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Document Status Sheet

| **Issue** | **Date** | **Comments** | **Editors** |
| --- | --- | --- | --- |
| 1.0D4 | 28/10/2021 | First internal draft 4 shared with ESA. | Y. Coene,  D. Guerrucci. |
| 1.0D5 | 12/11/2021 | Additional content added.  Version provided for internal ESA review. |  |
| 1.0D6 | 30/11/2021 | GeoDCAT-AP examples updated to use “@id” where otherwise ambiguous.  Additional content added.  Complete example files added in Annex C.  First draft for distribution to CEOS SLT Team. |  |
| 1.0D7 | 11/03/2022 | Updated after feedback from CEOS SLT Team.   * Resolved comments MM-1, MM-2, MM-3, MM-4, MM-5, MM-7, MM-9. * BP-0021 and corresponding encoding “requirements” downgraded to “recommendation” (MM-11). * BP-0022 and corresponding encoding “requirements” downgraded to “recommendation” (MM-12). * BP-0032 and BP-X420 upgraded to “requirement” (DJN-13). * BP-8240 updated to include allowed enumeration values and “ProjectionAuthority” added to example (MM-16). * BP-8415 and other corresponding encoding “recommendations” for BP-0031 upgraded to “requirement” (MM-17). * “should” used instead of “shall” for all “recommendations” (MM-17). * “Resource locator“ and “Coupled resource” recommendations and associated examples removed including BP-0051, BP-0052, BP-2610, BP-2620, BP-3610, BP-3620, BP-4610, BP-5610, BP-7620, BP-8620 (DJN-14, DJN-19). * Requirement BP-0515 for discovery interface added to allow for coupled resource discovery (DJN-14, DJN-19). * Requirements BP-0534, BP-0542 and BP-0544 about search parameters added. * Reference document [RD-38] added. | Y. Coene,  M. Morahan,  D.J. Newman. |
| 1.0D8 | 15/04/2022 | Updated after feedback related to remaining TBD/TBC from M. Morahan as discussed at SLT meeting (29/03/2022):   * SRV-BP-2220 (ISO19139) mapping proposed for “Version Description” (gmd:otherCitationDetails) derived from mapping provided for ISO19115-2 (Email M. Morahan 5/4/2022 point 1). * SRV-BP-7220 (ISO19115-3): mapping proposed for “Version Description” (cit:otherCitationDetails) derived from mapping provided for ISO19115-2 (Email M. Morahan 5/4/2022 point 1). * TBD removed for “Version Description” mapping in SRV-BP-3220 and SRV-BP-6220 as no mapping currently available (Email M. Morahan 5/4/2022 point 1). * SRV-BP-8710 (UMM-JSON): Role=TBD replaced by Role=PUBLISHER and footnote added with allowed role values for organization (Email M. Morahan 5/4/2022 point 2). * SRV-BP-0411: Updated to take into account that type values are not in KMS (Email M. Morahan 5/4/2022 point 3). * SRV-BP-0451: Updated and reference to ROR removed (Email M. Morahan 5/4/2022 point 4). Use of ROR limited to schema.org encoding in separate requirement SRV-BP-0452. * §4.1 NASA CMR: Updated as per email from M. Morahan 5/4/2022 point 5. * SRV-BP-0524: optional search parameters removed from requirement. | Y. Coene,  M. Morahan. |
| 1.0D9 | 05/05/2022 | “Resource locator“ and “Coupled resource” recommendations and associated examples included that were removed in 1.0D7 to allow obtaining broader feedback during document review.  The affected recommendations are currently labelled as “[Under-Review]” and include BP-0051, BP-0052, BP-2610, BP-2620, BP-3610, BP-3620, BP-4610, BP-5610, BP-7620, BP-8620. They will be converted into [Recommendation] or be removed depending on the document review feedback collected. | Y. Coene,  D. Guerrucci. |
| 1.0 | 10/11/2022 | Recommendations labelled as [Under-Review] upgraded to [Recommendation].  Note added to SRV-BP-0033 addressing comment from J. Del Rio Vera (WGCapD), 29/09/2022.  Verb (shall/should) aligned with obligation in BP-8710, BP-0411, BP-0542.  URL corrected in BP-0452. | Y. Coene |

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# Introduction

## Background

CEOS agencies have made significant progress in recent years in making available EO collection and granule metadata in an interoperable way by applying Best Practices [AD-1]. This has allowed for discovery or metadata through a common two-step mechanism based on OpenSearch. In addition, the number of EO collections discoverable through the CEOS International Directory Network (IDN) continues to grow as partners make available their collection metadata in one of the supported encodings of the Unified Metadata Model for collections, such as the metadata format (DIF10) annotated with platform, instrument and science keywords from a common thesaurus (GCMD).



*Figure 1: Different encodings of UMM-C metadata*

A logical next step is for CEOS agencies to support interoperable discovery of services, applications or tools related to their EO collections and make available information about these services, applications or tools in an agreed metadata format for future publication through IDN. The “service” resources which are the subject of the current document, are intended to view, process, access, transform or analyze data from EO collections and include, but are not limited to:

* Downloadable tools and applications,
* Tools and applications accessible online via a Web-based user interface,
* Services offering machine to machine interfaces (API).



*Figure 2: Different encodings of UMM-S/T metadata*

At the moment, other formats than UMM-JSON are not supported within IDN.

## Purpose of the document

This document aims to provide minimal recommendations and best practices on the use of service, tool and application metadata and discovery.

The purpose of this document is to achieve the following

* Promote the use of a common approach for service/tool/application metadata and discovery, associated with Earth Observation collections.
* Define the expectations and requirements of candidate implementations.
* Remove ambiguity in implementation where possible.
* Facilitate the aggregation of results between disparate Earth Data providers and Earth Data services/tools/applications via common standards.
* Allow for clients to access and invoke services with no prior knowledge of the service interface.
* Facilitate smooth integration between related implementations for collection and granule discovery and subsequent use of compatible services or tools possibly from other providers.

## Document overview

The document is organized as follows:

* Chapter 1 is the introduction of the document.
* Chapter 2 gives an overview of objectives and needs.
* Chapter 3 lists the Best Practices and recommendations. The Best Practices and recommendations include general recommendations not tied to a specific implementation technology and recommendations which only apply when a specific technology or encoding is used.
* Chapter 4 describes some current practices.

Finally, Annex A provides a overview of (mandatory) metadata elements present in UMM-S, UMM-T and INSPIRE Technical Guidance and provides a traceability to the corresponding CEOS Best Practice (if any) described in the current document.

## Terms, Definitions and Abbreviated Terms

### Terms and Definitions

See [RD-1]. The following terms and definitions are also used in this document.

|  |  |
| --- | --- |
| **Term** | **Definition** |
| access point | An internet address containing a detailed description of a spatial data service, including a list of end points to allow its execution. |
| application | A self-contained set of operations to be performed, typically to achieve a desired data manipulation, written in a specific language (e.g. Python, R, Java, C++, C#, IDL) [RD-17]. |
| application package | A platform independent and self-contained representation of an Application, providing executables, metadata and dependencies such that it can be deployed to and executed within an Exploitation Platform [RD-17]. |
| Collection | A collection is an aggregation of granules sharing the same product specification. A collection typically corresponds to the series of products derived from data acquired by a sensor on board a satellite and having the same mode of operation [AD-1]. |
| container | A container is a standard unit of software that packages up code and all its dependencies so that includes everything needed to run an application: code, runtme, system tools, system libraries and settngs [RD-17]. |
| Exploitation platform | An on-line system made of products, services and tools for exploitation of data [RD-17]. |
| FedEO | FedEO provides interoperable access, following ISO/OGC interface guidelines, to Earth Observation metadata (https://fedeo-client.ceos.org/about). |
| Granule | A granule is the finest granularity of data that can be independently managed. A granule usually matches the individual file of EO satellite data. [AD-1]. |
| IDN | An international effort developed to assist researchers in locating information on available collections and services. The directory is sponsored as a service to the Earth science community (https://idn.ceos.org). |
| Interface | named set of operations that characterize the ehavior of an entity [ISO19119]. |
| Invocable Spatial Data Service | a spatial data service that (a) has metadata which fulfils the requirements of the INSPIRE Implementing Rules for Metadata, (b) has at least one resource locator that is an access point, (c) is conformant with a documented and publicly available set of technical specifications providing the information necessary for its execution [RD-6]. |
| metadata | Information about a resource [RD-2]. |
| metadata element | Discrete unit of metadata [RD-2]. |
| service | distinct part of the functionality that is provided by an entity through interfaces [RD-2].  Services provide functions for the creation, access, processing and analysis of data.Services can be web services, provided across the web and following a well-defined machine protocol. In these guidelines software can be a service or web service. Services can be delivered through an implemented software instance that enables users to ‘do’ something with data. The user does not necessarily directly interact with the code [RD-14]. |
| service interface | shared boundary between an automated system or human being and another automated system or human being [ISO 19101]. |
| software | A computer program, in source code or compiled form, that supports scholarly research. Software may be downloaded, compiled, executed and instantiated [RD-14]. |
| Spatial Data Service | The operations which may be performed, by invoking a computer application, on the spatial data contained in spatial data sets or on the related metadata [RD-6]. |
| tool | Includes downloadable tools and tools accessible via a web user interface. |

### Acronyms

See [RD-1]. The following acronyms are also used in this document.

|  |  |
| --- | --- |
| **Acronym** | **Definition** |
| API | Application Programming Interface |
| CMR | Common Metadata Repository |
| DIF-10 | Directory Interchange Format Version 10 |
| FedEO | Federated Earth Observation Missions |
| GCMD | Global Change Master Directory |
| IDN | International Directory Network |
| INSPIRE | INfrastructure for SPatial InfoRmation in Europe |
| KMS | Keyword Management System (<https://gcmd.earthdata.nasa.gov/kms/>, https://gcmd.earthdata.nasa.gov/KeywordViewer/) |
| STAC | SpatioTemporal Asset Catalog |
| UMM | Unified Metadata Model |

## References

### Applicable Documents

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Reference** | **Title** | **Issue** |
| [AD-1] | CEOS-OPENSEARCH-BP-V1.3 | CEOS OpenSearch Best Practice Document | 1.3 |

Table 1 – Applicable documents

### Reference Documents

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Reference** | **Title** | **Issue** |
| [RD-1] | CEOS/WGISS/DSIG/GLOS | Long-Term Preservation of Earth Observation Space Data: Glossary of Acronyms and Terms | 1.3 |
| [RD-2] | ISO 19115-1:2014 | Geographic Information – Metadata – Part 1: Fundamentals, <https://www.iso.org/standard/53798.html> | First Edition 2014-04-01 |
| [RD-3] | DIF-10 | <https://earthdata.nasa.gov/esdis/eso/standards-and-references/directory-interchange-format-dif-standard> | 10 |
| [RD-4] | EED2-TP-040\_Rev04\_UMM-S | UMM-Services, <https://wiki.earthdata.nasa.gov/display/CMR/UMM+Documents> | 1.4 |
| [RD-5] | UMM-T, 423-FORM-002, A | Appendix F. Metadata requirements ase reference for Unified Metadata Model – Tool (UMM-T), 5/14/2020, <https://wiki.earthdata.nasa.gov/display/CMR/UMM+Documents> | 1.0 |
| [RD-6] |  | Technical Guidance for the implementation of INSPIRE dataset and service metadata based on ISO/TS 19139:2007, 2017-03-02, <https://inspire.ec.europa.eu/id/document/tg/metadata-iso19139> | 2.0.1 |
| [RD-7] | ISO 19119:2005 | Geographic Information – Services, <http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=39890> |  |
| [RD-8] | ISO 19115-3:2016 | Geographic Information – Metadata – Part 3: XML schema implementation for fundamental concepts, <http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=32579> |  |
| [RD-9] | ISO 19139:2007 | ISO 19139, Geographic Information – Metadata XML (ISO 19139:2007), <http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=32557> |  |
| [RD-10] | <https://semiceu.github.io/GeoDCAT-AP/releases/2.0.0>] | GeoDCAT-AP Version 2.0.0, SEMIC Recommendation 23 December 2020 | 2.0.0 |
| [RD-11] | OGC 11-035r1 | EO Product Collection, Service and Sensor Discovery using the CS-W ebRIM Catalogue, 2013-03-26 | 1.0 |
| [RD-12] | OGC 19-020r1 | OGC Testbed-15: Catalogue and Discovery Engineering Report, <https://docs.ogc.org/per/19-020r1.html> |  |
| [RD-13] | UMM-JSON | <https://git.earthdata.nasa.gov/projects/EMFD/repos/unified-metadata-model/browse> |  |
| [RD-14] |  | ESIP Software and Services Citation Cluster. (2019). Software and Services Citation Guidelinesand Examples. Ver. 1. ESIP. ​<https://doi.org/10.6084/m9.figshare.7640426>​. |  |
| [RD-15] | CEOS/WGISS/DSIG/PIDBP | Persistent Identifiers Best Practices, July 2021 | 1.4 |
| [RD-16] |  | <https://commonmark.org/> |  |
| [RD-17] | OGC 20-089 | OGC Best Practice for Earth Observation Application Package, 2021-08-21, Candidate TC Vote Draft. | 1.0 |
| [RD-18] | OGC 12-084r2 | OGC OWS Context Atom Encoding Standard, <http://docs.opengeospatial.org/is/12-084r2/12-084r2.html>, 14/01/2014. | 1.0 |
| [RD-19] | OGC 14-055r2 | OGC OWS Context GeoJSON Encoding Standard, <https://docs.opengeospatial.org/is/14-055r2/14-055r2.html>, 2017-04-13 | 1.0 |
| [RD-20] |  | DataCite Metadata Working Group. (2021). DataCite Metadata Schema Documentation for the Publication and Citation of Research Data and Other Research Outputs. Version 4.4. DataCite e.V.  <https://doi.org/10.14454/3w3z-sa82> | 4.4 |
| [RD-21] |  | Arfon M. Smith et al., “Software citation principle”, 2016, <https://doi.org/10.7717/peerj-cs.86> |  |
| [RD-22] | OGC 10-032r8 | OGC OpenSearch Geo and Time Extensions, Version 1.0, 14-04-2014. |  |
| [RD-23] | OGC 13-026r9 | OGC Opensearch Extension for Earth Observation, Version 1.1, 25-11-2019, <https://docs.ogc.org/is/13-026r9/13-026r9.html> |  |
| [RD-24] |  | <https://github.com/dewitt/opensearch/blob/master/mediawiki/Community/Proposal/Specifications/OpenSearch/Extensions/Semantic/1.0/Draft%201.wiki> |  |
| [RD-25] | OGC 17-047r1 | OGC OpenSearch-EO GeoJSON(-LD) Response Encoding Standard, Version 1.0, 2020-04-27, <https://docs.opengeospatial.org/is/17-047r1/17-047r1.html> |  |
| [RD-26] |  | Technical Guidance for the implementation of INSPIRE Discovery Services, 2011-11-07, Version 3.1. |  |
| [RD-27] | OGC 07-045r1 | OGC Catalogue Services Specification 2.0.2 – ISO Metadata Application Profile for CSW 2.0, version 1.0.1 (2007), <https://www.ogc.org/standards/cat>. |  |
| [RD-28] | RFC-4287 | The Atom Syndication Format, <https://tools.ietf.org/html/rfc4287> |  |
| [RD-29] | RFC-7946 | The GeoJSON Format, <https://tools.ietf.org/html/rfc7946> |  |
| [RD-30] | OGC 17-084r1 | EO Collection GeoJSON(-LD) Encoding, OGC Best Practice, <https://docs.ogc.org/bp/17-084r1/17-084r1.html> |  |
| [RD-31] | ICSM | ICSM ISO19115-1 Metadata for Services Best Practices, <https://icsm-au.github.io/metadata-working-group/defs/MetadataForServicesGuide.html> |  |
| [RD-32] | ESIP science-on-schema.org | Matthew B. Jones, Stephen Richard, Dave Vieglais, Adam Shepherd, Ruth Duerr, Doug Fils, Lewis McGibbney. (2021). Science-on-Schema.org v1.2.0 (Version 1.2.0). Zenodo. <https://doi.org/10.5281/zenodo.4477164>, <https://github.com/ESIPFed/science-on-schema.org> |  |
| [RD-33] |  | STAC API, https://github.com/radiantearth/stac-api-spec#stac-api |  |
| [RD-34] | OGC 17-069r3 | OGC 17-069r3, OGC API – Features – Part 1: Core, http://docs.opengeospatial.org/is/17-069r3/17-069r3.html |  |
| [RD-35] | OGC 20-004 | OGC API - Records - Part 1: Core, <https://github.com/opengeospatial/ogcapi-records>, http://docs.ogc.org/DRAFTS/20-004.html |  |
| [RD-36] | OGC 18-062 | <https://github.com/opengeospatial/ogcapi-processes>, https://docs.ogc.org/DRAFTS/18-062.html |  |
| [RD-37] | DCAT | Data Catalog Vocabulary (DCAT) – Version 2, W3C Recommendation, <http://www.w3.org/TR/vocab-dcat/> | 2.0 |
| [RD-38] | OGC 19-079r1 | OGC API - Features - Part 3: Filtering  http://docs.ogc.org/DRAFTS/19-079r1.html |  |

Table 2 – Reference documents

# Objectives and Needs

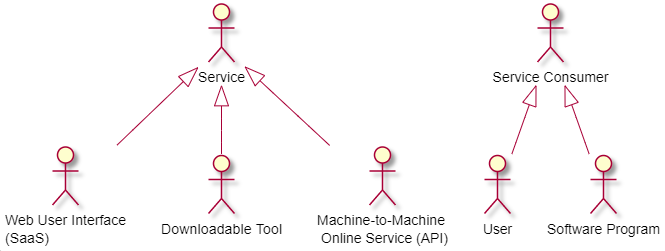
## Resources

The resources which are the subject of the current document include:

* Downloadable tools and applications,
* Tools and applications accessible online via a Web-based user interface,
* Services offering machine to machine interfaces.

They are intended to view, process, access, subset, transform or analyze data from EO collections. They may correspond to software available as source code, as an executable, a container, or a virtual machine image, while other software may be available as a service [RD-21].

For the sake of brevity, we use the term “Service” to denote any of these resources (See *Figure 3*). Also, depending on the context, a “Service Consumer” may be a user accessing a Web-based user interface or downloading a tool, or a software program invoking a machine to machine interface (API).



*Figure 3: Service and Service Consumer specializations*

The following resources can also be considered as examples of Tools or Services (or specific bindings) covered by the recommendations, if they are related to one or more collections:

* A Jupyter Notebook published in a repository (e.g. GitHub, Zenodo).
* Algorithm/software source code/scripts accessible in a repository.
* Docker image available on a public registry (e.g. DockerHub).
* An Earth Observation Application package as described in OGC 20-089 [RD-17] for deployment on an Exploitation Platform.

The objective of the current document is providing recommendations and best practices for describing ”Service” resources with metadata and supporting their discovery.

There are three groups of recommendations:

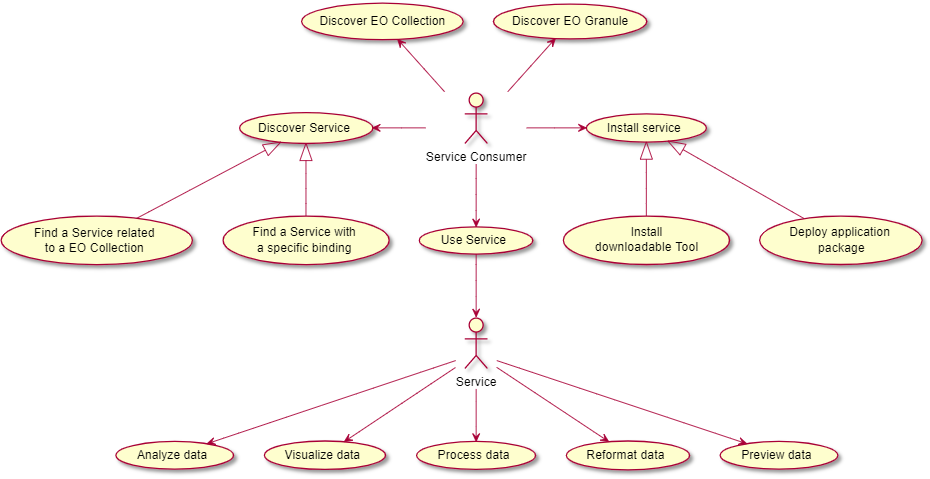
* A minimal metadata model to be supported (independent of encoding representation) is proposed in section 3.2.
* Recommendations which are encoding/format dependent are included in section 3.3.
* Recommendations related to the service discovery interface are presented in section 3.5.

## Use cases

The main objective is to make EO services and tools searchable, thereby making the information better findable and facilitate sharing across CEOS agencies and other stakeholders. The following are typical use cases that are considered:

* Find Web user interfaces applicable to a collection to visualize the data.
* Find Web user interfaces applicable to a collection to process, analyse and preview the data.
* Find downloadable tools applicable to a collection for analyzing the data.
* Find downloadable tools applicable to a collection for reformatting and processing the data.
* Find online machine to machine services (including Web service access points) applicable to a collection to visualize, process, analyze, reformat, process etc. the data.

These use cases complement the “Discovery” use cases for Collections and Granules covered in [AD-1]. The metadata available for a tool or service should ideally allow for locating the repository of the software and downloading and installing the software (if applicable) and/or invoking its Web GUI or online service endpoints.



*Figure 4: Actors and General Use Cases*

The following are additional more detailed examples:

* Search by science keywords, by category of service/tool, by mission (platform), by instrument, by collection, by DOI, using free text, by available technical interface/representation (e.g. OGC WMS, Docker image, Jupyter Notebook, EO Application Package .. …).
* After discovery of a collection, or granule, easily find coupled services for subsequent execution.
* Discovery of online machine to machine services including web service endpoints for discovery, viewing (e.g. Web Map Service, Web Map Tiling Service), ordering, processing, data access (e.g. Web Coverage Services, …), analytics, …
* Binding to a discovered service endpoint exploiting the metadata provided about the service, …
* Discovery of available analytics applications (Jupyter notebooks) for subsequent download or online execution.
* Discovery of EO application packages [RD-12], [RD-17] available for a collection, with all required information (incl. run-time context) to deploy and execute them on a cloud-based Exploitation Platform.

Agencies may provide their service metadata in multiple formats, for their specific user communities. In addition, we encourage providing the metadata in an encoding supported by the IDN/CMR for facilitating publication through in IDN.

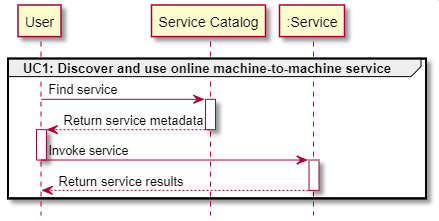
## Detailed Scenarios

The following subsections show the typical scenarios when discovering a “Service” of one of the subtypes presented in section 2.1.

### UC1 – Discover and use online machine to machine service

In this scenario, the metadata describes an online machine to machine interface (API) which can be invoked by a client application (User). This typically applies when service interfaces are available implementing OGC standards such as:

* OGC WM(T)S
* OGC WPS
* OGC WCS
* OGC CSW
* Etc..



*Figure 5: Discover and use online machine to machine service (UC1)*

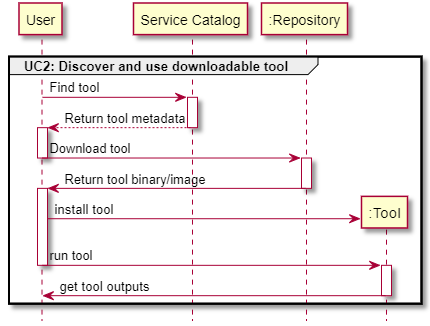
INSPIRE “Spatial Data Services”, including “Invocable Spatial Data Services” [RD-6] are other examples of such online services.

### UC2 – Discover and use downloadable tool

In this scenario, the service metadata describes a downloadable tool or toolbox and provides the download location for the tool. The user has to fulfil additional steps to download the tool or script, run it locally or on a cloud infrastructure to view or access the results of the processing, visualization etc...

This scenario also applies to:

* Software programs/scripts available for (file) download on a download location, e.g. a public repository (e.g. GitHub, Zenodo[[1]](#footnote-1),.. )
* Software packaged as a container published at a public registry (e.g. DockerHub[[2]](#footnote-2)).



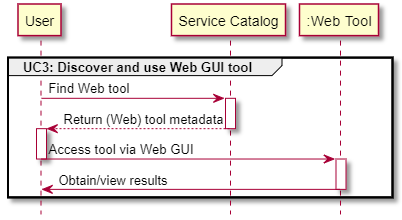
*Figure 6: Discover and use downloadable tool (UC2)*

### UC3 – Discover and use Web GUI Tool

In this scenario, the service metadata describes an interactive tool or toolbox accessed online via a Web-based graphical user interface at a URL provided as part of the metadata.

This scenario applies to:

* Software or tools provided as “Software as a Service” (SaaS)[[3]](#footnote-3) and accessed via a thin client (Web browser). E.g. Jupyter Notebook made available online via Google Colab[[4]](#footnote-4) or Binder[[5]](#footnote-5).

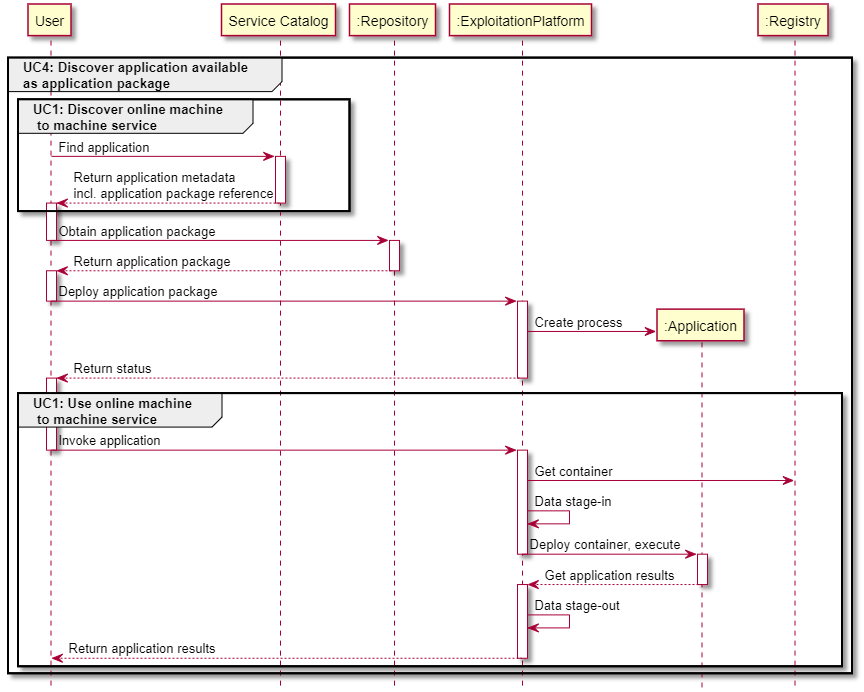


*Figure 7: Discover and use Web tool (UC3)*

### UC4 – Discover application available as application package

In this scenario, a service consumer discovers services or tools relevant for his/her data which is made available as an “EO application package” (See [RD-17]). The application package describes the inputs/outputs of an application which is packaged as a container. It can be deployed and run on an Exploitation Platform, hosting the data, providing a transactional OGC API – Processes interface allowing for its deployment and execution. The detailed steps are depicted in the sequence diagram below. We refer the reader to [RD-17] for additional details.

This scenario is an extension of the scenario UC1 providing access to an online service (API). It allows for a service consumer to deploy the service, including all its dependencies (e.g. libraries, language run-time, operating system), on a compatible Exploitation Platform before its invocation.

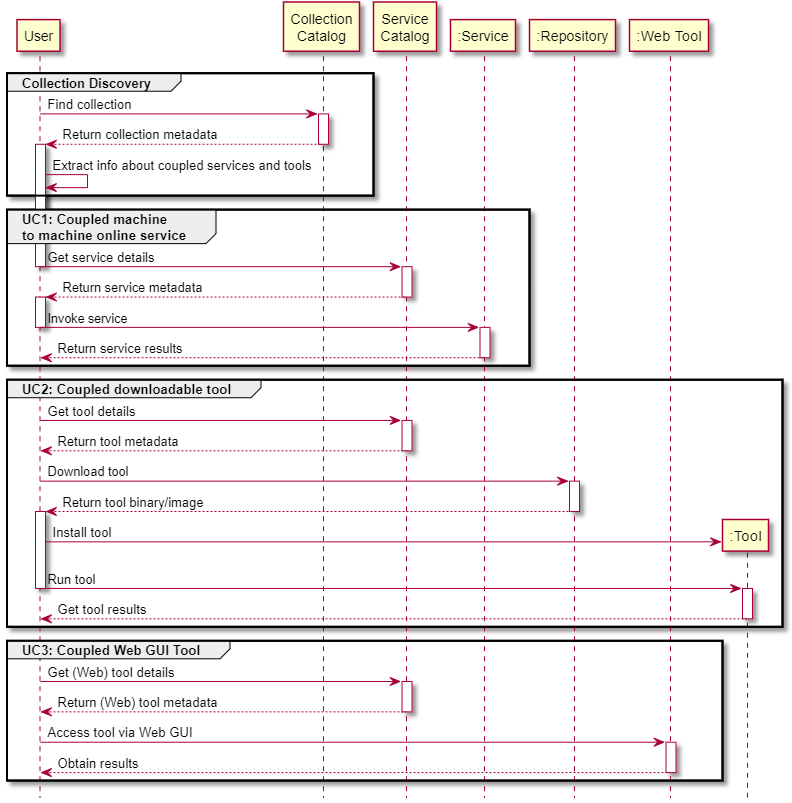


*Figure 8: Discover and use service available as application package (UC4)*

### UC5 – Discover Collection with coupled services

Any of the above scenarios UC1 to UC4 can be preceeded by a Collection discovery step. The detailed collection metadata may contain information about coupled resources (Services or tools) for which the detailed metadata can then be retrieved from the Service Catalog. The service metadata can then be exploited as described in the previous sections.

The same applies to granule discovery (not depicted). Granule metadata may equally contain information about coupled services or tools.



