

Extents

I need to define the spatial, temporal, and vertical extents of resources associated with my metadata.

Overview

The ISO EX_Extent object is used to describe the spatial, temporal and vertical extent of resources, responsibilities, processing, quality reports, or maintenance.

The EX_Extent object supports multiple geographic and temporal extents within a single object. This capability is quite useful for describing datasets created from observations collected at different locations and times. For example, a dataset that includes observations collected at different locations each field season.

Recommendations for ISO 19115 and 19115-1

Bounding Extent. The ISO metadata standards allow multiple extents to be associated with a resource. This capability can be very important as spatial and temporal observatory deployments become more complex. Many metadata tools require a single bounding extent in order to support simple spatial and temporal discovery. In order to easily and unambiguously identify the bounding extent for a resource, we recommend identifying it with an xml id = 'boundingExtent'.

ISO 19115	<code>/*gmd:identificationInfo/*gmd:extent/gmd:EX_Extent[@id='boundingExtent']</code>
ISO 19115-1	<code>/*mdb:identificationInfo/*mri:extent/mex:EX_Extent[@id='boundingExtent']</code>

Two-Dimensional Tiling Systems. Several NASA metadata standards include the capability to describe spatial extents of resources using two-dimensional tiling systems. The tile numbers in these systems are standard geographic identifiers that can be used to improve performance of spatial searches. [MENDS recommended syntax](#) for these tile identifiers in ISO.

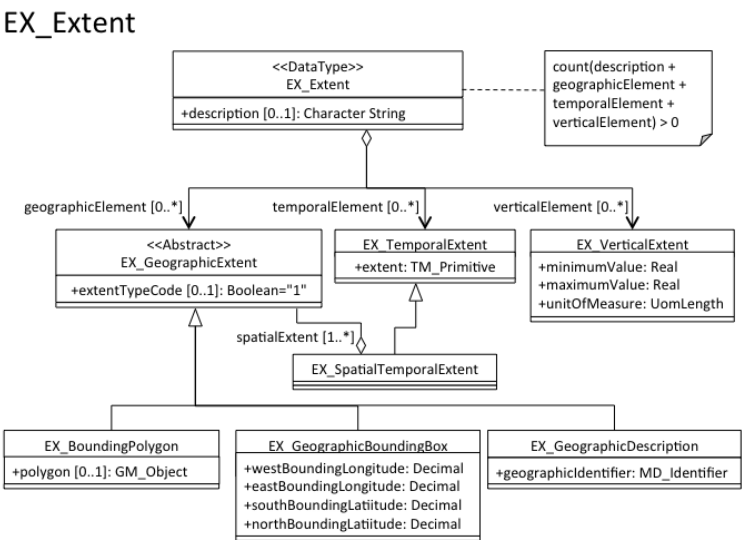
Conceptual Model (UML)

ISO 19115 combines spatial and temporal extents into a single object, called an EX_Extent, that includes temporal, vertical, and geographic extents. The temporal and vertical extents are simple descriptions of temporal or vertical ranges. The geographic extent can be described in three ways.

The first option is a simple bounding box for recording the north, south, east and west bounding coordinates.

The second option generalizes the bounding box to a bounding polygon. This covers a large number of cases which might involve natural shapes, such as watersheds, or political shapes, like county forecast zones, rather than rectangles.

The final option allows specification of an identifier of a geographic region. This identifier includes a namespace and a name, and allows the use of named spatial objects, like counties, to describe spatial extents.



