarise the operations that the service provides it may be better to document this one service in order not to duplicate or cause confusion. *GetCapabilities* would be an example of this as would an OpenAPI endpoint as implemented in OGC API common based services.

ICSM Recommendations

Therefore - If a potential client of a service is to use such service once discovered, descriptions of the functionality and use of operations provided should be documented in metadata of a geospatial service. When there exists an operation that details the operations available, such as *GetCapabilities* or an OpenAPI/Swagger endpoint, it is recommended that this operation be captured here. Further operations detailed by such a service need not be detailed here. At a minimum, the ICSM recommended sub-elements to be populated include *operationName*, *distributedComputingEnvironment*, *operationDescription*, *connectPoint*.

Recommended Sub-Elements

- **operationName** - (*type - charStr*) [1..1] - Mandatory. A unique identifier within the service for this interface e.g. GetCapabilities, OpenAPI
- **distributedComputingPlatform** - (*codelist - DCPList*) [1..*] - Mandatory by ISO 19115-1. Distributed computing platforms on which the operation has been implemented. Suggest use of *Web Services* as default value as use of this element is not clearly described or agreed upon.
- **operationDescription** - (*type - charStr*) [0..1] - Highly recommended. Free text description of the intent of the operation and the results of the operation
- **connectPoint** - (*class - CI_OnlineResource* [1..*]) - Mandatory. Handle for accessing the service interface. Usually a complete URL. Recommend that this be the full path to a *GetCapabilities* document. Recommended *connectPoint* sub-elements include for service operation:
 - **linkage** - Mandatory for (*class - CI_OnlineResource*). A URL link to invoke the service.
 - **protocol** - E.g. WFS, WFS, CSW
 - **function** - Drawn from codelist - *CI_OnlineFunctionCode*. Use if appropriate values are available.
 - **parameter** - (*class - SV_Parameter*) [0..*] - Recommended when parameters are needed for the operation. A description of the parameters that can be provided to the operation.

Other Optional Sub-Elements

- **invocationName** - (*type - charStr*) [0..1] - The name used to invoke this interface within the context of the DCP. The name is identical for all DCPs. The mandatory elements *operationName* and *connectPoint* usually suffice thus making *invocationName* superfluous in most cases
- **dependsOn** - (*class - SV_OperationsMetadata*) [0..*] - Recommended when there exists operations that must be completed immediately before current operation is invoked. When multiple, structured as a list for capturing alternate predecessor paths and sets for capturing parallel predecessor paths

Related Codelists

DCPList - codelist There are 10 options to choose from in the Distributed Computing Platform code list (DC-PList). At least one must be chosen when describing a service operation. As the use of this codelist has not been agreed upon, current ICSM guidance is to use *webService* as default value unless there is clear reason otherwise. Available values are as follows:

- **XML** - eXtensible Markup Language
- **CORBA** - Common Object Request Broker Architecture
- **JAVA** - JAVA programming language
- **COM** - Component Object Model - Microsoft's framework for developing and supporting program component objects
- **SQL** - Structured Query Language - a standard interactive and programming language for getting information from and updating a database
- **SOAP** - Simple Object Access Protocol
- **Z3950** - ISO 23950, an international standard client-server, application layer communications protocol for searching and retrieving information from a database over a TCP/IP computer network.
- **HTTP** - HyperText Transfer Protocol

- **FTP** - File Transfer Protocol
- **webServices - Default** - any web based services

Outstanding Issues

Distributed Computing Platform Codelist The mandatory selection of DCPList values presents some area for disagreement and varied implementation. The values available and guidance of their use and purpose is lacking.

Other Notes

OGC API Notes - The 'containsOperations' equivalent in OGC API Records (under development) will likely describe the operations available on a single path. A Path Item MAY be empty, due to ACL constraints. The path itself is still exposed to the document viewer but they will not know which operations and parameters are available.

Crosswalk considerations

ISO 19119/19139 None Known

Dublin core / CKAN / data.gov.au None Known

DCAT *operationDiscription* maps to *dcat:endpointDescription* *connectPoint* maps to *dcat:endpointURL*

RIF-CS *connectPoint* maps to *Location/Electronic/@type='url'*

Also Consider

Coupled Resource - Present an option to connect a coupled resource to a particular operation.

Examples

GA

{example - if any useful}

ABARES

{example - if any useful}

Others

{### who - example - if any useful}

XML -

```

<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <srv:SV_ServiceIdentification>
    ....
    <srv:containsOperations>
      <srv:SV_OperationMetadata>
        <srv:operationName>
          <gco:CharacterString>GetCapabilities</gco:CharacterString>
        </srv:operationName>
        <srv:distributedComputingPlatform>
          <srv:DCPList codeList="http://standards.iso.org/iso/19115/resources/Codelists/cat/codelists
            codeListValue="WebServices"/>
        </srv:distributedComputingPlatform>
        <srv:operationDescription>
          <gco:CharacterString>Description of available operations</gco:CharacterString>
        </srv:operationDescription>
        <srv:connectPoint>
          <cit:CI_OnlineResource>
            <cit:linkage>
              <gco:CharacterString>https://my.webite.io/cgi-bin/wfs?SERVICE=WFS&VERSION=1.0.0&
            </cit:linkage>
            <cit:protocol>
              <gco:CharacterString>OGC:WFS</gco:CharacterString>
            </cit:protocol>
            <cit:name gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:name>
            <cit:description gco:nilReason="missing">
              <gco:CharacterString/>
            </cit:description>
            <cit:function>
              <cit:CI_OnLineFunctionCode codeList="http://standards.iso.org/iso/19115/resources/Codeli
                codeListValue=""/>
            </cit:function>
          </cit:CI_OnlineResource>
        </srv:connectPoint>
      </srv:SV_OperationMetadata>
    </srv:containsOperations>
    ....
  </srv:SV_ServiceIdentification>
</mdb:identificationInfo>

```

....

</mdb:MD_Metadata>

UML diagrams

Recommended elements highlighted in Yellow

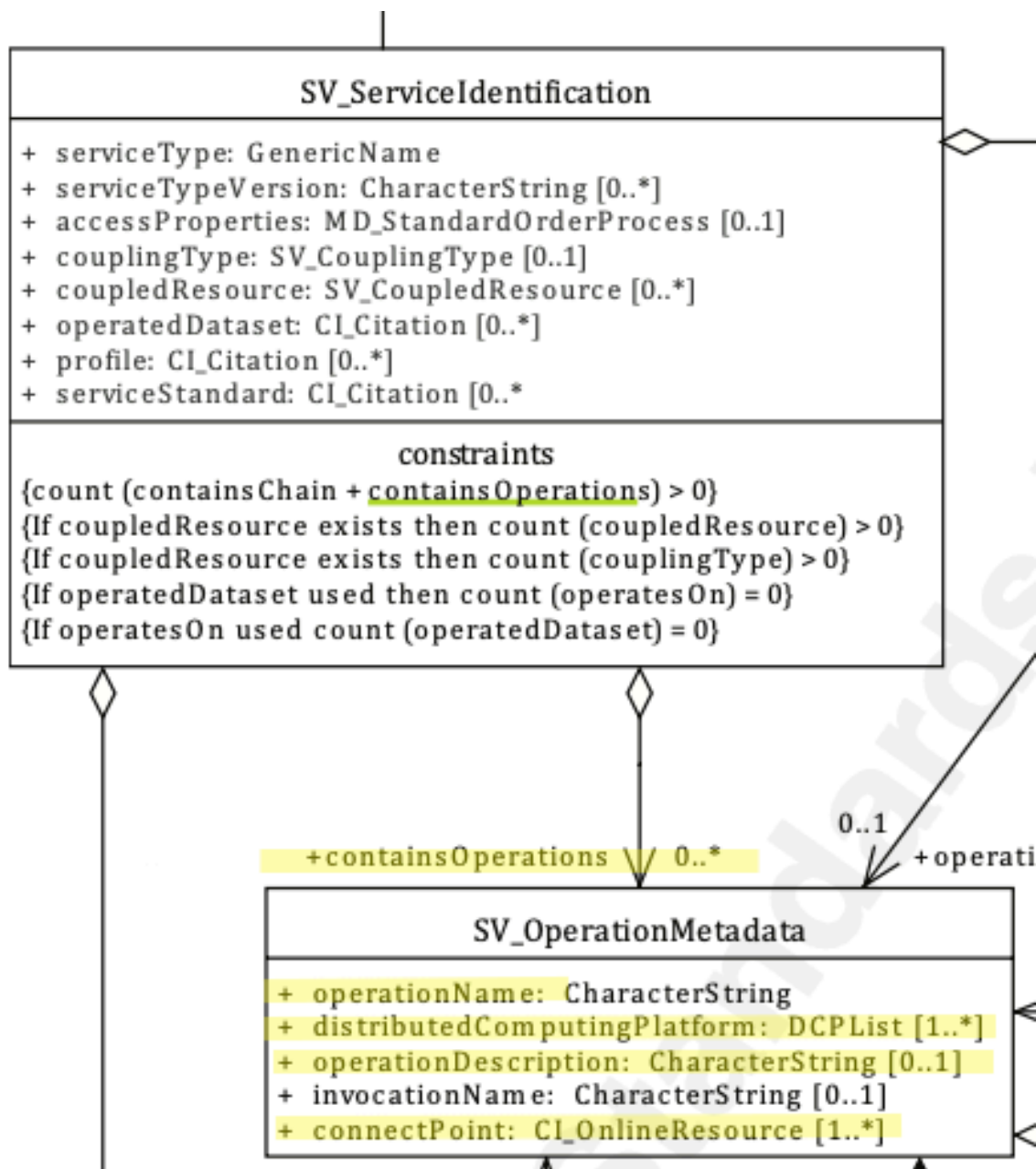


Figure 34: Contains Operation

Parameter ★★

Once a service operation has been discovered, potential users need to know the parameters that are required for this interface in sequence. Provision of the specifics of the operation parameters allows such evaluation and use.

Element Name	<i>parameter</i>
Parent	<i>MD_Metadata.identificationInfo>SV_ServiceIdentification</i>
Class/Type	<i>SV_Parameter</i>
Governance	<i>Domain, Agency</i>
Purpose	<i>Evaluation, Use</i>
Audience	machine resource - ★ ★ ★ ★ general - ★ ★ resource manager - ★ ★ specialist - ★ ★ ★ ★
Metadata type	<i>structural</i>
ICSM Level of Agreement	★ ★

Definition

the parameters that are required for a service operation interface, in sequence

ISO Requirements

This is an ISO optional element. There may be zero or many [0..*] *parameter* instances of class *SV_Parameter* associated to service operation (*containsOperations*, class *SV_OperationMetadata*) entries for the cited resource. If parameter order is important, then these should be recorded in the proper sequence.

Discussion

It is useful when documenting a service to document the particular parameters that the service operations need and expect if any. This documentation must include the parameter technical details including *name*, *direction*, *optionality*, and *repeatability*. A description of the purpose of the parameter is useful for users to evaluate the utility of such operations.

As many of the services we may call will have operations that summarise the operations that the service provides it may be better to document this one service in order not to duplicate or cause confusion. GetCapabilities would be an example of this as would an OpenAPI endpoint as implemented in OGC API common based services. These operations typically require no parameters, but the operations they describe will contain the necessary parameters.

ICSM Recommendations

Therefore - If a potential client of a service is to use such service, descriptions of the functionality and use of the parameters required by these operations should be documented in metadata of a geospatial service. When used, this element has several mandatory subelements as described below.

Recommended Sub-Elements

- **name** - (*class* - *MemberName*) [1..1] - Mandatory. The name, as used by the service for this parameter.
- **direction** - (*codelist* - *SV_ParameterDirection*) [1..1] - Mandatory. Indication if the parameter is an input to the service, an output or both
- **description** - (*type* - *charStr*) [0..1] - A narrative explanation of the role of the parameter
- **optionality** - (*type* - *Boolean*) [1..1] - Mandatory. Indication if the parameter is required (True or False)
- **repeatability** - (*type* - *Boolean*) [1..1] - Mandatory. Indication if more than one value of the parameter may be provided (True or False)

Related Codelists

SV_ParameterDirection - codelist When describing the service parameters, the *direction* for each parameter must be described from the *SV_ParameterDirection* codelist. Available values are:

- **in** - The parameter is an input parameter to the service instance
- **out** - The parameter is an output parameter to the service instance
- **in/out** - The parameter is both an input and output parameter to the service instance

Outstanding Issues

None known

Other Discussion None known

Crosswalk Considerations

None known

Examples

XML -

```
<mdb:MD_Metadata>
....
  </mdb:identificationInfo>
  </srv:SV_ServiceIdentification>
  ....
  <srv:containsOperations>
  ....
    <srv:parameter>
      <srv:SV_Parameter>
        <srv:name>
          <gco:MemberName>
            <gco:aName>
              <gco:CharacterString>VERSION</gco:CharacterString>
            
```



```

    </gco:aName>
    <gco:attributeType>
      <gco:TypeName>
        <gco:aName gco:nilReason="missing">
          <gco:CharacterString/>
        </gco:aName>
      </gco:TypeName>
    </gco:attributeType>
  </gco:MemberName>
</srv:name>
<srv:direction>
  <srv:SV_ParameterDirection>in</srv:SV_ParameterDirection>
</srv:direction>
<srv:description>
  <gco:CharacterString>Version of WFS. Accepted value = 1.0.0</gco:CharacterString>
</srv:description>
<srv:optionality>
  <gco:Boolean>true</gco:Boolean>
</srv:optionality>
<srv:repeatability>
  <gco:Boolean>false</gco:Boolean>
</srv:repeatability>
</srv:SV_Parameter>
</srv:parameter>
<srv:parameter>
  <srv:SV_Parameter>
    <srv:name>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>REQUEST</gco:CharacterString>
        </gco:aName>
      </gco:MemberName>
      <gco:attributeType>
        <gco:TypeName>
          <gco:aName gco:nilReason="missing">
            <gco:CharacterString/>
          </gco:aName>
        </gco:TypeName>
      </gco:attributeType>
    </gco:MemberName>
  </srv:name>
  <srv:direction>
    <srv:SV_ParameterDirection>in</srv:SV_ParameterDirection>
  </srv:direction>

```

```

    <srv:description>
      <gco:CharacterString>REQUEST=GetCapabilities</gco:CharacterString>
    </srv:description>
    <srv:optionality>
      <gco:Boolean>>false</gco:Boolean>
    </srv:optionality>
    <srv:repeatability>
      <gco:Boolean>>false</gco:Boolean>
    </srv:repeatability>
  </srv:SV_Parameter>
</srv:parameter>
<srv:parameter>
  <srv:SV_Parameter>
    <srv:name>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>SERVICE</gco:CharacterString>
        </gco:aName>
        <gco:attributeType>
          <gco:TypeName>
            <gco:aName gco:nilReason="missing">
              <gco:CharacterString/>
            </gco:aName>
          </gco:TypeName>
        </gco:attributeType>
      </gco:MemberName>
    </srv:name>
    <srv:direction>
      <srv:SV_ParameterDirection>in</srv:SV_ParameterDirection>
    </srv:direction>
    <srv:description>
      <gco:CharacterString>SERVICE=WFS</gco:CharacterString>
    </srv:description>
    <srv:optionality>
      <gco:Boolean>>false</gco:Boolean>
    </srv:optionality>
    <srv:repeatability>
      <gco:Boolean>>false</gco:Boolean>
    </srv:repeatability>
  </srv:SV_Parameter>
</srv:parameter>
</srv:SV_OperationMetadata>
</srv:containsOperations>

```

```

    </srv:SV_ServiceIdentification>
  </mdb:identificationInfo>
  ....
</mdb:MD_Metadata>

```

UML diagrams

{ Captured from official ISO documentation at <https://www.isotc211.org/hmmg/HTML/ConceptualModels/index.htm?goto=1:12:2:4095>
 Recommended elements highlighted in Yellow

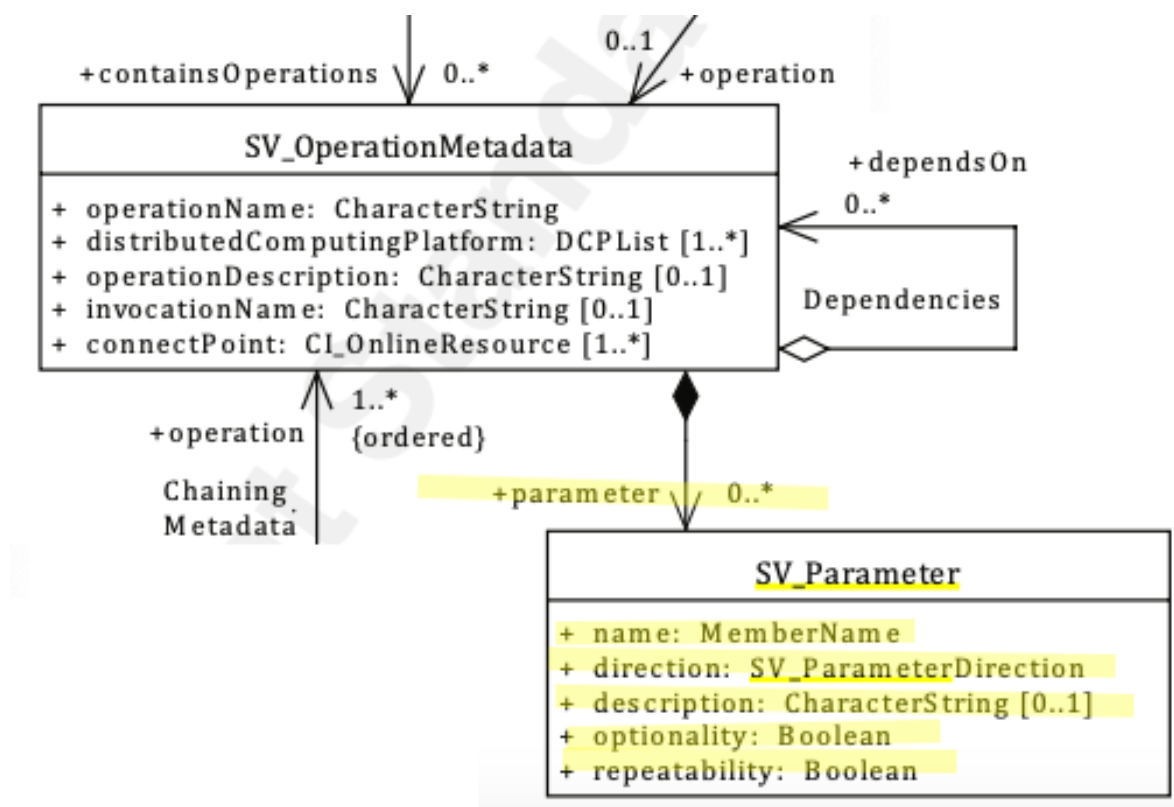


Figure 35: Parameter

Associated Resource ★★★

Geospatial data and service often are part of a larger collection of resources. Geospatial practitioners need to be provided linkages to these associated resources of which a given resource is a part. There are many types of associated resources, spatial and non-spatial. Associated resources can also provide a useful path for discovery.