*Figure 9: Discover services and (Web) tools coupled with collections (or granules) (UC5)*

# Best Practices and Recommendations

## Overview

The Best Practices are presented in separate sections covering:

* Service metadata model (Section 3.2: SRV-BP-00XX),
* Service metadata encoding(s) (Section 3.3: SRV-BP-XXXX),
* Controlled vocabularies to be used in the metadata (Section 3.4: SRV-BP-04XX),
* Service discovery interface (Section 3.5: SRV-BP-05XX).

There are three different levels of obligation for the Best Practices in the current chapter:

* “Requirements” are mandatory and must be implemented,
* “Recommendations” are optional, but strongly recommended for interoperability,
* “Optional” indicates an additional good practice.

## Service metadata model

The current section defines the requirements related to the service metadata model. They indicate which metadata elements have to be included in the metadata record when it is prepared or returned by a discovery interface. How these metadata elements are to be encoded depends on the encoding which is used and is described in section 3.3. The requirements in this section do not assume a particular encoding of the metadata record, e.g. using ISO19139.

The mandatory requirements presented in this section, correspond mainly to the common set of mandatory requirements defined by the UMM and INSPIRE (Service) metadata models [RD-4], [RD-5] and [RD-6]. For convenience, “Annex A: ” provides a cross-reference of the core metadata elements in [RD-4], [RD-5], [RD-6] and [RD-20]. Each of the requirements contains in the top-right corner of the requirements box a reference to the metadata models imposing a similar requirement, and where applicable, refer to the corresponding INSPIRE Technical Guidance (TG) requirement.

### Identification information

The metadata elements covered in this section belong to the Identification Information.

|  |  |  |
| --- | --- | --- |
| SRV-BP-0001 | Resource type [Requirement] | [RD-4], [RD-5], [RD-6] |
| Metadata records shall include the “resource type” as a controlled keyword (See section 3.4). | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0003 | Resource identifier [Requirement] | [RD-4], [RD-5], [RD-6], TG Rec. C.1 |
| Metadata records shall include a unique and persistent resource identifier (i.e. “fileidentifier” or “name”). | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0005 | Resource title [Requirement] | [RD-4], [RD-5], [RD-6] TG Req. C.8 |
| Metadata records shall include a “resource title” (longName). | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0007 | DOI [Recommendation] | [RD-5], [RD-20] |
| Metadata records should include a Digital Object Identifier (DOI) for the resource. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0009 | DOI and Citations [Recommendation] | REC\_23 of [RD-15] |
| DOI and citations assigned to EO services or tools should refer to the guidelines in [RD-14] | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0014 | Resource abstract [Requirement] | [RD-4], [RD-5], [RD-6] TG Req. C.9 |
| Metadata records shall include an “abstract” describing the resource. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0015 | Resource last revision date [Recommendation] | [RD-4], [RD-6] TG Req. C.11 |
| Metadata records should include a “resource last revision date”. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0016 | Resource version [Recommendation] | [RD-4], [RD-5] |
| Metadata records should include the “resource version”. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0017 | Resource version description [Recommendation] | [RD-4] |
| Metadata records should include a “resource version description”. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0018 | Responsible organization [Requirement] | [RD-4], [RD-5], [RD-6] TG Req. C.10,  TG Req. 6.4 |
| Metadata records shall include the point of contact information for the organization(s) responsible for the establishment, maintenance and distribution of the described resource. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0019 | Spatial resolution [Recommendation] | [RD-6] TG Req. 3.3 |
| Metadata records should express restriction on the spatial resolution if the service or tool has such restriction. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0020 | CRS identifier [Recommendation] | [RD-6] TG Req. 6.1,  TG Req. 6.2 |
| Metadata records should indicate the Coordinate Reference System (CRS) supported by the service/tool using identifiers specified in a well-known common register. | | |

### Constraint information

|  |  |  |
| --- | --- | --- |
| SRV-BP-0021 | Limitations on public access [Recommendation] | [RD-4], [RD-5], [RD-6] TG Req. C.17 |
| Metadata records should include information about limitations on public access or lack of such limitations. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0022 | Conditions for access and use [Recommendation] | [RD-4], [RD-5], [RD-6] TG Req. C.18 |
| Metadata records should include information about conditions for access and use or indicate that there are no such conditions or that the conditions are unknown. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0023 | Licenses [Recommendation] | [RD-6] TG Rec. C.10 |
| Metadata records should include information about the licensing of the resource by providing a link to the license type (e.g. <https://spdx.org/licenses/Apache-2.0>). The SPDX License List[[6]](#footnote-6) provides URI for most license types. | | |

### Distribution information

The metadata elements covered in this section belong to the Distribution Information.

|  |  |  |
| --- | --- | --- |
| SRV-BP-0031 | Resource URL [Requirement] | [RD-4], [RD-5], [RD-6] TG Req. 3.7 |
| (Tool) Metadata records shall include an “URL” element describing where the Web user interface can be accessed or where the tool can be downloaded. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0032 | Access points [Requirement] | [RD-4], [RD-6]  TG req. 3.7 |
| Metadata records shall include a “resource locator“ element (if available) providing the access point of the service, including a list of endpoints to allow for automatic binding and execution. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0033 | No online access [Recommendation] | [RD-4], [RD-5], [RD-6] TG req. 3.7 |
| Metadata records should include an “resource locator“ element providing access to additional information about the tool or service if no online access is available. | | |

The “additional information” in the recommendation above may include learning resources related to the tool or service including, but not limited to, user guides or tutorials in the form of documents, Jupyter notebooks, images or videos available for download or online access.

### Quality information

The metadata elements covered in this section belong to the Quality Information.

|  |  |  |
| --- | --- | --- |
| SRV-BP-0041 | Technical specification [Recommendation] | [RD-6] TG Req. 5.5, C.20, C.21 |
| Metadata records should declare compliance with at least one technical specification providing all technical elements to actually invoke the service and enable its usage. | | |

### Service coupling

The metadata elements covered in this section allow for referring from collection/granule metadata records and service metadata records or vice-versa.

|  |  |  |
| --- | --- | --- |
| SRV-BP-0051 | Resource locator [Recommendation] | [RD-6] TG Req. 1.8 |
| “Resource locator” information linking to the service(s) providing online access to a described collection of granule should be included in Collection and/or Granule metadata records, if such online access is available. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0052 | Coupled resources [Recommendation] | [RD-6] TG Req. 3.6 |
| Service/Tool metadata records should identify the target collections of the service/tool through their resource identifiers (URI). | | |

### Metadata information

|  |  |  |
| --- | --- | --- |
| SRV-BP-0061 | Metadata point of contact [Recommendation] | [RD-6] TG Req. C.6 |
| Metadata records should provide the “point of contact” for the provided metadata. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0062 | Latest update date of metadata [Recommendation] | [RD-6] TG Req. C.7 |
| Metadata records should provide the “latest update date” of the provided metadata. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0063 | Metadata language [Recommendation] | [RD-6] TG Req. C.5 |
| Metadata records should indicate the language of the provided metadata. | | |

### Descriptive keywords

|  |  |  |
| --- | --- | --- |
| SRV-BP-0071 | Resource keywords [Requirement] | [RD-4], [RD-5], [RD-6] |
| Metadata records shall include “descriptive keywords” describing the resource. | | |

### Extent information

This information includes temporal and geographical extents which are optional for service and tool metadata records.

|  |  |  |
| --- | --- | --- |
| SRV-BP-0081 | Temporal extent [Recommendation] | [RD-6] TG Req. C.14 |
| Metadata records should describe 0 to n temporal extents only if the service or tool has an explicit temporal extent. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0082 | Geographical extent [Recommendation] | [RD-6] TG Req. C.19 |
| Metadata records should describe 0 to n minimal geographic bounding boxes only if the service or tool has an explicit geographic extent. | | |

## Service metadata encoding

This section contains general applicable recommendations and recommendations which are specific for a particular implementation or encoding technology.

### General

|  |  |  |
| --- | --- | --- |
| SRV-BP-0910 | Supported metadata formats [Requirement] |  |
| The Service discovery interface shall provide access to service metadata records encoded according to at least one of the below specifications :   * ISO19139:2007 [RD-6] * ISO19115-3 [RD-8] * GeoDCAT-AP [RD-10] * UMM-JSON [RD-13] * OGC 19-020r1 [RD-12] * Schema.org | | |

### ISO19139 encoding

#### General

|  |  |  |
| --- | --- | --- |
| SRV-BP-2105 | metadata format [Recommendation] | TG Req. C.1 [RD-6] |
| The Service discovery interface should provide access to service metadata records in ISO19139:2007 [RD-9] format with identification info encoded using service metadata XML schema (srv namespace) as per TG Req. C.1 [RD-6]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-2110 | metadata format [Recommendation] | TG Req. C.1 [RD-6] |
| Service metadata records in ISO19139:2007 [RD-9] format should comply with the mandatory requirements for Service metadata provided in [RD-6] (where applicable). | | |

#### Identification information

|  |  |  |
| --- | --- | --- |
| SRV-BP-2210 | identification information [Requirement] | TG Req. C.1, C.8, C.9, C.10 [RD-6] |
| Service/tool metadata records in ISO19139 format shall encode the following mandatory properties of the metadata model defined in §3.2.1 as shown below:   * Resource identifier <gmd:fileIdentifier/>, (srv:SV\_ServiceIdentification/gmd:citation/gmd:CI\_Citation/gmd:identifier) * Resource title (srv:SV\_ServiceIdentification/gmd:citation/gmd:CI\_Citation/gmd:title) * Resource abstract (srv:SV\_ServiceIdentification/gmd:abstract) * Responsible organisation (srv:SV\_ServiceIdentification /gmd:pointOfContact/gmd:CI\_ResponsibleParty) | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-2220 | identification information [Recommendation] | [RD-6] TG C.11 |
| Service/tool metadata records in ISO19139 format should encode the following optional properties of the metadata model defined §3.2.1 as shown below:   * DOI[[7]](#footnote-7) (srv:SV\_ServiceIdentification/gmd:citation/gmd:CI\_Citation/gmd:identifier/ gmd:RS\_Identifier/gmd:code/gco:CharacterString[../../codeSpace/gco:CharacterString='http://doi.org']) * Last revision date (srv:SV\_ServiceIdentification/gmd:citation/gmd:CI\_Citation/gmd:date) * Resource version (srv:SV\_ServiceIdentification/gmd:citation/gmd:CI\_Citation/gmd:edition) * Resource version description (srv:SV\_ServiceIdentification/gmd:citation/gmd:CI\_Citation/gmd:otherCitationDetails/gco :CharacterString ) | | |

*Example 1: Identification information (ISO19139)*

<?xml version="1.0" encoding="UTF-8"?>

<gmd:MD\_Metadata xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gmi="http://www.isotc211.org/2005/gmi" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:gmx="http://www.isotc211.org/2005/gmx" xmlns:srv="http://www.isotc211.org/2005/srv" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.isotc211.org/2005/gmd ./apiso-inspire.xsd">

<gmd:fileIdentifier>

<gco:CharacterString>eo-pdgs-landsat-datacube</gco:CharacterString>

</gmd:fileIdentifier>

<gmd:language>

<gmd:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/" codeListValue="eng"/>

</gmd:language>

<gmd:hierarchyLevel>

<gmd:MD\_ScopeCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#MD\_ScopeCode" codeListValue="service">service</gmd:MD\_ScopeCode>

</gmd:hierarchyLevel>

<gmd:hierarchyLevelName>

<gco:CharacterString>Service</gco:CharacterString>

</gmd:hierarchyLevelName>

<gmd:contact>

</gmd:contact>

…

<gmd:identificationInfo>

<srv:SV\_ServiceIdentification>

<gmd:citation>

<gmd:CI\_Citation>

<gmd:title>

<gco:CharacterString>Landsat DataCube</gco:CharacterString>

</gmd:title>

<gmd:date>

<gmd:CI\_Date>

<gmd:date>

<gco:Date>2019-05-15</gco:Date>

</gmd:date>

<gmd:dateType>

<gmd:CI\_DateTypeCode codeList="http://standards.iso.org/iso/19139/resources/gmxCodelists.xml#CI\_DateTypeCode" codeListValue="revision">revision</gmd:CI\_DateTypeCode>

</gmd:dateType>

</gmd:CI\_Date>

</gmd:date>

<gmd:edition><gco:CharacterString>1.0</gco:CharacterString></gmd:edition>

<gmd:identifier>

<gmd:RS\_Identifier>

<gmd:code>

<gco:CharacterString>eo-pdgs-landsat-datacube</gco:CharacterString>

</gmd:code>

</gmd:RS\_Identifier>

</gmd:identifier>

<gmd:otherCitationDetails><gco:CharacterString>EO PDGS Landsat DataCube. (2020), European Space Agency.</gco:CharacterString></gmd:otherCitationDetails>

</gmd:CI\_Citation>

</gmd:citation>

<gmd:abstract>

<gco:CharacterString>ESA PDGS-DataCube enables multi-temporal and pixel-based access to a subset of the data available in the European Space Agency dissemination services, including Heritage Missions (HM), Third-Party Missions (TPM) and Earth Explorer (EE) data.</gco:CharacterString>

</gmd:abstract>

<gmd:pointOfContact>

<gmd:CI\_ResponsibleParty>

<gmd:organisationName>

<gco:CharacterString>ESA/ESRIN</gco:CharacterString>

</gmd:organisationName>

<gmd:contactInfo>

<gmd:CI\_Contact>

<gmd:phone>

<gmd:CI\_Telephone>

<gmd:voice>

<gco:CharacterString>tel:+39 06 94180777</gco:CharacterString>

</gmd:voice>

</gmd:CI\_Telephone>

</gmd:phone>

<gmd:address>

<gmd:CI\_Address>

<gmd:deliveryPoint>

<gco:CharacterString>Via Galileo Galilei CP. 64</gco:CharacterString>

</gmd:deliveryPoint>

<gmd:city>

<gco:CharacterString>Frascati</gco:CharacterString>

</gmd:city>

<gmd:postalCode>

<gco:CharacterString>00044</gco:CharacterString>

</gmd:postalCode>

<gmd:country>

<gco:CharacterString>Italy</gco:CharacterString>

</gmd:country>

<gmd:electronicMailAddress>

<gco:CharacterString>eohelp@eo.esa.int</gco:CharacterString>

</gmd:electronicMailAddress>

</gmd:CI\_Address>

</gmd:address>

<gmd:onlineResource>

<gmd:CI\_OnlineResource>

<gmd:linkage>

<gmd:URL>https://earth.esa.int</gmd:URL>

</gmd:linkage>

</gmd:CI\_OnlineResource>

</gmd:onlineResource>

</gmd:CI\_Contact>

</gmd:contactInfo>

<gmd:role>

<gmd:CI\_RoleCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_RoleCode" codeListValue="originator">originator</gmd:CI\_RoleCode>

</gmd:role>

</gmd:CI\_ResponsibleParty>

</gmd:pointOfContact>

</srv:SV\_ServiceIdentification>

</gmd:identificationInfo>

<gmd:distributionInfo/>

<gmd:dataQualityInfo/>

</gmd:MD\_Metadata>

|  |  |  |
| --- | --- | --- |
| SRV-BP-2230 | Spatial resolution [Recommendation] | [RD-6] TG Req. 3.3 |
| Metadata records should express restriction on the spatial resolution if the service or tool has such restriction in the abstract as per §C.2.18 of [RD-6]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-2240 | CRS identifier [Recommendation] | [RD-6] TG Req. 6.1, 6.2 |
| Metadata records should indicate the CRS supported by the service/tool using identifiers specified in a well-known common register, if the service or tool has such restriction in /gmd:MD\_Metadata/gmd:referenceSystemInfo as per example 3.13 of [RD-6]. | | |

#### Constraint information

|  |  |  |
| --- | --- | --- |
| SRV-BP-2310 | Limitations on public access [Recommendation] | [RD-4], [RD-5], [RD-6] TG Req. C.17 |
| Metadata records in ISO19139:2007 [RD-9] format should include information about limitations on public access or lack of such limitations as per [RD-6]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-2320 | Conditions for access and use [Recommendation] | [RD-4], [RD-5], [RD-6] TG Req. C.18 |
| Metadata records in ISO19139:2007 [RD-9] format should include information about conditions for access and use or indicate that there are no such conditions or that the conditions are unknown as per [RD-6]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-2330 | Licenses [Recommendation] | [RD-6] TG Rec. C.10 |
| Metadata records in ISO19139:2007 [RD-9] format should include information about the licensing of the resource by providing a link to the license type (e.g. <https://spdx.org/licenses/Apache-2.0>) as per [RD-6].. | | |

*Example 2: Distribution information for Access point (ISO19139)*

<gmd:resourceConstraints>

<gmd:MD\_LegalConstraints>

<gmd:useConstraints>

<gmd:MD\_RestrictionCode codeList="http://standards.iso.org/iso/19139/resources/gmxCodelists.xml#MD\_RestrictionCode" codeListValue="otherRestrictions"/>

</gmd:useConstraints>

<gmd:otherConstraints>

<gmx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/ConditionsApplyingToAccessAndUse/noConditionsApply">No conditions apply to access and use.</gmx:Anchor>

</gmd:otherConstraints>

</gmd:MD\_LegalConstraints>

</gmd:resourceConstraints>

<gmd:resourceConstraints>

<gmd:MD\_LegalConstraints>

<gmd:accessConstraints>

<gmd:MD\_RestrictionCode codeList="http://standards.iso.org/iso/19139/resources/gmxCodelists.xml#MD\_RestrictionCode" codeListValue="otherRestrictions"/>

</gmd:accessConstraints>

<gmd:otherConstraints>

<gmx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/LimitationsOnPublicAccess/noLimitations">no limitations to public access.</gmx:Anchor>

</gmd:otherConstraints>

</gmd:MD\_LegalConstraints>

</gmd:resourceConstraints>

*Example 3: Distribution information for Tool download (ISO19139)*

<gmd:resourceConstraints>

<gmd:MD\_LegalConstraints>

<gmd:useConstraints>

<gmd:MD\_RestrictionCode codeList="http://standards.iso.org/iso/19139/resources/gmxCodelists.xml#MD\_RestrictionCode" codeListValue="otherRestrictions"/>

</gmd:useConstraints>

<gmd:otherConstraints>

<gmx:Anchor xlink:href="https://spdx.org/licenses/GPL-3.0-only">GNU General Public License v3.0</gmx:Anchor>

</gmd:otherConstraints>

</gmd:MD\_LegalConstraints>

</gmd:resourceConstraints>

#### Distribution information

|  |  |  |
| --- | --- | --- |
| SRV-BP-2410 | Resource URL [Requirement] | [RD-4], [RD-5], [RD-6] TG Req. 3.7 |
| (Tool) Metadata records shall include an “URL” element describing where the Web user interface can be accessed or where the tool can be downloaded. | | |

*Example 4: Distribution information for Tool download (ISO19139)*

<gmd:distributionInfo>

<gmd:MD\_Distribution>

<gmd:transferOptions>

<gmd:MD\_DigitalTransferOptions>

<gmd:onLine>

<gmd:CI\_OnlineResource>

<gmd:linkage>

<gmd:URL>https://earth.esa.int/eogateway/gut-registration</gmd:URL>

</gmd:linkage>

<gmd:name>

<gco:CharacterString>Download the GOCE User Toolbox</gco:CharacterString>

</gmd:name>

<gmd:function>

<gmd:CI\_OnLineFunctionCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_OnLineFunctionCode" codeListValue="download"/>

</gmd:function>

</gmd:CI\_OnlineResource>

</gmd:onLine>

</gmd:MD\_DigitalTransferOptions>

</gmd:transferOptions>

</gmd:MD\_Distribution>

</gmd:distributionInfo>

*Example 5: Distribution information for Web User Interface (ISO19139)*

<gmd:distributionInfo>

<gmd:MD\_Distribution>

<gmd:transferOptions>

<gmd:MD\_DigitalTransferOptions>

<gmd:onLine>

<gmd:CI\_OnlineResource>

<gmd:linkage>

<gmd:URL>https://lpdaacsvc.cr.usgs.gov/appeears/</gmd:URL>

</gmd:linkage>

<gmd:name>

<gco:CharacterString>AppEEARS Landing Page</gco:CharacterString>

</gmd:name>

<gmd:function>

<gmd:CI\_OnLineFunctionCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_OnLineFunctionCode" codeListValue="information"/>

</gmd:function>

</gmd:CI\_OnlineResource>

</gmd:onLine>

</gmd:MD\_DigitalTransferOptions>

</gmd:transferOptions>

</gmd:MD\_Distribution>

</gmd:distributionInfo>

|  |  |  |
| --- | --- | --- |
| SRV-BP-2420 | ISO19139 access point information [Requirement] | TG Req. 3.7  [RD-6] |
| Service/tool metadata records in ISO19139:2007 [RD-9] format shall include access point information encoded according to §4.1.3 of [RD-6]. | | |

*Example 6: Distribution information for Access point (ISO19139)*

<gmd:distributionInfo>

<gmd:MD\_Distribution>

<gmd:transferOptions>

<gmd:MD\_DigitalTransferOptions>

<gmd:onLine>

<gmd:CI\_OnlineResource>

<gmd:linkage>

<gmd:URL>https://datacube.pdgs.eo.esa.int/wcs?service=WCS&amp;Request=DescribeCoverage&amp;version=2.0.0&amp;CoverageId=LE7\_RGB</gmd:URL>

</gmd:linkage>

<gmd:protocol>

<gco:CharacterString>OGC:WCS:DescribeCoverage</gco:CharacterString>

</gmd:protocol>

<gmd:description>

<gmx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/OnLineDescriptionCode/accessPoint">accessPoint</gmx:Anchor>

</gmd:description>

<gmd:function>

<gmd:CI\_OnLineFunctionCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_OnLineFunctionCode" codeListValue="information"/>

</gmd:function>

</gmd:CI\_OnlineResource>

</gmd:onLine>

<gmd:onLine>

<gmd:CI\_OnlineResource>

<gmd:linkage>

<gmd:URL>https://datacube.pdgs.eo.esa.int/wcs?service=WCS&amp;Request=GetCapabilities&amp;version=2.0.0</gmd:URL>

</gmd:linkage>

<gmd:protocol>

<gmx:Anchor xlink:href="http://www.opengis.net/def/serviceType/ogc/wcs/2.0">

OGC:WCS:GetCapabilities</gmx:Anchor>

</gmd:protocol>

<gmd:description>

<gmx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/OnLineDescriptionCode/accessPoint">accessPoint</gmx:Anchor>

</gmd:description>

<gmd:function>

<gmd:CI\_OnLineFunctionCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_OnLineFunctionCode" codeListValue="information"/>

</gmd:function>

</gmd:CI\_OnlineResource>

</gmd:onLine>

</gmd:MD\_DigitalTransferOptions>

</gmd:transferOptions>

</gmd:MD\_Distribution>

</gmd:distributionInfo>

OGC API compliant endpoints can be encoded as links (<gmd:CI\_OnlineResource/>) with “rel” (<gmd:protocol/>) and “href” (<gmd:linkage/>) as defined in OGC API – Processes [RD-36].

*Example 7: Distribution information for OGC API - Processes (ISO19139)*

<gmd:distributionInfo>

<gmd:MD\_Distribution>

<gmd:transferOptions>

<gmd:MD\_DigitalTransferOptions>

<gmd:onLine>

<gmd:CI\_OnlineResource>

<gmd:linkage>

<gmd:URL> https://facility.org/processes/NdviProcess/execution</gmd:URL>

</gmd:linkage>

<gmd:protocol> <gco:CharacterString>http://www.opengis.net/def/rel/ogc/1.0/execute</gco:CharacterString>

</gmd:protocol>

<gmd:description>

<gmx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/OnLineDescriptionCode/accessPoint">accessPoint</gmx:Anchor>

</gmd:description>

<gmd:function>

<gmd:CI\_OnLineFunctionCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_OnLineFunctionCode" codeListValue="information"/>

</gmd:function>

</gmd:CI\_OnlineResource>

</gmd:onLine>

</gmd:MD\_DigitalTransferOptions>

</gmd:transferOptions>

</gmd:MD\_Distribution>

</gmd:distributionInfo>

|  |  |  |
| --- | --- | --- |
| SRV-BP-2430 | No online access [Recommendation] | [RD-4], [RD-5], [RD-6] TG req. 3.7 |
| Metadata records should include an “resource locator“ element providing access to additional information about the tool or service if no online access is available. | | |

*Example 8: Distribution information when no online access (ISO19139)*

<gmd:distributionInfo>

<gmd:MD\_Distribution>

<gmd:transferOptions>

<gmd:MD\_DigitalTransferOptions>

<gmd:onLine>

<gmd:CI\_OnlineResource>

<gmd:linkage>

<gmd:URL> https://earth.esa.int/eogateway/documents/20142/37627/GOCE-User-Toolbox-Tutorial-P-Knudsen.pdf</gmd:URL>

</gmd:linkage>

<gmd:name>

<gco:CharacterString>GOCE User Toolbox and Tutorial</gco:CharacterString>

</gmd:name>

<gmd:function>

<gmd:CI\_OnLineFunctionCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_OnLineFunctionCode" codeListValue="information"/>

</gmd:function>

</gmd:CI\_OnlineResource>

</gmd:onLine>

</gmd:MD\_DigitalTransferOptions>

</gmd:transferOptions>

</gmd:MD\_Distribution>

</gmd:distributionInfo>

#### Quality information

|  |  |  |
| --- | --- | --- |
| SRV-BP-2510 | Technical specification [Recommendation] | [RD-6] TG Req. 5.5, C.20, C.21 |
| Metadata records for online services (API) in ISO19139:2007 [RD-9] format should declare compliance with at least one technical specification providing all technical elements to actually invoke the service and enable its usage. | | |

*Example 9: Compliance information for Access point (ISO19139)*

<gmd:dataQualityInfo>

<gmd:DQ\_DataQuality>

<gmd:scope>

<gmd:DQ\_Scope>

<gmd:level>

<gmd:MD\_ScopeCode codeList="http://standards.iso.org/iso/19139/resources/gmxCodelists.xml#MD\_ScopeCode" codeListValue="service"/>

</gmd:level>

<gmd:levelDescription>

<gmd:MD\_ScopeDescription>

<gmd:other>

<gco:CharacterString>Service</gco:CharacterString>

</gmd:other>

</gmd:MD\_ScopeDescription>

</gmd:levelDescription>

</gmd:DQ\_Scope>

</gmd:scope>

<gmd:report>

<gmd:DQ\_DomainConsistency>

<gmd:result>

<gmd:DQ\_ConformanceResult>

<gmd:specification>

<gmd:CI\_Citation>

<gmd:title>

<gmx:Anchor xlink:href="http://docs.opengeospatial.org/is/17-089r1/17-089r1.html">OGC Web Coverage Service 2.0</gmx:Anchor>

</gmd:title>

<gmd:date>

<gmd:CI\_Date>

<gmd:date>

<gco:Date>2010-10-27</gco:Date>

</gmd:date>

<gmd:dateType>

<gmd:CI\_DateTypeCode codeList="http://standards.iso.org/iso/19139/resources/gmxCodelists.xml#CI\_DateTypeCode" codeListValue="publication">publication</gmd:CI\_DateTypeCode>

</gmd:dateType>

</gmd:CI\_Date>

</gmd:date>

</gmd:CI\_Citation>

</gmd:specification>

<gmd:explanation>

<gco:CharacterString>This Spatial Data Service is conformant with the OGC Web Coverage Service 2.0 specification</gco:CharacterString>

</gmd:explanation>

<gmd:pass gco:nilReason=”unknown”/>

</gmd:DQ\_ConformanceResult>

</gmd:result>

</gmd:DQ\_DomainConsistency>

</gmd:report>

</gmd:DQ\_DataQuality>

</gmd:dataQualityInfo>

#### Service coupling

|  |  |  |
| --- | --- | --- |
| SRV-BP-2610 | DataIdentification id attribute [Recommendation] | TG Rec. 1.1,  TG Req. 3.6 [RD-6] |
| <gmd:MD\_DataIdentification/> sections of collection metadata records in ISO19139:2007 [RD-7B] format should have a unique “id” attribute (e.g. equal to the “fileIdentifier”[[8]](#footnote-8)) to allow for linking from services/tools metadata records to collection metadata records as per TG Rec. 1.1 and TG Req. 3.6 [RD-6]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-2620 | Service to collection coupling [Recommendation] | TG Rec. 1.1,  TG Req. 3.6 [RD-6] |
| Service metadata records in ISO19139:2007 [RD-7B] format should refer to online metadata records consumed or provided by the service using “srv:operatesOn” as per TG Req. 3.6 [RD-6]. | | |

*Example 10: Reference to related collections (ISO19139)*

<srv:operatesOn xlink:href="https://cat.ceos.org/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/vnd.iso.19139-2%2Bxml#LANDSAT.ETM.GTC"/>

#### Metadata information

|  |  |  |
| --- | --- | --- |
| SRV-BP-2710 | Metadata information [Recommendation] | TG Req. C.5, C.6, C.7 [RD-6] |
| Service/tool metadata records in ISO19139 format should encode the following metadata information properties of the metadata model defined in 3.2.6 as shown in the example below:   * Metadata point of contact (<gmd:contact/>) * Latest update date (<gmd:dateStamp/>) * Metadata language (<gmd:language/>) | | |

*Example 11: Metadata information (ISO19139)*

<?xml version="1.0" encoding="UTF-8"?>

<gmd:MD\_Metadata xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gmi="http://www.isotc211.org/2005/gmi" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:gmx="http://www.isotc211.org/2005/gmx" xmlns:srv="http://www.isotc211.org/2005/srv" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

<gmd:fileIdentifier>

<gco:CharacterString>eo-pdgs-landsat-datacube</gco:CharacterString>

</gmd:fileIdentifier>

<gmd:language>

<gmd:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/" codeListValue="eng"/>

</gmd:language>

<gmd:hierarchyLevel>

<gmd:MD\_ScopeCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#MD\_ScopeCode" codeListValue="service">service</gmd:MD\_ScopeCode>