XML Example - Bounding Extent

This example describes a simple spatial and temporal extent for a dataset that extends to the present. It includes ids (boundingExtent, boundingBox, and boundingTime) that allow the bounding extents to be referenced from other parts of the record or from external sources. These can also be used when translating the ISO metadata to standards that include only a bounding extent. It also include a geographicIdentifier, in this case a location keyword from the NASA GCMD.

```
<gmd:extent>
  <gmd:EX_Extent id="boundingExtent">
    <gmd:geographicElement>
      <gmd:EX_GeographicBoundingBox id="boundingGeographicBoundingBox">
        <gmd:extentTypeCode>
          <gco:Boolean>true</gco:Boolean>
        </gmd:extentTypeCode>
        <gmd:westBoundLongitude>
          <gco:Decimal>-178</gco:Decimal>
        </gmd:westBoundLongitude>
        <gmd:eastBoundLongitude>
          <gco:Decimal>180</gco:Decimal>
        </gmd:eastBoundLongitude>
        <gmd:southBoundLatitude>
          <gco:Decimal>-78</gco:Decimal>
        </gmd:southBoundLatitude>
        <gmd:northBoundLatitude>
          <gco:Decimal>75</gco:Decimal>
        </gmd:northBoundLatitude>
      </gmd:EX_GeographicBoundingBox>
    </gmd:geographicElement>
    <gmd:geographicElement>
      <gmd:EX_GeographicDescription>
        <gmd:geographicIdentifier>
          <gmd:MD_Identifier>
            <gmd:authority>
              <gmd:CI_Citation>
                <gmd:title>
                  <gco:CharacterString>NASA/GCMD Location Keywords</gco:CharacterString>
                </gmd:title>
                <gmd:date>
                  <gmd:CI_Date>
                    <gmd:date>
                      <gco:Date>2009-01-01</gco:Date>
                    </gmd:date>
                    <gmd:dateType>
                      <gmd:CI_DateTypeCode codeList="http://www.isotc211.org/2005
/resources/CodeList/gmxCodeLists.xml#CI_DateTypeCode" codeListValue="revision">revision</gmd:CI_DateTypeCode>
                    </gmd:dateType>
                  </gmd:CI_Date>
                </gmd:date>
              </gmd:CI_Citation>
            </gmd:authority>
            <gmd:code>
              <gco:CharacterString>Location > Geographic Region > Global Ocean</gco:
CharacterString>
            </gmd:code>
          </gmd:MD_Identifier>
        </gmd:geographicIdentifier>
      </gmd:EX_GeographicDescription>
    </gmd:geographicElement>
    <gmd:temporalElement>
      <gmd:EX_TemporalExtent id="boundingTemporalExtent">
        <gmd:extent>
          <gml:TimePeriod gml:id="someTimeID">
            <gml:beginPosition>1846</gml:beginPosition>
            <gml:endPosition indeterminatePosition="now"/>
          </gml:TimePeriod>
        </gmd:extent>
      </gmd:EX_TemporalExtent>
    </gmd:temporalElement>
    <gmd:verticalElement>
      <gmd:EX_VerticalExtent>
        <gmd:minimumValue>
          <gco:Real>10</gco:Real>
        </gmd:minimumValue>
        <gmd:maximumValue>
          <gco:Real>2810</gco:Real>
        </gmd:maximumValue>
        <gmd:verticalCRS gco:nilReason="unknown"/>
      </gmd:EX_VerticalExtent>
    </gmd:verticalElement>
  </gmd:EX_Extent>
</gmd:EX_Extent>
</gmd:extent>
```

XML Example - Vertical Extent

```

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

```

Usage

Where are EX_Extent objects?

Usage	Description and Xpath
Dataset or Service Extent MD_DataIdentification + citation : CI_Citation + abstract : CharacterString + purpose [0..1] : CharacterString + credit [0..*] : CharacterString + status [0..*] : MD_ProgressCode + pointOfContact [0..*] : CI_ResponsibleParty + resourceMaintenance [0..*] : MD_MaintenanceInfo + graphicOverview [0..*] : MD_BrowseGraphic + resourceFormat [0..*] : MD_Format [0..*] + descriptiveKeywords [0..*] : MD_Keywords + resourceSpecificUsage [0..*] : MD_Usage + resourceConstraints [0..*] : MD_Constraints + aggregationInfo [0..*] : MD_AggregateInformation + spatialRepresentationType [0..*] : MD_SpatialRepresentationTypeCode + spatialResolution [0..*] : MD_Resolution + language [1..*] : CharacterString + characterSet [0..*] : MD_CharacterSetCode = "utf8" + topicCategory [0..*] : MD_TopicCategoryCode + environmentDescription [0..1] : CharacterString + extent [0..*] : EX_Extent + supplementalInformation [0..1] : CharacterString	The EX_Extent object in MD_DataIdentification and SV_ServiceIdentification defines extents associated with a dataset or service. <i>/*/gmd:identificationInfo/*/gmd:extent/gmd:EX_Extent</i>
Source Extent of Process Step LI_Source + description [0..1] : CharacterString + scaleDenominator [0..1] : MD_RepresentativeFraction + sourceReferenceSystem [0..1] : MD_ReferenceSys + sourceCitation [0..1] : CI_Citation + sourceExtent [0..*] : EX_Extent	The EX_Extent object within LI_Source defines extents associated with data production sources. These sources are the inputs or outputs of data processing steps utilized to produce the data product. <i>/*/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:lineage/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sourceExtent/gmd:EX_Extent</i>
Scope Extent DQ_Scope + level : MD_ScopeCode + extent [0..1] : EX_Extent + levelDescription [0..*] : MD_ScopeDescription	The EX_Extent object within DQ_Scope defines extents associated with scope codes. Examples include collectionHardware, collectionSession, dataset, series, service, model, etc. <i>/*/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:scope/gmd:DQ_Scope/gmd:extent/gmd:EX_Extent</i>