Element Name	<i>associateResource</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>MD_AssociatedResource</i>
Governance	<i>Resource use, Discovery</i>
Purpose	<i>Discovery, Identification</i>
Audience	machine resource - ★ ★ general - ★ ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★ ★ ★
Metadata type	<i>administrative, descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

An entity to indicate an association between resources and records related to the resources when part of a larger collection

ISO Obligation -

- In a metadata record there should be zero to many [0..*] *associatedResources* packages for the cited resource in the *MD_DataIdentification* package of class *MD_AssociatedResource* that relate a resource to other resources. These should be of type *DS_AssociationTypeCode*.

Discussion

When important aspects or information about a spatial resource are derived by the association of this resource to others of which it is part, it is useful that these associations be documented in the metadata so as these can be captured and discovered. Doing so provides important avenues for additional data discovery. Some resources are truly of little use unless combined with others of which they are a part.

ICSM Recommendations

Therefore - to provide an effective way to document, preserve and provide discovery of associated resources, these relations should be documented in the metadata. At a minimum, this should include a name, description of the relationship and link to the resource or its metadata. In contrast to *additionalDocumentation* which can be thought of as outputs used to describe and understand a cited resource, an *associatedResource* is something that is of a piece of, or input to, the cited resource.

Recommended Sub-Elements

- **associationType** - (*codelist - DS_AssociationTypeCode*) [1..1] Mandatory for associated resource citations - one name for the type of relationship
- **crossReference** - reference from one resource to another
- **largerWorkCitation** - reference to a master resource of which this one is a part
- **partOfSeamlessDatabase** - part of same structured set of data held in a computer
- **stereoMate** - part of a set of imagery that when used together, provides three-dimensional images
- **isComposedOf** - reference to resources that are parts of this resource
- **collectiveTitle** - common title for a collection of resources
- **series** - associated through a common heritage such as produced to a common product specification
- **dependency** - associated through a dependency
- **revisionOf** - resource is a revision of associated resource
- **name** - (*class - CI_Citation*) {0..*} - citation information about the associated resource
- *Optional sub elements*
- **initiativeType** - (*codelist - DS_InitiativeTypeCode*) [0..1] - type of initiative under which the associated resource was produced
- **metadataReference** - (*class - CI_Citation*) [0..1] - reference to the metadata of the associated resource

Outstanding Issues

Geonetwork support Support of associated resources for iso19115-3 in GeoNetwork 3.6 seems limited and perhaps broken. This needs investigation.

Other discussion

DCAT Def - *A resource with an unspecified relationship to the catalogued item. Notes - Use only if more specific subproperty is not available. Sub-properties of dct:relation in particular dcat:distribution, dct:hasPart, (and its sub-properties dcat:catalog, dcat:dataset, dcat:service), dct:isPartOf, dct:conformsTo, dct:isFormatOf, dct:hasFormat, dct:isVersionOf, dct:hasVersion, dct:replaces, dct:isReplacedBy, dct:references, dct:isReferencedBy, dct:requires, dct:isRequiredBy*

Also Consider

- **additionalDocumentation** - other documentation associated with the resource, e.g. related articles, publications, user guides, data dictionaries.
- **resourceLineage** - Information about the provenance, source(s), and/or the production process(es) applied to the resource.
- **browseGraphic** - associates to a large number of packages to provide linkage to associated image files, such as business or product icons and logos
- **supplementalInformation** - a free text field that is defined as “any other descriptive information about the resource”.

Crosswalk considerations

ISO19139

MD_AssociatedResource replaces MD_AggregateInformation to clarify its role as a mechanism for associating resources. Changes include:

- MD_AssociatedResource/name:CI_Citation replaces MD_AggregateInformation/aggregateDatasetName
- The name this role was simplified along with the change to the name of the class.
- MD_AggregateInformation/aggregateDataSetIdentifier
- This MD_Identifier was removed because the MD_Identifier in the name:CI_Citation can be used to provide an identifier for the associated resource.
- MD_AssociatedResource /metadataReference:CI_Citation was added
- This new element was added to avoid ambiguity about whether the name:CI_Citation refers to a resource or to metadata for that resource. Now it is clear that name:CI_Citation refers to the resource and the metadataReference refers to metadata for that resource.

Dublin core / CKAN / data.gov.au

TBD {mapping to *DC element* and discussion???

DCAT

Maps to dct:relation

RIF-CS

Maps to “Related Information”

Examples

XML

```
<mdb:MD_Metadata>
....
</mdb:identificationInfo>
</mri:MD_DataIdentification>
....
<mri:associatedResource>
  <mri:MD_AssociatedResource>
    <mri:name>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>Big Project</gco:CharacterString>
        </cit:title>
      </cit:CI_Citation>
    </mri:name>
```

```

    <mri:associationType>
      <mri:DS_AssociationTypeCode codeList="https://schemas.isotc211.org
        /19115/resources/Codelist/cat/codelists.xml#DS_AssociationTypeCode"
        codeListValue="largerWorkCitation"/>
    </mri:associationType>
  </mri:MD_AssociatedResource>
</mri:associatedResource>
....
</mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

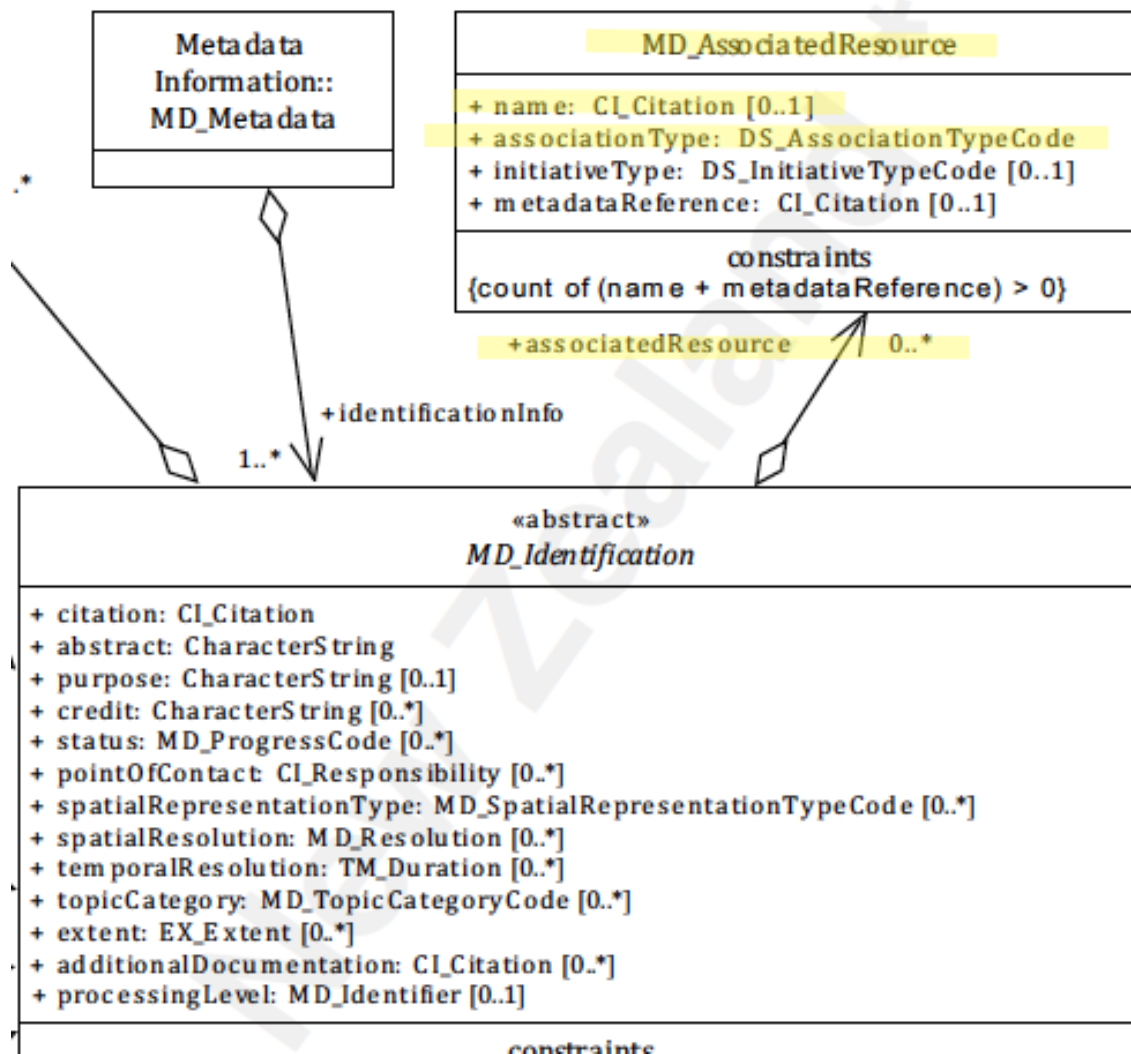


Figure 36: associateResource

Resource Format ★★★

Information about how a cited spatial resource is kept on the host system can be useful to individuals such as subject matter specialist and data managers. General audiences will be more interested in the distribution format.

- **Path** - *MD_Metadata.identificationInfo>MD_DataIdentification.resourceFormat*
- **Governance** - *Agency*
- **Audience** -
 - machine resource - ★★★
 - general - ★
 - data manager - ★★★★★
 - specialist - ★★★
- **Metadata type** - *administrative*
- **ICSM Level of Agreement** - ★★★

Definition

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

ISO Obligation

There may be zero or many [0..*] *resourceFormats* for the cited resource in the *MD_DataIdentification* package of class *MD_Format* described in a metadata record.

ICSM Good Practice

This element should be populated in all metadata records with information about the format in which the resource is stored and managed within the agency, This is not about the format in which the resource is distributed which often differs.

Recommended Sub-Elements From class - *MD_Format*

- **formatSpecificationCitation** - (*class - CI_Citation*) citation/URL of the specification for the format
- **medium** - (*class - MD_Medium*) medium used by the format

Discussion

Knowledge of the native format of a resource provides a user that has direct access to such a great deal of insight as to how the resource might fit their need. It also provides a specialist user insight as to the technical limitations and capabilities of the resource. It is of high value to data managers as it provides invaluable information about the storage and use of these resources which the manager can use to know how to provide future support. Most external users would likely be more interested in the distribution format.

Outstanding Issues

CORE ISSUE: This element seems to be about the native format in which the data is kept by an organisation. This may or may not be the same as the distribution format. It is the distribution format that most people would want to know from a metadata record (except internal users).

Applied to SV_ServiceIdentification This element makes more sense when applied to service metadata. In that case, the resource format is what is of interest as the service is the distribution channel.

Recommendations

Therefore - it is recommended that format information about a resource be captured in the metadata. The details to include are to be at the best judgement of the managers and direct users of the resource.

It is not recommended, except in the case of service information metadata, that this element be used to hold distribution format information. That is better conveyed in a *distributionFormat* element under MD_Distribution.

Crosswalk considerations

Dublin core / CKAN / data.gov.au likely unneeded unless a service

DCAT mapping as yet unknown

Also Consider

- **MD_Distribution.distributionFormat** - holds information about the format in which the data is distributed.

Examples

XML

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
    <mri:resourceFormat>
      <mrd:MD_Format>
        <mrd:formatSpecificationCitation>
          <cit:CI_Citation>
            <cit:title>
              <gco:CharacterString>PostGIS</gco:CharacterString>
            </cit:title>
          </cit:CI_Citation>
        </mrd:formatSpecificationCitation>
      <mrd:medium>
        <mrd:MD_Medium>
```

```

    <mrd:name>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>My Cloud
        </gco:CharacterString>
        </cit:title>
      </cit:CI_Citation>
    </mrd:name>
  </mrd:MD_Medium>
</mrd:medium>
</mrd:MD_Format>
</mri:resourceFormat>
....
</mri:supplementalInformation>
</mri:MD_DataIdentification>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

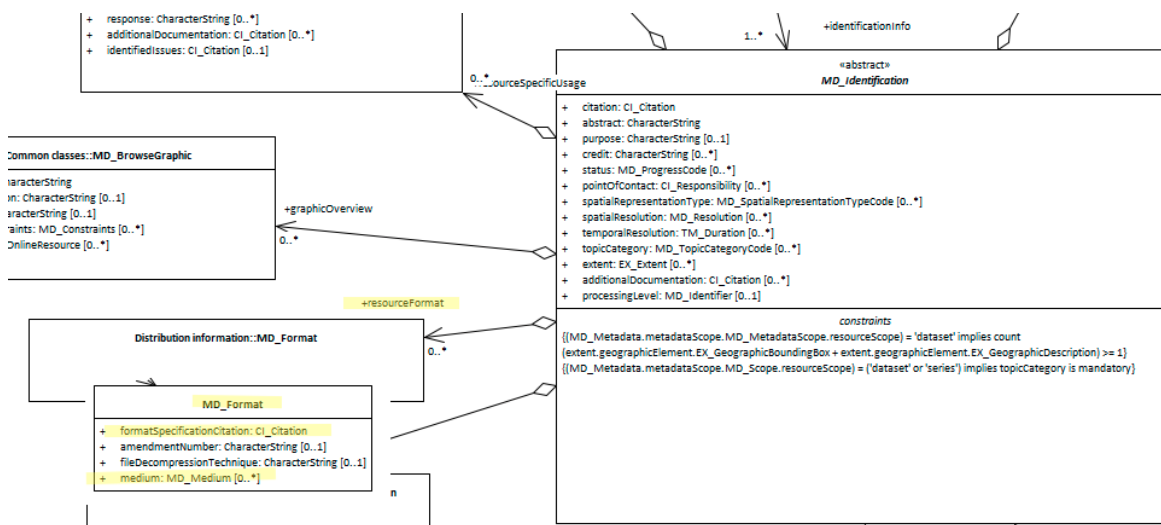


Figure 37: resourceFormat

Resource Graphic Overview ★★★

Geospatial data and service are largely visual by nature. Geospatial practitioners tend to be visually oriented. Browse graphics are a way of including in the metadata visual clues as to the nature and usefulness of resources.

Element Name	<i>graphicOverview</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>MD_BrowseGraphic</i>
Governance	<i>Common ICSM, Agency, Domain</i>
Purpose	<i>Discovery, Identification</i>
Audience	machine resource - ★ general - ★ ★ ★ ★ ★ resource manager - ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

A graphic that provides an illustration of a resource

NOTE - Should include a legend for the graphic, if applicable.

EXAMPLE - A dataset thumbnail image, an organisation logo, security constraint or citation graphic.

ISO Obligation

In a metadata record there should be zero to many [0..*] *graphicOverview* packages for the cited resource in the *MD_DataIdentification* package of class *MD_BrowseGraphic* in a metadata record.

Discussion

Geospatial professionals by nature, rely to a large extent on visual information to gain an understanding of resources. Browse graphics provide in the metadata a way to communicate with users visually.

ICSM Recommendations

Therefore - to provide a quick way for users to discover and identify the resource they need, provide a graphic overview of the metadata. At a minimum, this should include a name and link to the image.

Recommended Sub-Elements From class *MD_BrowseGraphic*

- **fileName** - (*type - CharStr*) [1..1] Mandatory for browse graphic elements - name of the file that contains a graphic that provides an illustration of the resource.
- **linkage** - (*class - CI_OnlineResource*) [0..*] - link to browse graphic.
- Optional:

- **imageConstraints** - (*class* - *MD_Constraints*) [0..*] - restriction on access and/or use of browse graphic
- **fileType** - (*type* - *CharStr*) [0..*] - format in which the illustration is encoded (e.g.: EPS, GIF, JPEG, PBM, PS, TIFF, PDF)
- **extent** - (*class* - *EX_Extent*) [0..*] Information about the horizontal, vertical and temporal extent of the resource specified by the scope

Also Consider

- **MD_BrowseGraphic** - associates to a large number of packages for different purposes, such as business or product icons and logos
- **CI_OnLineFunctionCode** - Thisodelist contains an option *browseGraphic*

Crosswalk considerations

ISO19139

browseGraphic is a new package in iso19115-1. New elements include: - **MD_BrowseGraphic.imageConstraint** (*class* - *MD_Constraints*) - *This new element was added in order to allow the specification of constraints on a browse graphic associated with a resource.* - **MD_BrowseGraphic.linkage** (*class* - *CI_OnlineResource*) - *This new element was added in order to allow a straightforward specification of the link to the browse graphic and the capability to add additional information (name, description, ...) about that graphic.*

Examples

XML -

```
<mdb:MD_Metadata>
....
<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    <mri:citation>
      <cit:CI_Citation>
        ....
        <cit:graphic>
          <mcc:MD_BrowseGraphic>
            <mcc:fileName>
              <gco:CharacterString>
                https://static.wixstatic.com/media
                /414fd2_2f712656fb5547f39a08a53aab98cc29~mv2.png/v1
                /fill/w_92,h_146,al_c,q_80,usm_0.66_1.00_0.01
                /IFaGR9yg.webp</gco:CharacterString>
              </mcc:fileName>
            <mcc:linkage>
              <cit:CI_OnlineResource>
                <cit:linkage>
                  <gco:CharacterString>
```

```

    https://static.wixstatic.com/media
    /414fd2_2f712656fb5547f39a08a53aab98cc29~mv2.png
    /v1/fill/w_92,h_146,al_c,q_80,usm_0.66_1.00_0.01
    /IFaGR9yg.webp
  </gco:CharacterString>
</cit:linkage>
<cit:protocol>
  <gco:CharacterString>
    WWW:LINK-1.0-http--link
  </gco:CharacterString>
</cit:protocol>
<cit:name gco:nilReason="missing">
  <gco:CharacterString/>
</cit:name>
<cit:description gco:nilReason="missing">
  <gco:CharacterString/>
</cit:description>
<cit:function>
  <cit:CI_OnLineFunctionCode codeList=
    "https://schemas.isotc211.org/19115/resources
    /Codelist/cat/codelists.xml#CI_OnLineFunctionCode"
    codeListValue="browseGraphic"/>
  </cit:function>
</cit:CI_OnlineResource>
</mcc:linkage>
</mcc:MD_BrowseGraphic>
....
  </cit:CI_Citation>
</mri:citation>
</mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

MD_BrowseGraphic
<ul style="list-style-type: none">+ fileName : CharacterString+ fileDescription : CharacterString [0..1]+ fileType : CharacterString [0..1]+ imageConstraints : MD_Constraints [0..*]+ linkage : CI_OnlineResource [0..*]

Figure 38: browseGraphic

Keywords ★★★★★

Keywords are the important ideas and topics that summarise and define what your resource is about. In most search engines, these are indexed and typically normalised to resemble the base word in order to capture variations. Keywords are useful in discovering and organising resources.

