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**Geographic information — Content  
components and encoding rules for  
imagery and gridded data —**

**Part 2:  
Implementation schema**

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

Geographic imagery and gridded thematic data are widely used in the geospatial community and related fields. Over the past two decades, several standards of geographic images have been developed by ISO/TC 211. ISO 19123 defines a conceptual schema for the spatial characteristics of coverages and defines the relationship between the domain of coverages and an associated attribute range. Multiple types of coverages are defined in ISO 19123, including raster, triangulated irregular network, point, curve and polygon coverages.

Although ISO/TS 19163-1 specifies logical data structures and the rules for encoding the content components in the structures, it is not an implementation schema. Without a concrete implementation structure, the specified UML cannot be mapped to the encodings used in various data formats, such as JPEG2000, GeoTIFF, NetCDF, and GMLJP2.

This part of ISO 19163 proposes a GML-based implementation schema of ISO/TS 19163-1 as a binding between the content components and specific encoding formats.

This document conforms to the coverage structure defined in ISO 19123-2.

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# Geographic information — Content components and encoding rules for imagery and gridded data —

## Part 2: Implementation schema

### 1 Scope

This document specifies an implementation schema based on the content models for geographic imagery and gridded thematic data defined in the ISO/TS 19163-1.

This document defines a structure that is suitable for binding content components and specific encoding formats. It also provides an implementation schema for binding a concrete, implementable, conformance-testable coverage structure as defined in ISO 19123-2.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 19163-1:2016, *Geographic information — Content components and encoding rules for imagery and gridded data — Part 1: Content model*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1 binding

specification of a mapping relating the information defined in a content model (data and metadata) to the data format that carries that information

[SOURCE: ISO/TS 19163-1:2016, 4.2]

#### 3.2 conversion rule

rule for converting instances in the input data structure to instances in the output data structure

[SOURCE: ISO 19118:2011, 4.7]

#### 3.3 document

<XML> well-formed data object

### 3.4 encoding rule

identifiable collection of *conversion rules* (3.2) that define the encoding for a particular data structure

EXAMPLE XML, ISO 10303-21, ISO/IEC 8211.

Note 1 to entry: An encoding rule specifies the types of data to be converted as well as the syntax, structure and codes used in the resulting data structure.

[SOURCE: ISO 19118:2011, 4.14]

### 3.5 grid

network composed of two or more sets of curves in which the members of each set intersect the members of the other sets in an algorithmic way

[SOURCE: ISO 19123:2005, 4.1.23]

### 3.6 gridded data

data whose *attribute* values are associated with positions on a *grid* (3.5) coordinate system

[SOURCE: ISO 19115-2:2019, 3.16, modified — Note 1 to entry has been removed.]

### 3.7 imagery

representation of phenomena as images produced by electronic and/or optical techniques

Note 1 to entry: The term imagery is often used colloquially with various meanings in different contexts. It is often used to describe any set of gridded, point set or other form of coverage data that can be portrayed.

[SOURCE: ISO 19101-2:2018, 3.14, modified — Note 1 to entry has been added.]

### 3.8 namespace

collection of names, identified by a URI reference, which are used in *XML documents* (3.3) as element names and attribute names

### 3.9 schema document

<XML> *XML document* (3.3) containing schema component definitions and declarations

Note 1 to entry: The W3C XML Schema provides an XML interchange format for schema information. A single schema document provides descriptions of components associated with a single XML *namespace* (3.8), but several documents may describe components in the same schema, i.e. the same target namespace.

[SOURCE: ISO 19136-1:2020, 3.1.54]

## 4 Symbols and abbreviated terms

### 4.1 Abbreviations

|        |                                      |
|--------|--------------------------------------|
| CIS    | Coverage Implementation Schema       |
| CRS    | Coordinate Reference System          |
| GML    | Geography Markup Language            |
| GMLCOV | GML Application Schema for Coverages |



|     |                            |
|-----|----------------------------|
| SWE | Sensor Web Enablement      |
| UML | Unified Modeling Language  |
| URI | Unique Resource Identifier |
| XML | eXtensible Markup Language |
| XSD | XML Schema Definition      |

## 5 Conformance

This document defines two classes of conformance: schema implementation and binding rules. Any product claiming conformance with one of these classes shall pass all the requirements described in the corresponding abstract test suite in [Annex A](#).

Requirements and conformance test URIs defined in this document are relative to <https://standards.iso211.org/iso19163-2/1>

## 6 XML Schema requirements class

### 6.1 Introduction

The normative parts of this document use the W3C XML Schema language to describe the grammar of conformant XML data instances. XML Schema is a rich language with many capabilities and subtleties. While a reader who is unfamiliar with XML Schema may be able to follow the description in a general fashion, this document is not intended to serve as an introduction to XML Schema. In order to have a full understanding of this document, it is necessary for the reader to have a reasonable knowledge of XML Schema.

