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OGC® EO Data Access Best Practice

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Abstract

This OGC Best Practice document details proposed configuration and instantiation conventions for access to Earth Observation (EO) data developed in the European Space Agency (ESA) funded project Evolution of EO Online Data Access Services (EVO-ODAS).

It defines how to utilize WCS with EO products including generic conventions and recommendations for data and metadata mapping and conversion which are to be used in concrete tailoring for specific missions. It further considers how to link to other services like CSW, WMS, and WPS.

Suggested additions, changes, and comments on this draft document are welcome and encouraged. Such suggestions may be submitted by email message, by creating an issue or a pull request at the [GitHub repository](#), or by making suggested changes in an edited copy of this document.

Keywords

ogcdoc, eo, earth observation, data access, wcs, eo-wcs

Submitting organizations

The following organizations have submitted this Best Practice to the Open GeoSpatial Consortium, Inc.:

- EOX IT Services GmbH
- German Aerospace Center (DLR)
- GeoSolutions S.A.S.
- European Space Agency (ESA)

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Changes to the OGC ® Abstract Specification

The OGC ® Abstract Specification does not require any changes to accommodate the technical contents of this (part of this) document.

Future Work

Please send any suggestions for future work to the document editor or contributors named above.

Foreword

This OGC Best Practice document details proposed configuration and instantiation conventions for access to Earth Observation (EO) data developed in the European Space Agency (ESA) funded project Evolution of EO Online Data Access Services (EVO-ODAS).

It defines how to utilize WCS with EO products including generic conventions and recommendations for data and metadata mapping and conversion which are to be used in concrete tailoring for specific missions. It further considers how to link to other services like CSW, WMS, and WPS.

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Introduction

TODO

OGC® EO Data Access Best Practice

Chapter 1. Scope

This OGC Best Practice document details configuration and instantiation conventions for access to Earth Observation (EO) data. It defines how to utilize WCS with EO products including generic conventions and recommendations for data and metadata mapping and conversion which are to be used in concrete tailoring for specific missions. It further considers how to link to other services like CSW, WMS, and WPS.

TODO Assumption service stack around EO-WCS at least including EO-WMS possibly also OpenSearch and/or CSW and WPS for additional processing not covered by WCS and its extensions

Introduce concepts of EO-WCS (e.g. limit size of capabilities response -> DatasetSeries -> DescribeEOCoverageSet operation including spatial-temporal search, etc.)

Maybe point to youtube video???

Chapter 2. Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

OGC 06-121r9, *OGC Web Services Common Standard*, version 2.0

TBD OGC 09-146r2, *Coverages Implementation Schema / GML 3.2.1 Application Schema for Coverages*, version 1.1

Conformance classes used: *gml-coverage*

TBD OGC 09-110r4, *OGC® Web Coverage Service 2.1 Interface Standard Core*, version 2.1

Conformance classes used: *core*

TBD OGC 10-140r1, *OGC® Web Coverage Service 2.0 Interface Standard - Earth Observation Application Profile*, version 1.1

Conformance classes used: *eowcs*, *eowcs_geteocoverageset*, *eowcs_get-kvp*, *eowcs_soap*,

OGC 11-053r1, *OGC® Web Coverage Service Interface Standard - CRS Extension*, version 1.0

Conformance classes used: *crs*, *crs-gridded-coverage*

OGC 12-039, *OGC® Web Coverage Service Interface Standard - Scaling Extension*, version 1.0

Conformance classes used: *scaling*

OGC 12-040, *OGC® Web Coverage Service Interface Standard - Range Subsetting Extension*, version 1.0

Conformance classes used: *record-subsetting*

OGC 12-049, *OGC® Web Coverage Service Interface Standard - Interpolation Extension*, version 1.0

Conformance classes used: *interpolation*

OGC 09-147r3, *OGC® WCS 2.0 Interface Standard - KVP Protocol Binding Extension*, version 1.0

Conformance classes used: *get-kvp*

OGC 09-149r1, *OGC® WCS 2.0 Interface Standard - SOAP Protocol Binding Extension*, version 1.0