- **Path** - *MD_Metadata.identificationInfo>MD_DataIdentification.descriptiveKeywords*
- **Governance** - *Common ICSM, Agency, Domain*
- **Primary use** - *Discovery, Data management*
- **Audience** -
 - machine resource - ★★★★★
 - general - ★★★★★
 - data manager - ★★★★★
 - specialist - ★★★★★
- **Metadata type** - *descriptive*
- **ICSM Level of Agreement** - ★★

Definition -

Words or phrases describing the resource to be indexed and searched.

ISO Obligation

- There can be zero or many [0..*] descriptive keywords for the cited resource in the *MD_DataIdentification* package of class *MD_Keywords* in a metadata record.

ICSM Good Practice

- There should be multiple keywords selected from a referenced thesaurus present in a metadata record for a spatial resource.

Recommended Sub-Elements From class *MD_Keywords*

- **keyword** - *(type - charStr) Mandatory, preferably chosen from a thesaurus
- **type** - (codelist - *MD_KeywordTypeCode*) highly recommended - 15 options (substantial increase from iso19139)
 - *discipline* - keyword identifies a branch of instruction or specialized learning
 - *place* - keyword identifies a location
 - *stratum* - keyword identifies the layer(s) of any deposited substance or levels within an ordered system
 - *temporal* - keyword identifies a time period related to the dataset
 - *theme* - keyword identifies a particular subject or topic
 - *dataCentre* - keyword identifies a repository or archive that manages and distributes data

- *featureType* - keyword identifies a resource containing or about a collection of feature instances with common characteristics
- *instrument* - keyword identifies a device used to measure or compare physical properties
- *platform* - keyword identifies a structure upon which an instrument is mounted
- *process* - keyword identifies a series of actions or natural occurrences
- *product* - keyword identifies a type of product
- *project* - keyword identifies an endeavour undertaken to create or modify a product or service
- *service* - keyword identifies an activity carried out by one party for the benefit of another
- *subTopicCategory* - refinement of a topic category for the purpose of geographic data classification
- *taxon* - keyword identifies a taxonomy of the resource
- **thesaurusName** - (*class* - *CI_Citation*) highly recommended if thesaurus is used. Must include at minimum the title of the thesaurus.
- **keywordClass** - (*class* - *MD_KeywordClass*) recommended for enhanced ontology support. Includes the following subelements
 - **className** - (*type* - *charStr*) [1..1] Mandatory for MD_KeywordClass. A character string to label the keyword category in natural language
 - **conceptIdentifier** - (*type* - *URI*) [0..1] Recommended. URI of concept in ontology specified by the ontology attribute; this concept is labeled by the className: CharacterString.
 - **ontology** - (*class* - *CI_Citation*) [1..1] Mandatory for MD_KeywordClass. A reference that binds the keyword class to a formal conceptualisation of a knowledge domain for use in semantic processing. NOTE: Keywords in the associated MD_Keywords keyword list must be within the scope of this ontology

Discussion

Keywords are a foundational technology for organising and discovering resources. ISO19115-1 provides powerful tools to expand on these capabilities but these tools are most often very lightly used. The use of thesauri to normalise and standardise terms helps greatly. Ontologies and registries in which the definitions of these terms may be stored and linked help ensure consistent use and understanding. In Australia several agencies have developed and implemented thesauri and mandated their use. These include:

- *"ABS Field of Research* - The Australian and New Zealand Standard Research Classification (ANZSRC), 2008 defined field or fields of research relevant to the dataset.
- *ABARES Keywords* - (Need Definition)
- *AGIFT Keyword* - Australian Governments' Interactive Functions Thesaurus (AGIFT) that describes the high-level business functions carried out across Commonwealth, state and local governments in Australia.
- *GCMD Keywords* - The Global Change Master Directory (GCMD) Keywords are a hierarchical set of con-

trolled Earth Science vocabularies that help ensure Earth science data, services, and variables are described in a consistent and comprehensive manner and allow for the precise searching of metadata and subsequent retrieval of data, services, and variables.

NOTE - When the resource described is a service, one instance of MD_Keyword should refer to the service taxonomy defined in ISO 19119.

Ontology support with keywordClass A keywordClass role is an association of a MD_Keywords instance with a MD_KeywordClass used to provide user-defined categorisation of groups of keywords that extend or are orthogonal to the standardised KeywordTypeCodes and are associated with an ontology that allows additional semantic query processing. The thesaurus citation specifies a collection of instances from some ontology, but is not an ontology. It might be a list of places that include rivers, mountains, counties and cities. There might be a Laconte county, the city of Laconte, the Laconte River, and Mt. Laconte; when searching it is useful for the user to be able to restrict the search to only rivers. the addition of keywordClass provides support for this functionality.

Outstanding Issues

CORE ISSUE: Current practice in most agencies in use of keywords is not good. Thesauri are too often not used. Comma delimited list are common in some shops where others have separate entries. Good practice guidance development and training is needed and should be a special focus area.

Thesaurus citation: What is important to capture beside the mandatory title element in the citation of a thesaurus?

Tech issue needs fix - GN Thesaurus builder References the old KeywordTypeCode list

Recommendations

Therefore - It is highly recommended that the metadata for spatial resources contains as many keywords as needed to provide ease of discovery and improved data management practices. Capture keywords for multiple audiences, general, domain or agency specific to aid the different users of the resource. However, excessive use of keywords that target minor aspects of a resource should be avoided. Consider providing a limit to the number of keywords used and focus on those of most importance.

It is recommended that all keywords have a topic category assigned. These must be sourced from the 15 values in the MD_KeywordTypeCode. Helps understand the keywords in context and further categorise resources.

In addition, while free text keywords are allowed, it is recommended that well managed thesauri be used to increase consistency of how keywords are used and understood. Thesauri should be used whenever possible, and where they do not exist they should be created.

The new keywordClass package should be explored to allow the greater use of semantic principles in search and data management.

Crosswalk considerations

ISO19139 MD_KeywordClass was added to allow further categorisation of keywords

Dublin core / CKAN / data.gov.au Mapping not yet discussed.

DCAT ISO 19115 can group keywords according to type (theme, place, temporal, discipline and stratum), or according to thesaurus; this information is lost in DCAT. DCAT keywords are mapped to ISO 19115 keywords without type or thesaurus.

Also Consider

There are several elements outside the keywords class that are in effect keywords. These include:

- **Topic Category** - The main themes of the resource populated from a fixed domain of values mandated by ISO19115-1
- **Extent Geographic Description** - verbal description of place by names
- **Spatial Representation Type** - holds a set of values from a domain that provides keyword values about the technical method used by the resource to spatially represent geographic information.

Examples

XML -

```
<mdb:MD_Metadata>
....
  <mdb:identificationInfo>
    <mri:MD_DataIdentification>
      ....
      <mri:descriptiveKeywords>
        <mri:MD_Keywords>
          <mri:keyword gco:nilReason="missing">
            <gco:CharacterString/>
          </mri:keyword>
          <mri:type>
            <mri:MD_KeywordTypeCode codeListValue="theme"
              codeList="https://schemas.isotc211.org/19115/resources
                /Codelist/cat/codelists.xml#MD_KeywordTypeCode"/>
          </mri:type>
        </mri:MD_Keywords>
      </mri:descriptiveKeywords>
      <mri:descriptiveKeywords>
        <mri:MD_Keywords>
          <mri:keyword>
            <gco:CharacterString>
              World
            </gco:CharacterString>
          </mri:keyword>
          <mri:type>
```

```

    <mri:MD_KeywordTypeCode codeListValue="place"
      codeList="https://schemas.isotc211.org/19115/resources
        /Codelist/cat/codelists.xml#MD_KeywordTypeCode"/>
  </mri:type>
</mri:MD_Keywords>
</mri:descriptiveKeywords>
<mri:descriptiveKeywords>
  <mri:MD_Keywords>
    <mri:keyword>
      <gco:CharacterString>Tasman Sea</gco:CharacterString>
    </mri:keyword>
    <mri:type>
      <mri:MD_KeywordTypeCode
        codeList="https://schemas.isotc211.org/19115/resources
          /Codelist/cat/codelists.xml#MD_KeywordTypeCode"
        codeListValue="place"/>
    </mri:type>
    <mri:thesaurusName>
      <cit:CI_Citation>
        <cit:title>
          <gco:CharacterString>
            Continents, countries, sea regions of the world.
          </gco:CharacterString>
        </cit:title>
        <cit:date>
          <cit:CI_Date>
            <cit:date>
              <gco:Date>2015-07-17</gco:Date>
            </cit:date>
            <cit:dateType>
              <cit:CI_DateTypeCode
                codeList="https://schemas.isotc211.org/19115
                  /resources/Codelist/cat
                  /codelists.xml#CI_DateTypeCode"
                codeListValue="publication"/>
            </cit:dateType>
          </cit:CI_Date>
        </cit:date>
        <cit:identifier>
          <mcc:MD_Identifier>
            <mcc:code>
              <gco:Anchor
                xlink:href="http://202.49.243.69:8080/geonetwork

```

```

        /srv/eng/thesaurus.download?ref=
        external.place.regions">
        geonetwork.thesaurus.external.place.regions
        </gcx:Anchor>
    </mcc:code>
</mcc:MD_Identifier>
</cit:identifier>
</cit:CI_Citation>
</mri:thesaurusName>
</mri:MD_Keywords>
</mri:descriptiveKeywords>
    ....
</mri:MD_DataIdentification>
</mdb:identificationInfo>
    ....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

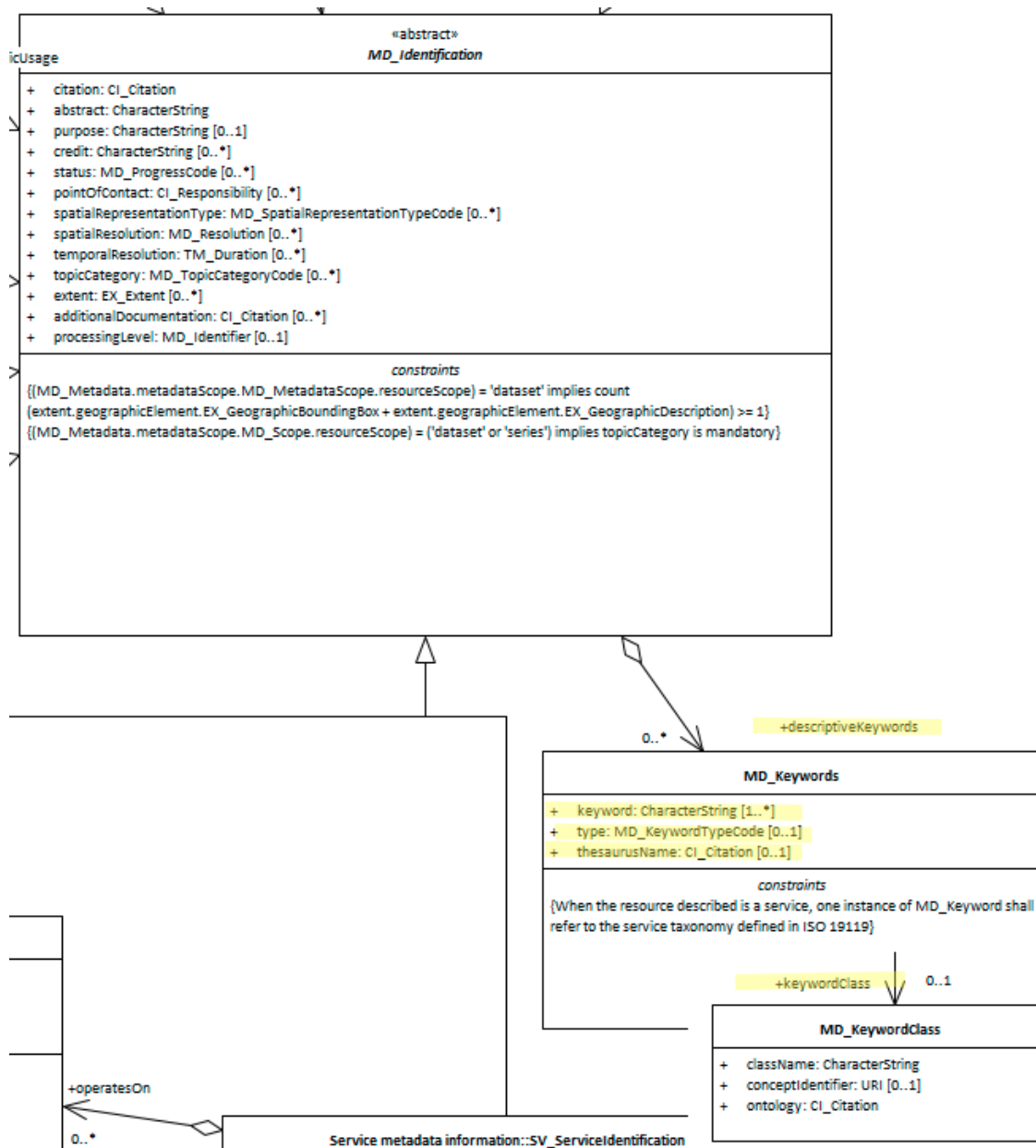


Figure 39: keywords

Resource Maintenance ★★★★★

A great deal of geospatial data and service exist as living changing resources. It is often the timeliness that these cycles provide that make these resources so valuable. These update and maintenance schedules are important to document and share so that those who wish to use such resources know how to arrange their work flows to best suit.

- **Path** - *MD_Metadata.identificationInfo>MD_DataIdentification.resourceMaintenance*
- **Governance** - *Agency*
- **Purpose** - *Resource use*
- **Audience** -
 - machine resource - ★★★
 - general - ★★
 - resource manager - ★★★★★
 - specialist - ★★
- **Metadata type** - *administrative*
- **ICSM Level of Agreement** - ★★★

Definition

Information about the frequency of resource updates, and the scope of those updates.

ISO Obligation

- There should be zero to many [0..*] *resourceMaintenance* packages for the cited resource in the *MD_DataIdentification* package of class *MD_MaintenanceInformation* in a metadata record.

ICSM Good Practice

- Maintenance information about a citedresource should be documented. This should include descriptions of the update and maintenance frequency and scope.

Recommended Sub-Elements From class *MD_MaintenanceInformation*

- **maintenanceAndUpdateFrequency** - (*codelist - MD_MaintenanceFrequencyCode*) [0..1] frequency with which changes and additions are made to the resource after the initial resource is completed.
- **userDefinedMaintenanceFrequency** - (*class - TM_PeriodDuration*) [0..1] alternate maintenance period other than those defined. Use when *MD_MaintenanceFrequencyCode* do not suit.
- **maintenanceScope** - (*class - MD_Scope*) [0..*] type of resource(s) and/or extent to which the maintenance information applies. Recommended subelements include:
 - **level** - (*codelist - MD_ScopeCode*) [1..1] Mandatory for *MD_Scope*. The target resource covered
 - **extent** - (*class - EX_Extent*) Information about the horizontal, vertical and temporal extent of the resource specified by the scope
 - **levelDescription** - (*union - MD_ScopeDescription*) [0..*] detailed description/listing of the items specified by the level. As a union, only one value may be selected per instance

Discussion

In order for users of a resource to know when the next update will occur or to know how many cycles old a particular version may be, resource owners and custodians should document in the metadata the maintenance and update frequency of a resource. If this frequency changes, this change should be reflected in the metadata. If the scope of the update is less than the whole resource, the scope limitation needs to be recorded.

Recommendations

Therefore - custodians of a resource should capture in the metadata the frequency and scope of update and maintenance of a resource. If none are planned, then record this fact.

Crosswalk considerations

ISO19139 in ISO19115-1 attributes were replaced to provide a more flexible and unambiguous description of maintenance dates and scope.

- **MD_MaintenanceInformation.dateOfNextUpdate** was replaced by **MD_MaintenanceInformation.maintenanceDate**
 - This role was replaced by maintenanceDate in order to enable inclusion of a CI_DateTypeCode to describe the type of the date. Note that nextUpdate was added to that code list.
- **MD_MaintenanceInformation.updateScope** and **MD_MaintenanceInformation.updateScopeDescription** were replaced by **MD_MaintenanceInformation.maintenanceScope**
 - These two roles were combined into maintenance-Scope: MD_Scope [0..*] in order to allow specifying a scope that includes a spatial and temporal extent.

Dublin core / CKAN / data.gov.au {if any} Maps to update frequency

RIF-CS Maps to Description 'lineage'

Also Consider

- **metadataMaintenance** - documents the update and maintenance of the metadata record and not the resource. There are many reasons the two may not be in sync. It is usually more important to document the update cycles of the resource than the metadata. (Not included in MDWG Guidance.)

Examples

XML