</gmd:hierarchyLevel>

<gmd:hierarchyLevelName>

<gco:CharacterString>Service</gco:CharacterString>

</gmd:hierarchyLevelName>

<gmd:contact>

<gmd:CI\_ResponsibleParty>

<gmd:organisationName>

<gco:CharacterString>ESA/ESRIN</gco:CharacterString>

</gmd:organisationName>

<gmd:contactInfo>

<gmd:CI\_Contact>

<gmd:phone>

<gmd:CI\_Telephone>

<gmd:voice>

<gco:CharacterString>tel:+39 06 94180777</gco:CharacterString>

</gmd:voice>

</gmd:CI\_Telephone>

</gmd:phone>

<gmd:address>

<gmd:CI\_Address>

<gmd:deliveryPoint>

<gco:CharacterString>Via Galileo Galilei CP. 64</gco:CharacterString>

</gmd:deliveryPoint>

<gmd:city>

<gco:CharacterString>Frascati</gco:CharacterString>

</gmd:city>

<gmd:postalCode>

<gco:CharacterString>00044</gco:CharacterString>

</gmd:postalCode>

<gmd:country>

<gco:CharacterString>Italy</gco:CharacterString>

</gmd:country>

<gmd:electronicMailAddress>

<gco:CharacterString>eohelp@eo.esa.int</gco:CharacterString>

</gmd:electronicMailAddress>

</gmd:CI\_Address>

</gmd:address>

<gmd:onlineResource>

<gmd:CI\_OnlineResource>

<gmd:linkage>

<gmd:URL>https://earth.esa.int</gmd:URL>

</gmd:linkage>

</gmd:CI\_OnlineResource>

</gmd:onlineResource>

</gmd:CI\_Contact>

</gmd:contactInfo>

<gmd:role>

<gmd:CI\_RoleCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_RoleCode" codeListValue="pointOfContact">pointOfContact</gmd:CI\_RoleCode>

</gmd:role>

</gmd:CI\_ResponsibleParty>

</gmd:contact>

<gmd:dateStamp>

<gco:DateTime>2019-05-15T09:00:00</gco:DateTime>

</gmd:dateStamp>

<gmd:metadataStandardName>

<gco:CharacterString>ISO19115</gco:CharacterString>

</gmd:metadataStandardName>

<gmd:metadataStandardVersion>

<gco:CharacterString>2005/Cor.1:2006</gco:CharacterString>

</gmd:metadataStandardVersion>

#### Descriptive keywords

|  |  |  |
| --- | --- | --- |
| SRV-BP-2810 | Descriptive keywords [Recommendation] |  |
| Service/tool metadata records in ISO19139 format should encode descriptive keywords as shown in the example below. | | |

*Example 12: Descriptive Keywords (ISO19139)*

<gmd:descriptiveKeywords>

<gmd:MD\_Keywords>

<gmd:keyword>

<gmx:Anchor xlink:href="https://earth.esa.int/concept/landsat-7">Landsat-7</gmx:Anchor>

</gmd:keyword>

<gmd:keyword>

<gmx:Anchor xlink:href="https://earth.esa.int/concept/landsat-8">Landsat-8</gmx:Anchor>

</gmd:keyword>

<gmd:type>

<gmd:MD\_KeywordTypeCode codeList="http://www.isotc211.org/2005/resources/codeList.xml#MD\_KeywordTypeCode" codeListValue="theme"/>

</gmd:type>

<gmd:thesaurusName>

<gmd:CI\_Citation>

<gmd:title>

<gmx:Anchor xlink:href="https://earth.esa.int/concepts/concept\_scheme/platforms">EO Parameter Code List - Platforms</gmx:Anchor>

</gmd:title>

<gmd:date>

<gmd:CI\_Date>

<gmd:date>

<gco:Date>2018</gco:Date>

</gmd:date>

<gmd:dateType>

<gmd:CI\_DateTypeCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_DateTypeCode" codeListValue="publication">publication</gmd:CI\_DateTypeCode>

</gmd:dateType>

</gmd:CI\_Date>

</gmd:date>

<gmd:identifier>

<gmd:MD\_Identifier>

<gmd:code>

<gco:CharacterString/>

</gmd:code>

</gmd:MD\_Identifier>

</gmd:identifier>

</gmd:CI\_Citation>

</gmd:thesaurusName>

</gmd:MD\_Keywords>

</gmd:descriptiveKeywords>

#### Extent information

|  |  |  |
| --- | --- | --- |
| SRV-BP-2910 | Temporal extent [Recommendation] | [RD-6] TG Req. C.14 |
| Metadata records in ISO19139 encoding should describe 0 to n temporal extents only if the service or tool has an explicit temporal extent as shown in the example below. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-2920 | Geographical extent [Recommendation] | [RD-6] TG Req. C.19 |
| Metadata records in ISO19139 encoding should describe 0 to n minimal geographic bounding boxes only if the service or tool has an explicit geographic extent as shown in the example below. | | |

*Example 13: Temporal and geographical extents (ISO19139)*

<gmd:extent>

<gmd:EX\_Extent>

<gmd:temporalElement>

<gmd:EX\_TemporalExtent>

<gmd:extent>

<gml:TimePeriod xmlns:gml="http://www.opengis.net/gml/3.2" gml:id="timeperiod1">

<gml:beginPosition>2009-01-27</gml:beginPosition>

<gml:endPosition>2011-08-09</gml:endPosition>

</gml:TimePeriod>

</gmd:extent>

</gmd:EX\_TemporalExtent>

</gmd:temporalElement>

</gmd:EX\_Extent>

</gmd:extent>

<!-- Geographic Extent -->

<gmd:extent>

<gmd:EX\_Extent>

<gmd:geographicElement>

<gmd:EX\_GeographicBoundingBox>

<gmd:westBoundLongitude>

<gco:Decimal>-100</gco:Decimal>

</gmd:westBoundLongitude>

<gmd:eastBoundLongitude>

<gco:Decimal>160</gco:Decimal>

</gmd:eastBoundLongitude>

<gmd:southBoundLatitude>

<gco:Decimal>-50</gco:Decimal>

</gmd:southBoundLatitude>

<gmd:northBoundLatitude>

<gco:Decimal>40</gco:Decimal>

</gmd:northBoundLatitude>

</gmd:EX\_GeographicBoundingBox>

</gmd:geographicElement>

</gmd:EX\_Extent>

</gmd:extent>

### Atom encoding

#### General

None.

#### Identification information

|  |  |  |
| --- | --- | --- |
| SRV-BP-3210 | identification information [Requirement] |  |
| Service/tool metadata records in <entry/> format shall encode the following mandatory properties of the metadata model defined §3.2.1 as shown in the example below:   * Resource identifier (<dc:identifier/>) * Resource title (<atom:title/>) * Resource abstract (<atom:content/>) * Responsible organisation (<atom:author/>, <atom:contributor/>, <dc:creator/>, <dc:publisher/>) | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-3220 | identification information [Recommendation] |  |
| Service/tool metadata records in Atom <entry/> format should encode the following optional properties of the metadata model defined §3.2.1 as shown in the example below:   * DOI (<atom:link/>) * Last revision date (<atom:updated/>) * Resource version (TBC) | | |

*Example 14: Identification information (Atom)*

<?xml version="1.0" encoding="UTF-8"?>

<atom:feed xmlns:atom="http://www.w3.org/2005/Atom" xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:georss="http://www.georss.org/georss">

<atom:entry>

<atom:content type="html">Backend NetCDF to Zarr service option description for Harmony data transformations. Cannot be chained with other operations from this record.</atom:content>

<atom:title>PO.DAAC harmony-netcdf-to-zarr Service Options</atom:title>

<atom:updated>2021-09-22T15:08:10.803Z</atom:updated>

<dc:identifier>harmony-netcdf-to-zarr</dc:identifier>

<atom:author>

<atom:name>NASA/GSFC/EOS/EOSDIS/EMD</atom:name>

<atom:uri>https://earthdata.nasa.gov/eosdis</atom:uri>

</atom:author>

<dc:date>2021-02-23T03:34:10.803Z/</dc:date>

<atom:category label="EARTH SCIENCE SERVICES &gt; DATA MANAGEMENT/DATA HANDLING &gt; DATA ACCESS/RETRIEVAL" term="https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea"/>

<atom:category label="EARTH SCIENCE SERVICES &gt; DATA MANAGEMENT/DATA HANDLING &gt; DATA INTEROPERABILITY &gt; DATA REFORMATTING" term="https://gcmd.earthdata.nasa.gov/kms/concept/dad75074-b2f7-4cb7-ae02-02d054f18251"/>

<atom:category label="NETCDF-4" term="NETCDF-4"/>

<atom:category label="ZARR" term="ZARR"/>

<atom:id>https://cat.ceos.org/collections/services/items/harmony-netcdf-to-zarr?httpAccept=application/atom%2Bxml</atom:id>

<atom:link href="https://cat.ceos.org/collections/services/items/harmony-netcdf-to-zarr?httpAccept=application/vnd.iso.19139%2Bxml" rel="alternate" title="ISO 19139 metadata" type="application/vnd.iso.19139+xml"/>

<atom:link href="https://cat.ceos.org/collections/services/items/harmony-netcdf-to-zarr?mode=owc" rel="alternate" title="OGC 19-020r1 metadata" type="application/geo+json;profile=&quot;http://www.opengis.net/spec/eopad-geojson/1.0&quot;"/>

<atom:link href="https://cmr.earthdata.nasa.gov/search/services.umm\_json?name=PO.DAAC harmony-netcdf-to-zarr&amp;pretty=true" rel="via" title="UMM JSON format" type="application/vnd.nasa.cmr.umm+json"/>

<atom:link href="https://harmony.earthdata.nasa.gov" rel="describedby" title="This is the harmony root endpoint." type="text/html"/>

<atom:summary type="html"><![CDATA[<table>

</table>

]]></atom:summary>

</atom:entry>

</atom:feed>

DOI of the resource can be included as href attribute of an atom:link (rel=”describedby”), either using the “doi” URI scheme[[9]](#footnote-9), or a URL with <https://doi.org>: prefix (preferred).

*Example 15: Identification information with DOI (Atom)*

<?xml version="1.0" encoding="UTF-8"?>

<atom:feed xmlns:atom="http://www.w3.org/2005/Atom" xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:eo="http://a9.com/-/opensearch/extensions/eo/1.0/" xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/" xmlns:georss="http://www.georss.org/georss" xmlns:os="http://a9.com/-/spec/opensearch/1.1/" xmlns:owc="http://www.opengis.net/owc/1.0" xmlns:referrer="http://a9.com/-/opensearch/extensions/referrer/1.0/" xmlns:semantic="http://a9.com/-/opensearch/extensions/semantic/1.0/" xmlns:sru="http://a9.com/-/opensearch/extensions/sru/2.0/" xmlns:time="http://a9.com/-/opensearch/extensions/time/1.0/">

<atom:entry>

<atom:title>rasdaman - raster data manager</atom:title>

<atom:updated>2021-10-20T16:12:55.511Z</atom:updated>

<dc:identifier>rasdaman</dc:identifier>

<atom:id>https://cat.ceos.org/collections/services/items/rasdaman?httpAccept=application/atom%2Bxml</atom:id>

<atom:link href="https://spdx.org/licenses/GPL-3.0-only.html" rel="license" title="GNU General Public License v3.0"/>

<atom:link href="http://www.rasdaman.org/" rel="describedby" title="Welcome to rasdaman — the world's most flexible and scalable Array / Datacube Engine" type="text/html"/>

<atom:link href="https://doi.org/10.5281/zenodo.1040170" rel="describedby" type="text/html"/>

<atom:link href="https://cat.ceos.org/collections/services/items/rasdaman?httpAccept=application/vnd.iso.19139%2Bxml" rel="alternate" title="ISO 19139 metadata" type="application/vnd.iso.19139+xml"/>

<atom:content type="html">Rasdaman (raster data manager) is an open source array database system, which provides flexible, fast, scalable geo services for multi-dimensional spatio-temporal sensor, image, simulation, and statistics data of unlimited volume. ... data with all geo data in the PostgreSQL database, support for the raster-relevant OGC standards, Reference Implementation for WCS Core and WCPS.</atom:content>

<atom:category label="EARTH SCIENCE SERVICES &gt; DATA MANAGEMENT/DATA HANDLING &gt; DATA ACCESS/RETRIEVAL" term="https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea"/>

<atom:category label="OGC Web Coverage Service 2.0" term="http://www.opengis.net/def/serviceType/ogc/wcs/2.0"/>

<atom:category label="Coverage access service" term="https://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/infoCoverageAccessService"/>

<atom:category label="statistics data" term="statistics data"/>

<atom:category label="rasdaman GmbH" term="rasdaman GmbH"/>

</atom:entry>

</atom:feed>

|  |  |  |
| --- | --- | --- |
| SRV-BP-3230 | File identifier [Recommendation] | [AD-1] |
| Service/tool metadata records in Atom entry format should include a <dc:identifier/> element with a value identical to the corresponding ISO19139 “fileIdentifier”. | | |

#### Constraint information

|  |  |  |
| --- | --- | --- |
| SRV-BP-3310 | Use limitation URL [Recommendation] |  |
| Service/tool metadata records as Atom entry should include conditions applying to access and use available as URL as <atom:link/> with rel=”license” attribute[[10]](#footnote-10). | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-3320 | Use limitation text [Recommendation] |  |
| Service/tool metadata records as Atom entry should include textual conditions applying to access and use not available as URL as <atom:rights/> element. | | |

*Example 16: License information for Tool download (Atom)*

<atom:entry>

<atom:id>https://cat.ceos.org/collections/services/items/coastline-classifier?httpAccept=application/atom%2Bxml</atom:id>

<atom:link href="https://spdx.org/licenses/Apache-2.0" rel="license" title="Apache License 2.0" />

<atom:link href="https://raw.githubusercontent.com/ceos-seo/data\_cube\_notebooks/master/notebooks/water/coastline/Coastline\_Classifier.ipynb" rel="enclosure" title="Download the Notebook" type="application/x-ipynb+json"/>

<atom:title>Coastline Classifier</atom:title>

<atom:updated>2021-03-17T11:41:21.000Z</atom:updated>

<dc:identifier>coastline-classifier</dc:identifier>

</atom:entry>

#### Distribution information

|  |  |  |
| --- | --- | --- |
| SRV-BP-3410 | Tool download [Requirement] |  |
| Service/tool metadata records in Atom format shall include tool download information encoded as <atom:link/> with rel=”enclosure” attribute. | | |

*Example 17: Distribution information for Tool download (Atom)*

<atom:entry>

<atom:id>https://cat.ceos.org/collections/services/items/coastline-classifier</atom:id>

<atom:link href="https://raw.githubusercontent.com/ceos-seo/data\_cube\_notebooks/master/notebooks/water/coastline/Coastline\_Classifier.ipynb" rel="enclosure" title="Download the Notebook" type="application/x-ipynb+json"/>

<atom:summary type="html"><![CDATA[<table>

</table>

]]></atom:summary>

<atom:content type="html">A coastal boundary algorithm is used to classify a given pixel as either coastline or not coastline using a simple binary format. The algorithm makes a classification by examining surrounding pixels and making a determination based on how many pixels around it are water</atom:content>

<atom:title>Coastline Classifier</atom:title>

<atom:updated>2021-03-17T11:41:21.000Z</atom:updated>

<dc:identifier>coastline-classifier</dc:identifier>

<dc:date>1999-01-01T12:00:00.000Z/2003-12-31T11:59:59.000Z</dc:date>

</atom:entry>

|  |  |  |
| --- | --- | --- |
| SRV-BP-3415 | Web GUI URL [Requirement] |  |
| Service/Tool Metadata records in Atom format shall include an “URL” element describing where the Web user interface can be accessed encoded as <atom:link/> with rel=”describes” attribute. | | |

*Example 18: Distribution information for Web User Interface (Atom)*

<atom:entry>

<atom:id>https://cat.ceos.org/collections/services/items/appeears</atom:id>

<atom:link href="https://lpdaacsvc.cr.usgs.gov/appeears/" rel="describes" title="AppEEARS Landing Page" type="text/html"/>

<atom:content type="text">The Application for Extracting and Exploring Analysis Ready Samples (AρρEEARS) offers a simple and efficient way to access..</atom:content>

<atom:title>Application for Extracting and Exploring Analysis Ready Samples</atom:title>

<atom:updated>2021-03-17T11:41:21.000Z</atom:updated>

<atom:rights>Users must have a NASA Earthdata Login account to use the AρρEEARS site and API.</atom:rights>

<dc:identifier>appeears</dc:identifier>

</atom:entry>

|  |  |  |
| --- | --- | --- |
| SRV-BP-3420 | Atom access point information [Requirement] |  |
| Service/tool metadata records in Atom format, for instance included in OpenSearch responses, shall include access point information encoded according to OGC 12-084r2 [RD-18] (<owc:offering/>). | | |

Example 19: *Distribution information for Access point (Atom)*

<?xml version="1.0" encoding="UTF-8"?>

<atom:feed xmlns:atom="http://www.w3.org/2005/Atom" xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:eo="http://a9.com/-/opensearch/extensions/eo/1.0/" xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/" xmlns:georss="http://www.georss.org/georss" xmlns:os="http://a9.com/-/spec/opensearch/1.1/" xmlns:owc="http://www.opengis.net/owc/1.0" xmlns:referrer="http://a9.com/-/opensearch/extensions/referrer/1.0/" xmlns:semantic="http://a9.com/-/opensearch/extensions/semantic/1.0/" xmlns:sru="http://a9.com/-/opensearch/extensions/sru/2.0/" xmlns:time="http://a9.com/-/opensearch/extensions/time/1.0/">

<atom:entry>

<atom:id>https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube?httpAccept=application/atom%2Bxml</atom:id>

<atom:link href="https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube?httpAccept=application/atom%2Bxml" rel="alternate" title="Atom format" type="application/atom+xml"/>

<atom:link href="http://www.opengis.net/def/serviceType/ogc/wcs/2.0" rel="profile" title="OGC Web Coverage Service 2.0"/>

<atom:summary type="html"><![CDATA[<table></table>

]]></atom:summary>

<atom:content type="text">ESA PDGS-DataCube enables multi-temporal and pixel-based access to a subset of the data available in the European Space Agency dissemination services, including Heritage Missions (HM), Third-Party Missions (TPM) and Earth Explorer (EE) data.</atom:content>

<atom:title>Landsat DataCube</atom:title>

<atom:updated>2021-09-24T12:10:29Z</atom:updated>

<dc:identifier>eo-pdgs-landsat-datacube</dc:identifier>

<dc:date>2020-09-29T12:00:00.000Z/</dc:date>

<owc:offering code="http://www.opengis.net/spec/owc-atom/1.0/req/wcs">

<owc:operation code="DescribeCoverage" href="https://datacube.pdgs.eo.esa.int/wcs?service=WCS&amp;Request=DescribeCoverage&amp;version=2.0.0&amp;CoverageId=LE7\_RGB"/>

<owc:operation code="GetCapabilities" href="https://datacube.pdgs.eo.esa.int/wcs?service=WCS&amp;Request=GetCapabilities&amp;version=2.0.0"/>

</owc:offering>

</atom:entry>

</atom:feed>

|  |  |  |
| --- | --- | --- |
| SRV-BP-3430 | Access points [Recommendation] |  |
| Metadata records in Atom format should include an “resource locator“ element providing access to additional information about the tool or service if no online access is available encoded as <atom:link/> with rel=”describedby” attribute. | | |

#### Quality information

|  |  |  |
| --- | --- | --- |
| SRV-BP-3510 | Technical specification [Recommendation] |  |
| Metadata records for online services (API) or tools in Atom format should declare compliance with technical specifications using <atom:link> with rel=”profile” and URI identifying the protocol type as per SRV-BP-0415. | | |

*Note: a similar encoding is used by OGC 12-084r2[[11]](#footnote-11).*

*Example 20: Technical specification (Atom)*

<atom:link href="http://www.opengis.net/def/serviceType/ogc/wcs/2.0" rel="profile" title="OGC Web Coverage Service 2.0"/>

#### Service coupling

|  |  |  |
| --- | --- | --- |
| SRV-BP-3610 | Collection to service coupling [Recommendation] |  |
| Collection metadata records in Atom encoding should identify coupled services/tools as as <atom:link/> with rel=”service” attribute referencing the corresponding service/tool metadata record. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-3620 | Service to collection coupling [Recommendation] |  |
| Service metadata records in Atom format should refer to online collection metadata records consumed or provided by the service with <atom:link/> with rel=”collection” or rel=”related” attribute. | | |

#### Metadata information

|  |  |  |
| --- | --- | --- |
| SRV-BP-3710 | Metadata information [Recommendation] |  |
| Service/tool metadata records in Atom (Entry) format should encode the following metadata information properties of the metadata model defined in 3.2.6 as shown in the example below:   * Metadata point of contact (Not available) * Latest update date (<atom:updated/>) * Metadata language (xml:lang) | | |

*Example 21: Metadata information (Atom)*

<atom:entry xml:lang="en">

…

<atom:updated>2021-03-31T00:00:00.000Z</atom:updated>

</atom:entry>

#### Descriptive keywords

|  |  |  |
| --- | --- | --- |
| SRV-BP-3810 | Atom descriptive keywords [Recommendation] |  |
| Service/tool metadata records in Atom format should include descriptive keywords encoded as <atom:category/>, including the scheme attribute and a URI for the term attribute when available. | | |

*Example 22: Descriptive Keywords (Atom)*

<?xml version="1.0" encoding="UTF-8"?>

<atom:feed xmlns:atom="http://www.w3.org/2005/Atom" xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:georss="http://www.georss.org/georss">

<atom:entry>

<atom:content type="html">Backend NetCDF to Zarr service option description for Harmony data transformations. Cannot be chained with other operations from this record.</atom:content>

<atom:title>PO.DAAC harmony-netcdf-to-zarr Service Options</atom:title>

<dc:identifier>harmony-netcdf-to-zarr</dc:identifier>

<atom:category label="EARTH SCIENCE SERVICES &gt; DATA MANAGEMENT/DATA HANDLING &gt; DATA ACCESS/RETRIEVAL" term="https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea" scheme=" https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/sciencekeywords"/>

<atom:category label="EARTH SCIENCE SERVICES &gt; DATA MANAGEMENT/DATA HANDLING &gt; DATA INTEROPERABILITY &gt; DATA REFORMATTING" term="https://gcmd.earthdata.nasa.gov/kms/concept/dad75074-b2f7-4cb7-ae02-02d054f18251" scheme="https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/sciencekeywords"/>

<atom:category label="NETCDF-4" term="NETCDF-4"/>

<atom:category label="ZARR" term="ZARR"/>

</atom:entry>

</atom:feed>

#### Extent information

|  |  |  |
| --- | --- | --- |
| SRV-BP-3910 | Geographic extent [Recommendation] | [AD-1] |
| Service/tool metadata records in Atom format should include geographic extent (bounding box) - if applicable - encoded as <georss:\*/> according to the Best Practice CEOS-BP-014E [AD-1]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-3920 | Temporal extent [Recommendation] | [AD-1] |
| Service/tool metadata records in Atom format should include temporal extent if applicable - encoded as <dc:date/> according to the Best Practice CEOS-BP-013B [AD-1]. | | |

*Example 23: Temporal and geographical extents (Atom)*

<atom:entry>

…

<dc:date>2009-01-27T00:00:00.000Z/2011-08-09T23:59:59.999Z</dc:date>

<georss:box> -50 -100 40 160</georss:box>

</atom:entry>

### OGC 19-020r1 GeoJSON encoding

#### General

The OGC 19-020r1 [RD-12] is a GeoJSON encoding derived from the corresponding OGC Best Practice for EO Collection metadata encoding in GeoJSON(-LD) OGC 17-084r1 [RD-30].

#### Identification information

|  |  |  |
| --- | --- | --- |
| SRV-BP-4210 | Identification information [Requirement] | [RD-12], [RD-30] |
| Service/tool metadata records in OGC 19-020r1 (GeoJSON Feature) format shall encode the following mandatory properties of the metadata model defined §3.2.1 as shown in the example below:   * Resource identifier ($.properties.identifier) * Resource title ($.properties.title) * Resource abstract ($.properties.abstract) * Responsible organisation ($.properties.contactPoint) | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-4220 | Identification information [Recommendation] | [RD-12], [RD-30] |
| Service/tool metadata records in OGC 19-020r1 (GeoJSON Feature) format should encode the following optional properties of the metadata model defined §3.2.1 as shown in the example below:   * DOI ($.properties.doi) * Last revision date ($.properties.updated) * Resource version ($.properties.versionInfo) * Resource version description ($.properties.versionNotes) | | |

*Example 24: Identification information (OGC 19-020r1)*

{

"geometry": null,

"id": "https://cat.ceos.org/collections/services/items/rasdaman",

"type": "Feature",

"properties": {

"identifier": "rasdaman",

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "rasdaman - raster data manager",

"doi": "10.5281/zenodo.1040170",

"bibliographicCitation": "Peter Baumann, email: p.baumann@jacobs-university.de, & website: rasdaman.org. (2018, January 31). rasdaman - raster data manager (Version 9.5.0). Zenodo. http://doi.org/10.5281/zenodo.1163021",

"abstract": "Rasdaman (raster data manager) is an open source array database system, which provides flexible, fast, scalable geo services for multi-dimensional spatio-temporal sensor, image, simulation, and statistics data of unlimited volume. ... data with all geo data in the PostgreSQL database, support for the raster-relevant OGC standards, Reference Implementation for WCS Core and WCPS.",

"versionInfo": "9.5",

"updated": "2018-01-31T00:00:55.511Z",

"contactPoint": [

{

"type": "Organization",

"name": "rasdaman GmbH",

"uri": "http://rasdaman.org"

}

]

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-4230 | File identifier [Recommendation] | [AD-1] |
| Service/tool metadata records in OGC 19-020r1 (GeoJSON Feature) format should include a $.properties.identifier element with a value identical to the corresponding ISO19139 “fileIdentifier”. The same applies to the $.id property returned in an OGC API – Features (GeoJSON Feature) response etc. | | |

#### Constraint information

|  |  |  |
| --- | --- | --- |
| SRV-BP-4310 | Use limitation URL [Recommendation] | [RD-12], [RD-30] |
| Service/tool metadata records in OGC 19-020r1 (GeoJSON Feature) format should include conditions applying to access and use with $.properties.license and $.properties.accessRights. | | |

*Example 25: Constraint information for Access point (OGC19-020r1)*

{

"geometry": null,

"type": "Feature",

"id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"properties": {

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "Landsat DataCube",

"identifier": "eo-pdgs-landsat-datacube",

"accessRights": [

{

"type": "RightsStatement",

"label": "No limitations to public access."

},

"http://inspire.ec.europa.eu/metadata-codelist/LimitationsOnPublicAccess/noLimitations"

],

"license": [

"http://inspire.ec.europa.eu/metadata-codelist/ConditionsApplyingToAccessAndUse/noConditionsApply",

{

"type": "LicenseDocument",

"label": "No conditions apply to access and use."

}

]

}

}

*Example 26: License information for Tool download (OGC19-020r1)*

{

"geometry": null,

"id": "https://cat.ceos.org/collections/services/items/coastline-classifier",

"type": "Feature",

"properties": {

"identifier": "coastline-classifier",

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "Coastline Classifier",

"license": [

"https://spdx.org/licenses/Apache-2.0"

]

}

}

#### Distribution information

|  |  |  |
| --- | --- | --- |
| SRV-BP-4410 | GeoJSON tool download [Requirement] | [RD-12], [RD-30] |
| Service/tool metadata records in GeoJSON format shall include tool download information ($.properties.link.data). | | |

*Example 27: Distribution information for Tool download (OGC19-020r1)*

{

"geometry": null,

"id": "https://cat.ceos.org/collections/services/items/coastline-classifier",

"type": "Feature",

"properties": {

"identifier": "coastline-classifier",

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "Coastline Classifier",

"links": {

"data": [

{

"href": "https://raw.githubusercontent.com/ceos-seo/data\_cube\_notebooks/master/notebooks/water/coastline/Coastline\_Classifier.ipynb",

"title": "Download the Notebook",

"type": "application/x-ipynb+json"

}

]

}

}

}

*Example 28: Distribution information for Container (OGC19-020r1)*

{

"geometry": null,

"id": "https://cat.ceos.org/collections/services/items/rasdaman",

"type": "Feature",

"properties": {

"identifier": "rasdaman",

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "rasdaman - raster data manager",

"abstract": "Rasdaman (raster data manager) is an open source array database system, which provides flexible, fast, scalable geo services for multi-dimensional spatio-temporal sensor, image, simulation, and statistics data of unlimited volume. ... data with all geo data in the PostgreSQL database, support for the raster-relevant OGC standards, Reference Implementation for WCS Core and WCPS.",

"offerings": [

{

"type": "Offering",

"code": "http://www.opengis.net/spec/eopad-geojson/1.0/req/docker/image",

"contents": [

{

"type": "text/plain",

"content": "arpasmr/rasdaman:latest"

}

]

}

]

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-4415 | Web GUI URL [Requirement] | [RD-12], [RD-30] |
| Service/Tool metadata records in GeoJSON format shall include an “URL” element describing where the Web user interface can be accessed encoded as $.properties.links.describes (i.e. equivalent to link with rel=”describes” attribute. | | |

*Example 29: Distribution information for Web User Interface (OGC19-020r1)*

{

"geometry": null,

"id": "https://cat.ceos.org/collections/services/items/appeears",

"type": "Feature",

"properties": {

"identifier": "appeears",

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "Application for Extracting and Exploring Analysis Ready Samples",

"abstract": "The Application for Extracting and Exploring Analysis Ready Samples (AρρEEARS) offers a simple and efficient way to access..",

"links": {

"describes": [

{

"href": "https://lpdaacsvc.cr.usgs.gov/appeears/",

"title": "AppEEARS Landing Page",

"type": "text/html"

}

]

}

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-4420 | GeoJSON access point information [Requirement] | [RD-19] |
| Service/tool metadata records in GeoJSON format shall include access point information encoded according to OGC 14-055r2 [RD-19] (“offerings”). | | |

*Example 30: Distribution information for Access point (OGC19-020r1)*

{

"geometry": null,

"id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"type": "Feature",

"properties": {

"identifier": "eo-pdgs-landsat-datacube",

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "Landsat DataCube",

"offerings": [

{

"code": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs",

"operations": [

{

"code": "DescribeCoverage",

"method": "GET",

"href": "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=DescribeCoverage&version=2.0.0&CoverageId=LE7\_RGB",

"type": "text/xml"

},

{

"code": "GetCapabilities",

"method": "GET",

"href": "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetCapabilities&version=2.0.0",

"type": "text/xml"

}

]

}

],

...

}

}

OGC API compliant endpoints can be encoded as links with “rel” and “href” attributes as defined in OGC API – Processes [RD-36].