Conformance classes used: *soap*

OGC 12-100r1, *OGC® GML Application Schema - Coverages - GeoTIFF Coverage Encoding Profile*, version 1.0

Conformance classes used: *geotiff-coverage*

OGC 14-100r2, *OGC® CF-netCDF 3.0 encoding using GML Coverage Application*, version 2.0

Conformance classes used: *CF-netCDF-1.6 GML encoding*, *CF-netCDF-1.6 data format*, *CF-netCDF-1.6 multipart data encoding*

OGC 12-108, *OGC® GML Application Schema - Coverages JPEG2000 Coverage Encoding Extension*, version 1.0

Conformance classes used: *jpeg2000-coverage*

OGC 10-157r4, *Earth Observation Metadata Profile of Observations and Measurements*, version 1.1.0

Conformance classes used: *eop*, *sar*, *opt*

Chapter 3. Terms and definitions

This document uses the standard terms defined in Subclause 5.3 of [OGC 06-121r9], which is based on the ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards. In particular, the word "shall" (not "must") is the verb form used to indicate a requirement to be strictly followed to conform to this standard.

For the purposes of this document, the terms and definitions given in the above references, particularly EO-WCS [10-140r1], apply. In addition, the following terms and definitions apply. An arrow "→" indicates that the following term is defined in this Clause.

3.1. Coverage

digital representation of a spatio-temporally varying phenomenon as defined in

3.2. Dataset

2-D → EO Coverage



A Dataset usually represents observations obtained by satellite instruments.

3.3. Dataset Series

collection of → EO Coverages

3.4. EO Coverage

Rectified Grid → Coverage or Referenceable Grid → Coverage having an → EO Metadata record and a WGS84 bounding box

3.5. EO Metadata

→ EO Coverage's metadata record

3.6. Stitched Mosaic

→ EO Coverage composed from subsets of one or more co-referenced → Datasets

3.7. EO Product

An EO Product contains one or more related → EO Product Datasets plus metadata and

optionally auxiliary data like → EO Product Quicklooks.

3.8. EO Product Dataset

One or more files each containing one or more → EO Coverages.

3.9. EO Product Quicklook

A visual representation of a usually reduced → EO Product Dataset encoded in an image format. The → EO Product Dataset may combine different bands.

3.10. Lineage record

Data structure documenting an operation that has been applied to the → coverage it is part of

3.11. refers to

contains, in its → EO Metadata element as defined in [OGC 10-157r4], the → EO Metadata element of

Chapter 4. Conventions

4.1. UML notation

Unified Modeling Language (UML) static structure diagrams appearing in this specification are used as described in Subclause 5.2 of OGC Web Services Common [OGC 06-121r9].

4.2. Data dictionary tables

The UML model data dictionary is specified herein in a series of tables. The contents of the columns in these tables are described in Subclause 5.5 of [OGC 06-121r9]. The contents of these data dictionary tables are normative, including any table footnotes.

4.3. Namespace prefix conventions

The following namespaces are used in this document. The prefix abbreviations used constitute conventions used here, but are **not** normative. The namespaces to which the prefixes refer are normative, however.

Table 1. Namespace mappings

Prefix	Namespace URI	Description
xsd	http://www.w3.org/2001/XMLSchema	XML Schema namespace
ows	http://www.opengis.net/ows/2.0	OWS Common 2.0
gml	http://www.opengis.net/gml/3.2	GML 3.2.1
gmlcov	http://www.opengis.net/gmlcov/1.1	Coverages Implementation Schema 1.1
wcs	http://www.opengis.net/wcs/2.1	WCS 2.1
eop	http://www.opengis.net/eop/2.0	Earth Observation Metadata Profile of Observations and Measurements
opt	http://www.opengis.net/opt/2.0	Optical Earth Observation Metadata Profile of Observations and Measurements (extension of eop)
sar	http://www.opengis.net/sar/2.0	SAR Earth Observation Metadata Profile of Observations and Measurements (extension of eop)
wcseo	http://www.opengis.net/wcs/wcseo/1.1	WCS Application Profile - Earth Observation 1.1