```
<mdb:MD_Metadata>
....
  <mdb:identificationInfo>
    <mri:MD_DataIdentification>
      ....
      <mri:resourceMaintenance>
        <mmi:MD_MaintenanceInformation>
```



```

    <mmi:maintenanceAndUpdateFrequency>
      <mmi:MD_MaintenanceFrequencyCode
        codeListValue="irregular"
        codeList="https://schemas.isotc211.org/19115/resources
          /Codelist/cat/codelists.xml#MD_MaintenanceFrequencyCode"/>
    </mmi:maintenanceAndUpdateFrequency>
    <mmi:maintenanceScope>
      <mcc:MD_Scope>
        <mcc:level>
          <mcc:MD_ScopeCode
            codeList="https://schemas.isotc211.org/19115/resources
              /Codelist/cat/codelists.xml#MD_ScopeCode"
            codeListValue="attribute"/>
          </mcc:level>
        </mcc:MD_Scope>
      </mmi:maintenanceScope>
    </mmi:MD_MaintenanceInformation>
  </mri:resourceMaintenance>
  ....
</mri:MD_DataIdentification>
<mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

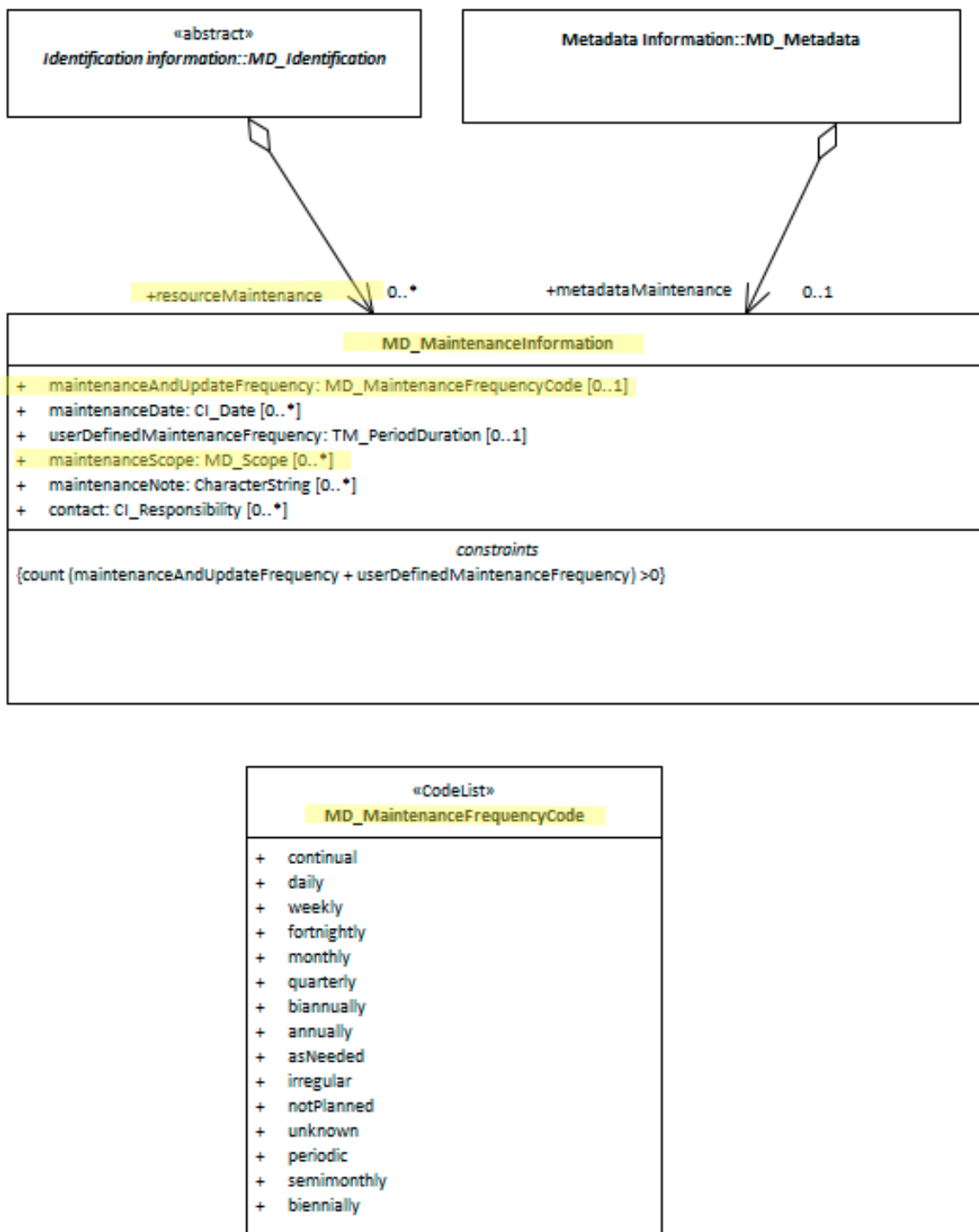


Figure 40: resourceMaintenance

class - MD_Constraints

When constraints are placed on a spatial resource or its metadata, it is important to document these.. Potential users need to be informed of rights, restrictions and responsibilities (or lack thereof) that apply to the use of such resources.

- **Governance** - ISO, National
- **Metadata Type** - structural
- **ISCM Level of Agreement** - **

Definition

restrictions on the access and use of a resource or metadata.

ISO Associations (May be found in)

- MD_Metadata.metadataConstraints
- MD_Identification.resourceConstraints
- MD_BrowseGraphic.imageConstraints

Attributes -

- **useLimitation** - (type - charStr) [0..*] limitation affecting the fitness for use of the resource or metadata.
Example, "not to be used for navigation"
- **constraintApplicationScope** - (class - MD_Scope) [0..1] the target resource and physical extent for which information is reported
- **graphic** - (class - MD_BrowseGraphic) [0..*] graphic /symbol indicating the constraint
- **reference** - (class - CI_Citation) [0..*] citation/URL for the limitation or constraint, eg. copyright statement, license agreement, etc
- **releasability** - (class - MD_Releasability) [0..1] Requires an addressee or statement - information concerning the parties to whom the resource can or cannot be released
 - **addressee** - (class - CI_Responsibility) [0..*] party to which the release statement applies
 - **statement** - (type - charStr) [0..1] release statement
 - **disseminationConstraints** - (codelist - MD_RestrictionCode) [0..*] component in determining releasability.
- **responsibleParty** - (class - CI_Responsibility) [0..*] party responsible for the resource constraints

Associated Classes, Codelists and Unions

MD_RestrictionCode - codelist The name of the handling restrictions on the resource

- *unclassified* - information applies to the dataset
- *restricted* - information applies to the series
- *confidential* - information applies to non-geographic data
- *secret* - information applies to a dimension group
- *topSecret* - information applies to a feature
- *sensitiveButUnclassified* - although unclassified, requires strict controls over its distribution

- *forOfficialUseOnly* - information applies to the characteristic of a feature
- *protected* - information applies to the collection hardware class
- *limitedDistribution* - information applies to the collection session

MD_Scope - class See MD_Scope

MD_BrowseGraphic - class

- **fileName** - (*type - charStr*) Mandatory when using MD_BrowseGraphic - name of the file that contains a graphic that provides an illustration of the resource.
- **linkage** - (*class - CI_OnlineResource*) 0 to many - link to browse graphic.
- **imageConstraints** - (*class - MD_Constraints*) 0 to many - restriction on access and/or use of browse graphic
- **fileType** - (*type - charStr*) f0 to 1 - format in which the illustration is encoded (e.g.: EPS, GIF, JPEG, PBM, PS, TIFF, PDF)
- **extent** - (*class - Extent*) Information about the horizontal, vertical and temporal extent of the resource specified by the scope

Generalisations of MD_Constraints

MD_Constraints may be expressed as:

- **MD_LegalConstraints**
- **MD_SecurityConstraints**

Discussion

Information about constraints on the access and use of a resource or its metadata is of high importance to document as this information strongly impacts on the usability of the resource to the user. Constraints may be security (*MD_SecurityConstraints*), legal (*MD_LegalConstraints*) or other (*MD_Constraints*).

A restriction may be applicable to a particular aspect of the resource. In this case capture this scope in *constraintApplicationScope* using a value from *MD_Scope*

Outstanding Issues

Good Practice examples lacking There is a need to gain greater consensus as to the general use of MD_Constraints across its instances by the MDWG.

Distribution Constraints Currently there are no clear methods to apply different constraints to different distributions. This may be an ISO issue to address. We should develop use cases.

Recommendations

Crosswalk considerations

ISO19139

- *MD_BrowseGraphic.imageConstraint* - This new element was added in order to allow the specification of constraints on a browse graphic associated with a resource.
- *MD_Constraints.constraintApplicationScope* - This new element was added in order to allow description of constraints on a resource that vary in space and/or time and/or level.
- *MD_Constraints.graphic* - This new element was added in order to allow inclusion of a logo or other graphic that is associated with a particular constraint.
- *MD_Constraints.reference* - This new element was added in order to allow inclusion of a reference to more detailed information about a constraint.
- *MD_Constraints.releasability* - This new element was added in order to allow specification of constraints that apply to specific people or organizations.
- *MD_Constraints.responsibleParty* - This new element was added in order to allow specification of people or organisations responsible for the constraints.
- *MD_Releasability* - This new class was added to provide information about resource release constraints

Related Classes

- ****MD_LegalConstraints** An extension to MD_Constraints for constraints applied for legal reasons.
- ****MD_SecurityConstraints** An extension to MD_Constraints for constraints applied for security purposes.

UML diagrams

Recommended elements highlighted in Yellow

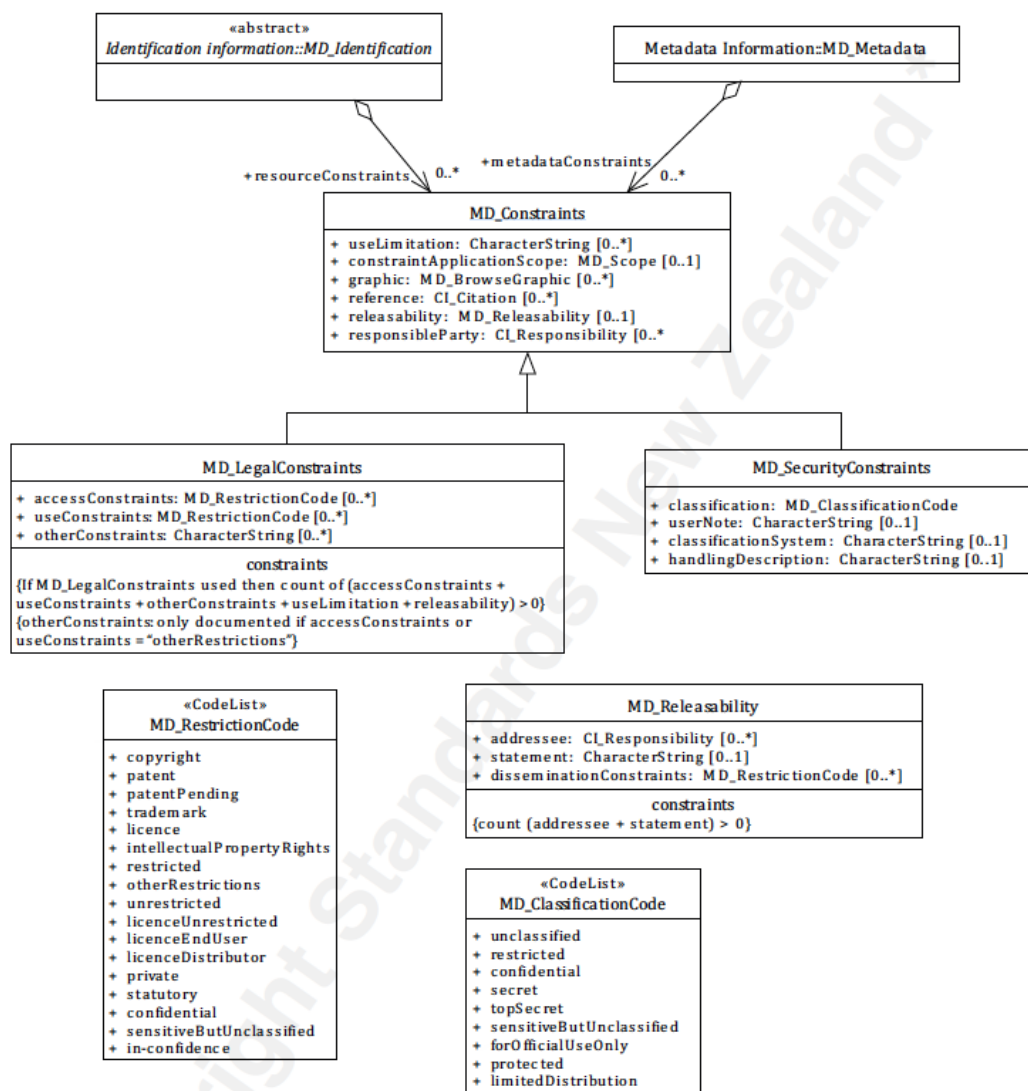


Figure 41: MD_Constraints

Resource Extent ★★★★★

- To quickly determine the general location of features included in a cited spatial resource, it is useful that extent information, geographic, vertical and temporal, are documented in the metadata.*

Element Name	<i>extent</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification</i>
Class/Type	<i>EX_Extent</i>
Governance	<i>Common ICSM, Domain</i>
Purpose	<i>Discovery</i>
Audience	machine resource - ★ ★ ★ ★ general - ★ ★ ★ ★ resource manager - ★ ★ specialist - ★ ★ ★ (higher if domain specific placenames are used)
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

The spatial and temporal extent of the resource.

ISO Obligation

- There can be zero to many [0..*] *extent* packages for the cited resource in the *MD_Metadata* package in a metadata record. These may be of the type *Geographic* (EX_GeographicExtent), *Vertical* (EX_VerticalExtent), or *Temporal* (EX_TemporalExtent).

Discussion

Every metadata record describing resources should describe the extent of the area of interest of that resource. This extents descriptions may be surface geographic, vertical and / or temporal and may contain exclusions. Those searching for resources can be provided with a quick idea of the extent of the resource. Software can use these extents to analyses and narrow searches to particular areas of interest.

The use of multiple instances is useful for describing more complicated resources.

ICSM Recommendations

Therefore - It is strongly recommended that to support discovery of resources, every metadata record contains, as needed, surface geometric, vertical and temporal extent description of the resource area of interest. Use multiple instances if it helps describe the resource for the user.

Metadata for spatial resources should at a minimum contain bounding box description of the resource. Other dimensions, such as time, should be described when useful.

Recommended Sub-Classes

- **geographicElement** - (*class - EX_GeographicExtent*)
- **verticalElement** - (*class - EX_VerticalExtent*)
- **temporalElement** - (*class - EX_TemporalExtent*)

Also Consider

- **GeoExtent** (*abstract class - EX_GeographicExtent*) has two ICSM recommended types. The third type, bounding polygons if used, should be in addition to:
- **Extent Geographic Description** (*class - EX_GeographicDescription*) description of the geographic area using identifiers
- **Extent Bounding Box** (*class - EX_GeographicExtent*) approximate geographic position of the resource using EPSG 4326 coordinate pairs with a precision of up to two decimal places
- **Extent Vertical** (*class - EX_GeographicExtent*) vertical domain of resource in specified units
- **Extent Temporal** (*class - EX_GeographicExtent*) time period covered by the content of the resource

Outstanding Issues

EX_Extent.description

The “*description*” element of EX_Extent offers a freeform way of describing the extent of a resource. We have not had any discussion as to the use of this element. GeoNetwork uses it to provide a code list delimited set of values by which the EX_GeographicBoundingBox elements are populated. It would seem more correct to use EX_GeographicDescription and its MD_Identifier element to this purpose.

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Mapping to CKAN and Dublin core elements, particularly as used by data.gov.au needs discussion

Examples

UML diagrams

Recommended elements highlighted in Yellow

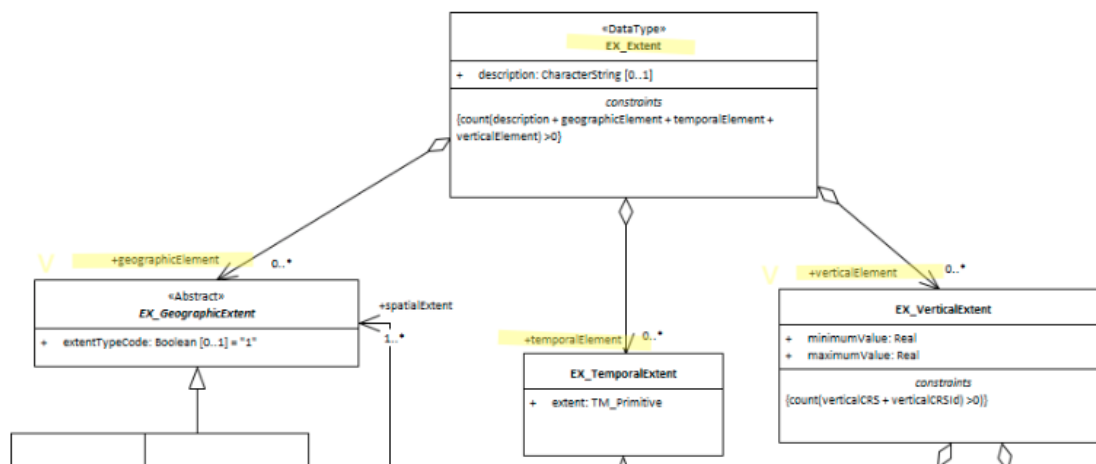


Figure 42: Extent

Geographic Extent ★★★★★

To quickly determine the general location of spatial features included in a cited resource it is useful that the extent information is provided in such a way so that the geographical extent of the resource can be easily understood.