*Example 31: Distribution information for OGC API - Processes (OGC19-020r1)*

{

...

"links": {

"http://www.opengis.net/def/rel/ogc/1.0/execute": [

{

"href": "https://facility.org/processes/NdviProcess/execution",

"title": "Execution endpoint"

}

]

}

...

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-4430 | No online access [Recommendation] | [RD-12], [RD-30] |
| Metadata records should include an “resource locator“ element providing access to additional information about the tool or service if no online access is available, using the “describedby” relation. | | |

*Example 32: Distribution information when no online access (OGC19-020r1)*

{

"geometry": null,

"id": "https://cat.ceos.org/collections/services/items/goce-user-toolbox",

"type": "Feature",

"properties": {

"identifier": "goce-user-toolbox",

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "GOCE User Toolbox",

"links": {

"describedby": [

{

"href": "https://earth.esa.int/eogateway/documents/20142/37627/GOCE-User-Toolbox-Tutorial-P-Knudsen.pdf",

"title": "GOCE User Toolbox and Tutoral",

"type": "application/pdf"

}

]

}

}

}

#### Quality information

|  |  |  |
| --- | --- | --- |
| SRV-BP-4510 | Technical specification [Recommendation] | [RD-6] TG Req. 5.5, C.20, C.21 |
| Metadata records for online services (API) in OGC 19-020r1 format should declare compliance with technical specifications providing all technical elements to actually invoke the service and enable its usage, using the “wasUsedBy” pattern shown below and also used by GeoDCAT-AP. | | |

*Example 33: Compliance information for Access point (OGC19-020r1)*

{

"type": "Feature",

"id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"properties": {

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "Landsat DataCube",

"identifier": "eo-pdgs-landsat-datacube",

"wasUsedBy": [

{

"type": "Activity",

"generated": {

"type": "Entity",

"degree": "http://inspire.ec.europa.eu/metadata-codelist/DegreeOfConformity/conformant",

"description": "See the referenced specification"

},

"qualifiedAssociation": {

"type": "Association",

"hadPlan": {

"type": "Plan",

"wasDerivedFrom": {

"type": "Standard",

"title": "COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services",

"issued": "2010-12-08T00:00:00Z"

}

}

}

}

]

}

}

#### Service coupling

|  |  |  |
| --- | --- | --- |
| SRV-BP-4610 | Collection to service coupling [Recommendation] |  |
| Collection metadata records in GeoJSON Feature encoding should identify coupled services/tools as $.properties.links.service[\*] (OGC 17-084r1) or $.link[\*] with rel=”service” attribute (OGC API - Features) referencing the corresponding service/tool metadata record. | | |

#### Metadata information

|  |  |  |
| --- | --- | --- |
| SRV-BP-4710 | Metadata information [Recommendation] | [RD-12], [RD-30] |
| Service/tool metadata records in OGC 19-020r1 (GeoJSON Feature) format should encode the following metadata information properties of the metadata model defined in 3.2.6 as shown in the example below:   * Metadata point of contact ($.properties.isPrimaryTopicOf.contactPoint) * Latest update date ($.properties.isPrimaryTopicOf.updated) * Metadata language ($.properties.isPrimaryTopicOf.lang) | | |

*Example 34: Metadata information (OGC 19-020r1)*

{

"geometry": null,

"id": "https://cat.ceos.org/collections/services/items/rasdaman",

"type": "Feature",

"properties": {

"identifier": "rasdaman",

"isPrimaryTopicOf": {

"created": "2021-10-20T16:12:55.511Z",

"type": "CatalogRecord",

"lang": "en",

"updated": "2021-10-20T16:12:55.511Z",

"contactPoint": [

{

"type": "Organization",

"name": "Committee on Earth Observation Satellites",

"uri": "https://ceos.org"

}

]

}

}

}

#### Descriptive keywords

|  |  |  |
| --- | --- | --- |
| SRV-BP-4810 | Descriptive keywords [Recommendation] | [RD-12], [RD-30] |
| Service/tool metadata records in OGC 19-020r1 (GeoJSON Feature) format should encode descriptive keywords with $.properties.categories (preferred) or $.properties.keyword as shown in the example below. | | |

*Example 35: Descriptive Keywords (OGC19-020r1)*

{

"geometry": null,

"id": "https://cat.ceos.org/collections/services/items/rasdaman",

"type": "Feature",

"properties": {

"identifier": "rasdaman",

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "rasdaman - raster data manager",

"categories": [

{

"scheme": "https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/sciencekeywords",

"term": "https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea",

"label": "EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > DATA ACCESS/RETRIEVAL"

},

{

"scheme": "https://inspire.ec.europa.eu/metadata-codelist/ProtocolValue",

"term": "http://www.opengis.net/def/serviceType/ogc/wcs/2.0",

"label": "OGC Web Coverage Service 2.0"

},

{

"scheme": "http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory",

"term": "https://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/infoCoverageAccessService",

"label": "Coverage access service"

}

],

"keyword": [

"Big Data",

"OGC",

"WMS",

"WCS",

"WCS-T",

"WCPS"

]

}

}

#### Extent information

|  |  |  |
| --- | --- | --- |
| SRV-BP-4910 | Geographic extent [Recommendation] | [RD-29] |
| Service/tool metadata records in GeoJSON format should include geographic extent (bounding box) - if applicable - encoded as “$.bbox” or “$.geometry” according to the GeoJSON specification [RD-29]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-4920 | Temporal extent [Recommendation] | [RD-19] |
| Service/tool metadata records in GeoJSON format should include temporal extent if applicable - encoded as $.properties.date according to [RD-19]. | | |

*Example 36: Temporal and geographical extents* (OGC 19-020r1)

{

"type": "Feature",

"bbox": [ -100, -50, 160, 40 ],

"geometry": {

"coordinates": [

[

[

-100,

-50

],

[

160,

-50

],

[

160,

40

],

[

-100,

40

],

[

-100,

-50

]

]

],

"type": "Polygon"

},

"properties": {

"date": "2009-01-27T00:00:00.000Z/2011-08-09T23:59:59.999Z",

…

}

}

### GeoDCAT-AP encoding

#### General

GeoDCAT-AP [RD-10] is based on DCAT [RD-37]. It provides an RDF vocabulary and the corresponding RDF syntax bindings (JSON-LD, RDF/XML, Turtle) for the union of metadata elements of the core profile of ISO 19115:2003 and those defined in the framework of the INSPIRE Directive of the European Union.

#### Identification information

|  |  |  |
| --- | --- | --- |
| SRV-BP-5210 | Identification information [Requirement] | [RD-10] |
| Service/tool metadata records in GeoDCAT-AP format shall encode the following mandatory properties of the metadata model as shown in the example below:   * Resource identifier (dct:identifier) * Resource title (dct:title) * Resource abstract (dct:description) * Responsible organisation (e.g. dcat:contactPoint) | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-5220 | Identification information [Recommendation] | [RD-10] |
| Service/tool metadata records in GeoDCAT-AP format should encode the following optional properties of the metadata model as shown in the example below:   * DOI (adms:identifier) * Last revision date (dct:modified) * Resource version (owl:versionInfo) * Resource version description (adms:versionNotes) | | |

*Example 37: Identification information (GeoDCAT-AP)*

{

"@context": {

"void": "http://rdfs.org/ns/void#",

"adms": "http://www.w3.org/ns/adms#",

"gsp": "http://www.opengis.net/ont/geosparql#",

"owl": "http://www.w3.org/2002/07/owl#",

"skos": "http://www.w3.org/2004/02/skos/core#",

"rdfs": "http://www.w3.org/2000/01/rdf-schema#",

"vcard": "http://www.w3.org/2006/vcard/ns",

"dct": "http://purl.org/dc/terms/",

"iana": "http://www.iana.org/assignments/relation/",

"owc": "http://www.opengis.net/ont/owc/1.0/",

"dcat": "http://www.w3.org/ns/dcat#",

"atom": "http://www.w3.org/2005/Atom",

"locn": "http://www.w3.org/ns/locn#",

"prov": "http://www.w3.org/ns/prov#",

"foaf": "http://xmlns.com/foaf/0.1/"

},

"@type": "dcat:DataService",

"dct:type": {

"@id": "http://inspire.ec.europa.eu/metadata-codelist/ResourceType/service"

},

"dct:title": "rasdaman - raster data manager",

"@id": "https://cat.ceos.org/collections/services/items/rasdaman?httpAccept=application/ld%2Bjson",

"owl:versionInfo": "9.5",

"dct:identifier": "rasdaman",

"adms:identifier": {

"@type": "adms:Identifier",

"dct:creator": {

"@id": "https://doi.org/"

},

"skos:notation": "https://doi.org/10.5281/zenodo.1040170"

},

"dct:modified": "2018-01-31T00:00:55.511Z",

"dct:description": "Rasdaman (raster data manager) is an open source array database system, which provides flexible, fast, scalable geo services for multi-dimensional spatio-temporal sensor, image, simulation, and statistics data of unlimited volume. ... data with all geo data in the PostgreSQL database, support for the raster-relevant OGC standards, Reference Implementation for WCS Core and WCPS.",

"dcat:contactPoint": {

"@type": "vcard:Organization",

"vcard:hasName": {

"@value": "rasdaman GmbH",

"@language": "en"

},

"vcard:hasURL": {

"@id": "http://rasdaman.org"

}

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-5230 | File identifier [Recommendation] | [AD-1] |
| Service/tool metadata records in GeoDCAT-AP format should include a dct:identifier element with a value identical to the corresponding ISO19139 “fileIdentifier”. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-5235 | Spatial resolution [Recommendation] | [RD-10] |
| Metadata records should express restriction on the spatial resolution if the service or tool has such restriction using dcat:spatialResolutionInMeters or dqv:hasQualityMeasurement as defined in §A.2 of [RD-10]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-5240 | CRS identifier [Recommendation] | [RD-10] |
| Metadata records should indicate the CRS supported by the service/tool using identifiers specified in a well-known common register, if the service or tool has such restriction using dct:conformsTo as per [RD-10]. | | |

*Example 38: CRS identifier and spatial resolution (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"dcat:spatialResolutionInMeters": "5000",

"dct:conformsTo": {

"@id": "http://www.opengis.net/def/crs/EPSG/0/4258",

"@type": "dct:Standard",

"skos:inScheme": {

"@id": "http://www.opengis.net/def/crs/OGC"

},

"dct:type": {

"@id": "http://inspire.ec.europa.eu/glossary/SpatialReferenceSystem"

}

}

}

#### Constraint information

|  |  |  |
| --- | --- | --- |
| SRV-BP-5310 | Use limitation URL [Recommendation] | [RD-10] |
| Service/tool metadata records in GeoDCAT-AP format should include conditions applying to access and use with dct:license and dct:accessRights. | | |

*Example 39: Constraint information for Access point (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"@id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"dct:type": {

"@id": "http://purl.org/dc/dcmitype/Service"

},

"dct:title": "Landsat DataCube",

"dct:identifier": "eo-pdgs-landsat-datacube",

"dct:accessRights": [

{

"@type": "RightsStatement",

"rdfs:label": "No limitations to public access."

},

{

"@id" : "http://inspire.ec.europa.eu/metadata-codelist/LimitationsOnPublicAccess/noLimitations"

}

],

"dct:license": [

{

"@id" : "http://inspire.ec.europa.eu/metadata-codelist/ConditionsApplyingToAccessAndUse/noConditionsApply"

},

{

"@type": "LicenseDocument",

"rdfs:label": "No conditions apply to access and use."

}

]

}

*Example 40: License information for Tool download (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"@id": "https://cat.ceos.org/collections/services/items/coastline-classifier",

"dct:identifier": "coastline-classifier",

"dct:type": {

"@id": "http://purl.org/dc/dcmitype/Service"

},

"dct:title": "Coastline Classifier",

"dct:license": [

{

"@id": "https://spdx.org/licenses/Apache-2.0"

}

]

}

#### Distribution information

|  |  |  |
| --- | --- | --- |
| SRV-BP-5410 | GeoDCAT-AP tool download [Requirement] | [RD-10] |
| Service/tool metadata records in GeoDCAT-AP format shall include tool download information. | | |

*Example 41: Distribution information for Tool download (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"@id": "https://cat.ceos.org/collections/services/items/coastline-classifier",

"dct:identifier": "coastline-classifier",

"dct:type": {

"@id": "http://purl.org/dc/dcmitype/Service"

},

"dct:title": "Coastline Classifier",

"dcat:endpointURL": "https://raw.githubusercontent.com/ceos-seo/data\_cube\_notebooks/master/notebooks/water/coastline/Coastline\_Classifier.ipynb"

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-5415 | GeoDCAT-AP Web GUI URL [Requirement] | [RD-10] |
| Service/Tool metadata records in GeoDCAT-AP format shall include an “URL” element describing where the Web user interface can be accessed encoded as dcat:landingPage. | | |

*Example 42: Distribution information for Web User Interface (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"@id": "https://cat.ceos.org/collections/services/items/appeears",

"dct:identifier": "appeears",

"dct:type": {

"@id": "http://purl.org/dc/dcmitype/Service"

},

"dct:title": "Application for Extracting and Exploring Analysis Ready Samples",

"dct:description": "The Application for Extracting and Exploring Analysis Ready Samples (AρρEEARS) offers a simple and efficient way to access..",

"dcat:landingPage": {

"@id": "https://lpdaacsvc.cr.usgs.gov/appeears/"

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-5420 | GeoDCAT-AP access point information [Requirement] | [RD-10] |
| Service/tool metadata records in GeoDCAT-AP format shall include access point information encoded using the “dcat:endpointDescription” property. | | |

*Example 43: Access point information (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"dct:type": {

"@id": "http://purl.org/dc/dcmitype/Service"

},

"dct:identifier": "eo-pdgs-landsat-datacube",

"@id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"dct:title": "Landsat DataCube",

"dcat:endpointURL":“https://datacube.pdgs.eo.esa.int/wcs”,

"dcat:endpointDescription": [

{

"@type": "owc:Offering",

"owc:code": {

"@id": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs"

},

"owc:operations": [

{

"owc:href": "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=DescribeCoverage&version=2.0.0&CoverageId=LE7\_RGB",

"@type": "owc:Operation",

"owc:type": "text/xml",

"owc:code": "DescribeCoverage",

"owc:method": "GET"

},

{

"owc:href": "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetCapabilities&version=2.0.0",

"@type": "owc:Operation",

"owc:type": "text/xml",

"owc:code": "GetCapabilities",

"owc:method": "GET"

}

]

}

]

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-5430 | No online access [Recommendation] | [RD-10] |
| Metadata records in GeoDCAT-AP format should include an “resource locator“ element providing access to additional information about the tool or service if no online access is available using foaf:isPrimaryTopicOf. | | |

*Example 44: Distribution information when no online access (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"@id": "https://cat.ceos.org/collections/services/items/goce-user-toolbox",

"dct:identifier": "goce-user-toolbox",

"dct:type": {

"@id": "http://purl.org/dc/dcmitype/Service"

},

"foaf:isPrimaryTopicOf": [

{

"@type": "foaf:Document",

"@id": "https://earth.esa.int/eogateway/documents/20142/37627/GOCE-User-Toolbox-Tutorial-P-Knudsen.pdf",

"dct:title": "GOCE User Toolbox and Tutoral",

"dct:format": "application/pdf"

}

]

}

#### Quality information

|  |  |  |
| --- | --- | --- |
| SRV-BP-5510 | Technical specification [Recommendation] | [RD-10], [RD-6] TG Req. 5.5, C.20, C.21 |
| Metadata records for online services (API) in GeoDCAT-AP format should declare compliance with technical specifications providing all technical elements to actually invoke the service and enable its usage, using “dcat:conformsto” (with protocol type as per SRV-BP-0415) or the “wasUsedBy” pattern shown below. | | |

*Example 45: Technical specification (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"@id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"dct:type": {

"@id": "http://purl.org/dc/dcmitype/Service"

},

"dct:conformsTo": {

"@id": “http://www.opengis.net/def/serviceType/ogc/wcs/2.0”

}

}

*Example 46: Compliance information for Access point (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"@id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"dct:type": {

"@id": "http://purl.org/dc/dcmitype/Service"

},

"dct:title": "Landsat DataCube",

"dct:identifier": "eo-pdgs-landsat-datacube",

"prov:wasUsedBy": [

{

"@type": "prov:Activity",

"prov:generated": {

"@type": "prov:Entity",

"dct:type": "http://inspire.ec.europa.eu/metadata-codelist/DegreeOfConformity/conformant",

"dct:description": "See the referenced specification"

},

"prov:qualifiedAssociation": {

"@type": "prov:Association",

"prov:hadPlan": {

"@type": "prov:Plan",

"prov:wasDerivedFrom": {

"@type": "dct:Standard",

"dct:title": "COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services",

"dct:issued": "2010-12-08T00:00:00Z"

}

}

}

}

]

}

#### Service coupling

|  |  |  |
| --- | --- | --- |
| SRV-BP-5610 | Coupled resources [Recommendation] | [RD-6] TG Req. 3.6 |
| Service/Tool metadata records in GeoDCAT-AP encoding should identify the target collections of the service/tool as shown in the example below. | | |

*Example 47: Service to Collection coupling (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"dct:type": {

"@id": "http://inspire.ec.europa.eu/metadata-codelist/ResourceType/service"

},

"dct:identifier": "eo-pdgs-landsat-datacube",

"dcat:servesDataset": {

"@type": "dcat:Dataset",

"@id": "https://cat.ceos.org/collections/series/items/LANDSAT.ETM.GTC",

"dct:identifier": "LANDSAT.ETM.GTC"

}

}

#### Metadata information

|  |  |  |
| --- | --- | --- |
| SRV-BP-5710 | Metadata information [Recommendation] | [RD-10] |
| Service/tool metadata records in GeoDCAT-AP format should encode the following metadata information properties of the metadata model defined in 3.2.6 as shown in the example below:   * Metadata point of contact (dcat:contactPoint) * Latest update date (dct:modified) * Metadata language (dct:language) | | |

*Example 48: Metadata information (GeoDCAT-AP)*

{

"@id": "https://cat.ceos.org/collections/services/items/rasdaman",

"@type": "dcat:DataService",

"dct:identifier": "rasdaman",

"foaf:isPrimaryTopicOf": {

"type": "dcat:CatalogRecord",

"dct:conformsTo": {

"@id": "https://joinup.ec.europa.eu/release/geodcat-ap/20",

},

"dct:modified": "2021-10-20T16:12:55.511Z",

"dct:language": {

"@id": "http://publications.europa.eu/resource/authority/language/EN"

},

"dcat:contactPoint": [

{

"@type": "vcard:Organization",

"vcard:organization-name": "Committee on Earth Observation Satellites"

}

]

}

}

#### Descriptive keywords

|  |  |  |
| --- | --- | --- |
| SRV-BP-5810 | GeoDCAT-AP descriptive keywords [Recommendation] | [RD-10] |
| Service/tool metadata records in GeoDCAT-AP format should include descriptive keywords encoded as dcat:theme (preferred) or dcat:keyword. | | |

*Example 49: Descriptive Keywords (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"@id": "https://cat.ceos.org/collections/services/items/rasdaman?httpAccept=application/ld%2Bjson",

"dct:title": "rasdaman - raster data manager",

"dct:type": {

"@id": "http://inspire.ec.europa.eu/metadata-codelist/ResourceType/service"

},

"dct:identifier": "rasdaman",

"dcat:keyword": [

"Big Data",

"OGC",

"WMS",

"WCS",

"WCS-T",

"WCPS"

],

"dcat:theme": [

{

"skos:inScheme": {

"@id": "https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/sciencekeywords"

},

"skos:preflabel": "EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > DATA ACCESS/RETRIEVAL",

"@id": "https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea"

},

{

"skos:inScheme": {

"@id": "https://inspire.ec.europa.eu/metadata-codelist/ProtocolValue"

},

"skos:preflabel": "OGC Web Coverage Service 2.0",

"@id": "http://www.opengis.net/def/serviceType/ogc/wcs/2.0"

},

{

"skos:inScheme": {

"@id": "http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory"

},

"skos:preflabel": "Coverage access service",

"@id": "https://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/infoCoverageAccessService"

}

]

}

#### Extent information

|  |  |  |
| --- | --- | --- |
| SRV-BP-5910 | Geographic extent [Recommendation] | [RD-10] |
| Service/tool metadata records in GeoDCAT-AP format should include geographic extent (bounding box) - if applicable - encoded with dct:spatial, dcat:bbox and locn:geometry according to the GeoDCAT-AP specification [RD-10]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-5920 | Temporal extent [Recommendation] | [RD-10] |
| Service/tool metadata records in GeoDCAT-AP format should include temporal extent if applicable - encoded as dct:temporal according to [RD-25]. | | |

*Example 50: Temporal and geographical extents (GeoDCAT-AP)*

{

"@type": "dcat:DataService",

"bbox": [ -100, -50, 160, 40 ],

"dct:spatial": {

"@type": "dct:location",

"dcat:bbox": [

{

"@value": "POLYGON((-100.0 -50.0,160.0 -50.0,160.0 40.0,-100.0 40.0,-100.0 -50.0))",

"@type": "gsp:wktLiteral"

},

],

"locn:geometry": [

{

"@value": "{\"type\":\"Polygon\",\"coordinates\":[[[-100,-50],[160,-50],[160,40],[-100,40],[-100,-50]]] }",

"@type": "gsp:geoJSONLiteral"

},

{

"@value": "POLYGON((-100.0 -50.0,160.0 -50.0,160.0 40.0,-100.0 40.0,-100.0 -50.0))",

"@type": "gsp:wktLiteral"

},

{

"@value": "<gml:Envelope srsName=\"http://www.opengis.net/def/crs/OGC/1.3/CRS84\"><gml:lowerCorner>-100.0 -50.0</gml:lowerCorner><gml:upperCorner>160.0 40.0</gml:upperCorner></gml:Envelope>",

"@type": "gsp:gmlLiteral"

}

]

},

"dct:temporal": {

"@type": "dct:PeriodOfTime",

"dcat:startDate": {

"@value": "2009-01-27T00:00:00.000Z",

"@type": "xsd:date"

},

"dcat:endDate": {

"@value": "2011-08-09T23:59:59.999Z",

"@type": "xsd:date"

}

}

}

### Schema.org encoding

#### General

None.

#### Identification information

|  |  |  |
| --- | --- | --- |
| SRV-BP-6210 | identification information [Requirement] |  |
| Service/tool metadata records in schema.org format shall encode the following mandatory properties of the metadata model defined §3.2.1 as shown in the example below:   * Resource identifier (identifier) * Resource title (name) * Resource abstract (description) * Responsible organisation (e.g. provider) | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-6220 | identification information [Recommendation] |  |
| Service/tool metadata records in schema.org format should encode the following optional properties of the metadata model defined §3.2.1 as shown in the example below:   * DOI (identifier) * Last revision date (dateModified) * Resource version (version) | | |

*Example 51: Identification information (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"name": "rasdaman - raster data manager",

"@id": "https://cat.ceos.org/collections/services/items/rasdaman",

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"description": "Rasdaman (raster data manager) is an open source array database system, which provides flexible, fast, scalable geo services for multi-dimensional spatio-temporal sensor, image, simulation, and statistics data of unlimited volume. ... data with all geo data in the PostgreSQL database, support for the raster-relevant OGC standards, Reference Implementation for WCS Core and WCPS.",

"alternateName": "rasdaman",

"version": "9.5",

"dateModified": "2018-01-31T00:00:55.511Z",

"identifier": [

"rasdaman",

{

"@type": "PropertyValue",

"@id": "https://doi.org/10.5281/zenodo.1040170",

"propertyID": "https://registry.identifiers.org/registry/doi",

"value": "doi:10.5281/zenodo.1040170",

"url": "https://doi.org/10.5281/zenodo.1040170"

}

],

"provider": [

{

"@type": "Organization",

"name": "rasdaman GmbH",

"url": "http://rasdaman.org"

}

]

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-6240 | CRS identifier [Recommendation] | [RD-32] |
| Metadata records in schema.org format should indicate the CRS supported by the service/tool using identifiers specified in a well-known common register, if the service or tool has such restriction using schema:additionalProperty. | | |

*Example 52: CRS identifier (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"additionalProperty": [

{

"@type": "PropertyValue",

"propertyID": "http://inspire.ec.europa.eu/glossary/SpatialReferenceSystem",

"value": "http://www.opengis.net/def/crs/EPSG/0/4258"

}

]

}

[RD-32][[12]](#footnote-12) proposes using “http://dbpedia.org/resource/Spatial\_reference\_system” as “propertyID” to identify the property as a spatial reference system instead.

#### Constraint information

|  |  |  |
| --- | --- | --- |
| SRV-BP-6310 | Use limitation URL [Recommendation] |  |
| Service/tool metadata records in schema.org format should include conditions applying to access and use with license and conditionsOfAccess properties. | | |

*Example 53: Constraint information for Access point (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"@id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"name": "Landsat DataCube",

"identifier": "eo-pdgs-landsat-datacube",

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"conditionsOfAccess": "No limitations to public access.",

"license": [

"http://inspire.ec.europa.eu/metadata-codelist/ConditionsApplyingToAccessAndUse/noConditionsApply",

{

"@type": "CreativeWork",

"description": "No conditions apply to access and use."

}

]

}

*Example 54: License information for Tool download (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"@id": "https://cat.ceos.org/collections/services/items/coastline-classifier",

"name": "Coastline Classifier",

"identifier": [ "coastline-classifier" ],

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"license": [

"https://spdx.org/licenses/Apache-2.0"

]

}

#### Distribution information

|  |  |  |
| --- | --- | --- |
| SRV-BP-6410 | Tool download [Requirement] |  |
| Service/tool metadata records in schema.org format shall include tool download information as DataDownload. | | |

*Example 55: Distribution information for Tool download (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"name": "Coastline Classifier",

"@id": "https://foo.ceos.org/collections/services/items/coastline-classifier",

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"description": "A coastal boundary algorithm is used to classify a given pixel as either coastline or not coastline using a simple binary format. The algorithm makes a classification by examining surrounding pixels and making a determination based on how many pixels around it are water",

"alternateName": "coastline-classifier",

"dateModified": "2021-03-17T11:41:21Z",

"identifier": [

"coastline-classifier"

],

"license": [

"https://spdx.org/licenses/Apache-2.0"

],

"subjectOf": [

{

"@type": "DataDownload",

"contentUrl": "https://raw.githubusercontent.com/ceos-seo/data\_cube\_notebooks/master/notebooks/water/coastline/Coastline\_Classifier.ipynb",

"name": "Download the Notebook",

"encodingFormat": "application/x-ipynb+json"

}

],

"provider": [

{

"@type": "Organization",

"name": "CEOS",

"url": "https://ceos.org"

}

]

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-6415 | Web GUI URL [Requirement] |  |
| Service/Tool metadata records in schema.org format shall include an “URL” element describing where the Web user interface can be accessed encoded as schema:url. | | |

*Example 56: Distribution information for Web User Interface (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"@id": "https://cat.ceos.org/collections/services/items/appeears",

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"name": "Application for Extracting and Exploring Analysis Ready Samples",

"description": "The Application for Extracting and Exploring Analysis Ready Samples (AρρEEARS) offers a simple and efficient way to access..",

"url": "https://lpdaacsvc.cr.usgs.gov/appeears/"

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-6420 | Access point information [Requirement] |  |
| Service/tool metadata records in schema.org format shall include access point information encoded using “schema:potentialAction” and additional “schema:Action” properties. | | |

*Example 57: Access point information (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"name": "Landsat DataCube",

"@id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"identifier": [

"eo-pdgs-landsat-datacube"

],

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"potentialAction": [

{

"identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs",

"@type": "UseAction",

"target": [

{

"identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs#DescribeCoverage",

"@type": "EntryPoint",

"urlTemplate": "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=DescribeCoverage&version=2.0.0&CoverageId=LE7\_RGB",

"description": "DescribeCoverage",

"httpMethod": "GET",

"contentType": [

"text/xml"

]

},

{

"identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs#GetCapabilities",

"@type": "EntryPoint",

"urlTemplate": "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetCapabilities&version=2.0.0",

"description": "GetCapabilities",

"httpMethod": "GET",

"contentType": [

"text/xml"

]

}

]

}

]

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-6430 | No online access [Recommendation] |  |
| Metadata records in schema.org format should include an “resource locator“ element providing access to additional information about the tool or service if no online access is available. | | |

*Example 58: Distribution information when no online access (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"name": "GOCE User Toolbox",

"@id": "https://foo.ceos.org/collections/services/items/goce-user-toolbox",

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"identifier": [

"goce-user-toolbox"

],

"subjectOf": [

{

"@type": "HowTo",

"contentUrl": "https://earth.esa.int/eogateway/documents/20142/37627/GOCE-User-Toolbox-Tutorial-P-Knudsen.pdf",

"name": "GOCE User Toolbox and Tutoral",

"encodingFormat": "application/pdf"

}

]

}

#### Quality information

|  |  |  |
| --- | --- | --- |
| SRV-BP-6510 | Technical specification [Recommendation] | [RD32] |
| Metadata records for online services (API) in schema.org format should declare compliance with technical specifications providing all technical elements to actually invoke the service and enable its usage, using the “wasUsedBy” pattern shown below. | | |

Schema.org does not include specific properties to describe this. We therefore propose use of the provenance vocabulary within schema.org encodings as also proposed by [RD-32][[13]](#footnote-13).