Prefix	Namespace URI	Description
scal	http://www.opengis.net/wcs/scaling/1.0 (schema uses http://www.opengis.net/WCS_service-extension_scaling/1.0)	WCS Scaling Extension
int	http://www.opengis.net/wcs/interpolation/1.0 (schema uses http://www.opengis.net/WCS_service-extension_interpolation/1.0)	WCS Interpolation Extension
crs	http://www.opengis.net/wcs/crs/1.0	WCS CRS Extension
gmd	http://www.isotc211.org/2005/gmd	ISO 19139 Metadata
gmi	http://standards.iso.org/iso/19115-2/gmi/1.0	ISO 19139-2 Metadata
mdb	http://standards.iso.org/iso/19115-3/mdb/1.0	ISO 19115-3 Metadata

4.4. Multiple representations

When multiple representations of the same information are given in a specification document these are consistent. Should this not be the case then this is considered an error, and the [XML Schema](#) shall take precedence.

Chapter 5. Cross Service Interaction

5.1. Overview

TODO

TODO

Chapter 6. Grouping of Associated Data

6.1. Overview

TODO

TODO

Chapter 7. Collection and Product Registration

7.1. Overview

TODO

TODO

Chapter 8. Condense Coverage Description Information

8.1. Overview

TODO

TODO

Chapter 9. Uniform Coverage Grouping

9.1. Overview

TODO

TODO

Chapter 10. WCS Masking Extension

10.1. Overview

TODO

TODO

Chapter 11. rangeType Description Enhancements

11.1. Overview

EO-WCS 1.1 extends the range type description of WCS 2.0 which is inherited from CIS 1.0 (formerly known as GMLCO).

The extension includes elements to specify the measured physical properties (`wcseo:dataSemantics`), the data types of stored numbers (`wcseo:dataType`), the conversion from stored numbers to physical properties (`wcseo:dataType2dataSemantics`), as well as a hint for how to generate a RGB version (`wcseo:RGBgenerationHint`).

The additional range type information is provided via the `wcseo:rangeTypeExtension` element which is either included once for the whole range type under the `swe:DataRecord` element or separately for each channel (band) under each `swe:DataRecord/swe:field/swe:Quantity` element. It may also be included in both locations for example when the RGB generation hint is common for all bands but the data conversion is different.

Extensive examples are given [below](#).

11.2. Physical Properties

The `wcseo:rangeTypeExtension` element includes the `wcseo:dataSemantics` element of type `anyURI`. This element preferably holds an URI resolving to a description of the observed physical property.

XML instance examples included with the OGC schemas make use of <http://www.opengis.net/def/property/OGC/0/Radiance> which doesn't resolve to something useful as expected. Another URI used in OGC examples is <http://sweet.jpl.nasa.gov/2.0/physRadiation.owl#Radiance>. The latest version of this is version is supposedly <http://sweet.jpl.nasa.gov/2.3/propEnergyFlux.owl#Radiance>.

It is suspected that the ESA funded projects RARE, SMAAD, OBEOS, or PRODTREES define URI to describe physical properties as well. However, a web research didn't bring up anything useful in this direction.

Besides this URI the `gmlcov:rangeType` element provides the unit of measure via the `code` attribute of the `swe:uom` element of each `swe:Quantity` element. Of course this uom and the `wcseo:dataSemantics` need to match. An example for a uom is `W.m-2.sr-1` (<http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#wattPerMeterSquaredPerSteradian>) for radiance as used above.

11.3. Data Types

TODO

11.4. Conversion from Data Type to Physical Properties

TODO

11.5. Hint for RGB Generation

TODO

11.6. Examples

TODO

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- [9] OGC 16-118 EO Data Access Best Practice, version 0.0.1

Annex A: Revision History

Date	Release	Author	Paragraph modified	Description
2016-07-22	0.0.1	Stephan Meißl	All	Draft proposal from ESA project EVO-ODAS