Element Name	<i>geographicElement</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification.extent</i>
Class/Type	<i>EX_GeographicExtent</i>
Governance	<i>Common ICSM, Domain</i>
Purpose	<i>Discovery</i>
Audience	machine resource - ★ ★ ★ ★ general - ★ ★ ★ ★ resource manager - ★ ★ specialist - ★ ★ ★ (higher if domain specific placenames are used)
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

A description of the spatial area of the resource. These may be of the type Bounding Box, Geographic Description, or Bounding Polygon.

ISO Obligation

- There can be zero to many [0..*] *Geographical Extent* packages for the cited resource in the *Resource Extent* package. These may be of the type *Bounding Box* (EX_GeographicBoundingBox), *Geographic Description* (EX_GeographicDescription), or *Bounding Polygon* (EX_BoundingPolygon).

Discussion

Every metadata record describing geographic resources should contain descriptions that explain the area of interest of the resource. These may be in the form of place names, bounding box coordinate values and lastly, bounding polygons. With these, those searching for resources can be provided with a quick visual of the usable location of the resource. Catalogue software can use these descriptions to analyse and narrow searches to particular areas of interest.

The use of multiple geographic extents is recommended for more complicated geometries, including exclusion areas.

As these extents are meant to be used to give a general rough comparison to other geospatial data from sources, coordinates values should be captured in WGS 84 (EPSG 4326)

Recommendations

Therefore - It is strongly recommended that to support the discovery of resources, every metadata record that describes a geographic resource contains geographic descriptions of the area of interest for the resource. At a

minimum one description needs be in bounding box coordinate values. If there be any exclusion areas, the use of the boolean `extentTypeCode` (set to “0”) is recommended.

The MDWG recommends populating as many instances of Geographical Extent packages as needed to give a common understanding of the spatial coverage of the cited resource.

Recommended Sub Types **EX_GeographicExtent** is an abstract class that is expressed by one of the three options

- **Geographic Bounding Box** - (*class - EX_GeographicBoundingBox*) highly recommended for resources with geographic extent. An approximate geographic position of the resource using EPSG 4326 coordinate pairs with a precision of up to two decimal places
- **Geographic Description** - (*class - EX_GeographicDescription*) highly recommended for resources with geographic extent. A description of the geographic area using identifiers
- **Bounding Polygon** - (*class EX_BoundingPolygon*) optional - not recommended by MDWG except in cases where the other options do not suit
- Use **extentTypeCode** (*Boolean*) [0..1] with a value of “0” to indicate exclusions

Also Consider

- **EX_GeographicExtents** is an abstract class that can be express three ways:
- **EX_GeographicBoundingBox** - at least one of these should be present for resources that describe geographic resources
- **EX_GeographicDescription** - One of these should be present for resources that describe geographic resources
- **EX_BoundingPolygon** While very useful, particularly in describing irregular areas, this element is not described by the MDWG as a recommended element due to the difficulties that many systems have in implementing it.
- **EX_Extent** The class that contains all extent information about the cited resource - vertical, geographical or temporal.
- **EX_TemporalExtent** Contains temporal extent information for the cited resource
- **EX_VerticalExtent** - captures the vertical range of a resource.

Other Discussion

data.gov.au guidance Free text with a mandatory requirement to use one of the following:

- a point/polygon (WKT);
- an administrative boundary API; or,
- a reference URL (website address) from the National Gazetteer. Gazetteer reference URLs can be found by searching for a place at <http://www.ga.gov.au/place-names/> then clicking through to the most appropriate location “Reference ID”, and then copying and pasting the URL from the page into the Geospatial field in data.gov.au.

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Maps to jurisdiction or geospatial coverage

DCAT

Maps to dct.spatial

RIF-CS

Maps to Coverage/Spatial

Examples

UML diagrams

Recommended elements highlighted in Yellow

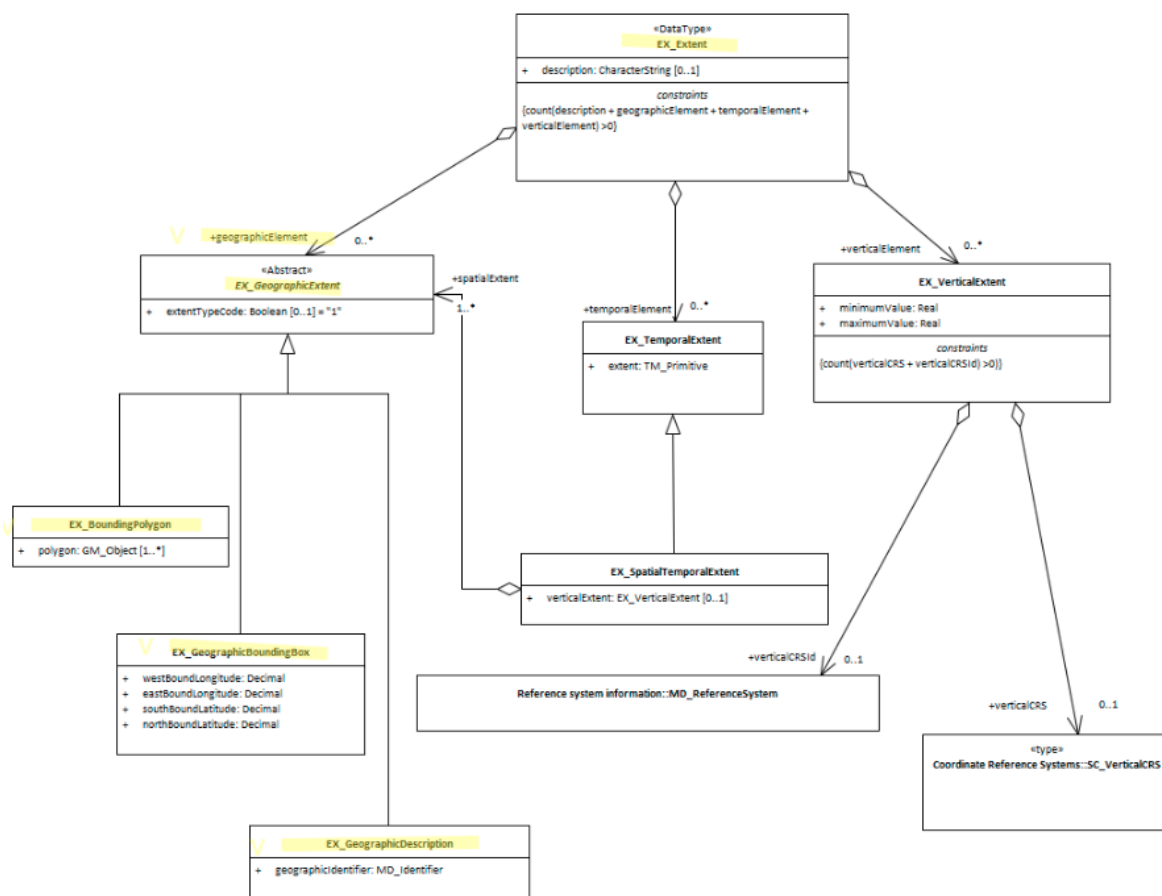


Figure 43: geographicExtent

Extent Geographic Description ★★★★★

To quickly determine the general location of spatial features included in a cited resource, it is useful that the extent information contains a verbal description of the geographic extent using common (to your community) place names.

Element Name	<i>geographicIdentifier</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identificationextent</i> <i>>EX_Extent.geographicElement></i>
Class/Type	<i>EX_GeographicDescription</i>
Governance	<i>Common ICSM, Domain</i>
Purpose	<i>Discovery</i>
Audience	machine resource - ★ ★ ★ general - ★ ★ ★ ★ resource manager - ★ ★ specialist - ★ ★ ★ (higher if domain specific placenames are used)
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

A Geographic description or placename which describes the location of the resource.

ISO Obligation

- A metadata record may have zero to many [0..*] *geographicIdentifier* elements for the cited resource in the *GeographicExtent* package of class *EX_GeographicDescription* that described the geographic extent of a cited resource.

Discussion

To provide a quick guide as to the spatial area of interest for a cited resource, every metadata record describing geographic resources should contain a descriptor that indicates the location of the area of interest of the resource. Catalogue software can use this information to analyse and narrow searches to particular areas of interest.

The use of multiple descriptors is recommended for more complicated geometries, including exclusion areas.

ICSM Recommendations

Therefore - It is highly recommended that to support the discovery of resources, every metadata record that describes a geographic resource contains geographic descriptions of the area of interest for the resource. This description must contain a *code* that holds the value of the geographic descriptor and should contain in the *codespace* the codelist or domain from which it was derived. The *authority* element may contain additional documentation of the codelist.

The MDWG recommends including as many instances of Geographical Extent packages as useful to give a common understanding of the spatial coverage of the cited resource. These names may be particular to your domain.

Recommended Sub-Elements

Use **extentTypeCode** (*type - Boolean*) [0..1] with a value of “0” to indicate exclusions class MD_Identifier

- **code** - (*type - charStr*) mandatory for MD_Identifier
- **codespace** - (*type - charStr*) ?a codelist that contains the code?
- **authority** - (*class - CI_Citation*) optional, may contain the provider of the codelist of placenames

Also Consider

- **EX_Extent** The class that contains all extent information about the cited resource - vertical, geographical or temporal.
- **EX_GeographicExtents** is an abstract class and the parent of **EX_GeographicDescription**
- **EX_GeographicBoundingBox** - a sibling to this element.
- **EX_BoundingPolygon** While very useful, particularly in describing irregular areas, this element is not described by the MDWG as a recommended element due to the difficulties that many systems have in implementing it.
- **EX_TemporalExtent** Contains temporal extent information for the cited resource
- **EX_VerticalExtent** - captures the vertical range of a resource.
- **GeoNames** - Provides a free geographical database is available for download free of charge under a creative commons attribution license. It contains over 25 million geographical names and consists of over 11 million unique features whereof 4.8 million populated places and 13 million alternate names. All features are categorized into one out of nine feature classes and further subcategorized into one out of 645 feature codes.

Outstanding Issues

GeoNetwork use of EX_Extent.description The “*description*” element of EX_Extent offers a freeform way of describing the extent of a resource. GeoNetwork uses it to provide a codelist delimited set of values by which the EX_GeographicBoundingBox elements are populated. It would seem more correct to use EX_GeographicDescription and its MD_Identifier element to this purpose.

Crosswalk considerations

Dublin core / CKAN / data.gov.au {if any}

Mapping geographic extents to CKAN and Dublin core elements, particularly as used by data.gov.au needs discussion

Examples

XML

```
<mdb:MD_Metadata>
....
```

```

<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
    <mri:extent>
      <gex:EX_Extent>
        <gex:temporalElement>
          <gex:EX_TemporalExtent>
            <gex:extent>
              <gml:TimePeriod gml:id="A1234">
                <gml:beginPosition/>
                <gml:endPosition/>
              </gml:TimePeriod>
            </gex:extent>
          </gex:EX_TemporalExtent>
        </gex:temporalElement>
      </gex:EX_Extent>
    </mri:extent>
    <mri:extent>
      <gex:EX_Extent>
        <gex:geographicElement>
          <gex:EX_GeographicBoundingBox>
            <gex:westBoundLongitude>
              <gco:Decimal>110.70922852</gco:Decimal>
            </gex:westBoundLongitude>
            <gex:eastBoundLongitude>
              <gco:Decimal>157.79663086</gco:Decimal>
            </gex:eastBoundLongitude>
            <gex:southBoundLatitude>
              <gco:Decimal>-39.32048764</gco:Decimal>
            </gex:southBoundLatitude>
            <gex:northBoundLatitude>
              <gco:Decimal>-10.68489957</gco:Decimal>
            </gex:northBoundLatitude>
          </gex:EX_GeographicBoundingBox>
        </gex:geographicElement>
        <gex:geographicElement>
          <gex:EX_GeographicDescription>
            <gex:geographicIdentifier>
              <mcc:MD_Identifier>
                <mcc:code>
                  <gco:CharacterString>
                    Australia
                  </gco:CharacterString>

```

```

    </mcc:code>
    </mcc:MD_Identifier>
    </gex:geographicIdentifier>
    </gex:EX_GeographicDescription>
    </gex:geographicElement>
    </gex:EX_Extent>
    </mri:extent>
    ....
    </mri:MD_DataIdentification>
    </mdb:identificationInfo>
    ....
    </mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

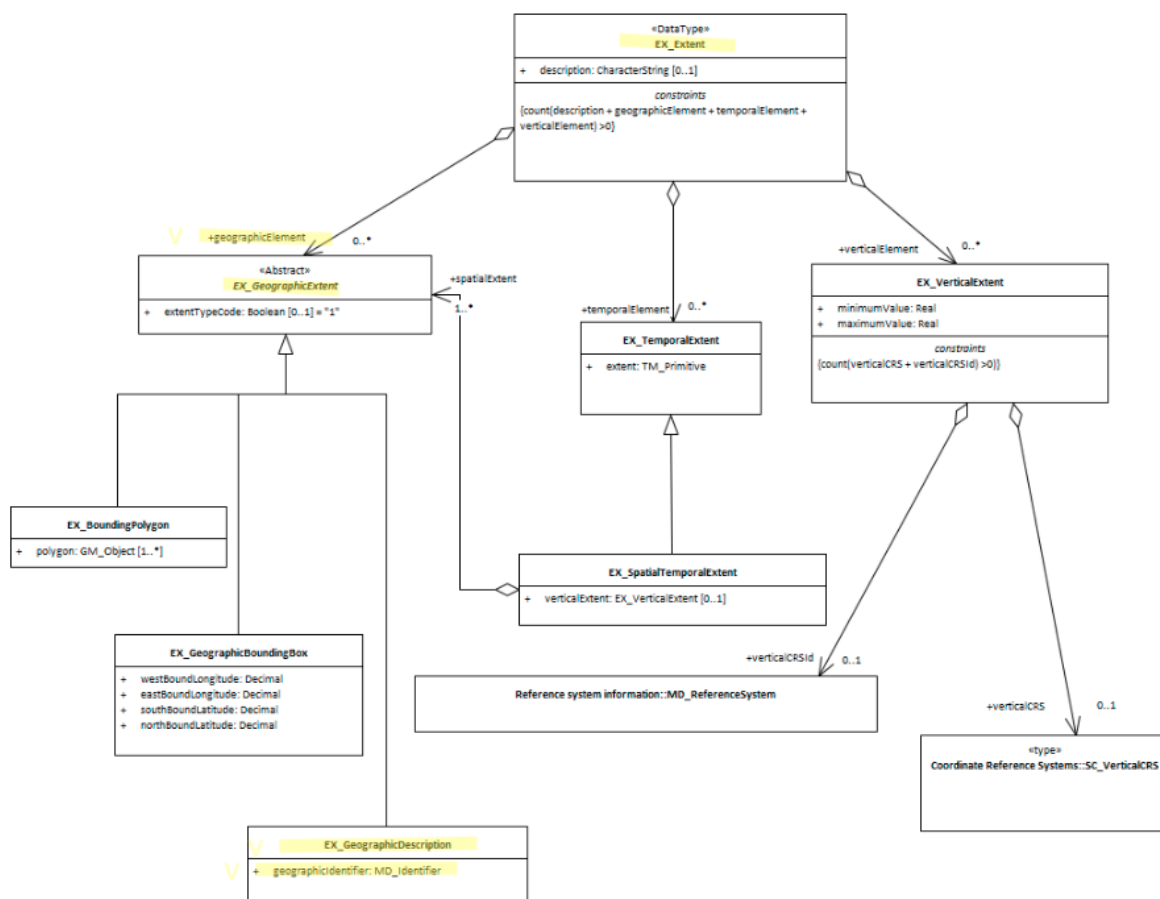


Figure 44: ExGeoDescription

Extent Bounding Box ★★★★★

*To quickly determine the general location of spatial features included in a cited resource it is useful that the extent information includes a minimal set of coordinate values that form a bounding box containing all the features of the resource.**

Element Name	<i>geographicElement</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identificationextent >EX_Extent.geographicElement></i>
Class/Type	<i>EX_GeographicBoundingBox</i>
Governance	<i>Common ICSM, Domain</i>
Purpose	<i>Discovery</i>
Audience	machine resource - ★ ★ ★ ★ general - ★ ★ ★ ★ resource manager - ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★ ★

Definition

A minimal set of geographic coordinates describing the geographic position of the resource. This is only an approximate reference so specifying the coordinate reference system is unnecessary and need only be provided with a precision of up to two decimal places

ISO Obligation

- A metadata record may have zero to many [0..*] *geographicIdentifier* elements for the cited resource in the *GeographicExtent* package of class *EX_GeographicBoundingBox* that described the geographic extent of a cited resource.

Discussion

Every metadata record describing geographic resources should contain a bounding box description that covers the location which describes the area of interest of the resource. Those searching for resources can be provided with a quick visual of the usable location of the resource. Catalogue software can use these boxes to do overlay analyses and narrow searches to particular areas of interest. To ensure ease of use with metadata from other sources that may contain data in any number of projections, these bounding box needs to be expressed in a common WGS 84 projection.

Because of the simple mathematics involved in calculating overlap with two coordinate pairs, bounding box descriptions provide a lightweight way that those without GIS tools can tell if the resource overlaps with another.

The use of multiple bounding boxes is recommended for more complicated geometries, including exclusion areas.

ICSMRecommendations

Therefore - It is strongly recommended that to support the discovery of resources, every metadata record that describes a geographic resource contains at a minimum one bounding box description of the resource area of interest. To ensure commonality with other catalogued data, the coordinates of such need be captured in WGS 84. If there be any exclusion areas, the use of the boolean extentTypeCode (set to “0”) is recommended.

The MDWG recommends populating as many instances of Geographical Extent packages as needed to give a common understanding of the spatial coverage of the cited resource.

Recommended Sub Elements

Use **extentTypeCode** (*Boolean*) [0..1] with a value of “0” to indicate exclusions All four following subelements must be included in a bounding box description

- **westBoundLongitude** - (*type - Decimal*) western-most coordinate of the limit of the resource extent, expressed in longitude in decimal degrees (positive east - WGS 84)
- **eastBoundLongitude** - (*type - Decimal*) eastern-most coordinate of the limit of the resource extent, expressed in longitude in decimal degrees (positive east - WGS 84)
- **southBoundLatitude** - (*type - Decimal*) southern-most coordinate of the limit of the resource extent, expressed in latitude in decimal degrees (positive north - WGS 84)
- **eastBoundLongitude** - (*type - Decimal*) northern-most, coordinate of the limit of the resource extent expressed in latitude in decimal degrees (positive north - WGS 84)

Also Consider

- **EX_Extent** The class that contains all extent information about the cited resource - vertical, geographical or temporal.
- **EX_GeographicExtents** is an abstract class and the parent of **EX_GeographicBoundingBox**
- **EX_GeographicDescription** - a sibling to this element.
- **EX_BoundingPolygon** While very useful, particularly in describing irregular areas, this element is not described by the MDWG as a recommended element due to the difficulties that many systems have in implementing it.
- **EX_TemporalExtent** Contains temporal extent information for the cited resource
- **EX_VerticalExtent** - captures the vertical range of a resource.

Outstanding Issues

Projections Geospatial data may be held and maintained by an organisation in any number of projections. Capturing the bounding box in common WGS 84 coordinates may require reprojection of coordinates. Workflows and tools need to be available to the metadata authors to simplify this task and reduce transcription errors.

180 degree problem To capture a bounding box that describes the area of the country of New Zealand, one must draw across 180 degrees Longitude. This creates an issue with most software descriptions of bounding boxes and results in a bounding box that circles the world and excludes New Zealand. One common solution is to split into two such bounding boxes at +/-180 degree latitude.

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Maps to geospatial coverage

DCAT

Maps to dct.spatial

RIF-CS

Maps to the aggregate element Coverage/Spatial

Examples

XML