*Example 59: Compliance information for Access point (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/",

"prov": "http://www.w3.org/ns/prov#",

"dct": "http://purl.org/dc/terms/"

},

"@type": "CreativeWork",

"@id": "https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube",

"name": "Landsat DataCube",

"prov:wasUsedBy": [

{

"@type": "prov:Activity",

"prov:generated": {

"@type": "prov:Entity",

"dct:type": "http://inspire.ec.europa.eu/metadata-codelist/DegreeOfConformity/conformant",

"dct:description": "See the referenced specification"

},

"prov:qualifiedAssociation": {

"@type": "prov:Association",

"prov:hadPlan": {

"@type": "prov:Plan",

"prov:wasDerivedFrom": {

"@type": "dct:Standard",

"dct:title": "COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services",

"dct:issued": "2010-12-08T00:00:00Z"

}

}

}

}

]

}

#### Service coupling

|  |  |  |
| --- | --- | --- |
| SRV-BP-6610 | Coupled resources [Recommendation] | [RD-6] TG Req. 3.6 |
| Service/Tool metadata records in schema.org encoding should identify the target collections of the service/tool as shown in the example below. | | |

*Example 60: Service to Collection coupling (Schema.org)*

"potentialAction": [

{

"identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs",

"@type": "UseAction",

"object": {

"@type": "Dataset",

"@id": "https://cat.ceos.org/collections/series/items/LANDSAT.ETM.GTC",

"identifier": "LANDSAT.ETM.GTC"

},

"target": []

}

]

#### Metadata information

|  |  |  |
| --- | --- | --- |
| SRV-BP-6710 | Metadata information [Recommendation] |  |
| Service/tool metadata records in schema.org format should encode the following metadata information properties of the metadata model defined in 3.2.6 as shown in the example below:   * Metadata point of contact ($.subjectOf[\*].\*[\*].contactPoint) * Latest update date ($.subjectOf[\*].dateModified) * Metadata language ($.subjectOf[\*].inLanguage) | | |

*Example 61: Metadata information (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"name": "rasdaman - raster data manager",

"@id": "https://eovoc.spacebel.be/collections/services/items/rasdaman",

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"identifier": [

"rasdaman"

],

"subjectOf": {

"@type": ["CreativeWork", “ListItem”],

"dct:conformsTo": "https://joinup.ec.europa.eu/release/geodcat-ap/20",

"encodingFormat": "application/ld%2Bjson;profile=https://schema.org",

"dateModified": "2021-10-20T16:12:55.511Z",

"inLanguage": {

"@type": "Language",

"name": "eng",

"@id": "http://id.loc.gov/vocabulary/iso639-1/en"

},

"publisher": [

{

"@type": "Organization",

"name": "Committee on Earth Observation Satellites",

"contactPoint": {

"@type": "ContactPoint"

}

}

]

}

}

#### Descriptive keywords

|  |  |  |
| --- | --- | --- |
| SRV-BP-6810 | Schema.org descriptive keywords [Recommendation] |  |
| Service/tool metadata records in schema.org format should include descriptive keywords encoded as keywords. | | |

*Example 62: Descriptive Keywords (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"name": "rasdaman - raster data manager",

"@id": "https://eovoc.spacebel.be/collections/services/items/rasdaman",

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"identifier": [

"rasdaman"

],

"keywords": [

{

"@type": "DefinedTerm",

"name": "EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > DATA ACCESS/RETRIEVAL",

"@id": "https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea",

"inDefinedTermSet": "https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/sciencekeywords"

},

{

"@type": "DefinedTerm",

"name": "OGC Web Coverage Service 2.0",

"@id": "http://www.opengis.net/def/serviceType/ogc/wcs/2.0",

"inDefinedTermSet": "https://inspire.ec.europa.eu/metadata-codelist/ProtocolValue"

},

{

"@type": "DefinedTerm",

"name": "Coverage access service",

"@id": "https://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/infoCoverageAccessService",

"inDefinedTermSet": "http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory"

},

"Big Data",

"arrays",

"raster data",

"OGC",

"WMS",

"WCS",

"statistics data"

]

}

#### Extent information

|  |  |  |
| --- | --- | --- |
| SRV-BP-6910 | Geographic extent [Recommendation] |  |
| Service/tool metadata records in schema.org format should include geographic extent (bounding box) - if applicable - encoded with spatialCoverage, geo and box properties. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-6920 | Temporal extent [Recommendation] |  |
| Service/tool metadata records in schema.org format should include temporal extent if applicable - encoded as temporalCoverage. | | |

*Example 63: Temporal and geographical extents* (Schema.org)

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"spatialCoverage": {

"geo": {

"box": "-50.0 -100.0 40.0 160.0",

"polygon": "-50.0 -100.0 -50.0 160.0 40.0 160.0 40.0 -100.0 -50.0 -100.0",

"@type": "GeoShape"

},

"@type": "Place"

},

"temporalCoverage": "2009-01-27T00:00:00.000Z/2011-08-09T23:59:59.999Z"

}

### ISO19115-3 encoding

#### General

None.

#### Identification information

|  |  |  |
| --- | --- | --- |
| SRV-BP-7210 | identification information [Requirement] |  |
| Service/tool metadata records in ISO19115-3 format shall encode the following mandatory properties of the metadata model defined §3.2.1 as shown below:   * Resource identifier < mdb:metadataIdentifier/>, (srv:SV\_ServiceIdentification/mri:citation/cit:CI\_Citation/cit:identifier) * Resource title (srv:SV\_ServiceIdentification/mri:citation/cit:CI\_Citation/cit:title) * Resource abstract (srv:SV\_ServiceIdentification/mri:abstract) * Responsible organisation (srv:SV\_ServiceIdentification /mri:pointOfContact/cit:CI\_Responsibility) | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-7220 | identification information [Recommendation] |  |
| Service/tool metadata records in ISO19115-3 format should encode the following optional properties of the metadata model defined in §3.2.1 as shown below:   * DOI[[14]](#footnote-14) (srv:SV\_ServiceIdentification/mri:citation/cit:CI\_Citation/cit:identifier/ mcc:MD\_Identifier/mcc:code/gco:CharacterString[../../mcc :codeSpace/gco:CharacterString='https://doi.org']) * Last revision date (srv:SV\_ServiceIdentification/mri:citation/cit:CI\_Citation/cit:date) * Resource version (srv:SV\_ServiceIdentification/mri:citation/cit:CI\_Citation/cit:edition) * Resource version description (srv:SV\_ServiceIdentification/mri:citation/cit:CI\_Citation/cit:otherCitationDetails) | | |

*Example 64: Identification information (ISO19115-3)*

<?xml version="1.0" encoding="UTF-8"?>

<mdb:MD\_Metadata xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:mdb="http://standards.iso.org/iso/19115/-3/mdb/1.0" xmlns:mac="http://standards.iso.org/iso/19115/-3/mac/1.0" xmlns:mcc="http://standards.iso.org/iso/19115/-3/mcc/1.0" xmlns:gco="http://standards.iso.org/iso/19115/-3/gco/1.0" xmlns:gcx="http://standards.iso.org/iso/19115/-3/gcx/1.0" xmlns:gex="http://standards.iso.org/iso/19115/-3/gex/1.0" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:mri="http://standards.iso.org/iso/19115/-3/mri/1.0" xmlns:srv="http://standards.iso.org/iso/19115/-3/srv/2.0" xmlns:mrd="http://standards.iso.org/iso/19115/-3/mrd/1.0" xmlns:lan="http://standards.iso.org/iso/19115/-3/lan/1.0" xmlns:cit="http://standards.iso.org/iso/19115/-3/cit/1.0" xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="http://standards.iso.org/iso/19115/-3/mds/1.0 ./standards.iso.org/19115/-3/mds/1.0/mds.xsd">

<mdb:metadataIdentifier>

<mcc:MD\_Identifier>

<mcc:code>

<gco:CharacterString>goce-user-toolbox</gco:CharacterString>

</mcc:code>

</mcc:MD\_Identifier>

</mdb:metadataIdentifier>

<mdb:defaultLocale>

<lan:PT\_Locale>

<lan:language>

<lan:LanguageCode codeList="codeListLocation#LanguageCode" codeListValue="eng">eng</lan:LanguageCode>

</lan:language>

<lan:characterEncoding/>

</lan:PT\_Locale>

</mdb:defaultLocale>

<mdb:metadataScope>

<mdb:MD\_MetadataScope>

<mdb:resourceScope>

<mcc:MD\_ScopeCode codeList="codeListLocation#MD\_ScopeCode" codeListValue="service">service</mcc:MD\_ScopeCode>

</mdb:resourceScope>

</mdb:MD\_MetadataScope>

</mdb:metadataScope>

…

<mdb:identificationInfo>

<srv:SV\_ServiceIdentification>

<mri:citation>

<cit:CI\_Citation>

<cit:title>

<gco:CharacterString>GOCE User Toolbox</gco:CharacterString>

</cit:title>

<cit:date>

<cit:CI\_Date>

<cit:date>

<gco:DateTime>2020-12-04T00:00:00</gco:DateTime>

</cit:date>

<cit:dateType>

<cit:CI\_DateTypeCode codeList="codeListLocation#CI\_DateTypeCode" codeListValue="revision">revision</cit:CI\_DateTypeCode>

</cit:dateType>

</cit:CI\_Date>

</cit:date>

<cit:edition>

<gco:CharacterString>1.0</gco:CharacterString>

</cit:edition>

<cit:identifier>

<mcc:MD\_Identifier>

<mcc:code>

<gco:CharacterString>goce-user-toolbox</gco:CharacterString>

</mcc:code>

</mcc:MD\_Identifier>

</cit:identifier>

</cit:CI\_Citation>

</mri:citation>

<mri:abstract>

<gco:CharacterString>The GOCE User Toolbox (GUT) is a compilation of tools for the utilisation and analysis of GOCE products. GUT supports applications in Geodesy, Oceanography and Solid Earth Physics.</gco:CharacterString>

</mri:abstract>

<mri:pointOfContact>

<cit:CI\_Responsibility>

<cit:role>

<cit:CI\_RoleCode codeList="codeListLocation#CI\_RoleCode" codeListValue="pointOfContact">pointOfContact</cit:CI\_RoleCode>

</cit:role>

<cit:party>

<cit:CI\_Organisation>

<cit:name>

<gco:CharacterString>ESA/ESRIN</gco:CharacterString>

</cit:name>

<cit:contactInfo>

<cit:CI\_Contact>

<cit:phone>

<cit:CI\_Telephone>

<cit:number>

<gco:CharacterString>+3906941801</gco:CharacterString>

</cit:number>

<cit:numberType>

<cit:CI\_TelephoneTypeCode codeList="codeListLocation#CI\_TelephoneTypeCode" codeListValue="voice">voice</cit:CI\_TelephoneTypeCode>

</cit:numberType>

</cit:CI\_Telephone>

</cit:phone>

<cit:phone>

<cit:CI\_Telephone>

<cit:number>

<gco:CharacterString>+390694180280</gco:CharacterString>

</cit:number>

<cit:numberType>

<cit:CI\_TelephoneTypeCode codeList="codeListLocation#CI\_TelephoneTypeCode" codeListValue="facsimile">facsimile</cit:CI\_TelephoneTypeCode>

</cit:numberType>

</cit:CI\_Telephone>

</cit:phone>

<cit:address>

<cit:CI\_Address>

<cit:deliveryPoint>

<gco:CharacterString>Largo Galileo Galilei 1</gco:CharacterString>

</cit:deliveryPoint>

<cit:city>

<gco:CharacterString>Frascati (Roma)</gco:CharacterString>

</cit:city>

<cit:postalCode>

<gco:CharacterString>00044</gco:CharacterString>

</cit:postalCode>

<cit:country>

<gco:CharacterString>Italy</gco:CharacterString>

</cit:country>

<cit:electronicMailAddress>

<gco:CharacterString>eohelp@esa.int</gco:CharacterString>

</cit:electronicMailAddress>

</cit:CI\_Address>

</cit:address>

<cit:onlineResource>

<cit:CI\_OnlineResource>

<cit:linkage>

<gco:CharacterString>https://www.esa.int</gco:CharacterString>

</cit:linkage>

</cit:CI\_OnlineResource>

</cit:onlineResource>

</cit:CI\_Contact>

</cit:contactInfo>

<cit:individual>

<cit:CI\_Individual>

<cit:positionName>

<gco:CharacterString>ESRIN Earth Observation Help Desk</gco:CharacterString>

</cit:positionName>

</cit:CI\_Individual>

</cit:individual>

</cit:CI\_Organisation>

</cit:party>

</cit:CI\_Responsibility>

</mri:pointOfContact>

<mri:extent>

</mri:extent>

<mri:descriptiveKeywords>

<srv:serviceType>

<gco:ScopedName codeSpace="http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType">transformation</gco:ScopedName>

</srv:serviceType>

</srv:SV\_ServiceIdentification>

</mdb:identificationInfo>

</mdb:MD\_Metadata>

*Example 65: Identification information with DOI (ISO19115-3)*

<mdb:identificationInfo>

<srv:SV\_ServiceIdentification>

<mri:citation>

<cit:CI\_Citation>

<cit:title>

<gco:CharacterString>rasdaman - raster data manager</gco:CharacterString>

</cit:title>

<cit:date>

<cit:CI\_Date>

<cit:date>

<gco:DateTime>2020-12-04T00:00:00</gco:DateTime>

</cit:date>

<cit:dateType>

<cit:CI\_DateTypeCode codeList="codeListLocation#CI\_DateTypeCode" codeListValue="revision">revision</cit:CI\_DateTypeCode>

</cit:dateType>

</cit:CI\_Date>

</cit:date>

<cit:edition>

<gco:CharacterString>9.5</gco:CharacterString>

</cit:edition>

<cit:identifier>

<mcc:MD\_Identifier>

<mcc:code>

<gco:CharacterString>rasdaman</gco:CharacterString>

</mcc:code>

</mcc:MD\_Identifier>

</cit:identifier>

<cit:identifier>

<mcc:MD\_Identifier>

<mcc:code>

<gco:CharacterString>10.5281/zenodo.1040170</gco:CharacterString>

</mcc:code>

<mcc:codeSpace>

<gco:CharacterString>https://doi.org</gco:CharacterString>

</mcc:codeSpace>

<mcc:description>

<gco:CharacterString>Baumann, P., Email: P.Baumann@Jacobs-University.De, &amp; Website: Rasdaman.Org. (2017). Rasdaman - Raster Data Manager. Zenodo. https://doi.org/10.5281/ZENODO.1040170</gco:CharacterString>

</mcc:description>

</mcc:MD\_Identifier>

</cit:identifier>

</cit:CI\_Citation>

</mri:citation>

|  |  |  |
| --- | --- | --- |
| SRV-BP-7230 | Spatial resolution [Recommendation] | [RD-2],  [RD-6] TG Req. 3.3 |
| Metadata records should express restriction on the spatial resolution if the service or tool has such restriction in MD\_Metadata.identificationInfo > MD\_Identification/spatialResolution as per table G.2 of [RD-2]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-7240 | CRS identifier [Recommendation] | [RD-2],  [RD-6] TG Req. 6.1, 6.2 |
| Metadata records should indicate the CRS supported by the service/tool using identifiers specified in a well-known common register, if the service or tool has such restriction in MD\_Metadata.referenceSystemInfo as per Table B.2 of [RD-2]. | | |

#### Constraint information

The proposed encoding is a straight translation of the equivalent encoding with ISO19139.

|  |  |  |
| --- | --- | --- |
| SRV-BP-7310 | Limitations on public access [Recommendation] | [RD-8] |
| Metadata records in ISO19115-3 format should include information about limitations on public access or lack of such limitations. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-7320 | Conditions for access and use [Recommendation] | [RD-8] |
| Metadata records in ISO19115-3 format should include information about conditions for access and use or indicate that there are no such conditions or that the conditions are unknown. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-7330 | Licenses [Recommendation] | [RD-8] |
| Metadata records in ISO19115-3 format should include information about the licensing of the resource by providing a link to the license type (e.g. <https://spdx.org/licenses/Apache-2.0>). | | |

*Example 66: Constraint information for Access point (ISO19115-3)*

<mri:resourceConstraints>

<mco:MD\_LegalConstraints>

<mco:useConstraints>

<mco:MD\_RestrictionCode codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat/codeLists.xml#MD\_RestrictionCode" codeListValue="otherRestrictions"/>

</mco:useConstraints>

<mco:otherConstraints>

<gcx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/ConditionsApplyingToAccessAndUse/noConditionsApply">No conditions apply to access and use.</gcx:Anchor>

</mco:otherConstraints>

</mco:MD\_LegalConstraints>

</mri:resourceConstraints>

<mri:resourceConstraints>

<mco:MD\_LegalConstraints>

<mco:accessConstraints>

<mco:MD\_RestrictionCode codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat/codeLists.xml#MD\_RestrictionCode" codeListValue="otherRestrictions"/>

</mco:accessConstraints>

<mco:otherConstraints>

<gcx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/LimitationsOnPublicAccess/noLimitations">no limitations to public access.</gcx:Anchor>

</mco:otherConstraints>

</mco:MD\_LegalConstraints>

</mri:resourceConstraints>

*Example 67: Constraint information for Tool download (ISO19115-3)*

<mri:resourceConstraints>

<mco:MD\_LegalConstraints>

<mco:useConstraints>

<mco:MD\_RestrictionCode codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat/codeLists.xml#MD\_RestrictionCode" codeListValue="otherRestrictions"/>

</mco:useConstraints>

<mco:otherConstraints>

<gcx:Anchor xlink:href="https://spdx.org/licenses/GPL-3.0-only">GNU General Public License v3.0</gcx:Anchor>

</mco:otherConstraints>

</mco:MD\_LegalConstraints>

</mri:resourceConstraints>

#### Distribution information

|  |  |  |
| --- | --- | --- |
| SRV-BP-7410 | Resource URL [Requirement] | [RD-8] |
| (Tool) metadata records in ISO19115-3 format shall include an “URL” element describing where the Web user interface can be accessed or where the tool can be downloaded. | | |

*Example 68: Distribution information for Tool download (ISO19115-3)*

<mdb:distributionInfo>

<mrd:MD\_Distribution>

<mrd:transferOptions>

<mrd:MD\_DigitalTransferOptions>

<mrd:onLine>

<cit:CI\_OnlineResource>

<cit:linkage>

<gco:CharacterString>https://earth.esa.int/eogateway/gut-registration</gco:CharacterString>

</cit:linkage>

<cit:name>

<gco:CharacterString>Download the GOCE User Toolbox</gco:CharacterString>

</cit:name>

<cit:function>

<cit:CI\_OnLineFunctionCode codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat/codelists.xml#CI\_OnLineFunctionCode" codeListValue="download"/>

</cit:function>

</cit:CI\_OnlineResource>

</mrd:onLine>

</mrd:MD\_DigitalTransferOptions>

</mrd:transferOptions>

</mrd:MD\_Distribution>

</mdb:distributionInfo>

|  |  |  |
| --- | --- | --- |
| SRV-BP-7420 | Access point information [Requirement] | [RD-8] |
| Service/tool metadata records in ISO19115-3 format shall include access point information encoded according to [RD-8]. | | |

*Example 69: Distribution information for Access point (ISO19115-3)*

<mdb:distributionInfo>

<mrd:MD\_Distribution>

<mrd:transferOptions>

<mrd:MD\_DigitalTransferOptions>

<mrd:onLine>

<cit:CI\_OnlineResource>

<cit:linkage>

<gco:CharacterString>https://datacube.pdgs.eo.esa.int/wcs?service=WCS&amp;Request=DescribeCoverage&amp;version=2.0.0&amp;CoverageId=LE7\_RGB</gco:CharacterString>

</cit:linkage>

<cit:protocol>

<gco:CharacterString>OGC:WCS:DescribeCoverage</gco:CharacterString>

</cit:protocol>

<cit:name>

<gco:CharacterString>DescribeCoverage</gco:CharacterString>

</cit:name>

<cit:description>

<gcx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/OnLineDescriptionCode/accessPoint">accessPoint</gcx:Anchor>

</cit:description>

<cit:function>

<cit:CI\_OnLineFunctionCode codeList=" https://schemas.isotc211.org/19115/resources/Codelist/cat/codeLists.xml#CI\_OnLineFunctionCode" codeListValue="information"/>

</cit:function>

</cit:CI\_OnlineResource>

</mrd:onLine>

<mrd:onLine>

<cit:CI\_OnlineResource>

<cit:linkage>

<gco:CharacterString>https://datacube.pdgs.eo.esa.int/wcs?service=WCS&amp;Request=GetCapabilities&amp;version=2.0.0</gco:CharacterString>

</cit:linkage>

<cit:protocol>

<gcx:Anchor xlink:href="http://www.opengis.net/def/serviceType/ogc/wcs/2.0">

OGC:WCS:GetCapabilities</gcx:Anchor>

</cit:protocol>

<cit:name>

<gco:CharacterString>GetCapabilities</gco:CharacterString>

</cit:name>

<cit:description>

<gcx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/OnLineDescriptionCode/accessPoint">accessPoint</gcx:Anchor>

</cit:description>

<cit:function>

<cit:CI\_OnLineFunctionCode codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat/codeLists.xml#CI\_OnLineFunctionCode" codeListValue="information"/>

</cit:function>

</cit:CI\_OnlineResource>

</mrd:onLine>

</mrd:MD\_DigitalTransferOptions>

</mrd:transferOptions>

</mrd:MD\_Distribution>

</mdb:distributionInfo>

|  |  |  |
| --- | --- | --- |
| SRV-BP-7430 | No online access [Recommendation] | [RD-8] |
| Metadata records in ISO19115-3 should include an “resource locator“ element providing access to additional information about the tool or service if no online access is available. | | |

*Example 70: Distribution information when no online access (ISO19115-3)*

<mdb:distributionInfo>

<mrd:MD\_Distribution>

<mrd:transferOptions>

<mrd:MD\_DigitalTransferOptions>

<mrd:onLine>

<cit:CI\_OnlineResource>

<cit:linkage>

<gco:CharacterString>https://earth.esa.int/eogateway/documents/20142/37627/GOCE-User-Toolbox-Tutorial-P-Knudsen.pdf</gco:CharacterString>

</cit:linkage>

<cit:name>

<gco:CharacterString>GOCE User Toolbox and Tutoral</gco:CharacterString>

</cit:name>

<cit:function>

<cit:CI\_OnLineFunctionCode codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat/codeLists.xml#CI\_OnLineFunctionCode" codeListValue="information"/>

</cit:function>

</cit:CI\_OnlineResource>

</mrd:onLine>

</mrd:MD\_DigitalTransferOptions>

</mrd:transferOptions>

</mrd:MD\_Distribution>

</mdb:distributionInfo>

#### Quality information

|  |  |  |
| --- | --- | --- |
| SRV-BP-7510 | Technical specification [Recommendation] | [RD-8] |
| Metadata records for online services (API) in ISO19115-3 format should declare compliance with at least one technical specification providing all technical elements to actually invoke the service and enable its usage. | | |

*Example 71: Compliance information for Access point (ISO19115-3)*

<mdb:dataQualityInfo>

<mdq:DQ\_DataQuality>

<mdq:scope>

<mcc:MD\_Scope>

<mcc:level>

<mcc:MD\_ScopeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/CodeLists.xml#MD\_ScopeCode" codeListValue="service"/>

</mcc:level>

<mcc:levelDescription/>

</mcc:MD\_Scope>

</mdq:scope>

<mdq:report>

<mdq:DQ\_DomainConsistency>

<mdq:result>

<mdq:DQ\_ConformanceResult>

<mdq:specification>

<cit:CI\_Citation>

<cit:title>

<gcx:Anchor xlink:href="http://docs.opengeospatial.org/is/17-089r1/17-089r1.html">OGC Web Coverage Service 2.0</gcx:Anchor>

</cit:title>

<cit:date>

<cit:CI\_Date>

<cit:date>

<gco:Date>2010-10-27</gco:Date>

</cit:date>

<cit:dateType>

<cit:CI\_DateTypeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI\_DateTypeCode" codeListValue="publication"/>

</cit:dateType>

</cit:CI\_Date>

</cit:date>

</cit:CI\_Citation>

</mdq:specification>

<mdq:explanation>

<gco:CharacterString>This Spatial Data Service is conformant with the OGC Web Coverage Service 2.0 specification</gco:CharacterString>

</mdq:explanation>

<mdq:pass gco:nilReason="unknown"/>

</mdq:DQ\_ConformanceResult>

</mdq:result>

</mdq:DQ\_DomainConsistency>

</mdq:report>

</mdq:DQ\_DataQuality>

</mdb:dataQualityInfo>

#### Service coupling

|  |  |  |
| --- | --- | --- |
| SRV-BP-7620 | operatesOn [Recommendation] | [RD-8] |
| Service metadata records in ISO19115-3 format should refer to online metadata records consumed or provided by the service using “mri:associatedResource” as defined in [RD-8]. | | |

*Example 72: Reference to related collection (ISO19115-3)*

<mri:associatedResource>

<mri:MD\_AssociatedResource>

<mri:associationType>

<mri:DS\_AssociationTypeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.xml#DS\_AssociationTypeCode" codeListValue="dependency"/>

</mri:associationType>

<mri:metadataReference>

<cit:CI\_Citation>

<cit:title>

<gco:CharacterString>Landsat 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain Corrected Systematic processing</gco:CharacterString>

</cit:title>

<cit:identifier>

<mcc:MD\_Identifier>

<mcc:code>

<gco:CharacterString>C1532648148-ESA</gco:CharacterString>

</mcc:code>

<mcc:codeSpace>

<gco:CharacterString>https://idn.ceos.org</gco:CharacterString>

</mcc:codeSpace>

</mcc:MD\_Identifier>

</cit:identifier>

<cit:onlineResource>

<cit:CI\_OnlineResource>

<cit:linkage>

<gco:CharacterString>https://eovoc.spacebel.be/collections/series/items/LANDSAT.ETM.GTC</gco:CharacterString>

</cit:linkage>

</cit:CI\_OnlineResource>

</cit:onlineResource>

</cit:CI\_Citation>

</mri:metadataReference>

</mri:MD\_AssociatedResource>

</mri:associatedResource>

#### Metadata information

|  |  |  |
| --- | --- | --- |
| SRV-BP-7710 | Metadata information [Recommendation] | [RD-8] |
| Service/tool metadata records in ISO19115-3 format should encode the following metadata information properties of the metadata model defined in 3.2.6 as follows:   * Metadata point of contact (mdb:MD\_Metadata/mdb:contact) * Latest update date (mdb:MD\_Metadata/mdb:dateInfo) * Metadata language (mdb:MD\_Metadata/mdb:defaultLocale/lan:PT\_Locale/lan:language) | | |

*Example 73: Metadata information (ISO19115-3)*

<?xml version="1.0" encoding="UTF-8"?>

<mdb:MD\_Metadata xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:mdb="http://standards.iso.org/iso/19115/-3/mdb/1.0" xmlns:mac="http://standards.iso.org/iso/19115/-3/mac/1.0" xmlns:mcc="http://standards.iso.org/iso/19115/-3/mcc/1.0" xmlns:gco="http://standards.iso.org/iso/19115/-3/gco/1.0" xmlns:gcx="http://standards.iso.org/iso/19115/-3/gcx/1.0" xmlns:gex="http://standards.iso.org/iso/19115/-3/gex/1.0" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:mri="http://standards.iso.org/iso/19115/-3/mri/1.0" xmlns:srv="http://standards.iso.org/iso/19115/-3/srv/2.0" xmlns:mrd="http://standards.iso.org/iso/19115/-3/mrd/1.0" xmlns:lan="http://standards.iso.org/iso/19115/-3/lan/1.0" xmlns:cit="http://standards.iso.org/iso/19115/-3/cit/1.0" xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="http://standards.iso.org/iso/19115/-3/mds/1.0 ./standards.iso.org/19115/-3/mds/1.0/mds.xsd">

<mdb:metadataIdentifier>

<mcc:MD\_Identifier>

<mcc:code>

<gco:CharacterString>eo-pdgs-landsat-datacube</gco:CharacterString>

</mcc:code>

</mcc:MD\_Identifier>

</mdb:metadataIdentifier>

<mdb:defaultLocale>

<lan:PT\_Locale>

<lan:language>

<lan:LanguageCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/lan/LanguageCode.xml#LanguageCode" codeListValue="eng"/>

</lan:language>

<lan:characterEncoding/>

</lan:PT\_Locale>

</mdb:defaultLocale>

<mdb:metadataScope>

<mdb:MD\_MetadataScope>

<mdb:resourceScope>

<mcc:MD\_ScopeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#MD\_ScopeCode" codeListValue="service"/>

</mdb:resourceScope>

</mdb:MD\_MetadataScope>

</mdb:metadataScope>

<mdb:contact>

<cit:CI\_Responsibility>

<cit:role>

<cit:CI\_RoleCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI\_RoleCode" codeListValue="pointOfContact"/>

</cit:role>

<cit:party>

<cit:CI\_Organisation>

<cit:name>

<gco:CharacterString>ESA/ESRIN</gco:CharacterString>

</cit:name>

<cit:contactInfo>

<cit:CI\_Contact>

<cit:phone>

<cit:CI\_Telephone>

<cit:number>

<gco:CharacterString>+3906941801</gco:CharacterString>

</cit:number>

<cit:numberType>

<cit:CI\_TelephoneTypeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI\_TelephoneTypeCode" codeListValue="voice"/>

</cit:numberType>

</cit:CI\_Telephone>

</cit:phone>

<cit:phone>

<cit:CI\_Telephone>

<cit:number>

<gco:CharacterString>+390694180280</gco:CharacterString>

</cit:number>

<cit:numberType>

<cit:CI\_TelephoneTypeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI\_TelephoneTypeCode" codeListValue="facsimile"/>

</cit:numberType>

</cit:CI\_Telephone>

</cit:phone>

<cit:address>

<cit:CI\_Address>

<cit:deliveryPoint>

<gco:CharacterString>Largo Galileo Galilei 1</gco:CharacterString>

</cit:deliveryPoint>

<cit:city>

<gco:CharacterString>Frascati (Roma)</gco:CharacterString>

</cit:city>

<cit:postalCode>

<gco:CharacterString>00044</gco:CharacterString>

</cit:postalCode>

<cit:country>

<gco:CharacterString>Italy</gco:CharacterString>

</cit:country>

<cit:electronicMailAddress>

<gco:CharacterString>eohelp@esa.int</gco:CharacterString>

</cit:electronicMailAddress>

</cit:CI\_Address>

</cit:address>

<cit:onlineResource>

<cit:CI\_OnlineResource>

<cit:linkage>

<gco:CharacterString>https://earth.esa.int</gco:CharacterString>

</cit:linkage>

</cit:CI\_OnlineResource>

</cit:onlineResource>

</cit:CI\_Contact>

</cit:contactInfo>

<cit:individual>

<cit:CI\_Individual>

<cit:positionName>

<gco:CharacterString>ESRIN Earth Observation Help Desk</gco:CharacterString>

</cit:positionName>

</cit:CI\_Individual>

</cit:individual>

</cit:CI\_Organisation>

</cit:party>

</cit:CI\_Responsibility>

</mdb:contact>

<mdb:dateInfo>

<cit:CI\_Date>

<cit:date>

<gco:DateTime>2019-05-15T09:00:00</gco:DateTime>

</cit:date>

<cit:dateType>

<cit:CI\_DateTypeCode codeList="codeListLocation#CI\_DateTypeCode" codeListValue="revision">revision</cit:CI\_DateTypeCode>