This XML Schema implementation of ISO/TS 19163-1 follows the general rules defined in ISO 19118 and ISO/TS 19139-1 for transforming UML models to XML Schema. ISO 19118 specifies conversion rules for transforming data from an input data structure to an output data structure. ISO/TS 19139-1 provides the details on how to convert UML classes, attributes, associations, aggregations and compositions into XML elements.

### 6.2 XML namespaces

UML diagrams and XML code fragments adhere to the namespace conventions shown in [Table 1](#). The namespace prefixes used in this document are not normative and are merely chosen for convenience. They may appear in examples without being formally declared and have no semantic significance. The namespaces to which the prefixes correspond are normative.

All components defined or declared in this document use the same target namespace of <https://www.iso211.org/xsd/gmi>.

**Table 1 — Namespace mapping conventions**

| Prefix | Namespace URI                                                                 | Description                                      |
|--------|-------------------------------------------------------------------------------|--------------------------------------------------|
| gmi    | <a href="https://www.iso211.org/2005/gmi">https://www.iso211.org/2005/gmi</a> | Geographic Metadata for imagery and gridded data |
| gmd    | <a href="https://www.iso211.org/2005/gmd">https://www.iso211.org/2005/gmd</a> | Geographic MetaData extensible markup language   |
| gco    | <a href="https://www.iso211.org/2005/gco">https://www.iso211.org/2005/gco</a> | Geographic Common extensible markup language     |
| gmx    | <a href="https://www.iso211.org/2005/gmx">https://www.iso211.org/2005/gmx</a> | Geographic Metadata XML Schema                   |

**Table 1** (continued)

| Prefix      | Namespace URI                                                                                                       | Description                                          |
|-------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| gss         | <a href="https://www.isotc211.org/2005/gss">https://www.isotc211.org/2005/gss</a>                                   | Geographic Spatial Schema extensible markup language |
| gsr         | <a href="https://www.isotc211.org/2005/gsr">https://www.isotc211.org/2005/gsr</a>                                   | Geographic Spatial Referencing extensible markup     |
| gts         | <a href="https://www.isotc211.org/2005/gts">https://www.isotc211.org/2005/gts</a>                                   | Geographic Temporal Schema extensible markup         |
| gml         | <a href="http://www.opengis.net/gml/3.2">http://www.opengis.net/gml/3.2</a>                                         | GML 3.2.1                                            |
| swe         | <a href="http://www.opengis.net/swe/2.0">http://www.opengis.net/swe/2.0</a>                                         | SWE Common 2.0                                       |
| gmlcov      | <a href="http://www.opengis.net/gmlcov/1.0">http://www.opengis.net/gmlcov/1.0</a>                                   | GML Application Schema for Coverages 1.0             |
| gmlcovrgrid | <a href="http://schemas.opengis.net/gmlcov/gmlcovrgrid/1.0/">http://schemas.opengis.net/gmlcov/gmlcovrgrid/1.0/</a> | ReferenceableGridCoverage Extension 1.0              |
| cis         | <a href="http://www.opengis.net/cis/1.0">http://www.opengis.net/cis/1.0</a>                                         | Coverage Implementation Schema 1.0                   |

NOTE 1 CIS 1.0 is a derived work based on OGC GMLCOV 1.0. The two documents are functionally equivalent.

NOTE 2 ReferenceableGridCoverage Extension provides a set of referenceable grid elements for use as sub-elements of ReferenceableGridCoverage, via an extension GMLCOVRGRID of GMLCOV 1.0.

### 6.3 UML and XML Schema mapping

This XML Schema document shall implement the UML conceptual schema defined in ISO/TS 19163-1. The schema mapping between UML and XML is listed in Table 2.

**Table 2 — UML and XML Schema mapping**

| XML Schema              | UML conceptual schema     |
|-------------------------|---------------------------|
| ImageandGriddedData.xsd | IE_ImageryAndGriddedData  |
|                         | IE_Georectified           |
|                         | IE_Georeferenceable       |
| ThematicGriddedData.xsd | IE_ThematicGriddedData    |
|                         | IE_CategoricalGriddedData |
|                         | IE_NumericalGriddedData   |
| Imagery.xsd             | IE_Imagery                |
|                         | IE_SyntheticImage         |
|                         | IE_FusedImage             |
|                         | IE_SimulatedImage         |
|                         | IE_OpticalImage           |
|                         | IE_MicrowaveData          |
|                         | IE_ActiveMWData           |
|                         | IE_SARData                |
|                         | IE_PassiveMWData          |
|                         | IE_RadiometerData         |