```
<mdb:MD_Metadata>
....
  <mdb:identificationInfo>
    <mri:MD_DataIdentification>
      ....
      <gex:EX_Extent>
        <gex:geographicElement>
          <gex:EX_GeographicBoundingBox>
            <gex:westBoundLongitude>
              <gco:Decimal>110.70922852</gco:Decimal>
            </gex:westBoundLongitude>
            <gex:eastBoundLongitude>
              <gco:Decimal>157.79663086</gco:Decimal>
            </gex:eastBoundLongitude>
            <gex:southBoundLatitude>
              <gco:Decimal>-39.32048764</gco:Decimal>
            </gex:southBoundLatitude>
            <gex:northBoundLatitude>
              <gco:Decimal>-10.68489957</gco:Decimal>
            </gex:northBoundLatitude>
          </gex:EX_GeographicBoundingBox>
        </gex:geographicElement>
      </gex:EX_Extent>
      ....
    </mri:MD_DataIdentification>
  </mdb:identificationInfo>
  ....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

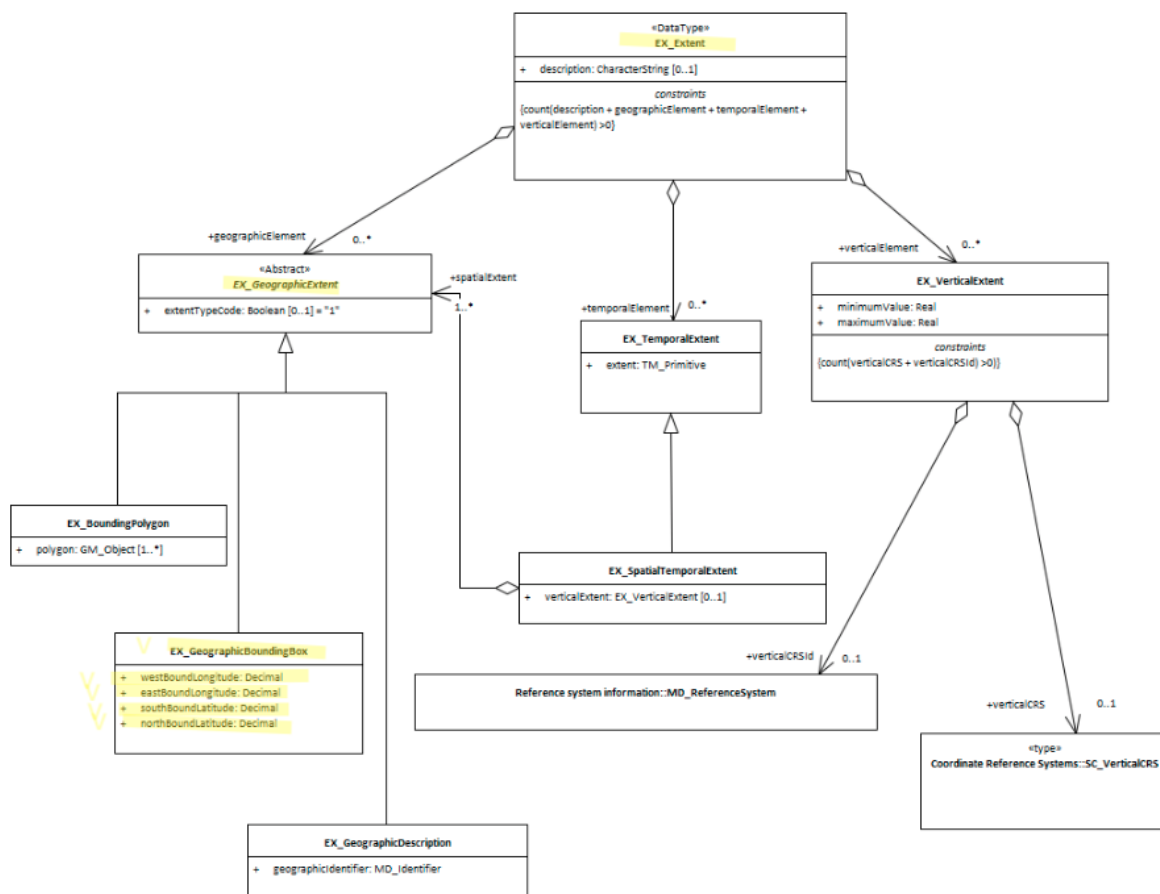


Figure 45: EXBoundingBox

Vertical Extent ★★★

To quickly determine the general location of features included in an identified resource it is useful that the extent information include any descriptions vertical extents.

Element Name	<i>verticalElement</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification.extent</i>
Class/Type	<i>EX_VerticalExtent</i>
Purpose	<i>Discovery</i>
Audience	machine resource - ★ ★ ★ ★ general - ★ ★ ★ ★ resource manager - ★ ★ specialist - ★ ★ ★ (higher if domain specific time periods are used)
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

Provides vertical component of the extent of the resource to aid discovery.

ISO Obligation

- There can be zero to many [0..*] *verticalElements* packages for the cited resource in the *Resource Extent* package of class *EX_VerticalExtent* for a resource cited in a metadata record.

Discussion

Every metadata record describing resources which contain height or depth information should describe the limits of that extent. These extents descriptions should include units of measure and other information so that those searching for resources can be provided with a quick idea of the vertical range of the resource.

The use of multiple vertical extents is useful for describing more complicated resources.

ICSM Recommendations

Therefore - It is strongly recommended that to support the discovery of resources, every metadata record contains, as needed vertical extent description of the resource area of interest. Capture the units of measure and the datum used.

The MDWG recommends, when the heights and depths of a resource are important to the resource, populating as many instances of Vertical Extent packages as needed to give a common understanding of the depth and elevation coverage of the cited resource.

Recommended Sub-Elements

- **minimumValue** - (*type* - *Real*) The minimum vertical extent to which the resource is designed to be used

- **maximumValue** - (*type - Real*) The maximum vertical extent to which the resource is designed to be used
- **verticalCRSId** - (*class - SC_VerticalCRS*) Identifies the vertical coordinate reference system used for the minimum and maximum values

Also Consider

- **EX_Extent** The class that contains all extent information about the cited resource - vertical, geographical or temporal.
- **EX_GeographicExtents** is an abstract class that can be express three ways:
- **EX_GeographicBoundingBox** - at least one of these should be present for resources that describe geographic resources
- **EX_GeographicDescription** - One of these should be present for resources that describe geographic resources
- **EX_BoundingPolygon** While very useful, particularly in describing irregular areas, this element is not described by the MDWG as a recommended element due to the difficult that many systems have in implementing it.
- **EX_TemporalExtent** Contains temporal extent information for the cited resource

Outstanding Issues

verticalCRS The vertical CRS can be captured here or under the SpatialReferenceSystem package. We need to decide when to recommend capturing it here. As other extent parameters do not include the CRS, I would make a recommendation that we treat vertical the same and capture this info in the SRS section. Note BC 21-9: GN in the 19115-3 plugin captures the extent info as the old RS_Identifier instead of MD_Identifier

Units of measure These are not specified. I would suggest that we use metres relative to sea level WGS 84 as the universal units for vertical extents. As with the mandate of WGS 84 for the projection for bounding box extents, it is important to have as a close to a universally common reference frame as we can get to compare disparate resources.

Datum Issues What is “zero” is an open question. There may be little common between domains. In 3D cadastre, the level above ground may be the measure. There also is no agreement between land vertical datums and those for the sea.

Crosswalk considerations

Dublin core / CKAN / data.gov.au

Mapping to CKAN and Dublin core elements, particularly as used by data.gov.au needs discussion

DCAT

Maps to `dct.spatial`

RIF-CS

Maps to Coverage/Spatial

Examples

XML

```

<mdb:MD_Metadata>
....
  <mdb:identificationInfo>
    <mri:MD_DataIdentification>
      ....
      <mri:extent>
        <gex:EX_Extent>
          <gex:verticalElement>
            <gex:EX_VerticalExtent>
              <gex:minimumValue>
                <gco:Real>-1000</gco:Real>
              </gex:minimumValue>
              <gex:maximumValue>
                <gco:Real>1000</gco:Real>
              </gex:maximumValue>
              <gex:verticalCRSId>
                <mrs:MD_ReferenceSystem>
                  <gmd:referenceSystemInfo xmlns:gmd="http://www.isotc211.org/2005/gmd">
                    <gmd:MD_ReferenceSystem>
                      <gmd:referenceSystemIdentifier>
                        <gmd:RS_Identifier>
                          <gmd:code>
                            <gco:CharacterString
                              xmlns:gco="http://www.isotc211.org/2005/gco">
                                WGS 84 (EPSG:4326)</gco:CharacterString>
                            </gmd:code>
                          <gmd:codeSpace>
                            <gco:CharacterString
                              xmlns:gco="http://www.isotc211.org/2005/gco">
                                EPSG
                              </gco:CharacterString>
                            </gmd:codeSpace>
                          <gmd:version>
                            <gco:CharacterString
                              xmlns:gco="http://www.isotc211.org/2005/gco">
                                8.6
                              </gco:CharacterString>

```

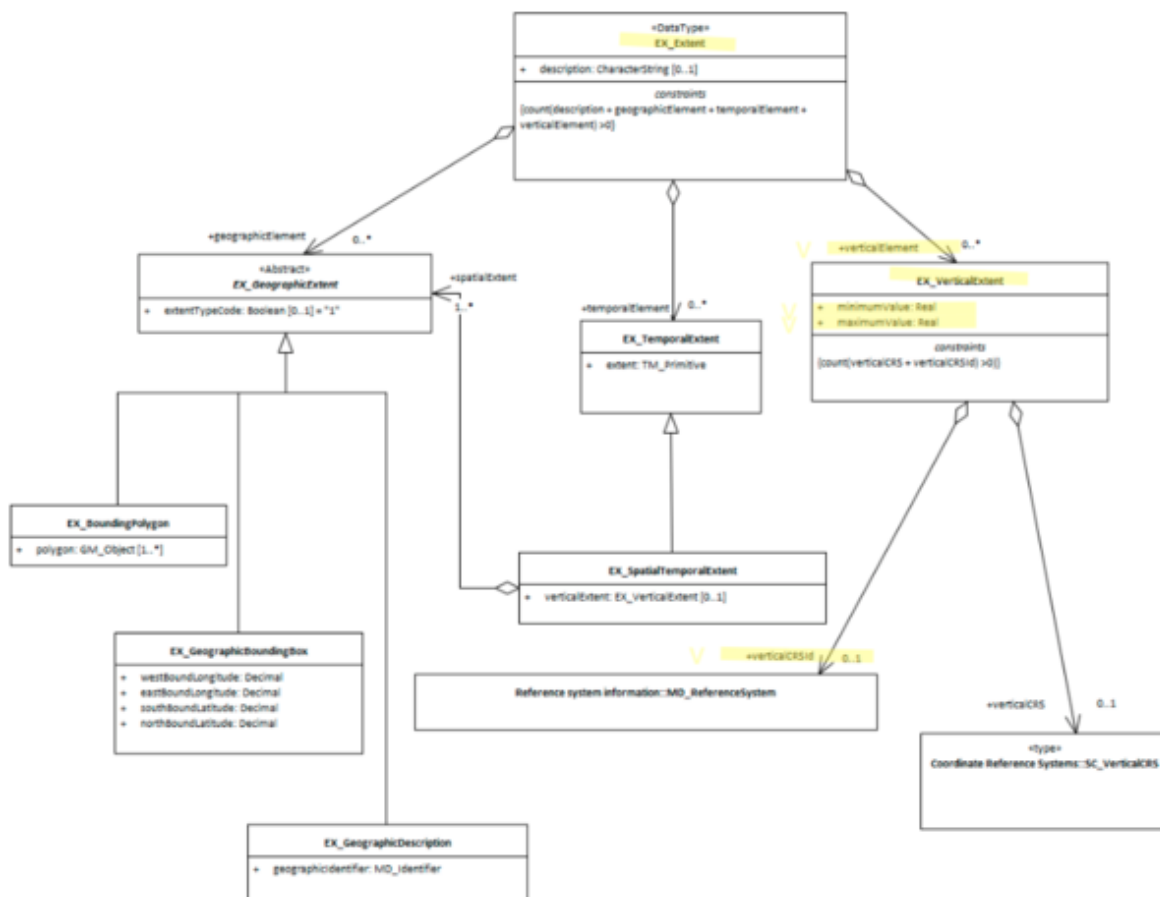
```

    </gmd:version>
    </gmd:RS_Identifier>
    </gmd:referenceSystemIdentifier>
    </gmd:MD_ReferenceSystem>
    </gmd:referenceSystemInfo>
    </mrs:MD_ReferenceSystem>
    </gex:verticalCRSId>
    </gex:EX_VerticalExtent>
    </gex:verticalElement>
    </gex:EX_Extent>
    </mri:extent>
    ....
    </mri:MD_DataIdentification>
    </mdb:identificationInfo>
    ....
  </mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow



Temporal Extents ★★ ★

To quickly determine the temporal range of features included in an identified resource it is useful that the extent information include any temporal extents and limitations.

Element Name	<i>temporalElement</i>
Parent	<i>MD_Metadata.identificationInfo>MD_Identification.extent</i>
Class/Type	<i>EX_TemporalExtent</i>
Governance	<i>Common ICSM, Domain</i>
Purpose	<i>Discovery</i>
Audience	machine resource - ★ ★ ★ ★ general - ★ ★ ★ ★ resource manager - ★ ★ specialist - ★ ★ ★
Metadata type	<i>descriptive</i>
ICSM Level of Agreement	★ ★ ★

Definition

This element provides a temporal component of the extent of the resource to aid discovery.

ISO Obligation

- There can be zero to many [0..*] *temporalElements* packages for the cited resource in the *Resource Extent* package of class *EX_TemporalExtent* for a cited resource. The attribute type is of class *TM_Primitive*. Temporal Extents may be of type *Time instant*, *Time period*, *Time node*, or *Time edge*.

Discussion

Every metadata record describing resources should describe the temporal validity of the resource.

The use of multiple temporal extents is useful for describing more complicated resources. Where these are tied to and vary by spatial dimensions in the resource these may be expressed using *EX_SpatialTemporalExtent*.

With the advent of dynamic datums for high precision applications of spatial data, temporal information becomes even more important.

ICSM Recommendations

Therefore - It is strongly recommended that to support discovery of resources, and ensure the resource is fit to purpose, every metadata record contains, as needed, temporal extent description of the resource period of interest. Dates may be captured as type *date* or *dateTime* depending on your need and tools. If your data is of high precision then capture temporal extents to support dynamic datums. the capture of *timePeriod* information is highly recommended.

The MDWG recommends populating as many instances of temporalExtent packages as needed to give a common understanding of the temporal coverage of the cited resource.

Recommended Temporal Extent types

- **Time instant** - (*class - gml:TimeInstance*) The instant is the 0-dimensional geometric primitive in time, equivalent to a point in space. An instant shall occupy a single temporal position in a given temporal reference system
- **timePosition** - (*type - date or dateTime*)
- **Time period** - (*class - gml:TimePeriod*) Mandatory elements are:
- **beginPosition** (*type - date or dateTime*)
- **endPosition** (*type - date or dateTime*)
- **duration** (*type- duration*)
- **timeInterval** (*type - decimal*)

Also Consider

- **EX_Extent** The class that contains all extent information about the cited resource - vertical, geographical or temporal.
- **EX_GeographicExtents** is an abstract class that can be express three ways:
- **EX_GeographicBoundingBox** - at least one of these should be present for resources that describe geographic resources
- **EX_GeographicDescription** - One of these should be present for resources that describe geographic resources
- **EX_BoundingPolygon** While very useful, particularly in describing irregular areas, this element is not described by the MDWG as a recommended element due to the difficulties that many systems have in implementing it.
- **EX_VerticalExtent** - captures the vertical range of a resource.

Outstanding Issues

Our understanding of temporal metadata is poor and the documentation of such is weak and by reference in ISO19115-1. There is the use of GML elements when these are described as being TM_Primitives. What is the relation? Also, What about Time node and Time edge? Need help with this timey whimey stuff.

Crosswalk considerations

Dublin core / CKAN / data.gov.au {if any}

Mapping to CKAN and Dublin core elements, particularly as used by data.gov.au needs discussion

Examples

XML