</cit:dateType>

</cit:CI\_Date>

</mdb:dateInfo>

<mdb:metadataStandard>

<cit:CI\_Citation>

<cit:title>

<gco:CharacterString>ISO 19115-3</gco:CharacterString>

</cit:title>

<cit:edition>

<gco:CharacterString>2016-08-15</gco:CharacterString>

</cit:edition>

</cit:CI\_Citation>

</mdb:metadataStandard>

<mdb:identificationInfo>

</mdb:identificationInfo>

<mdb:distributionInfo>

</mdb:distributionInfo>

</mdb:MD\_Metadata>

#### Descriptive keywords

|  |  |  |
| --- | --- | --- |
| SRV-BP-7810 | Descriptive keywords [Recommendation] | [RD-8] |
| Service/tool metadata records in ISO19115-3 format should encode descriptive keywords as shown in the example below. | | |

*Example 74: Descriptive Keywords (ISO19115-3)*

<mri:descriptiveKeywords>

<mri:MD\_Keywords>

<mri:keyword>

<gcx:Anchor xlink:href="https://earth.esa.int/concept/gravity-gravitational-field">Gravity and Gravitational Field</gcx:Anchor>

</mri:keyword>

<mri:keyword>

<gcx:Anchor xlink:href="https://earth.esa.int/concept/solid-earth">Solid Earth</gcx:Anchor>

</mri:keyword>

<mri:keyword>

<gcx:Anchor xlink:href="https://earth.esa.int/concept/oceans">Oceans</gcx:Anchor>

</mri:keyword>

<mri:type>

<mri:MD\_KeywordTypeCode codeList="theme" codeListValue="http://www.isotc211.org/2005/resources/codeList.xml#MD\_KeywordTypeCode"/>

</mri:type>

<mri:thesaurusName>

<cit:CI\_Citation>

<cit:title>

<gcx:Anchor xlink:href="https://earth.esa.int/concepts/concept\_scheme/earth-topics">EO Parameter Code List - Earth Topics</gcx:Anchor>

</cit:title>

<cit:date>

<cit:CI\_Date>

<cit:date>

<gco:DateTime>2019-05-13T00:00:00</gco:DateTime>

</cit:date>

<cit:dateType>

<cit:CI\_DateTypeCode codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/codelist/ML\_gmxCodelists.xml#CI\_DateTypeCode" codeListValue="publication">publication</cit:CI\_DateTypeCode>

</cit:dateType>

</cit:CI\_Date>

</cit:date>

</cit:CI\_Citation>

</mri:thesaurusName>

</mri:MD\_Keywords>

</mri:descriptiveKeywords>

#### Extent information

|  |  |  |
| --- | --- | --- |
| SRV-BP-7910 | Temporal extent [Recommendation] | [RD-8] |
| Metadata records in ISO19115-3 encoding should describe 0 to n temporal extents only if the service or tool has an explicit temporal extent using MD\_Metadata/mdb:identificationInfo/srv:SV\_ServiceIdentification/mri:extent as shown in the example below. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-7920 | Geographical extent [Recommendation] | [RD-8] |
| Metadata records in ISO19115-3 encoding should describe 0 to n minimal geographic bounding boxes only if the service or tool has an explicit geographic extent using MD\_Metadata/mdb:identificationInfo/srv:SV\_ServiceIdentification/mri:extent as shown in the example below. | | |

*Example 75: Temporal and geographical extents (ISO19115-3)*

<mri:extent>

<gex:EX\_Extent>

<gex:temporalElement>

<gex:EX\_TemporalExtent>

<gex:extent>

<gml:TimePeriod gml:id="timeperiod1">

<gml:beginPosition>2009-01-01</gml:beginPosition>

<gml:endPosition>2011-08-09</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>-100</gco:Decimal>

</gex:westBoundLongitude>

<gex:eastBoundLongitude>

<gco:Decimal>160</gco:Decimal>

</gex:eastBoundLongitude>

<gex:southBoundLatitude>

<gco:Decimal>-50</gco:Decimal>

</gex:southBoundLatitude>

<gex:northBoundLatitude>

<gco:Decimal>40</gco:Decimal>

</gex:northBoundLatitude>

</gex:EX\_GeographicBoundingBox>

</gex:geographicElement>

</gex:EX\_Extent>

</mri:extent>

### UMM-JSON encoding

#### General

|  |  |  |
| --- | --- | --- |
| SRV-BP-8110 | UMM-JSON [Requirement] | [RD-4], [RD-5],  [RD-13] |
| Service/tool metadata records in UMM-JSON format shall encode the metadata according to UMM-JSON UMM-T [RD-5] (for downloadable tool or Web tool) or UMM-JSON UMM-S[[15]](#footnote-15) [RD-4] (for headless services or API). | | |

#### Identification information

|  |  |  |
| --- | --- | --- |
| SRV-BP-8210 | Identification information [Requirement] | [RD-4], [RD-5],  [RD-13] |
| Service/tool metadata records in UMM-JSON format shall encode the following mandatory properties of the metadata model defined in §3.2.1 as shown below:   * Resource identifier ($.umm.Name) * Resource title ($.umm.LongName) * Resource abstract ($.umm.Description) * Responsible organisation   + UMM-S: ($.umm.ServiceOrganizations[\*])   + UMM-T: ($.umm.Organizations[\*], $.umm.ContactPersons[\*]) | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-8220 | Identification information [Recommendation] | [RD-4], [RD-5],  [RD-13] |
| Service/tool metadata records in UMM-JSON format should encode the following optional properties of the metadata model defined §3.2.1 as shown below:   * DOI ($.umm.DOI allowed for UMM-T encoding only) * Last revision date ($.umm.LastUpdatedDate) * Resource version ($.umm.Version) * Resource version description ($.umm.VersionDescription) | | |

*Example 76: Identification information (UMM-S)*

{

"meta": {

"native-id": "mmt\_service\_14322",

"provider-id": "POCLOUD",

"concept-type": "service",

"concept-id": "S2009180097-POCLOUD",

"revision-date": "2021-02-23T03:34:10.803Z",

"user-id": "mgangl",

"deleted": false,

"revision-id": 2,

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

"URL": {

"Description": "This is the harmony root endpoint.",

"URLValue": "https://harmony.earthdata.nasa.gov"

},

"Type": "Harmony",

"ServiceKeywords": [

{

"ServiceCategory": "EARTH SCIENCE SERVICES",

"ServiceTopic": "DATA MANAGEMENT/DATA HANDLING",

"ServiceTerm": "DATA ACCESS/RETRIEVAL"

},

{

"ServiceCategory": "EARTH SCIENCE SERVICES",

"ServiceTopic": "DATA MANAGEMENT/DATA HANDLING",

"ServiceTerm": "DATA INTEROPERABILITY",

"ServiceSpecificTerm": "DATA REFORMATTING"

}

],

"ServiceOrganizations": [

{

"Roles": [

"PUBLISHER",

"SERVICE PROVIDER"

],

"ShortName": "NASA/GSFC/EOS/EOSDIS/EMD",

"LongName": "Maintenance and Development, Earth Observing System Data and Information System, Earth Observing System,Goddard Space Flight Center, NASA"

}

],

"Description": "Backend NetCDF to Zarr service option description for Harmony data transformations. Cannot be chained with other operations from this record.",

"VersionDescription": "Data operation version\r\n\r\n",

"Version": "0.9.0",

"LastUpdatedDate": "2021-02-23T03:34:10.803Z",

"Name": "PO.DAAC harmony-netcdf-to-zarr",

"ServiceOptions": {

"SupportedReformattings": [

{

"SupportedInputFormat": "NETCDF-4",

"SupportedOutputFormats": [

"ZARR"

]

}

]

},

"MetadataSpecification": {

"URL": "https://cdn.earthdata.nasa.gov/umm/service/v1.4",

"Name": "UMM-S",

"Version": "1.4"

},

"LongName": "PO.DAAC harmony-netcdf-to-zarr Service Options"

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-8240 | CRS identifier [Recommendation] | [RD-4], [RD-5],  [RD-13] |
| Metadata records should indicate the CRS supported by the service/tool using identifiers "4326", "3395", "3785", "9807", "2000.63", "2163", "3408", "3410", "6931", "6933", "3411", "9822", "54003", "54004", "54008", "54009", "26917" or "900913", if the service or tool has such restriction in $.umm/ServiceOptions.SupportedInputProjections and SupportedOutputProjections. | | |

*Example 77: CRS identifier (UMM-S)*

{

"meta": {

"native-id": "mmt\_service\_7097",

"provider-id": "PODAAC",

"concept-type": "service",

"concept-id": "S1607544506-PODAAC",

...

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

"URL": {

"Description": "PO.DAAC OPeNDAP server URL",

"URLValue": "https://opendap.jpl.nasa.gov/"

},

"Type": "OPeNDAP",

...

"Name": "OPeNDAP",

"ServiceOptions": {

"SupportedInputProjections": [

{

"ProjectionName": "Geographic",

"ProjectionAuthority": "4326"

}

],

…

},

…

}

}

#### Constraint information

|  |  |  |
| --- | --- | --- |
| SRV-BP-8310 | Use limitation URL [Recommendation] |  |
| Service/tool metadata records in UMM-JSON format should include conditions applying to access and use with $.umm.UseConstraints and $.umm.accessConstraints. | | |

*Example 78: Constraint information for Access point (UMM-S)*

{

"meta": {

"native-id": "mmt\_service\_7097",

"provider-id": "PODAAC",

"concept-type": "service",

"concept-id": "S1607544506-PODAAC",

…

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

"URL": {

"Description": "PO.DAAC OPeNDAP server URL",

"URLValue": "https://opendap.jpl.nasa.gov/"

},

"Type": "OPeNDAP",

…

"AccessConstraints": "None",

…

"UseConstraints": {

"LicenseText": "None. "

},

"Name": "OPeNDAP",

…

"LongName": "Open-source Project for a Network Data Access Protocol/Hyrax"

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-8320 | Conditions for access and use [Recommendation] | [RD-4], [RD-5],  [RD-13] |
| Metadata records in UMM-JSON format should include information about conditions for access and use or indicate that there are no such conditions or that the conditions are unknown. | | |

*Example 79: Constraint information for Access (UMM-T)*

{

"meta": {

"native-id": "AppEEARS",

"provider-id": "LPDAAC\_ECS",

"concept-type": "tool",

"concept-id": "TL1860232272-LPDAAC\_ECS",

...

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

...

"Type": "Web User Interface",

"AccessConstraints": "Users must have a NASA Earthdata Login account to use the AρρEEARS site and API.",

...

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-8330 | Licenses [Recommendation] | [RD-4], [RD-5],  [RD-13] |
| Metadata records in UMM-JSON format should include information about the licensing of the resource by providing a link to the license type (e.g. <https://spdx.org/licenses/Apache-2.0>) as value of $.umm.UseConstraints.LicenseUrl. | | |

*Example 80: License information for Tool download (UMM-T)*

{

"meta": {

"concept-type": "tool",

...

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

...

"Name": "Coastline Classifier",

"Type": "Downloadable Tool",

"UseConstraints": {

"LicenseUrl": "https://spdx.org/licenses/Apache-2.0"

},

...

}

}

#### Distribution information

The URLContentType[[16]](#footnote-16) property of “$.umm.URL” can have multiple specializations (“Type”, “Subtype”) in KMS depending on the use case:

* DistributionURL
  + DOWNLOAD SOFTWARE
  + GET CAPABILITIES
  + GOTO WEB TOOL
  + USE SERVICE API
    - WEB MAP SERVICE (WMS)
    - WEB COVERAGE SERVICE (WCS)
    - …
* PublicationURL
  + HOW-TO
  + USER’S GUIDE
  + …

|  |  |  |
| --- | --- | --- |
| SRV-BP-8410 | tool download [Recommendation] | [RD-5] |
| Tool metadata records in UMM-JSON format should include tool download information encoded as $.umm.URL “DistributionURL” with “Type” equal to “DOWNLOAD SOFTWARE”. | | |

*Example 81: Distribution information for Tool download (UMM-T)*

{

"meta": {

"native-id": "ACON",

"provider-id": "SCIOPS",

"concept-type": "tool",

"concept-id": "TL1860342070-SCIOPS",

...

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

"URL": {

"Description": "Download the ACON software.",

"URLValue": "http://www.bio.gc.ca/science/data-donnees/acon-en.php",

"URLContentType": "DistributionURL",

"Type": "DOWNLOAD SOFTWARE"

},

"Type": "Downloadable Tool",

"Name": "ACON",

…

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-8415 | Web GUI URL [Requirement] | [RD-5],  [RD-13] |
| Service/Tool Metadata records shall include an “URL” element describing where the Web user interface can be accessed encoded as $.umm.URL “DistributionURL” with “Type” equal to “GOTO WEB TOOL”. | | |

*Example 82: Distribution information for Web User Interface (UMM-T)*

{

"meta": {

"native-id": "AppEEARS",

"provider-id": "LPDAAC\_ECS",

"concept-type": "tool",

"concept-id": "TL1860232272-LPDAAC\_ECS",

...

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

"URL": {

"Description": "AppEEARS Landing Page",

"URLValue": "https://lpdaacsvc.cr.usgs.gov/appeears/",

"URLContentType": "DistributionURL",

"Type": "GOTO WEB TOOL"

},

"Type": "Web User Interface",

...

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-8420 | access point information [Recommendation] | [RD-4] |
| Service/tool metadata records in UMM-JSON format should include access point information encoded with $.umm.URL “DistributionURL” and $.umm.ServiceOptions to [RD-4]. | | |

*Example 83: Distribution information for Access point (UMM-S)*

{

"meta": {

"native-id": "mmt\_service\_7097",

"provider-id": "PODAAC",

"concept-type": "service",

"concept-id": "S1607544506-PODAAC",

...

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

"URL": {

"Description": "PO.DAAC OPeNDAP server URL",

"URLValue": "https://opendap.jpl.nasa.gov/"

},

"Type": "OPeNDAP",

…

"ServiceOptions": {

"SupportedInputProjections": [

{

"ProjectionName": "Geographic"

}

],

…

},

"MetadataSpecification": {

"URL": "https://cdn.earthdata.nasa.gov/umm/service/v1.4",

"Name": "UMM-S",

"Version": "1.4"

},

"LongName": "Open-source Project for a Network Data Access Protocol/Hyrax"

}

}

|  |  |  |
| --- | --- | --- |
| SRV-BP-8430 | No online access [Recommendation] | [RD-8] |
| Metadata records in UMM-JSON format should include an “resource locator“ element encoded with $.umm.URL “PublicationURL” providing access to additional information about the tool or service if no online access is available. | | |

#### Quality information

None.

#### Service coupling

|  |  |  |
| --- | --- | --- |
| SRV-BP-8620 | Service to collection coupling [Recommendation] |  |
| Service/tool metadata records in UMM-JSON should refer to online collection metadata records consumed or provided by the service as $.umm.RelatedURLs with URLContentType “CollectionURL” with “Type” equal to “DATA SET LANDING PAGE” or the CoupledResource property. | | |

*Example 84: Reference to related collection (UMM-S)*

{

"meta": {

"concept-type": "service",

...

},

"umm": {

...

"OperationMetadata": [

{

"CoupledResource": {

"DataResource": {

"DataResourceIdentifier": "C1532648148-ESA",

"DataResourceSourceType": "Collection"

}

}

}

]

}

}

#### Metadata information

|  |  |  |
| --- | --- | --- |
| SRV-BP-8710 | Metadata information [Recommendation] |  |
| Service/tool metadata records in UMM-JSON format should encode the following metadata information properties of the metadata model defined in 3.2.6 as shown in the example below:   * Metadata point of contact[[17]](#footnote-17)   + UMM-S: $.umm.ServiceOrganizations[] with Role=”PUBLISHER”   + UMM-T: $.umm.Organizations[] with Role=”PUBLISHER” * Latest update date ($umm.meta.revision-date) * Metadata language (Not available) | | |

*Example 85: Metadata information (UMM-S)*

{

"meta": {

"native-id": "mmt\_service\_14322",

"provider-id": "POCLOUD",

"concept-type": "service",

"concept-id": "S2009180097-POCLOUD",

"revision-date": "2021-02-23T03:34:10.803Z",

"user-id": "mgangl",

"deleted": false,

"revision-id": 2,

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

"ServiceOrganizations": [

{

"Roles": [

"PUBLISHER",

"SERVICE PROVIDER"

],

"ShortName": "NASA/GSFC/EOS/EOSDIS/EMD",

"LongName": "Maintenance and Development, Earth Observing System Data and Information System, Earth Observing System,Goddard Space Flight Center, NASA"

}

],

"MetadataSpecification": {

"URL": "https://cdn.earthdata.nasa.gov/umm/service/v1.4",

"Name": "UMM-S",

"Version": "1.4"

}

}

}

*Example 86: Metadata information (UMM-T)*

{

"meta": {

"native-id": "Proba-V\_MEP",

"provider-id": "ESA",

"concept-type": "tool",

"concept-id": "TL2093861884-ESA",

"revision-date": "2021-10-04T20:04:50.558Z",

"user-id": "mmorahan",

"deleted": false,

"revision-id": 2,

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

...

"ContactPersons": [

{

"Roles": [

"SERVICE PROVIDER"

],

"LastName": "VITO Helpdesk/Operations",

"ContactInformation": {

"ContactMechanisms": [

{

"Type": "Email",

"Value": "remotesensing@vito.be"

},

{

"Type": "Telephone",

"Value": "+32 14 33 68 55"

}

]

}

}

],

"Organizations": [

{

"Roles": [

"SERVICE PROVIDER"

],

"ShortName": "VITO",

"LongName": "Flemish Institute for Technological Research",

"URLValue": "https://www.vito.be/"

},

{

"Roles": [

"PUBLISHER"

],

"ShortName": "ESA/EO",

"LongName": "Observing the Earth, European Space Agency",

"URLValue": "http://www.esa.int/esaEO/"

}

],

"MetadataSpecification": {

"URL": "https://cdn.earthdata.nasa.gov/umm/tool/v1.1",

"Name": "UMM-T",

"Version": "1.1"

},

...

}

}

#### Descriptive keywords

|  |  |  |
| --- | --- | --- |
| SRV-BP-8810 | Descriptive keywords [Recommendation] | [RD-4], [RD-5] |
| Service/tool metadata records in UMM-JSON format should include descriptive keywords encoded as $.umm.ServiceKeywords (UMM-S), $.umm.ToolKeywords (UMM-T) and $.umm.AncillaryKeywords. | | |

*Example 87: Descriptive Keywords (UMM-S)*

{

"meta": {

"native-id": "mmt\_service\_14322",

"provider-id": "POCLOUD",

"concept-type": "service",

"concept-id": "S2009180097-POCLOUD",

...

},

"umm": {

...

"Type": "Harmony",

"ServiceKeywords": [

{

"ServiceCategory": "EARTH SCIENCE SERVICES",

"ServiceTopic": "DATA MANAGEMENT/DATA HANDLING",

"ServiceTerm": "DATA ACCESS/RETRIEVAL"

},

{

"ServiceCategory": "EARTH SCIENCE SERVICES",

"ServiceTopic": "DATA MANAGEMENT/DATA HANDLING",

"ServiceTerm": "DATA INTEROPERABILITY",

"ServiceSpecificTerm": "DATA REFORMATTING"

}

],

...

}

}

*Example 88: Descriptive Keywords (UMM-T)*

{

"meta": {

"native-id": "Proba-V\_MEP",

"provider-id": "ESA",

"concept-type": "tool",

"concept-id": "TL2093861884-ESA",

...

},

"umm": {

...

"AncillaryKeywords": [

"Sentinel satellites",

"ESA",

"Imagery",

"Urban development",

"Natural disaster management",

"Satellite data",

"CEOS"

],

"Type": "Web User Interface",

...

"ToolKeywords": [

{

"ToolCategory": "EARTH SCIENCE SERVICES",

"ToolTopic": "DATA MANAGEMENT/DATA HANDLING",

"ToolTerm": "CATALOGING"

}

],

...

}

#### Extent information

|  |  |  |
| --- | --- | --- |
| SRV-BP-8910 | Temporal extent [Recommendation] | [RD-13] |
| Service metadata records in UMM-JSON format should describe 0 to n temporal extents only if the service or tool has an explicit temporal extent using the DataResourceTemporalExtent property as shown in the example below. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-8920 | Geographical extent [Recommendation] | [RD-13] |
| Service metadata records in UMM-JSON format should describe 0 to n minimal geographic bounding boxes only if the service has an explicit geographic extent with the DataResourceSpatialExtent property as shown in the example below. | | |

*Example 89: Temporal and geographical extents (UMM-S)*

{

"meta": {

"concept-type": "service",

...

},

"umm": {

...

"OperationMetadata": [

{

"CoupledResource": {

"DataResource": {

"DataResourceIdentifier": "C1532648148-ESA",

"DataResourceSourceType": "Collection",

"DataResourceTemporalExtent": {

"DataResourceTimePoints": [

{

"TimeValue": "2009-01-01"

},

{

"TimeValue": "2011-08-09"

}

]

},

"DataResourceSpatialExtent": {

"SpatialBoundingBox": {

"WestBoundingCoordinate": -100,

"NorthBoundingCoordinate": 40,

"EastBoundingCoordinate": 160,

"SouthBoundingCoordinate": -50,

"CRSIdentifier": "EPSG:4326"

}

}

}

}

}

]

}

}

## Controlled vocabularies

It is recommended to encode some of the information in the metadata with terminology from a controlled vocabulary (a.k.a codelist, thesaurus, taxonomy), typically represented as a concept with label, URI and explicit thesaurus identification (e.g. scheme URI). The current section identifies the information that should be encoded in this way and the taxonomies to be used.

* Service/tool types / categories from agreed thesaurus
* Science keywords from agreed thesaurus
* Platform names from agreed thesaurus
* Instrument names from agreed thesaurus
* Organization names from agreed thesaurus

|  |  |  |
| --- | --- | --- |
| SRV-BP-0402 | Multiple vocabularies [Recommendation] | [RD-6] |
| Metadata records should be annotated with keywords for a specific keyword type (e.g. science keyword, platform, instrument, organization, ..) originating from multiple controlled vocabularies, but at least one of the recommended controlled vocabularies should be used for each of the keyword types covered in the next subsections. | | |

*For example: European agencies may prefer using INSPIRE code lists and ESA Thesauri while others may prefer the NASA KMS (GCMD) Thesauri.*

|  |  |  |
| --- | --- | --- |
| SRV-BP-0403 | Keyword information [Recommendation] | [RD-6] |
| Keyword information from a controlled vocabulary included in metadata records should include label, URI and corresponding thesaurus identification (i.e. scheme URI). | | |

### Service types

|  |  |  |
| --- | --- | --- |
| SRV-BP-0411 | Service and Tool type [Recommendation] | [RD-4], [RD-5] |
| Service, tool and application metadata records should include a “type” metadata element with a value from a controlled vocabulary identifying the type of service or tool. | | |

*Note: UMM-S and UMM-T list a number of enumeration values for “service type” and “tool type”. These are not available in KMS. An ESA thesaurus with service and tool types is not available either.*

|  |  |  |
| --- | --- | --- |
| SRV-BP-0412 | Service and Tool type keywords [Recommendation] | [RD-4], [RD-5],  TG Req 3.4 [RD-6] |
| For service and tool type keywords, the NASA KMS[[18]](#footnote-18) thesaurus (concept scheme: <https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords>), in particular the branch “Earth Science Services” or ESA Thesaurus should be used as controlled vocabulary. | | |

*Note: this is also current practice for UMM-T and UMM-S metadata encodings in UMM-JSON.*

*Examples:*

* *“EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > DATA ACCESS/RETRIEVAL” (86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea)*
* *“EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > TRANSFORMATION/CONVERSION” (31ab3c10-1f10-4372-82d4-4c0c4be5999f)*
* *“EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > SUBSETTING/SUPERSETTING” (cc9e67fc-eafa-43cc-879f-0cb56b25bc39)*

|  |  |  |
| --- | --- | --- |
| SRV-BP-0413 | Resource Type [Recommendation] | [RD-6] |
| Service, tool and application metadata records should include the controlled keyword <http://inspire.ec.europa.eu/metadata-codelist/ResourceType/service> from the INSPIRE Registry identifying the resource type. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0414 | Spatial Data Service Type [Recommendation] | [RD-6]  TG Req. 3.5 |
| Service, tool and application metadata records should include a controlled keyword from the INSPIRE Registry https://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType identifying the spatial data service type. | | |

*Examples:*

* [*http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType/view*](http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType/view)
* [*http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType/download*](http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType/download)
* [*http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType/invoke*](http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType/invoke)
* [*http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType/transformation*](http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType/transformation)
* *http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceType/other*

|  |  |  |
| --- | --- | --- |
| SRV-BP-0415 | Protocol Type [Recommendation] | [RD-10] §5.2 |
| Service, tool and application metadata records should include a controlled keyword from the INSPIRE Registry https://inspire.ec.europa.eu/metadata-codelist/ProtocolValue whenever it is possible to recognise the service protocol. | | |

*Examples:*

* *http://www.opengis.net/def/serviceType/ogc/wcs,*
* [*http://www.opengis.net/def/serviceType/ogc/wms*](http://www.opengis.net/def/serviceType/ogc/wms)

*Alternative, identifiers from Wikidata can be used as proposed by https://github.com/earthcubearchitecture-project418/p419dcatservices#wikidata-api-types.*

|  |  |  |
| --- | --- | --- |
| SRV-BP-0416 | Spatial Data Service Category [Recommendation] | [RD-6]  TG Rec 3.2, TG Rec 3.3,  TG Req. 3.4 |
| Service, tool and application metadata records should include controlled keywords from the INSPIRE Registry http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory identifying the spatial data service category. | | |

*Example values:*

* [*http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/spatialCoordinateConversionService*](http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/spatialCoordinateConversionService)
* [*http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/thematicImageSynthesisService*](http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/thematicImageSynthesisService)
* [*https://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/infoCoverageAccessService*](https://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/infoCoverageAccessService)
* [*http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/humanGeographicViewer*](http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/humanGeographicViewer)

### Science keywords

|  |  |  |
| --- | --- | --- |
| SRV-BP-0421 | Science keywords [Recommendation] |  |
| For science keywords (label, URI, scheme), the NASA KMS[[19]](#footnote-19) thesaurus (concept scheme: https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/sciencekeywords) or ESA Thesaurus (concept scheme: https://earth.esa.int/concepts/concept\_scheme/earth-topics) should be used as controlled vocabulary. | | |

### Platforms

|  |  |  |
| --- | --- | --- |
| SRV-BP-0431 | Platform names [Recommendation] |  |
| For platform information, the NASA KMS thesaurus (concept scheme: https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/platforms) or ESA Thesaurus (concept scheme: https://earth.esa.int/concepts/concept\_scheme/platforms) should be used as controlled vocabulary. | | |

### Instruments

|  |  |  |
| --- | --- | --- |
| SRV-BP-0441 | Instrument names [Recommendation] |  |
| For instrument information, the NASA KMS thesaurus (concept scheme: https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/instruments) or ESA Thesaurus (concept scheme: https://earth.esa.int/concepts/concept\_scheme/instruments) should be used as controlled vocabulary. | | |

### Organisations

|  |  |  |
| --- | --- | --- |
| SRV-BP-0451 | Organization names [Recommendation] |  |
| For organization names, the NASA KMS thesaurus (concept scheme: https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/providers) should be used as controlled vocabulary (See https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/providers/?format=csv). | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0452 | Organization names [Recommendation] |  |
| For organization names in Schema.org[[20]](#footnote-20) encode metadata, the Research Organization Registry (https://ror.org/) vocabulary for organisations thesaurus should be used as controlled vocabulary for organisations in addition to the NASA KMS thesauri (See alsohttps://ror.readme.io/docs/include-ror-ids-in-doi-metadata). | | |

## Service discovery interface

### General

The current Best practices do not impose implementing a specific service binding but allow for multiple alternative bindings. For each of the allowed alternatives, additional requirements and recommendations are expressed in subsequent sections.

|  |  |  |
| --- | --- | --- |
| SRV-BP-0511 | Service bindings [Requirement] |  |
| The service discovery interface shall offer at least one of the following service bindings:   * OpenSearch [AD-1], [RD-22], [RD-23], * OGC API – Features (Part 1) [RD-34], * OGC API – Records [RD-35], * OGC CSW (e.g. ISO AP Profile) [RD-27], * STAC API [RD-33]. | | |

Note that using the STAC API implies that it is used with Items representing a single service or tools as GeoJSON so that it can be searched. The STAC Overview[[21]](#footnote-21) allows using the different parts of the core SpatioTemporal Asset Catalog specification separately, thus using the STAC API, STAC Catalog, STAC Collection without the original STAC Item specification.

|  |  |  |
| --- | --- | --- |
| SRV-BP-0512 | Search parameters [Requirement] |  |
| Service discovery interfaces shall support the following search parameters:   * Number of records, * Start index or start page * Free text (e.g. matching title, abstract, keywords, platform, instrument, .. etc. ) * Service identifier/name * DOI (optional) * Service category (optional) * Organisation name (optional) | | |

|  |  |  |  |
| --- | --- | --- | --- |
| SRV-BP-0513 | Hyperlink media relations [Requirement] | | CEOS-BP-012  CEOS-BP-012C  CEOS-BP-012D |
| When the service discovery response includes links to other resources using hyperlinks, the following relations “rel” shall be used: | | | |
|  | | | |
| *hyperlink “rel”* | | *Description of artifact* | |
| “via” | | Preferred to convey the authoritative metadata resource or the source of the information from where the catalog entry is made. | |
| “alternate” | | Refers to alternate representations of the metadata. | |
| “describedby” | | Used to reference the documentation (a file with human-readable information about the resources)  Use “type” to reference to documentation in Markdown format. | |
| “enclosure” | | Link allowing to download the tool/application. | |
| “license” | | Link to document identifying access and use constraints for the resource. | |

|  |  |  |  |
| --- | --- | --- | --- |
| SRV-BP-0514 | Hyperlink media types [Requirement] | | CEOS-BP-012C |
| When the service discovery response make available links to metadata records or resources using hyperlinks, the following relations “type” (media type) shall be used: | | | |
|  | | | |
| *Resource* | | *hyperlink “type”* | |
| ISO19139:2007 metadata | | application/vnd.iso.19139+xml | |
| ISO19115-3 metadata | | application/vnd.iso.19115-3+xml | |
| GeoDCAT-AP metadata | | application/ld+json;  profile=”http://data.europa.eu/930/”  application/rdf+xml;  profile=”http://data.europa.eu/930/”  text/turtle;  profile=”http://data.europa.eu/930/” | |
| UMM-JSON metadata | | application/vnd.nasa.cmr.umm+json | |
| OGC 19-020r1 | | application/geo+json profile=”http://www.opengis.net/spec/eopad-geojson/1.0” | |
| Documentation in Markdown format | | text/markdown[[22]](#footnote-22) | |
| Jupyter Notebook | | application/x-ipynb+json | |

Table 3 – Hyperlink media types

|  |  |  |
| --- | --- | --- |
| SRV-BP-0515 | Coupled resources [Requirement] |  |
| The service discovery interface shall allow clients to find services/applications given a collection or find collections given a service/application. | | |

*The above requirement can be implemented in various ways e.g. using an associations endpoint or by including coupled resource information in the service and/or collection metadata as proposed by [RD-6].*

### OpenSearch

|  |  |  |
| --- | --- | --- |
| SRV-BP-0521 | OpenSearch Best Practices [Requirement] | [AD-1] |
| Service discovery interfaces offering an OpenSearch binding shall apply the Best Practices defined in [AD-1] which are not specific for granule and/or collection discovery. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0522 | OSDD URL template relation [Requirement] | [AD-1] |
| Service discovery interfaces offering an OpenSearch binding shall use “service” as relation type for the corresponding URL template in the OSDD document as per CEOS-BP-003 of [AD-1]. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0523 | Response formats [Requirement] | [AD-1] |
| Service discovery interfaces offering an OpenSearch binding shall support at least one of the below response formats:   * Atom/XML [RD-22], [RD-23] * GeoJSON [RD-25] | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0524 | Search parameters [Requirement] | [AD-1] CEOS-BP-005 |
| OpenSearch service discovery interfaces shall support at least the following search parameters:   * count, * startIndex or startPage, * searchTerms, * geo:uid, * geo:box * time:start, time:end | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0525 | Additional search parameters [Recommendation] |  |
| OpenSearch service discovery interfaces shall by preference implement search parameters defined in well-known OpenSearch extensions (and namespaces), before deciding to use proprietary search parameter names e.g.   * Geo and Time extensions [RD-22], geo: and time: namespace, * Earth Observation extension [RD-23], eo: namespace. | | |

*Note that several “OpenSearch parameters listed for collection search” (table-4) and most of the “INSPIRE OpenSearch parameters for collection search” (table-5) in [RD-23] apply to service search as well.*

### OGC API – Features

|  |  |  |
| --- | --- | --- |
| SRV-BP-0534 | Search parameters [Requirement] | [RD-34] [AD-1] CEOS-BP-005 |
| Service discovery interfaces shall support at least the following search parameters:   * limit [RD-34], * bbox [RD-34] * datetime [RD-34] | | |

### OGC API – Records

|  |  |  |
| --- | --- | --- |
| SRV-BP-0542 | Record type [Recommendation] | [RD-35] |
| Service discovery interfaces should support the “type” search parameter for record type with value “service” to filter records representing “services” or “tools” if the catalog contains multiple record types. | | |

|  |  |  |
| --- | --- | --- |
| SRV-BP-0544 | Search parameters [Requirement] | [RD-35] [AD-1] CEOS-BP-005 |
| Service discovery interfaces shall support at least the following search parameters:   * limit [RD-34], * q [RD-35], * externalId [RD-35], * bbox [RD-34] * datetime [RD-34] * doi (via /queryables or /collections/{collectionId}/queryables) – optional * classifiedAs (via /queryables or /collections/{collectionId}/queryables) – optional | | |

### OGC CSW

|  |  |  |
| --- | --- | --- |
| SRV-BP-0531 | CSW ISO AP [Recommendation] | [RD-27] |
| CSW service discovery interfaces should implement the mandatory requirements of OGC 07-045r1 [RD-27]. | | |

# Current Implementations

This chapter gives an overview of existing implementations: Additional implementations may be added in future versions of this document.