Reference System Extent	The EX_Extent object within RS_ReferenceSystem defines the valid range of values for the reference system.
RS_ReferenceSystem + name: RS_Identifier + domainOfValidity: [0..*]EX_Extent	/*gmd:referenceSystemInfo/gmd:RS_ReferenceSystem/gmd:domainOfValidity /gmd:EX_Extent

Crosswalks

This table reflects the MENDS voting recommendations pertaining to the mapping of ECHO bounding coordinates to ISO.

ECHO Attribute	ISO Equivalent
/*Spatial/HorizontalSpatialDomain/Geometry /BoundingRectangle/CenterPoint/PointLatitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/gml:LineString/gml:posList
/*Spatial/HorizontalSpatialDomain/Geometry /BoundingRectangle/CenterPoint /PointLongitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/gml:LineString/gml:posList
/*Spatial/HorizontalSpatialDomain/Geometry /BoundingRectangle/EastBoundingCoordinate	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:eastBoundLongitude/gco:Decimal
/*Spatial/HorizontalSpatialDomain/Geometry /BoundingRectangle /NorthBoundingCoordinate	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:northBoundLatitude/gco:Decimal
/*Spatial/HorizontalSpatialDomain/Geometry /BoundingRectangle /SouthBoundingCoordinate	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:southBoundLatitude/gco:Decimal
/*Spatial/HorizontalSpatialDomain/Geometry /BoundingRectangle/WestBoundingCoordinate	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:westBoundLongitude/gco:Decimal
/*Spatial/HorizontalSpatialDomain/Geometry /GPolygon/Boundary/Point/PointLatitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/gml:LineString/gml:posList
/*Spatial/HorizontalSpatialDomain/Geometry /GPolygon/Boundary/Point/PointLongitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/gml:LineString/gml:posList
/*Spatial/HorizontalSpatialDomain/Geometry /GPolygon/CenterPoint/PointLatitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/gml:LineString/gml:posList
/*Spatial/HorizontalSpatialDomain/Geometry /GPolygon/CenterPoint/PointLongitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/gml:LineString/gml:posList
/*Spatial/HorizontalSpatialDomain/Geometry /Line/Point/PointLatitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:northBoundLatitude/gco:Decimal
/*Spatial/HorizontalSpatialDomain/Geometry /Line/Point/PointLongitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:westBoundLongitude/gco:Decimal
/*Spatial/HorizontalSpatialDomain/Geometry /Point/PointLatitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:northBoundLatitude/gco:Decimal
/*Spatial/HorizontalSpatialDomain/Geometry /Point/PointLatitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:southBoundLatitude/gco:Decimal
/*Spatial/HorizontalSpatialDomain/Geometry /Point/PointLongitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:eastBoundLongitude/gco:Decimal
/*Spatial/HorizontalSpatialDomain/Geometry /Point/PointLongitude	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent /gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:westBoundLongitude/gco:Decima

Revisions

The revision of 19115 adds extents to:

1. CI_ResponsibleParty to describe spatial/temporal extents of responsibilities.
2. MD_Constraints to describe spatial/temporal extents of constraints.

ISO 19115-1 introduces the capability for data providers to document the temporal resolution of the metadata resource using an ISO 8601-compliant string.