```
<mdb:MD_Metadata>
....
```

```

<mdb:identificationInfo>
  <mri:MD_DataIdentification>
    ....
    <mri:extent>
      <gex:EX_Extent>
        <gex:temporalElement>
          <gex:EX_TemporalExtent>
            <gex:extent>
              <gml:TimePeriod gml:id="d5078594e414a1056030">
                <gml:begin>
                  <gml:TimeInstant gml:id="d5078594e416a1056030">
                    <gml:timePosition>2019-07-01</gml:timePosition>
                  </gml:TimeInstant>
                </gml:begin>
                <gml:end>
                  <gml:TimeInstant gml:id="d5078594e420a1056030">
                    <gml:timePosition>2019-07-31</gml:timePosition>
                  </gml:TimeInstant>
                </gml:end>
              </gml:TimePeriod>
            </gex:extent>
          </gex:EX_TemporalExtent>
        </gex:temporalElement>
      </gex:EX_Extent>
    </mri:extent>
    ....
  </mri:MD_DataIdentification>
</mdb:identificationInfo>
....
</mdb:MD_Metadata>

```

UML diagrams

Recommended elements highlighted in Yellow

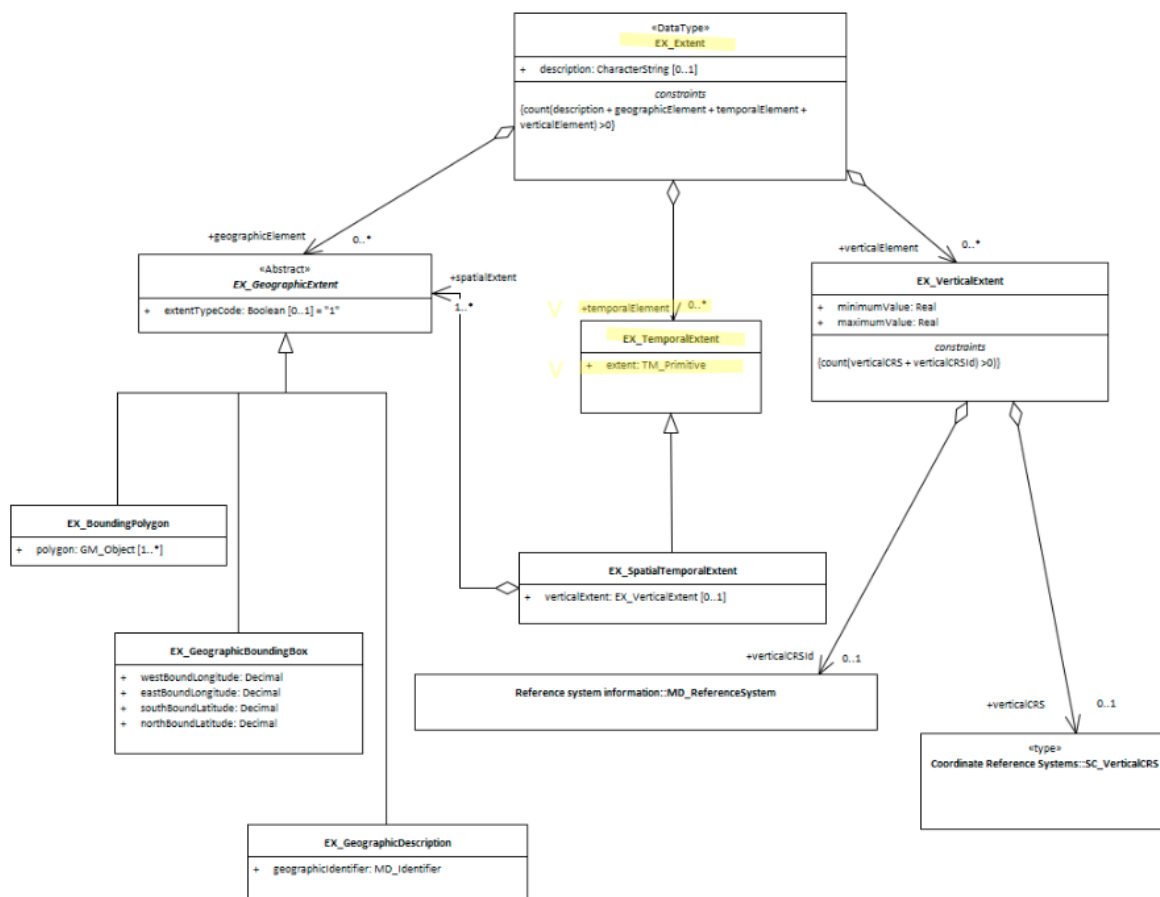


Figure 47: temporalExtent

Spatial Reference System ★★★★★

In order to be of repeatable use and combined with other resources, geospatial information is most always captured according to a spatial reference system - (SRS). (Also referred to as a Coordinate Reference System - CRS.) Sharing the specifics of the reference systems used allows the resource to be compared and combined with others with precision and accuracy.

Element Name	<i>referenceSystemInfo</i>
Parent	<i>MD_Metadata</i>
Class/Type	<i>MD_ReferenceSystem</i>
Governance	<i>Common ICSM (for acceptable CRS registries)</i> <i>Domain (for acceptable values within a community of users)</i>
Purpose	<i>Usage, Fitness</i>
Audience	machine resource - ★ ★ ★ ★ general - ★ ★ resource manager - ★ ★ ★ ★ specialist - ★ ★ ★ ★ ★
Metadata type	<i>Structural</i>
ICSM Level of Agreement	★ ★ ★

Definition

The information about the reference systems that define the system use to describe spatial position descriptions in a resource.

ISO Obligation

- There should be zero or many [0..*] *spatialReferenceInfo* packages for the cited resource in the *MD_Metadata* package of class *MD_ReferenceSystem* in a metadata record for spatial resources.

Discussion

In order to common understand of location in geospatial resource, standardised spatial reference systems are used. A spatial reference helps describe where features are located in the real world. Different spatial reference systems are used for different purposes. (The terms spatial reference and coordinate system used interchangeably although they are slightly different.) People and machines that use spatial resources need to be provided in the metadata the details of the spatial reference systems used by the resource in order to conduct meaningful analysis and to combine this resource with others.

To adequately describe a resource, there may be the need to include multiple SRS in the metadata. Usually, each of these would be of a different type (*referenceSystemType*).

Dynamic (Earth Centric) Datums Real world coordinates do change over time due to movements of the Earth's crust. These changes are significant and need be accounted for when combining data from different time periods. For Australia continental drift accounts for up to 70mm per year or 1.8 metres over the past 26 years. When

the SRS is Earth centered as is the case with WGS 84, in order to understand position relative to object captured in the same SRS but at a different date, the *Coordinate Epoch* (time of position information capture) must be recorded. A method of capturing this information within the ISO 19115-1 standard is under development. A best practice way of doing so in the interim is as follows: * Create an additional Instance of *spatialReferenceInfo* of *referenceSystemType - temporal*. The Description should read *Coordinate Epoch*. The *code* value should be the year in decimal degrees of at least 2 decimal places for the value of the coordinate reference frame within which the data is captured. For instance, if the data is captured using a GNSS device, the Coordinate Epoch may be the date at which the Coordinates were captured dependent on the methodology used. If the data is digitised from imagery, the Coordinate Epoch would be the same as that of the source imagery. The user must take care to determine the true coordinate system of their source data or method including its coordinate epoch.

ICSM Recommendations

Therefore - To ensure the usability of your spatial resource, it is important to include the Spatial Reference System used by this resource in its metadata. Doing so will allow the proper use and analysis to occur.

At a minimum the reference system type, the code and the codespace must be captured. In addition the Coordinate Epoch should be captured so changes in coordinate positions due to movements in the earth's crust can be accounted for. Until ISO 19115-1 support the capture of Coordinate Epoch directly, the creation of a separate instance of MD_Reference system should be created of type *temporal* with the decimal year to at least to places of the coordinate epoch as *code* and "Coordinate Epoch - Horizontal" or "Coordinate Epoch - Vertical" as **description*.

To date the European Petroleum Survey Group (EPSG) holds the most complete and common register of SRS. It is recommended that this source be used as codespace (and authority?) for SRS information in the metadata.

NOTE - There should be at least two instances of *referenceSystemInfo* for every resource that contains spatial information referenced to a datum. The first will provide reference to the spatial reference system used by the resource. The second will contain a **Coordinate Epoch**. This will be of *referenceSystemType Temporal* with a *description* of **Coordinate Epoch**. The value of the *code* will be the date of the the Coordinate Epoch in Decimal Year to least two places.

Recommended Sub-Classes

- **referenceSystemType** - (*codelist - MD_ReferenceSystemTypeCode*) 0 to 1 - to describe the type of system used. This value should be
- **referenceSystemIdentifier** - (*class - MD_Identifier*) mandatory - identifier, codespace and authority information for reference system
 - *code* - (type - charStr) mandatory - alphanumeric value identifying an instance in the namespace, e.g. '4283', '4326' . For Coordinate Epoch this code is the date in decimal year up to two decimal places
 - *codespace* - (type - charStr) strongly recommended (except for *coordinate epoch*) - Identifier or namespace in which the code is valid, e.g. EPSG
 - *version* - (type - charStr) optional - use if needed to distinguish a code
 - *description* - (type - charStr) optional - Common language description of the reference system, e.g. 'WGS84 - World Geodetic System 1984, used in GPS', 'NZTM'. For Coordinate Epoch this value should be "Decimal Year"

- *authority* - (class - *CI_Citation*) optional (GA, ABARES - conditional?) - Information about the party responsible for the spatial or temporal reference system used in this cited resource.
- **description** - Should read *Coordinate Epoch* when *referenceSystemInfo* instance is describing the *Coordinate Epoch*. Otherwise this field is optional

Related Codelists

MD_ReferenceSystemTypeCode

There are 28 options to choose from in the reference system type code list (*MD_ReferenceSystemTypeCode*). Many would never be used by a particular professional. The most common for most geospatial professionals is 'projected'. The list below sorts these options with the most common on top.

- Common
 - **projected** - coordinate reference system derived from a two-dimensional geodetic coordinate reference system by applying a map projection e.g. easting, northing
 - **temporal** - reference system against which time is measured e.g. time
 - **vertical** - one-dimensional coordinate reference system based on a vertical datum (datum describing the relation of gravity-related heights or depths to the Earth) e.g. [gravity-related] height or depth
 - **geodeticGeographic2D** - geodetic CRS having an ellipsoidal 2D coordinate system e.g. latitude, longitude
 - **geodeticGeographic3D** - geodetic CRS having an ellipsoidal 3D coordinate system e.g. latitude, longitude, ellipsoidal height
- Less common
 - **geodeticGeocentric** - geodetic CRS having a Cartesian 3D coordinate system e.g. [geocentric] X,Y,Z
 - **geographicIdentifier** - spatial reference in the form of a label or code that identifies a location e.g. post code
 - **linear** - reference system that identifies a location by reference to a segment of a linear geographic feature and distance along that segment from a given point e.g. x km along road
- Specialised
 - *compoundGeographic2DTemporal* - compound spatio-temporal coordinate reference system containing a 2 dimensional geographic horizontal coordinate reference system and a temporal reference system e.g. latitude, longitude, time
 - *compoundGeographic2DVertical* - compound coordinate reference system in which one constituent coordinate reference system is a horizontal geodetic coordinate reference system and one is a vertical coordinate reference system e.g. latitude, longitude, [gravity-related] height or depth
 - *compoundGeographic2DVerticalTemporal* - compound spatio-temporal coordinate reference system containing a 2 dimensional geographic horizontal, a vertical, and a temporal coordinate reference system e.g. latitude, longitude, height, time
 - *compoundGeographic3DTemporal* - compound spatio-temporal coordinate reference system containing a 3 dimensional geographic and a temporal coordinate reference system e.g. latitude, longitude, ellipsoidal height, time
 - *compoundGeographic2DParametric* - compound spatio-parametric coordinate reference system containing a 2 dimensional geographic horizontal coordinate reference system and a parametric reference system e.g. latitude, longitude, pressure

- *compoundGeographic2DParametricTemporal* - compound statio-parametric-temporal coordinate reference system containing a 2 dimensional geographic horizontal, a parametric and a temporal coordinate reference system e.g. latitude, longitude, pressure, time
- *compoundProjected2DParametric* - compound statio-parametric coordinate reference system containing a projected horizontal coordinate reference system and a parametric reference system e.g. easting, northing, density
- *compoundProjected2DParametricTemporal* - compound statio-parametric-temporal coordinate reference system containing a projected horizontal, a parametric, and a temporal coordinate reference system e.g. easting, northing, density, time
- *compoundProjectedTemporal* - compound spatio-temporal coordinate reference system containing a projected horizontal and a temporal coordinate reference system e.g. easting, northing, time
- *compoundProjectedVertical* - compound spatial reference system containing a horizontal projected coordinate reference system and a vertical coordinate reference system e.g. easting, northing, [gravity-related] height or depth
- *compoundProjectedVerticalTemporal* - compound spatio-temporal coordinate reference system containing a projected horizontal, a vertical, and a temporal coordinate reference system e.g. easting, northing, height, time
- *engineering* - coordinate reference system based on an engineering datum (datum describing the relationship of a coordinate system to a local reference)e.g. [local] x,y
- *engineeringDesign* - engineering coordinate reference system in which the base representation of a moving object is specified e.g. [local] x,y
- *engineeringImage* - coordinate reference system based on an image datum (engineering datum which defines the relationship of a coordinate system to an image)e.g. row, column
- *parametric* - coordinate reference system based on a parametric datum (datum describing the relationship of a parametric coordinate system to an object) e.g. pressure
- *compoundEngineeringParametric* - compound spatio-parametric coordinate reference system containing an engineering coordinate reference system and a parametric reference system e.g. [local] x, y, pressure
- *compoundEngineeringParametricTemporal* - compound spatio-parametric-temporal coordinate reference system containing an engineering, a parametric, and a temporal coordinate reference system e.g. [local] x, y, pressure, time
- *compoundEngineeringTemporal* - compound spatio-temporal coordinate reference system containing an engineering and a temporal coordinate reference system e.g. [local] x, y, time
- *compoundEngineeringVertical* - compound spatial reference system containing a horizontal engineering coordinate reference system and a vertical coordinate reference system e.g. [local] x, y, height
- *compoundEngineeringVerticalTemporal* - compound spatio-temporal coordinate reference system containing an engineering, a vertical, and a temporal coordinate reference system e.g. [local] x, y, height, time

Also Consider

- **Spatial representation information** (*class - MD_SpatialRepresentation*) Not discussed by MDWG. Contains detailed information about digital mechanisms used to represent spatial information. Particularly useful for gridded data.

Outstanding Issues

Dynamic (Earth Centric) Datums The latest amendment to ISO 19115-1 includes support for Coordinate Epoch capture as a sibling element to *ReferenceSystemIdentifier*. This guidance will be updated accordingly following the publication and adoption of these modifications

Authority Authority has been indicated as a conditional field by ABARES and GA. But little guidance exist on the use of this element in this context. Should authority be about the owner of the registry (e.g. EPSG) or the provider of the SRS (LINZ in the case of NZTM)?

MD_ReferenceSystemTypeCode This is a long and confusing list. Should we recommend a shortly one?

Crosswalk considerations

Dublin core / CKAN / data.gov.au

No mapping provided

DCAT

Maps to dct:conformsTo

RIF-CS

Maps to the aggregate element Coverage/Spatial

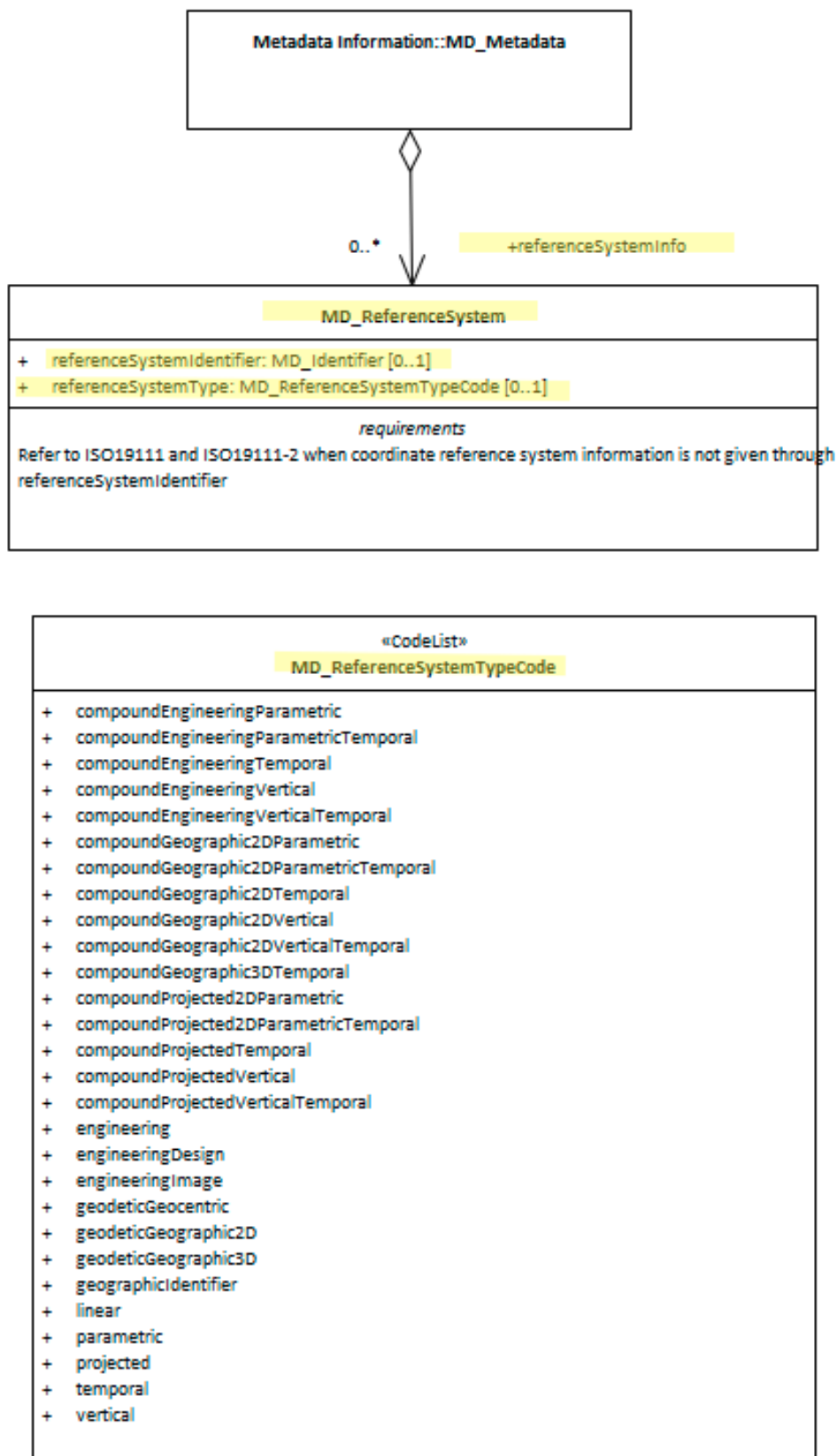
Examples

XML

```
<mdb:MD_Metadata>
....
  <mdb:referenceSystemInfo>
    <mrs:MD_ReferenceSystem>
      <mrs:referenceSystemIdentifier>
        <mcc:MD_Identifier>
          <mcc:code>
            <gco:CharacterString>WGS 1984</gco:CharacterString>
          </mcc:code>
        </mcc:MD_Identifier>
      </mrs:referenceSystemIdentifier>
    </mrs:MD_ReferenceSystem>
  </mdb:referenceSystemInfo>
....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow



Distribution Info ★★★★★

Commonly the most important purpose of a catalogue is to provide information by which one can access the resources described. In ISO19115-1 the `distributionInfo` package contains and provides this information describing both online and offline access methods, contacts, and instructions.