## NASA CMR

Supported Search parameters for Services and Tools include:

* Name
* Type
* Provider
* Native\_id
* Concept\_id
* Keyword (free text)

Responses are available in XML, JSON and UMM JSON.

For more information, refer to the online documentation at:

* <https://cmr.earthdata.nasa.gov/search/site/docs/search/api.html#searching-for-services>
* <https://cmr.earthdata.nasa.gov/search/site/docs/search/api.html#searching-for-tools>
* UMM-Service schema: https://git.earthdata.nasa.gov/projects/EMFD/repos/unified-metadata-model/browse/service
* UMM-Tool schema: https://git.earthdata.nasa.gov/projects/EMFD/repos/unified-metadata-model/browse/tool

Example requests:

* <https://cmr.earthdata.nasa.gov/search/services.json?pretty=true>
* <https://cmr.earthdata.nasa.gov/search/tools.json?pretty=true>
* <https://cmr.earthdata.nasa.gov/search/services.umm_json?name=OpenDAP&pretty=true>
* <https://cmr.earthdata.nasa.gov/search/services.umm_json?name=PO.DAAC%20harmony-netcdf-to-zarr&pretty=true>
* <https://cmr.earthdata.nasa.gov/search/tools.umm_json?name=AppEEARS&pretty=true>
* <https://cmr.earthdata.nasa.gov/search/tools.umm_json?keyword=CEOS&pretty=true>

## ESA FedEO

The operational version of FedEO does currently not support service discovery. An experimental implementation accessible via OpenSearch, OGC API-Features and STAC interfaces is available at <https://eovoc.spacebel.be> and <https://eovoc.spacebel.be/readme.html>.

Supported search parameters for Services and Tools are advertised in the OpenSearch Description Document and OpenAPI definition available at:

* <https://eovoc.spacebel.be/api?httpAccept=application/opensearchdescription%2Bxml>
* <https://eovoc.spacebel.be/api?httpAccept=application/openapi%2Bjson;version=3.0>
* <https://petstore.swagger.io/?url=https://eovoc.spacebel.be/api>

They include:

* dc:title
* eo:organisationName
* eo:platform
* eo:offering
* geo:uid
* semantic:classifiedAs (e.g. tool or service category URI)
* dc:subject (keywords)
* searchTerms (free text)

Responses are available in:

* GeoJSON (OGC 19-020r1, OGC 17-069r3)
* XML (ISO19139, Atom). Additional ISO19139 INSPIRE compliant and ISO19115-3 responses are planned.
* JSON-LD (schema.org, GeoDCAT-AP).
* RDF/XML (schema.org, GeoDCAT-AP).
* Turtle (schema.org, GeoDCAT-AP).
* HTML (including schema.org annotations)

Example requests:

* <https://eovoc.spacebel.be/collections/services/items?httpAccept=text/html>
* <https://eovoc.spacebel.be/collections/services/items/OPeNDAP?mode=owc> (Service)
* <https://eovoc.spacebel.be/collections/services/items/harmony-netcdf-to-zarr?mode=owc> (Service)
* <https://eovoc.spacebel.be/collections/services/items/appeears?mode=owc> (Tool)
* <https://eovoc.spacebel.be/collections/services/items/eo-pdgs-landsat-datacube?mode=owc> (DataCube with WCS interfaces)
* https://eovoc.spacebel.be/collections/services/items/coastline-classifier?mode=owc (Jupyter Notebook)

The HTML representation lists all alternative representations available:

* <https://eovoc.spacebel.be/collections/services/items/appeears?httpAccept=text/html>
* <https://eovoc.spacebel.be/collections/services/items?httpAccept=text/html>

The above interfaces are expected to be supported in the operational ESA FedEO and/or EOCAT Catalog in 2023.

1. Service and Tool Metadata Elements

This appendix gives an overview of the main service metadata elements required by the relevant INSPIRE Technical Guidance [RD-6], ISO 19115-1 [RD-2], UMM-Service [RD-4], UMM-Tool [RD-5] and DataCite [RD-20] metadata models.

| *ISO19115-1 [RD-2] §F.3[[23]](#footnote-23)* | *UMM-S  [RD-4] §D.2.2[[24]](#footnote-24)* | *INSPIRE [RD-6] § C.1.2* | *INSPIRE MD TG [RD-6]* | *UMM-T [RD-5]* | *GeoDCAT-AP [RD-10] Annex B* | *DataCite (Software) [RD-20][[25]](#footnote-25)* | *CEOS Best Practice / Recommendation* |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Metadata reference information (O/1) | Name [R] - §2.2.1 | File identifier | TG Recommendation C.1 | Name [R] – (F.2.2.1) | Metadata file identifier – B.6.17 | Identifier (1) [M] | SRV-BP-0003 |
| Resource Identifier (O/N) |  |  |  | DOI (F.2.2.9) | Unique resource identifier – B.6.5 | Identifier (1) [M] | SRV-BP-0007 |
| Resource Title (M/1) | LongName [R] - §2.2.2 | B1.1 Resource Title (Mandatory) | TG Requirement C.8 | LongName [R] – (F.2.2.2) | Resource title – B.6.1 | Title (3) [M] | SRV-BP-0005 |
| Resource type (M/1) |  | B1.3 Resource Type (Mandatory) – fixed value. | TG Requirement 3.1 |  | Resource type – B.6.3 | ResourceType (10) [M] |  |
|  | Type [R] with valid values from KMS - §2.2.3 | B2.2 Spatial data service type (Mandatory)  B3.1 Keyword value (Mandatory)  B1 Category (Conditional) | TG Requirement 3.5,  TG Requirement 4.1,  TG Requirement 5.1  TG Requirement 3.4  TG Requirement 3.4,  TG Requirement 5.4 | Type [R] with valid values from KMS. (F.2.2.3) | Spatial data service type – B.6.9 | ResourceType (10) [M]  Subject (6) [R] | SRV-BP-0001  SRV-BP-4005 |
|  | Version [R] - §2.2.4 |  |  | Version [R] – (F.2.2.4) |  | Version (15) [O] | SRV-BP-0016 |
|  | VersionDescription - §2.2.5 |  |  |  |  |  | SRV-BP-0017 |
| Reference Date (O/1) | LastUpdatedDate - §2.2.6 | D5.3 Temporal reference – Date of last revision (Conditional) | TG Requirement C.11,  TG Requirement C.13 |  | Temporal reference and metadata date – B.6.11 | Date (8) [R] | SRV-BP-0015 |
|  |  | D5.4 Temporal reference – Date of creation (Conditional) | TG Requirement C.11,  TG Requirement C.12 |  | Temporal reference and metadata date – B.6.11 | Date (8) [R] |  |
|  |  | D5.2 Temporal reference – Date of publication (Conditional) | TG Requirement C.11 |  | Temporal reference and metadata date – B.6.11 | PublicationYear (5) [M] |  |
|  |  | B5.1 Temporal reference – Temporal extent (Conditional) | TG Requirement C.14 |  |  |  | SRV-BP-0081 |
| Resource abstract (M/1) | Description [R] - §2.2.7 | B1.2 Resource abstract (Mandatory) | TG Requirement C.9 | Description [R] – (F.2.2.5) | Resource abstract -B.6.2 | Description (17) [R] | SRV-BP-0014 |
| Online Link (O/N) | URL [R] - §2.2.8 | B1.4 Resource locator | TG Requirement 3.7 | URL [R] – (F.2.2.8) | Resource locator – B.6.4 |  | SRV-BP-0031 |
| Service topic category (O/N)  Keywords (O/N) | ServiceKeywords [R] - §2.2.9 (values from KMS) | B3.1 Keyword value (Mandatory)  B3.2 Originating controlled vocabulary (Conditional) | TG Requirement 3.4  TG Requirement C.15 | ToolKeyword [R] – (F.2.2.6) | Keyword in services – B.6.8.2 | Subject (6) [R] | SRV-BP-4010,  SRV-BP-4020,  SRV-BP-4030,  SRV-BP-0071 |
|  | OperationMetadata - §2.2.11 | B1.4 Resource locator (Conditional)  B3 Invocation metadata (Conditional) | TG Requirement 1.8 (collections and granules),  TG Requirement 3.7  TG Requirement 7.1,  TG Requirement 7.2,  TG Requirement 7.3 | RelatedURLs (F.2.2.21)  SearchAction (F.2.2.22) |  |  | SRV-BP-0032  SRV-BP-0033  SRV-BP-0051 |
| Coupled Resource (O)  Coupled resource type (O) | Coupled Resource - §2.2.11.7 | B1.6 Coupled resource (Conditional) | TG Requirement 3.6 |  | Coupled resource – B.6.6 | RelatedIdentifier (12) [R] | SRV-BP-0515  SRV-BP-0052 |
|  | ServiceOptions - §2.2.10 |  |  | SupportedOutputFormats (F.2.2.10) |  |  |  |
|  | ServiceOptions - §2.2.10 |  |  | SupportedInputFormats (F.2.2.11) |  |  |  |
|  |  |  |  | SupportedOperatingSystem (F.2.2.12) |  |  |  |
|  |  |  |  | SupportedBrowsers (F.2.2.13) |  |  |  |
|  |  |  |  | SupportedSoftwareLanguage (F.2.2.14) |  |  |  |
| Responsible party (O/N) | ServiceOrganizations [R] - §2.2.12 (values from KMS) | B.9 Responsible organization (Mandatory) | TG Requirement C.10 | Organizations [R] – (F.2.2.7)  (from a controlled vocabulary). | Responsible party and metadata point of contact – B.6.16 | Creator (2) [M]  Publisher (4) [M]  Contributor (7) [R] | SRV-BP-0018 |
|  | ContactPersons - §2.2.13 |  |  | ContactPersons (F.2.2.19) |  |  | SRV-BP-0018 |
|  | ContactGroups - - §2.2.14 |  |  | ContactGroups (F.2.2.20) |  |  | SRV-BP-0018 |
|  | ServiceQuality - §2.2.15 | B4 Quality of Service (Conditional) | TG Requirement 6.5 | Quality (F.2.2.15) |  |  |  |
| Constraints on access and use (O/N) | AccessConstraints - §2.2.16 | B8.1 Conditions applying to access and use  B8.2 Limitations on public access | TG Requirement C.17 | AccessConstraints (F.2.2.16) | Conditions for access and use and limitations … - B.6.15 | Rights (16) [O] | SRV-BP-0021 |
| Constraints on access and use (O/N) | UseConstraints - §2.2.17 |  | TG Requirement C.18  TG Recommendation C.10 | UseConstraints (F.2.2.17) | Conditions for access and use and limitations … - B.6.15 | Rights (16) [O] | SRV-BP-0022  SRV-BP-0023 |
|  | AncillaryKeywords - §2.2.18 | B3.1 Keyword value (Mandatory) | TG Requirement 3.4 | AncillaryKeywords (F.2.2.18) | Keyword in services – B.6.8.2 |  | SRV-BP-4010,  SRV-BP-4020,  SRV-BP-4030 |
| Geographic location (M/1) |  | B4.1 Geographic bounding box (Conditional) | TG Requirement C.19 |  | Geographic bounding box – B.6.10 | GeoLocation (18) [R] | SRV-BP-0082 |
|  |  | B6.2 Spatial resolution (Conditional) | TG Requirement 3.3 |  | Spatial resolution – B.6.13 |  | SRV-BP-0019 |
|  |  | B7 Conformity (Mandatory) | TG Requirement C.20,  TG Requirement C.22,  TG Requirement C.21,  TG Requirement 1.10,  TG Requirement 5.3,  TG Requirement 5.5 |  | Conformity and data quality – B.6.14 |  | SRV-BP-0041 |
| Metadata point of contact (M/N) |  | B10.1 Metadata point of contact (Mandatory) | TG Requirement C.6 |  | Responsible party and metadata point of contact – B.6.16 |  | SRV-BP-0061 |
| Metadata date stamp (M/N) |  | B10.2 Metadata date (Mandatory) | TG Requirement C.7 |  | Temporal reference and metadata date – B.6.11 |  | SRV-BP-0062 |
|  |  | B10.3 Metadata language (Mandatory) | TG Requirement C.5 |  | Resource language and metadata language – B.6.7 |  | SRV-BP-0063 |
|  |  | B3 CRS Identifier (Conditional) | TG Requirement 6.1,  TG Requirement 6.2 |  | Coordinate reference systems and temporal reference systems – B.6.23 |  | SRV-BP-0020 |
|  |  |  |  |  |  |  |  |

1. Best Practices Overview per Encoding

| *CEOS Best Practice ID* | *CEOS Best Practice Topic* | *ISO19139* | *Atom* | *OGC 19-020r1* | *GeoDCAT-AP* | *Schema.org* | *ISO19115-3* | *UMM-JSON* |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SRV-BP-0001 | Resource type |  |  |  |  |  |  |  |
| SRV-BP-0003 | Resource identifier | SRV-BP-2210 | SRV-BP-3210  SRV-BP-3230 | SRV-BP-4210  SRV-BP-4230 | SRV-BP-5210  SRV-BP-5230 | SRV-BP-6210 | SRV-BP-7210 | SRV-BP-8210 |
| SRV-BP-0005 | Resource title | SRV-BP-2210 | SRV-BP-3210 | SRV-BP-4210 | SRV-BP-5210 | SRV-BP-6210 | SRV-BP-7210 | SRV-BP-8210 |
| SRV-BP-0007 | DOI | SRV-BP-2220 | SRV-BP-3220 | SRV-BP-4220 | SRV-BP-5220 | SRV-BP-6220 | SRV-BP-7220 | SRV-BP-8220 |
| SRV-BP-0009 | DOI and citations |  |  |  |  |  |  |  |
| SRV-BP-0014 | Resource abstract | SRV-BP-2210 | SRV-BP-3210 | SRV-BP-4210 | SRV-BP-5210 | SRV-BP-6210 | SRV-BP-7210 | SRV-BP-8210 |
| SRV-BP-0015 | Resource last revision date | SRV-BP-2220 | SRV-BP-3220 | SRV-BP-4220 | SRV-BP-5220 | SRV-BP-6220 | SRV-BP-7220 | SRV-BP-8220 |
| SRV-BP-0016 | Resource version | SRV-BP-2220 |  | SRV-BP-4220 | SRV-BP-5220 | SRV-BP-6220 | SRV-BP-7220 | SRV-BP-8220 |
| SRV-BP-0017 | Resource version description | SRV-BP-2220 |  | SRV-BP-4220 | SRV-BP-5220 |  | SRV-BP-7220 | SRV-BP-8220 |
| SRV-BP-0018 | Responsible organization | SRV-BP-2210 | SRV-BP-3210 | SRV-BP-4210 | SRV-BP-5210 | SRV-BP-6210 | SRV-BP-7210 | SRV-BP-8210 |
| SRV-BP-0019 | Spatial resolution | SRV-BP-2230 |  |  | SRV-BP-5235 |  | SRV-BP-7230 |  |
| SRV-BP-0020 | CRS | SRV-BP-2240 |  |  | SRV-BP-5240 | SRV-BP-6240 | SRV-BP-7240 | SRV-BP-8240 |
| SRV-BP-0021 | Limitations public access | SRV-BP-2310 | SRV-BP-3320 | SRV-BP-4310 | SRV-BP-5310 | SRV-BP-6310 | SRV-BP-7310 | SRV-BP-8310 |
| SRV-BP-0022 | Conditions for access and use | SRV-BP-2320 | SRV-BP-3310 | SRV-BP-4310 | SRV-BP-5310 | SRV-BP-6310 | SRV-BP-7320 | SRV-BP-8320 |
| SRV-BP-0023 | Licenses | SRV-BP-2330 | SRV-BP-3310 | SRV-BP-4310 | SRV-BP-5310 | SRV-BP-6310 | SRV-BP-7330 | SRV-BP-8330 |
| SRV-BP-0031 | Resource URL | SRV-BP-2410 | SRV-BP-3410  SRV-BP-3415 | SRV-BP-4410  SRV-BP-4415 | SRV-BP-5410  SRV-BP-5415 | SRV-BP-6410  SRV-BP-6415 | SRV-BP-7410 | SRV-BP-8410  SRV-BP-8415 |
| SRV-BP-0032 | Access points | SRV-BP-2420 | SRV-BP-3420 | SRV-BP-4420 | SRV-BP-5420 | SRV-BP-6420 | SRV-BP-7420 |  |
| SRV-BP-0033 | No online access | SRV-BP-2430 | SRV-BP-3430 | SRV-BP-4430 | SRV-BP-5430 | SRV-BP-6430 | SRV-BP-7430 | SRV-BP-8430 |
| SRV-BP-0041 | Technical specification | SRV-BP-2510 | SRV-BP-3510 | SRV-BP-4510 | SRV-BP-5510 | SRV-BP-6510 | SRV-BP-7510 |  |
| SRV-BP-0051 | Resource locator |  | SRV-BP-3610 |  |  |  |  |  |
| SRV-BP-0052 | Coupled resource | SRV-BP-2610  SRV-BP-2620 | SRV-BP-3620 | SRV-BP-4610 | SRV-BP-5610 |  | SRV-BP-7620 | SRV-BP-8620 |
| SRV-BP-0061 | Metadata point of contact | SRV-BP-2710 |  | SRV-BP-4710 | SRV-BP-5710 | SRV-BP-6710 | SRV-BP-7710 | SRV-BP-8710 |
| SRV-BP-0062 | Last update date of metadata | SRV-BP-2710 | SRV-BP-3710 | SRV-BP-4710 | SRV-BP-5710 | SRV-BP-6710 | SRV-BP-7710 | SRV-BP-8710 |
| SRV-BP-0063 | Metadata language | SRV-BP-2710 | SRV-BP-3710 | SRV-BP-4710 | SRV-BP-5710 | SRV-BP-6710 | SRV-BP-7710 |  |
| SRV-BP-0071 | Resource keywords | SRV-BP-2810 | SRV-BP-3810 | SRV-BP-4810 | SRV-BP-5810 | SRV-BP-6810 | SRV-BP-7810 | SRV-BP-8810 |
| SRV-BP-0081 | Temporal extent | SRV-BP-2910 | SRV-BP-3910 | SRV-BP-4910 | SRV-BP-5910 | SRV-BP-6910 | SRV-BP-7910 | SRV-BP-8910 |
| SRV-BP-0082 | Geographical extent | SRV-BP-2920 | SRV-BP-3920 | SRV-BP-4920 | SRV-BP-5920 | SRV-BP-6920 | SRV-BP-7920 | SRV-BP-8920 |
| SRV-BP-0910 | Metadata formats | SRV-BP-2105  SRV-BP-2110 |  |  |  |  |  |  |
| SRV-BP-0402 | Multiple vocabularies |  |  |  |  |  |  |  |
| SRV-BP-0403 | Keyword information |  |  |  |  |  |  |  |
| SRV-BP-0411 | Service and Tool type |  |  |  |  |  |  |  |
| SRV-BP-0412 | Service and Tool type keywords |  |  |  |  |  |  |  |
| SRV-BP-0413 | Resource type |  |  |  |  |  |  |  |
| SRV-BP-0414 | Spatial Data Service type |  |  |  |  |  |  |  |
| SRV-BP-0415 | Protocol type |  |  |  |  |  |  |  |
| SRV-BP-0416 | Spatial Data Service Category |  |  |  |  |  |  |  |
| SRV-BP-0421 | Science keywords |  |  |  |  |  |  |  |
| SRV-BP-0431 | Platform names |  |  |  |  |  |  |  |
| SRV-BP-0441 | Instrument names |  |  |  |  |  |  |  |
| SRV-BP-0451 | Organization names |  |  |  |  | SRV-BP-0452 |  |  |
| SRV-BP-0511 | Service bindings |  |  |  |  |  |  |  |
| SRV-BP-0512 | Search parameters |  |  |  |  |  |  |  |
| SRV-BP-0513 | Hyperlink media relations |  |  |  |  |  |  |  |
| SRV-BP-0514 | Hyperlink media types |  |  |  |  |  |  |  |
| SRV-BP-0515 | Coupled resources |  |  |  |  |  |  |  |

1. Examples

The current section includes complete examples for each of the proposed metadata encodings.

* 1. ISO19139

*Example 90: Complete example (ISO19139)*

<?xml version="1.0" encoding="UTF-8"?>

<gmd:MD\_Metadata xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gmi="http://www.isotc211.org/2005/gmi" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:gmx="http://www.isotc211.org/2005/gmx" xmlns:srv="http://www.isotc211.org/2005/srv" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.isotc211.org/2005/gmd ./apiso-inspire.xsd">

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<gmd:CI\_ResponsibleParty>

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<gmd:contactInfo>

<gmd:CI\_Contact>

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<gmd:CI\_Telephone>

<gmd:voice>

<gco:CharacterString>tel:+39 06 94180777</gco:CharacterString>

</gmd:voice>

</gmd:CI\_Telephone>

</gmd:phone>

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<gmd:CI\_Address>

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<gmd:electronicMailAddress>

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</gmd:title>

<gmd:date>

<gmd:CI\_Date>

<gmd:date>

<gco:Date>2010-12-08</gco:Date>

</gmd:date>

<gmd:dateType>

<gmd:CI\_DateTypeCode codeList="http://standards.iso.org/iso/19139/resources/gmxCodelists.xml#CI\_DateTypeCode" codeListValue="publication">publication</gmd:CI\_DateTypeCode>

</gmd:dateType>

</gmd:CI\_Date>

</gmd:date>

</gmd:CI\_Citation>

</gmd:specification>

<gmd:explanation>

<gco:CharacterString>This data set is conformant with the INSPIRE Implementing Rules for the interoperability of spatial data sets and services</gco:CharacterString>

</gmd:explanation>

<gmd:pass>

<gco:Boolean>true</gco:Boolean>

</gmd:pass>

</gmd:DQ\_ConformanceResult>

</gmd:result>

</gmd:DQ\_DomainConsistency>

</gmd:report>

<gmd:report>

<gmd:DQ\_DomainConsistency>

<gmd:result>

<gmd:DQ\_ConformanceResult>

<gmd:specification>

<gmd:CI\_Citation>

<gmd:title>

<gmx:Anchor xlink:href=" http://inspire.ec.europa.eu/id/ats/metadata/2.0/sds-invocable" xlink:title="INSPIRE Invocable Spatial Data Services metadata">invocable</gmx:Anchor>

</gmd:title>

<gmd:date>

<gmd:CI\_Date>

<gmd:date>

<gco:Date>2016-05-01</gco:Date>

</gmd:date>

<gmd:dateType>

<gmd:CI\_DateTypeCode codeList="http://standards.iso.org/iso/19139/resources/gmxCodelists.xml#CI\_DateTypeCode" codeListValue="publication">publication</gmd:CI\_DateTypeCode>

</gmd:dateType>

</gmd:CI\_Date>

</gmd:date>

</gmd:CI\_Citation>

</gmd:specification>

<gmd:explanation>

<gco:CharacterString>This Spatial Data Service set is conformant with the INSPIRE requirements for Invocable Spatial Data Services</gco:CharacterString>

</gmd:explanation>

<gmd:pass>

<gco:Boolean>true</gco:Boolean>

</gmd:pass>

</gmd:DQ\_ConformanceResult>

</gmd:result>

</gmd:DQ\_DomainConsistency>

</gmd:report>

<gmd:report>

<gmd:DQ\_DomainConsistency>

<gmd:result>

<gmd:DQ\_ConformanceResult>

<gmd:specification>

<gmd:CI\_Citation>

<gmd:title>

<gmx:Anchor xlink:href="http://docs.opengeospatial.org/is/17-089r1/17-089r1.html">OGC Web Coverage Service 2.0</gmx:Anchor>

</gmd:title>

<gmd:date>

<gmd:CI\_Date>

<gmd:date>

<gco:Date>2010-10-27</gco:Date>

</gmd:date>

<gmd:dateType>

<gmd:CI\_DateTypeCode codeList="http://standards.iso.org/iso/19139/resources/gmxCodelists.xml#CI\_DateTypeCode" codeListValue="publication">publication</gmd:CI\_DateTypeCode>

</gmd:dateType>

</gmd:CI\_Date>

</gmd:date>

</gmd:CI\_Citation>

</gmd:specification>

<gmd:explanation>

<gco:CharacterString>This Spatial Data Service is conformant with the OGC Web Coverage Service 2.0 specification</gco:CharacterString>

</gmd:explanation>

<gmd:pass>

<gco:Boolean>true</gco:Boolean>

</gmd:pass>

</gmd:DQ\_ConformanceResult>

</gmd:result>

</gmd:DQ\_DomainConsistency>

</gmd:report>

</gmd:DQ\_DataQuality>

</gmd:dataQualityInfo>

</gmd:MD\_Metadata>

* 1. Atom

*Example 91: Complete example (Atom)*

<?xml version="1.0" encoding="UTF-8"?>

<atom:feed xmlns:atom="http://www.w3.org/2005/Atom" xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:eo="http://a9.com/-/opensearch/extensions/eo/1.0/" xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/" xmlns:georss="http://www.georss.org/georss" xmlns:os="http://a9.com/-/spec/opensearch/1.1/" xmlns:owc="http://www.opengis.net/owc/1.0" xmlns:referrer="http://a9.com/-/opensearch/extensions/referrer/1.0/" xmlns:semantic="http://a9.com/-/opensearch/extensions/semantic/1.0/" xmlns:sru="http://a9.com/-/opensearch/extensions/sru/2.0/" xmlns:time="http://a9.com/-/opensearch/extensions/time/1.0/">

<atom:entry>

<atom:id>https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube?httpAccept=application/atom%2Bxml</atom:id>

<atom:link href="https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube?httpAccept=application/atom%2Bxml" rel="alternate" title="Atom format" type="application/atom+xml"/>

<atom:link href="https://cat.ceos.org/collections/services/items/eo-pdgs-landsat-datacube?httpAccept=application/vnd.iso.19139-2%2Bxml" rel="via" title="ISO19139 format" type="application/vnd.iso.19139%2Bxml"/>

<atom:link href="https://cat.ceos.org/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/vnd.iso.19139-2%2Bxml" rel="related" title="ISO19139 format" type="application/vnd.iso.19139-2%2Bxml"/>

<atom:category label="EARTH SCIENCE SERVICES &gt; DATA MANAGEMENT/DATA HANDLING &gt; DATA ACCESS/RETRIEVAL" term="https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea"/>

<atom:category label="OGC Web Coverage Service 2.0" term="http://www.opengis.net/def/serviceType/ogc/wcs/2.0"/>

<atom:category label="Landsat-7" term="https://earth.esa.int/concept/landsat-7"/>

<atom:category label="Landsat-8" term="https://earth.esa.int/concept/landsat-8"/>

<atom:summary type="html"><![CDATA[<table>

</table>

]]></atom:summary>

<atom:content type="text">The ESA PDGS-DataCube enables multi-temporal and pixel-based access to a subset of the data available in the European Space Agency dissemination services, including Heritage Missions (HM), Third-Party Missions (TPM) and Earth Explorer (EE) data.</atom:content>

<atom:title>Landsat DataCube</atom:title>

<atom:updated>2021-09-24T12:10:29Z</atom:updated>

<dc:identifier>eo-pdgs-landsat-datacube</dc:identifier>

<dc:date>2020-09-29T12:00:00.000Z/</dc:date>

<owc:offering code="http://www.opengis.net/spec/owc-atom/1.0/req/wcs">

<owc:operation code="DescribeCoverage" href="https://datacube.pdgs.eo.esa.int/wcs?service=WCS&amp;Request=DescribeCoverage&amp;version=2.0.0&amp;CoverageId=LE7\_RGB"/>

<owc:operation code="GetCapabilities" href="https://datacube.pdgs.eo.esa.int/wcs?service=WCS&amp;Request=GetCapabilities&amp;version=2.0.0"/>

</owc:offering>

</atom:entry>

</atom:feed>

* 1. OGC 19-020r1

*Example 92: Complete example (OGC 19-020r1)*

{

"geometry": null,

"id": " https://cat.ceos.org/collections/services/items/rasdaman",

"type": "Feature",

"properties": {

"identifier": "rasdaman",

"kind": "http://purl.org/dc/dcmitype/Service",

"title": "rasdaman - raster data manager",

"doi": "10.5281/zenodo.1040170",

"bibliographicCitation": "Peter Baumann, email: p.baumann@jacobs-university.de, & website: rasdaman.org. (2018, January 31). rasdaman - raster data manager (Version 9.5.0). Zenodo. http://doi.org/10.5281/zenodo.1163021",

"abstract": "Rasdaman (raster data manager) is an open source array database system, which provides flexible, fast, scalable geo services for multi-dimensional spatio-temporal sensor, image, simulation, and statistics data of unlimited volume. ... data with all geo data in the PostgreSQL database, support for the raster-relevant OGC standards, Reference Implementation for WCS Core and WCPS.",

"versionInfo": "9.5",

"updated": "2018-01-31T00:00:55.511Z",

"lang": "en",

"isPrimaryTopicOf": {

"created": "2021-10-20T16:12:55.511Z",

"type": "CatalogRecord",

"lang": "en",

"updated": "2021-10-20T16:12:55.511Z",

"contactPoint": [

{

"type": "Organization",

"name": "Committee on Earth Observation Satellites",

"uri": "https://ceos.org"

}

]

},

"contactPoint": [

{

"type": "Organization",

"name": "rasdaman GmbH",

"uri": "http://rasdaman.org"

}

],

"categories": [

{

"scheme": "https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/sciencekeywords",

"term": "https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea",

"label": "EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > DATA ACCESS/RETRIEVAL"

},

{

"scheme": "https://inspire.ec.europa.eu/metadata-codelist/ProtocolValue",

"term": "http://www.opengis.net/def/serviceType/ogc/wcs/2.0",

"label": "OGC Web Coverage Service 2.0"

},

{

"scheme": "http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory",

"term": "https://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/infoCoverageAccessService",

"label": "Coverage access service"

}

],

"keyword": [

"Big Data",

"arrays",

"raster data",

"OGC",

"WMS",

"WCS",

"WCS-T",

"WCPS",

"fast",

"scalable",

"flexible",

"open standards",

"free",

"cost-efficient",

"sensor",

"image",

"simulation",

"statistics data"

],

"offerings": [

{

"type": "Offering",

"code": "http://www.opengis.net/spec/eopad-geojson/1.0/req/docker/image",

"contents": [

{

"type": "text/plain",

"content": "arpasmr/rasdaman:latest"

}

]

}

],

"links": {

"describedby": [

{

"href": "http://www.rasdaman.org/",

"title": "Welcome to rasdaman — the world's most flexible and scalable Array / Datacube Engine",

"type": "text/html"

},

{

"href": "https://doi.org/10.5281/zenodo.1040170",

"title": "rasdaman - raster data manager",

"type": "text/html"

}

],

"profiles": [

{

"href": "http://www.opengis.net/spec/owc-geojson/1.0/req/core"

},

{

"href": "http://www.opengis.net/spec/eopad-geojson/1.0/req/core"

}

]

}

}

}

* 1. GeoDCAT-AP

*Example 93: Complete example (GeoDCAT-AP)*

{

"@context": {

"void": "http://rdfs.org/ns/void#",

"adms": "http://www.w3.org/ns/adms#",

"gsp": "http://www.opengis.net/ont/geosparql#",

"owl": "http://www.w3.org/2002/07/owl#",

"skos": "http://www.w3.org/2004/02/skos/core#",

"rdfs": "http://www.w3.org/2000/01/rdf-schema#",

"vcard": "http://www.w3.org/2006/vcard/ns",

"dct": "http://purl.org/dc/terms/",

"iana": "http://www.iana.org/assignments/relation/",

"owc": "http://www.opengis.net/ont/owc/1.0/",

"dcat": "http://www.w3.org/ns/dcat#",

"atom": "http://www.w3.org/2005/Atom",

"locn": "http://www.w3.org/ns/locn#",

"prov": "http://www.w3.org/ns/prov#",

"foaf": "http://xmlns.com/foaf/0.1/"

},

"@type": "dcat:DataService",

"dct:type": {

"@id": "http://inspire.ec.europa.eu/metadata-codelist/ResourceType/service"

},

"dct:title": "rasdaman - raster data manager",

"@id": " https://cat.ceos.org/collections/services/items/rasdaman?httpAccept=application/ld%2Bjson",

"owl:versionInfo": "9.5",

"dct:identifier": "rasdaman",

"adms:identifier": {

"@type": "adms:identifier",

"dct:creator": "https://doi.org/",

"skos:notation": "https://doi.org/10.5281/zenodo.1040170"

},

"dct:modified": "2018-01-31T00:00:55.511Z",

"dct:description": "Rasdaman (raster data manager) is an open source array database system, which provides flexible, fast, scalable geo services for multi-dimensional spatio-temporal sensor, image, simulation, and statistics data of unlimited volume. ... data with all geo data in the PostgreSQL database, support for the raster-relevant OGC standards, Reference Implementation for WCS Core and WCPS.",

"dcat:contactPoint": {

"@type": "vcard:Organization",

"vcard:hasName": {

"@value": "rasdaman GmbH",

"@language": "en"

},

"vcard:hasURL": {

"@id": "http://rasdaman.org"

}

},

"dcat:keyword": [

"Big Data",

"arrays",

"raster data",

"OGC",

"WMS",

"WCS",

"WCS-T",

"WCPS",

"fast",

"scalable",

"flexible",

"open standards",

"free",

"cost-efficient",

"sensor",

"image",

"simulation",

"statistics data"

],

"foaf:isPrimaryTopicOf": {

"dct:modified": "2021-10-20T16:12:55.511Z",

"dct:identifier": "https://cat.ceos.org/collections/services/items/rasdaman",

"dct:source": {

"@id": " https://cat.ceos.org/collections/services/items/rasdaman?httpAccept=application/vnd.iso.19139-2%2Bxml",

"type": "dcat:CatalogRecord",

"dct:conformsTo": {

"@type": "dct:Standard",

"dct:title": "ISO19139"

}

},

"type": "dcat:CatalogRecord",

"dct:conformsTo": {

"@id": "https://joinup.ec.europa.eu/release/geodcat-ap/20"

},

"dct:language": {

"@id": "http://publications.europa.eu/resource/authority/language/EN"

},

"dcat:contactPoint": [

{

"@type": "vcard:Organization",

"vcard:organization-name": "Committee on Earth Observation Satellites"

}

]

},

"foaf:page": [

{

"@type": "foaf:Document",

"@id": "http://www.rasdaman.org/",

"dct:title": {

"@value": "Welcome to rasdaman — the world's most flexible and scalable Array / Datacube Engine",

"@language": "en"

}

}

],

"dct:language": {

"@id": "http://publications.europa.eu/resource/authority/language/EN"

},

"dct:bibliographicCitation": "Peter Baumann, email: p.baumann@jacobs-university.de, & website: rasdaman.org. (2018, January 31). rasdaman - raster data manager (Version 9.5.0). Zenodo. http://doi.org/10.5281/zenodo.1163021",

"dcat:theme": [

{

"skos:inscheme": "https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/sciencekeywords",

"skos:preflabel": "EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > DATA ACCESS/RETRIEVAL",

"@id": "https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-9dc1-b0aea78f98ea"

},

{

"skos:inscheme": "https://inspire.ec.europa.eu/metadata-codelist/ProtocolValue",

"skos:preflabel": "OGC Web Coverage Service 2.0",

"@id": "http://www.opengis.net/def/serviceType/ogc/wcs/2.0"

},

{

"skos:inscheme": "http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory",

"skos:preflabel": "Coverage access service",

"@id": "https://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/infoCoverageAccessService"

}

]

}

* 1. Schema.org

*Example 94: Complete example (Schema.org)*

{

"@context": {

"@vocab": "https://schema.org/"

},

"@type": "CreativeWork",

"name": "Coastline Classifier",

"@id": "https://cat.ceos.org/collections/services/items/coastline-classifier",

"additionalType": [

"http://purl.org/dc/dcmitype/Service"

],

"description": "A coastal boundary algorithm is used to classify a given pixel as either coastline or not coastline using a simple binary format. The algorithm makes a classification by examining surrounding pixels and making a determination based on how many pixels around it are water",

"alternateName": "coastline-classifier",

"dateModified": "2021-03-17T11:41:21Z",

"identifier": [

"coastline-classifier"

],

"license": [

"https://spdx.org/licenses/Apache-2.0"

],

"keywords": [

{

"@type": "DefinedTerm",

"name": "EARTH SCIENCE > TERRESTRIAL HYDROSPHERE > GLACIERS/ICE SHEETS > COASTLINE",

"@id": "https://gcmd.earthdata.nasa.gov/kms/concept/18d136b8-728f-438b-90cb-3c82956e1c2c",

"inDefinedTermSet": "https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/sciencekeywords"

},

{

"@type": "DefinedTerm",

"name": "Landsat-8",

"@id": "https://earth.esa.int/concept/landsat-8",

"inDefinedTermSet": "https://earth.esa.int/concepts/concept\_scheme/platforms"

},

{

"@type": "DefinedTerm",

"name": "LANDSAT-8",

"@id": "https://gcmd.earthdata.nasa.gov/kms/concept/13e3a08a-0d28-4e3f-a306-a20d9fb4fff8",

"inDefinedTermSet": "https://gcmd.earthdata.nasa.gov/kms/concepts/concept\_scheme/platforms"

}

],

"subjectOf": [

{

"@type": "DataDownload",

"contentUrl": "https://raw.githubusercontent.com/ceos-seo/data\_cube\_notebooks/master/notebooks/water/coastline/Coastline\_Classifier.ipynb",

"name": "Download the Notebook",

"encodingFormat": "application/x-ipynb+json"

},

{

"@type": [

"ListItem",

"CreativeWork"

],

"inLanguage": {

"@type": "Language",

"name": "en",

"@id": "http://id.loc.gov/vocabulary/iso639-1/en"

},

"publisher": [

{

"@type": "Organization",

"name": "Committee on Earth Observation Satellites",

"contactPoint": {

"@type": "ContactPoint"

}

}

],

"encodingFormat": "application/vnd.iso.19139+xml",

"dateCreated": "2020-12-04T12:00:00.000Z",

"dateModified": "2021-03-17T11:41:21Z"

},

{

"contentUrl": "https://cat.ceos.org/collections/services/items/coastline-classifier?httpAccept=application/atom%2Bxml",

"additionalType": "http://www.iana.org/assignments/relation/alternate",

"@type": "MediaObject",

"name": "Atom format",

"encodingFormat": "application/atom+xml"

},

{

"contentUrl": "https://cat.ceos.org/collections/services/items/coastline-classifier",

"additionalType": "http://www.iana.org/assignments/relation/alternate",

"@type": "MediaObject",

"name": "OGC 17-069r3 metadata",

"encodingFormat": "application/geo+json;profile=\"http://www.opengis.net/spec/ogcapi-features-1/1.0\""

},

{

"contentUrl": "https://cat.ceos.org/collections/services/items/coastline-classifier?httpAccept=application/vnd.iso.19139%2Bxml",

"@type": "MediaObject",

"name": "ISO 19139 metadata",

"encodingFormat": "application/vnd.iso.19139+xml"

},

{

"contentUrl": "https://cat.ceos.org/collections/services/items/coastline-classifier?httpAccept=text/html",

"@type": "MediaObject",

"name": "HTML",

"encodingFormat": "text/html"

},

{

"contentUrl": "https://github.com/ceos-seo/data\_cube\_notebooks/blob/master/notebooks/water/coastline/Coastline\_Classifier.ipynb",

"@type": "MediaObject",

"name": "View the Notebook",

"encodingFormat": "text/html"

}

],

"spatialCoverage": {

"geo": {

"@type": "GeoShape"

},

"@type": "Place"

},

"temporalCoverage": "1999-01-01T12:00:00.000Z/2003-12-31T11:59:59.000Z",

"provider": [

{

"@type": "Organization",

"name": "CEOS",

"url": "https://ceos.org"

}

]

}

* 1. ISO19115-3

*Example 95: Complete example (ISO19115-3)*

<?xml version="1.0" encoding="UTF-8"?>

<mdb:MD\_Metadata xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:mdb="http://standards.iso.org/iso/19115/-3/mdb/1.0" xmlns:mac="http://standards.iso.org/iso/19115/-3/mac/1.0" xmlns:mcc="http://standards.iso.org/iso/19115/-3/mcc/1.0" xmlns:gco="http://standards.iso.org/iso/19115/-3/gco/1.0" xmlns:gcx="http://standards.iso.org/iso/19115/-3/gcx/1.0" xmlns:gex="http://standards.iso.org/iso/19115/-3/gex/1.0" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:mco="http://standards.iso.org/iso/19115/-3/mco/1.0" xmlns:mdq="http://standards.iso.org/iso/19157/-2/mdq/1.0" xmlns:mri="http://standards.iso.org/iso/19115/-3/mri/1.0" xmlns:srv="http://standards.iso.org/iso/19115/-3/srv/2.0" xmlns:mrd="http://standards.iso.org/iso/19115/-3/mrd/1.0" xmlns:lan="http://standards.iso.org/iso/19115/-3/lan/1.0" xmlns:cit="http://standards.iso.org/iso/19115/-3/cit/1.0" xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="http://standards.iso.org/iso/19115/-3/mds/1.0 ./standards.iso.org/19115/-3/mds/1.0/mds.xsd">

<mdb:metadataIdentifier>

<mcc:MD\_Identifier>

<mcc:code>

<gco:CharacterString>eo-pdgs-landsat-datacube</gco:CharacterString>

</mcc:code>

</mcc:MD\_Identifier>

</mdb:metadataIdentifier>

<mdb:defaultLocale>

<lan:PT\_Locale>

<lan:language>

<lan:LanguageCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/lan/LanguageCode.xml#LanguageCode" codeListValue="eng"/>

</lan:language>

<lan:characterEncoding/>

</lan:PT\_Locale>

</mdb:defaultLocale>

<mdb:metadataScope>

<mdb:MD\_MetadataScope>

<mdb:resourceScope>

<mcc:MD\_ScopeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#MD\_ScopeCode" codeListValue="service"/>

</mdb:resourceScope>

</mdb:MD\_MetadataScope>

</mdb:metadataScope>

<mdb:contact>

<cit:CI\_Responsibility>

<cit:role>

<cit:CI\_RoleCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI\_RoleCode" codeListValue="pointOfContact"/>

</cit:role>

<cit:party>

<cit:CI\_Organisation>

<cit:name>

<gco:CharacterString>ESA/ESRIN</gco:CharacterString>

</cit:name>

<cit:contactInfo>

<cit:CI\_Contact>

<cit:phone>

<cit:CI\_Telephone>

<cit:number>

<gco:CharacterString>+3906941801</gco:CharacterString>

</cit:number>

<cit:numberType>

<cit:CI\_TelephoneTypeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI\_TelephoneTypeCode" codeListValue="voice"/>

</cit:numberType>

</cit:CI\_Telephone>

</cit:phone>

<cit:phone>

<cit:CI\_Telephone>

<cit:number>

<gco:CharacterString>+390694180280</gco:CharacterString>

</cit:number>

<cit:numberType>

<cit:CI\_TelephoneTypeCode codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI\_TelephoneTypeCode" codeListValue="facsimile"/>

</cit:numberType>

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<gco:CharacterString>Largo Galileo Galilei 1</gco:CharacterString>

</cit:deliveryPoint>

<cit:city>

<gco:CharacterString>Frascati (Roma)</gco:CharacterString>

</cit:city>

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<gco:CharacterString>00044</gco:CharacterString>

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<cit:positionName>

<gco:CharacterString>ESRIN Earth Observation Help Desk</gco:CharacterString>

</cit:positionName>

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</cit:CI\_Responsibility>

</mdb:contact>

<mdb:dateInfo>

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<cit:title>

<gco:CharacterString>ISO 19115-3</gco:CharacterString>

</cit:title>

<cit:edition>

<gco:CharacterString>2016-08-15</gco:CharacterString>

</cit:edition>

</cit:CI\_Citation>

</mdb:metadataStandard>

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<mri:citation>

<cit:CI\_Citation>

<cit:title>

<gco:CharacterString>rasdaman - raster data manager</gco:CharacterString>

</cit:title>

<cit:date>

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<cit:date>

<gco:DateTime>2020-12-04T00:00:00</gco:DateTime>

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<cit:dateType>

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</mri:citation>

<mri:abstract>

<gco:CharacterString>ESA PDGS-DataCube enables multi-temporal and pixel-based access to a subset of the data available in the European Space Agency dissemination services, including Heritage Missions (HM), Third-Party Missions (TPM) and Earth Explorer (EE) data.</gco:CharacterString>

</mri:abstract>

<mri:pointOfContact>

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<cit:name>

<gco:CharacterString>ESA/ESRIN</gco:CharacterString>

</cit:name>

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<gco:CharacterString>+3906941801</gco:CharacterString>

</cit:number>

<cit:numberType>

<cit:CI\_TelephoneTypeCode codeList="codeListLocation#CI\_TelephoneTypeCode" codeListValue="voice">voice</cit:CI\_TelephoneTypeCode>

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</cit:deliveryPoint>

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</cit:city>

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<gco:CharacterString>ESRIN Earth Observation Help Desk</gco:CharacterString>

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</cit:party>

</cit:CI\_Responsibility>

</mri:pointOfContact>

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</gex:southBoundLatitude>

<gex:northBoundLatitude>

<gco:Decimal>90</gco:Decimal>

</gex:northBoundLatitude>

</gex:EX\_GeographicBoundingBox>

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<mri:MD\_Keywords>

<mri:keyword>

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</mri:keyword>

<mri:keyword>

<gcx:Anchor xlink:href="https://earth.esa.int/concept/landsat-8">Landsat-8</gcx:Anchor>

</mri:keyword>

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<gcx:Anchor xlink:href="https://earth.esa.int/concepts/concept\_scheme/platforms">EO Parameter Code List - Platforms</gcx:Anchor>

</cit:title>

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<cit:CI\_DateTypeCode codeList="https://schemas.isotc211.org/19115/resources/Codelists/cat/codelists.xml#CI\_DateTypeCode" codeListValue="publication">publication</cit:CI\_DateTypeCode>

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<mco:MD\_LegalConstraints>

<mco:useConstraints>

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</mco:useConstraints>

<mco:otherConstraints>

<gcx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/ConditionsApplyingToAccessAndUse/noConditionsApply">No conditions apply to access and use.</gcx:Anchor>

</mco:otherConstraints>

</mco:MD\_LegalConstraints>

</mri:resourceConstraints>

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<mco:MD\_LegalConstraints>

<mco:accessConstraints>

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<mco:otherConstraints>

<gcx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/LimitationsOnPublicAccess/noLimitations">no limitations to public access.</gcx:Anchor>

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</mri:resourceConstraints>

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</mri:associationType>

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<cit:CI\_Citation>

<cit:title>

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</cit:title>

<cit:identifier>

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<mrd:transferOptions>

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</cit:linkage>

<cit:protocol>

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</cit:protocol>

<cit:name>

<gco:CharacterString>DescribeCoverage</gco:CharacterString>

</cit:name>

<cit:description>

<gcx:Anchor xlink:href="http://inspire.ec.europa.eu/metadata-codelist/OnLineDescriptionCode/accessPoint">accessPoint</gcx:Anchor>

</cit:description>

<cit:function>

<cit:CI\_OnLineFunctionCode codeList="https://schemas.isotc211.org/19115/resources/Codelist/cat/codeLists.xml#CI\_OnLineFunctionCode" codeListValue="information"/>

</cit:function>

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<gco:CharacterString>https://datacube.pdgs.eo.esa.int/wcs?service=WCS&amp;Request=GetCapabilities&amp;version=2.0.0</gco:CharacterString>

</cit:linkage>

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OGC:WCS:GetCapabilities</gcx:Anchor>

</cit:protocol>

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<cit:description>

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<mdq:DQ\_DomainConsistency>

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<gcx:Anchor xlink:href="http://docs.opengeospatial.org/is/17-089r1/17-089r1.html">OGC Web Coverage Service 2.0</gcx:Anchor>

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</mdq:specification>

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<gco:CharacterString>This Spatial Data Service is conformant with the OGC Web Coverage Service 2.0 specification</gco:CharacterString>

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</mdq:report>

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* 1. UMM-JSON
     1. UMM-S

*Note: example was retrieved from https://cmr.earthdata.nasa.gov/search/services.umm\_json?name=PO.DAAC%20harmony-netcdf-to-zarr&pretty=true.*

{

"meta": {

"native-id": "mmt\_service\_14322",

"provider-id": "POCLOUD",

"concept-type": "service",

"concept-id": "S2009180097-POCLOUD",

"revision-date": "2021-02-23T03:34:10.803Z",

"user-id": "mgangl",

"deleted": false,

"revision-id": 2,

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

"URL": {

"Description": "This is the harmony root endpoint.",

"URLValue": "https://harmony.earthdata.nasa.gov"

},

"Type": "Harmony",

"ServiceKeywords": [

{

"ServiceCategory": "EARTH SCIENCE SERVICES",

"ServiceTopic": "DATA MANAGEMENT/DATA HANDLING",

"ServiceTerm": "DATA ACCESS/RETRIEVAL"

},

{

"ServiceCategory": "EARTH SCIENCE SERVICES",

"ServiceTopic": "DATA MANAGEMENT/DATA HANDLING",

"ServiceTerm": "DATA INTEROPERABILITY",

"ServiceSpecificTerm": "DATA REFORMATTING"

}

],

"ServiceOrganizations": [

{

"Roles": [

"PUBLISHER",

"SERVICE PROVIDER"

],

"ShortName": "NASA/GSFC/EOS/EOSDIS/EMD",

"LongName": "Maintenance and Development, Earth Observing System Data and Information System, Earth Observing System,Goddard Space Flight Center, NASA"

}

],

"Description": "Backend NetCDF to Zarr service option description for Harmony data transformations. Cannot be chained with other operations from this record.",

"VersionDescription": "Data operation version\r\n\r\n",

"Version": "0.9.0",

"Name": "PO.DAAC harmony-netcdf-to-zarr",

"ServiceOptions": {

"SupportedReformattings": [

{

"SupportedInputFormat": "NETCDF-4",

"SupportedOutputFormats": [

"ZARR"

]

}

]

},

"MetadataSpecification": {

"URL": "https://cdn.earthdata.nasa.gov/umm/service/v1.4",

"Name": "UMM-S",

"Version": "1.4"

},

"LongName": "PO.DAAC harmony-netcdf-to-zarr Service Options"

}

}

* + 1. UMM-T

*Note: example was retrieved from https://cmr.earthdata.nasa.gov/search/tools.umm\_json?name=Proba-V%20MEP&pretty=true.*

{

"meta": {

"native-id": "Proba-V\_MEP",

"provider-id": "ESA",

"concept-type": "tool",

"concept-id": "TL2093861884-ESA",

"revision-date": "2021-10-04T20:04:50.558Z",

"user-id": "mmorahan",

"deleted": false,

"revision-id": 2,

"format": "application/vnd.nasa.cmr.umm+json"

},

"umm": {

"URL": {

"Description": "Access the Proba-V MEP.",

"URLValue": "https://proba-v-mep.esa.int/",

"URLContentType": "DistributionURL",

"Type": "GOTO WEB TOOL",

"Subtype": "MAP VIEWER"

},

"AncillaryKeywords": [

"Sentinel satellites",

"ESA",

"Imagery",

"Urban development",

"Natural disaster management",

"Satellite data",

"CEOS"

],

"Type": "Web User Interface",

"AccessConstraints": "Viewing is anonymous. On-demand processing, notebook, Virtual Machines are free, but require registration.",

"Description": "Exploitation Platform for Proba-V, Spot-Vegetation and selected parameters from Copernicus Global Land. Several components are provided: full-resolution viewing, Time series viewing, Notebooks, VMs on private cloud, Hadooop/Spark cluster for large-scale parallel on-demand processing. Operations Start Date: 01/2016 Targeted Users: Scientific, Education, Public Authority. Data (Type, Mission, Time Series): Sentinel-2A, Sentinel-2B, Proba-V full archive, Spot-Vegetation full archive: Global from 1998. Copernicus global land service vegetation products. Meteo data from Chirps.",

"Version": "NOT PROVIDED",

"ToolKeywords": [

{

"ToolCategory": "EARTH SCIENCE SERVICES",

"ToolTopic": "DATA MANAGEMENT/DATA HANDLING",

"ToolTerm": "CATALOGING"

}

],

"Name": "Proba-V MEP",

"ContactPersons": [

{

"Roles": [

"SERVICE PROVIDER"

],

"LastName": "VITO Helpdesk/Operations",

"ContactInformation": {

"ContactMechanisms": [

{

"Type": "Email",

"Value": "remotesensing@vito.be"

},

{

"Type": "Telephone",

"Value": "+32 14 33 68 55"

}

]

}

}

],

"Organizations": [

{

"Roles": [

"SERVICE PROVIDER"

],

"ShortName": "VITO",

"LongName": "Flemish Institute for Technological Research",

"URLValue": "https://www.vito.be/"

},

{

"Roles": [

"SERVICE PROVIDER"

],

"ShortName": "ESA/EO",

"LongName": "Observing the Earth, European Space Agency",

"URLValue": "http://www.esa.int/esaEO/"

}

],

"MetadataSpecification": {

"URL": "https://cdn.earthdata.nasa.gov/umm/tool/v1.1",

"Name": "UMM-T",

"Version": "1.1"

},

"LongName": "Proba-V Mission Exploitation Platform (MEP)"

}

}

1. https://zenodo.org/ [↑](#footnote-ref-1)
2. https://hub.docker.com/ [↑](#footnote-ref-2)
3. https://en.wikipedia.org/wiki/Software\_as\_a\_service [↑](#footnote-ref-3)
4. https://colab.research.google.com/ [↑](#footnote-ref-4)
5. https://mybinder.org/ [↑](#footnote-ref-5)
6. https://spdx.org/licenses/ [↑](#footnote-ref-6)
7. See DOI mapping proposed in https://docs.ogc.org/is/13-026r9/13-026r9.html. [↑](#footnote-ref-7)
8. [↑](#footnote-ref-8)
9. https://datatracker.ietf.org/doc/html/draft-paskin-doi-uri [↑](#footnote-ref-9)
10. https://datatracker.ietf.org/doc/html/rfc4946 [↑](#footnote-ref-10)
11. https://docs.opengeospatial.org/is/12-084r2/12-084r2.html [↑](#footnote-ref-11)
12. https://github.com/ESIPFed/science-on-schema.org/blob/master/guides/Dataset.md#geoshape-location-extent [↑](#footnote-ref-12)
13. https://github.com/ESIPFed/science-on-schema.org/blob/master/guides/Dataset.md#indicating-a-software-workflow-or-processing-activity-provused-and-provwasgeneratedby [↑](#footnote-ref-13)
14. See DOI mapping proposed in https://docs.ogc.org/is/13-026r9/13-026r9.html. [↑](#footnote-ref-14)
15. https://cdn.earthdata.nasa.gov/umm/service/v1.4 [↑](#footnote-ref-15)
16. See https://gcmd.earthdata.nasa.gov/KeywordViewer/scheme/rucontenttype?gtm\_scheme=rucontenttype. [↑](#footnote-ref-16)
17. Not available in UMM-T and UMM-S. Role values for Service/Tool Organization have to match the available enumeration values “SERVICE PROVIDER”, “DEVELOPER”, “PUBLISHER”, “AUTHOR”, “PUBLISHER”, “AUTHOR”, “ORIGINATOR” but do not allow distinguish between responsibility for metadata and responsibility for the actual service or tool. [↑](#footnote-ref-17)
18. https://gcmd.earthdata.nasa.gov/static/kms/ [↑](#footnote-ref-18)
19. https://gcmd.earthdata.nasa.gov/static/kms/ [↑](#footnote-ref-19)
20. https://developers.google.com/search/docs/advanced/structured-data/dataset [↑](#footnote-ref-20)
21. https://github.com/radiantearth/stac-api-spec/blob/master/stac-spec/overview.md [↑](#footnote-ref-21)
22. https://datatracker.ietf.org/doc/html/rfc7763 [↑](#footnote-ref-22)
23. ISO19115-1 obligations: [M]=Mandatory, [O]=Optional [↑](#footnote-ref-23)
24. UMM-S and UMM-T obligations: [R]=Required (Mandatory). [↑](#footnote-ref-24)
25. DataCite obligations: [M]=Mandatory, [R]=Recommended, [O]=Optional [↑](#footnote-ref-25)