- **Path** - `MD_Metadata.distributionInfo`
- **Governance** - *Agency*
- **Purpose** - *Resource access*
- **Audience** -
 - machine resource - ★★★
 - general - ★★★
 - resource manager - ★★★
 - specialist - ★★★★★
- **Metadata type** - *administrative*
- **ICSM Level of Agreement** - ★★★

Definition

information about the distributor of and options for obtaining the resource

ISO Obligation -

- There should be zero to many [0..*] `distributionInfo` packages for the cited resource in the `MD_Metadata` package of class `MD_Distribution` in a metadata record.

ICSM Good Practice

- The `distributionInfo` package should be populated in all metadata records unless it obviously has no resource to be distributed, e.g. metadata for a series where resources are accessed via the children.

ICSM Recommended Sub-Elements

- **description** - (*type* - `charStr`)[0..1] (highly recommended when more than one `distributionInfo` package is present) a brief description of a set of distribution options
- **distributor** - (*class* - `MD_Distributor`) [0..*] Name, contact information, and role of the organisation from which this distribution of this cited resource may be obtained.
 - **distributorContact** - (*class* - `CI_Responsibility`) [0..*] (Highly recommended - `CI_RoleCode` should be *distributor*) party from whom the resource may be obtained. This list need not be exhaustive
 - **distributionOrderProcess** - (*class* - `MD_StandardOrderProcess`) [0..*] (recommended when useful) provides information about how the resource may be obtained, and related instructions and fee information
- **transferOptions** - (*class* - `MD_DigitalTransferOptions`) [0..*] technical means and media by which a resource is obtained from the distributor
 - **onLine** - (*class* - `CI_OnlineResource`) [0..*] information about online sources from which the resource can be obtained. > TODO Link to `CI_OnlineResource` discussion

- **linkage** - (*type - charStr*) [1..1] (required for each online resource) address for on-line access using a URL/URI or similar addressing scheme
- **protocol** - (*type - charStr*) [0..1] (optional) to document the connection type used.
- **applicationProfile** - (*type - charStr*) [0..1] (optional) may be useful when the application of this distribution is limited. The name of an application profile that can be used with the online resource
- **offline** - (*class - MD_Medium*) [0..*] information about offline media on which the resource can be obtained > TODO Link to MD_Medium discussion
- **distributionFormat** - (*class - MD_Format*) [0..*] The name and version of the specification for the data format by which a distribution of this cited resource is provided
 - **formatSpecificationCitation** - (*class - CI_Citation*) [1..1] citation/URL of the specification for the format
 - **title** - (*type - charStr*) [1..1] name of the data format in which the resource is distributed
 - **edition** - (*type - charStr*) [0..1] version of the distribution format used

Discussion

The distributionInfo package is highly flexible and provides multiple ways to capture information related to the distribution of resources described in a metadata record. In this entry we describe what we have determined to be best practice in the ICSM context. For instance, the format of a distribution could be captured using the path: `MD_Distribution.distributionFormat` or `MD_Distribution.transferOptions>MD_DigitalTransferOptions.distributionFormat`. We have chosen to recommend the later. This is to provide better clarity of the relation between the cited format to the cited access (online or off). This format element describes the format of the data for a particular distribution of the resource. It does not describe the format of the resource native store or of the metadata. There may be multiple formats for a distribution.

Recommendations

Therefore - This package should contain at least the minimum information necessary to contact the party responsible for this distribution of the resource. We have identified three primary sub-elements to recommend:

- *Distributor*
- *Online resource*
- *Format*

Of these, *distributor* is the most most highly recommended.

When needed, instructions for online access should be provided.

It is often unclear as to what qualifies as a different distribute and what is simply a different format of the same distribution. A web feed may qualify as a different distribution than a download, but a different mime type of a download may not. Provide as many distribution options as is useful. Capture of rarely used options or those with only minor differences, unless one wants to encourage their use, is at the descretion of an agency. Do not overload a distribution entry with too many options. If a distribution gets too complex because of too many options available, consider creating multiple distributions. It is recommended that the format details are specific for the distribution. If two different version of the same format are available they be documented as two different formats. When using a common distribution service that provides all data in a set number of formats, consider

using `MD_Distribution.distributor>MD_Distributor.distributorFormat`.

Offline distribution support

Offline access is an important option in many circumstances. For offline access to the resource we recommend the use of `MD_Distribution.transferOptions>MD_DigitalTransferOptions.offline` to capture information about the media on which the resource is stored.

The `MD_Distribution.transferOptions>MD_DigitalTransferOptions.online` with `CI_OnLineResource.function>CI_` value of `offlineAccess` is to be reserved for instructions (online) about how to access the resource from the provider offline. Another preferred approach is to provide such instructions via `MD_Distribution.distributor>MD_Distributor.distributionOrderProcess`.

There may also be instances where anonymous free online distribution is not desired for a cited resource. The distribution package may still be of value in providing contact information by which one may discuss obtaining the resource from the provider. In this case we recommend that the description be populated as well as distributor information. In addition population of `MD_Distribution.distributor>MD_Distributor.distributionOrderProcess` is recommended.

Crosswalk considerations

ISO19139

- The cardinality of **MD_Metadata.distributionInfo** was increased to `[0..*]` in order to allow more flexibility in defining distribution information.
- The new element **MD_Distribution.description** was added to allow a description of distribution options.
- **MD_Format.name**, **MD_Format.version** and **MD_Format.specification** were deleted and replaced with:
 - **MD_Format.formatSpecificationCitation** (*class - CI_Citation*)
 - This new element was added in order to allow more precise descriptions of formats and versions and to allow references to the full specifications of those formats.
- **MD_Format.medium**
 - This new element was added in order to facilitate more precise associations between formats and distribution media.
- **MD_DigitalTransferOptions.transferFrequency**
 - This new element was added in order to allow a distributor to specify how often new members of an on-going resource are made available.
- **MD_DigitalTransferOptions.distributionFormat**
 - This new element was added in order to allow unambiguous association of online resources with formats without requiring a separate `MD_Distributor` or `MD_Format`.
- **MD_Medium.identifier**
 - This new element was added to provide a unique identifier for an instance of the medium.
- **MD_StandardOrderProcess.orderOptionsType** and **MD_StandardOrderProcess.orderOptions**
 - These two new roles were added in order to allow specification of custom ordering options associated with specific resources or implementations.

Dublin core / CKAN / data.gov.au

- `Format` maps to `format` - The file format of the distribution. If available in IANA, use Media Type

- `OnlineResource` (*MD_DigitalTransferOptions.online*) maps to landing page, download URL, access URL

DCAT Recommended property to meet data citation requirement

- `distributionInfo` maps to `dct:distribution`
- `Format` maps to `dct:format`
- `distributor` maps to `dct:publisher`
- `OnlineResource` (*MD_DigitalTransferOptions.online*) maps to `dcat:accessURI/dcat:downloadURL/dcat:endpointDescription`
- `distributionFormat` - The file format, physical medium, or dimensions of the resource. A subproperty of `dct:relation`.

RIF-CS

- `Format` maps to `Location/Electronic/@format`
- `distributor` maps to `Related Party/relation='distributor'`
- `OnlineResource` (*MD_DigitalTransferOptions.online*) maps to `Location/Electronic/@url`

Also Consider

- **metadataLinkage** - for links that provide a download of the metadata
- **resourceLineage** - Information about the provenance, source(s), and/or the production process(es) applied to the resource.
- **browseGraphic** - associates to a large number of packages to provide linkage to associated image files, such as business or product icons and logos

Examples

XML

```
<mdb:MD_Metadata>
....
<mdb:distributionInfo>
  <mrd:MD_Distribution>
    <mrd:description>
      <gco:CharacterString>
        A sample distribution record for a dataset
      </gco:CharacterString>
    </mrd:description>
    <mrd:distributor>
      <mrd:MD_Distributor>
        <mrd:distributorContact>
          <cit:CI_Responsibility>
            <cit:role>
              <cit:CI_RoleCode
```



```

      codeList="https://schemas.isotc211.org/19115/resources
      /Codelist/cat/codelists.xml#CI_RoleCode"
      codeListValue="distributor"/>
    </cit:role>
    <cit:party>
      <cit:CI_Organisation>
        <cit:name>
          <gco:CharacterString>
            OpenWork Ltd
          </gco:CharacterString>
        </cit:name>
        <cit:contactInfo>
          <cit:CI_Contact>
            <cit:address>
              <cit:CI_Address>
                <cit:electronicMailAddress>
                  <gco:CharacterString>
                    info@openwork.nz
                  </gco:CharacterString>
                </cit:electronicMailAddress>
              </cit:CI_Address>
            </cit:address>
          </cit:CI_Contact>
        </cit:contactInfo>
      </cit:CI_Organisation>
    </cit:party>
  </cit:CI_Responsibility>
</mrd:distributorContact>
<mrd:distributionOrderProcess>
  <mrd:MD_StandardOrderProcess>
    <mrd:fees>
      <gco:CharacterString>Free</gco:CharacterString>
    </mrd:fees>
    <mrd:orderingInstructions>
      <gco:CharacterString>
        Contact us at the distributor email address
      </gco:CharacterString>
    </mrd:orderingInstructions>
  </mrd:MD_StandardOrderProcess>
</mrd:distributionOrderProcess>
</mrd:MD_Distributor>
</mrd:distributor>
<mrd:transferOptions>

```

```

<mrd:MD_DigitalTransferOptions>
  <mrd:onLine>
    <cit:CI_OnlineResource>
      <cit:linkage>
        <gco:CharacterString>
          https://data.openwork.nz/samplePath/toResource
        </gco:CharacterString>
      </cit:linkage>
      <cit:protocol gco:nilReason="missing">
        <gco:CharacterString/>
      </cit:protocol>
      <cit:name gco:nilReason="missing">
        <gco:CharacterString/>
      </cit:name>
      <cit:description gco:nilReason="missing">
        <gco:CharacterString/>
      </cit:description>
      <cit:function>
        <cit:CI_OnLineFunctionCode
          codeList="https://schemas.isotc211.org/19115/resources
          /Codelist/cat/codelists.xml#CI_OnLineFunctionCode"
          codeListValue=""/>
        </cit:function>
      </cit:CI_OnlineResource>
    </mrd:onLine>
    <mrd:distributionFormat>
      <mrd:MD_Format>
        <mrd:formatSpecificationCitation>
          <cit:CI_Citation>
            <cit:title>
              <gco:CharacterString>
                geopackage
              </gco:CharacterString>
            </cit:title>
            <cit:edition>
              <gco:CharacterString>1.2.0</gco:CharacterString>
            </cit:edition>
          </cit:CI_Citation>
        </mrd:formatSpecificationCitation>
      </mrd:MD_Format>
    </mrd:distributionFormat>
  </mrd:MD_DigitalTransferOptions>
</mrd:transferOptions>

```

```

<mrd:transferOptions>
  <mrd:MD_DigitalTransferOptions>
    <mrd:onLine>
      <cit:CI_OnlineResource>
        <cit:linkage>
          <gco:CharacterString>
            https://info.openwork.nz/linkTo/offlineAccess/instructions
          </gco:CharacterString>
        </cit:linkage>
        <cit:protocol>
          <gco:CharacterString>
            WWW:DOWNLOAD-1.0-http--download
          </gco:CharacterString>
        </cit:protocol>
        <cit:name gco:nilReason="missing">
          <gco:CharacterString/>
        </cit:name>
        <cit:description gco:nilReason="missing">
          <gco:CharacterString/>
        </cit:description>
        <cit:function>
          <cit:CI_OnLineFunctionCode
            codeList="https://schemas.isotc211.org/19115/resources
              /Codelist/cat/codelists.xml#CI_OnLineFunctionCode"
            codeListValue=""/>
          </cit:function>
        </cit:CI_OnlineResource>
      </mrd:onLine>
      <mrd:offLine>
        <mrd:MD_Medium>
          <mrd:name>
            <cit:CI_Citation>
              <cit:title>
                <gco:CharacterString>
                  BigProject data
                </gco:CharacterString>
              </cit:title>
            </cit:CI_Citation>
          </mrd:name>
        </mrd:MD_Medium>
      </mrd:offLine>
    </mrd:MD_DigitalTransferOptions>
  </mrd:transferOptions>

```

```
</mrd:MD_Distribution>
</mdb:distributionInfo>
....
</mdb:MD_Metadata>
```

UML diagrams

Recommended elements highlighted in Yellow

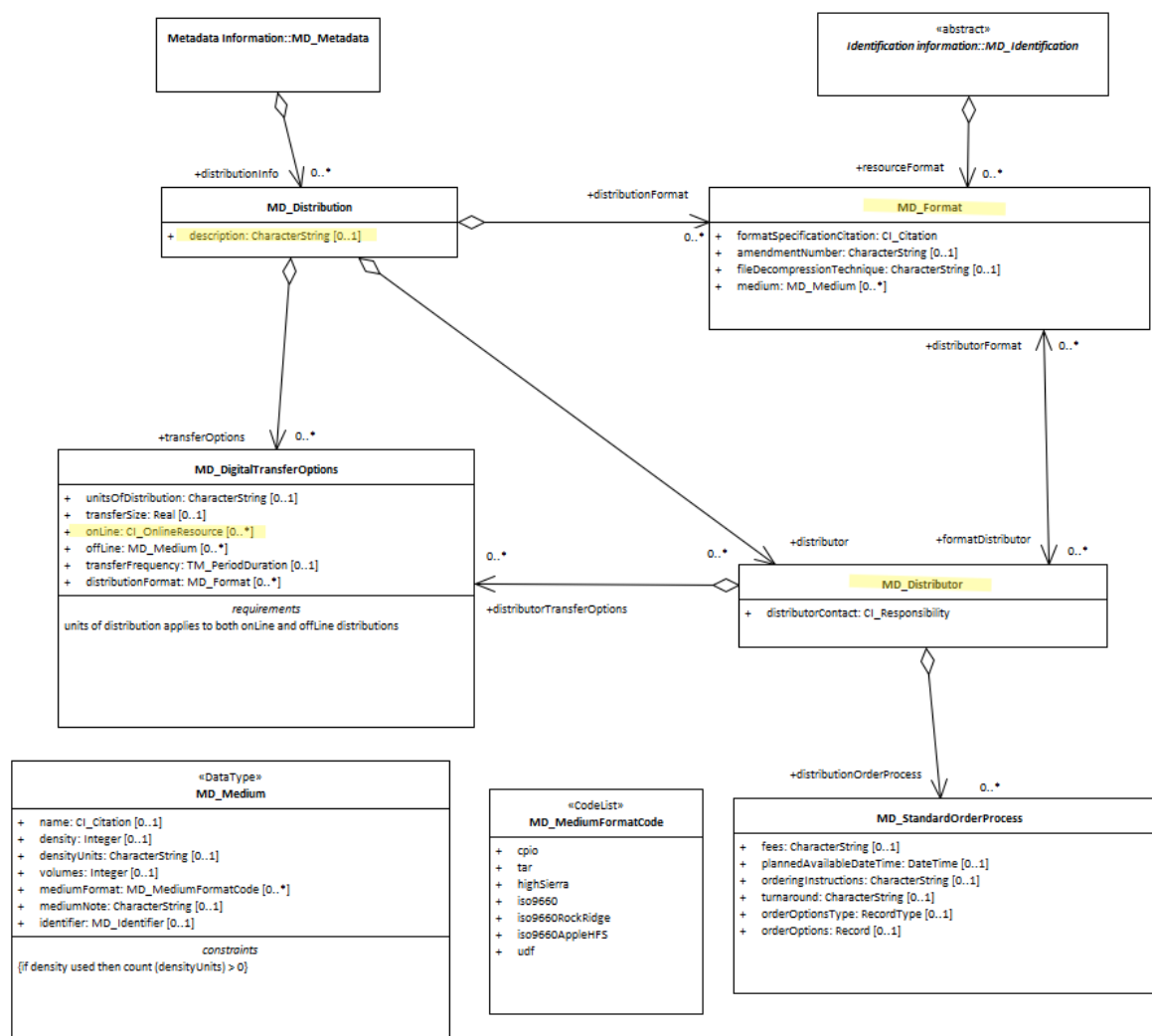


Figure 49: Distribution