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EO COLLECTION GEOJSON(-LD) ENCODING

BEST PRACTICE General

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ABSTRACT

JavaScript Object Notation (JSON) [NR1] has been gaining in popularity for encoding data in Web-based applications. JSON consists of sets of objects described by name/value pairs. GeoJSON [NR2] is a format for encoding collections of simple geographical features along with their non-spatial attributes using JSON. This OGC Best Practice describes a GeoJSON [NR2] and JSON-LD [NR13] encoding for Earth Observation (EO) metadata for collections (dataset series). This standard can be applied to encode metadata based on the OGC 11-035r1 [OR20] or ISO19139 [OR27], ISO19139-2 [OR28] specifications, or as an encoding of the Unified Metadata Model for Collections (UMM-C) conceptual model [OR2].

The GeoJSON encoding defined in this document is defined as a compaction¹ through a normative context, of the proposed JSON-LD encoding, with some extensions as presented in section 8 of this document. Therefore, the JSON-LD encoding can also be applied to other RDF [OR8] encodings including RDF/XML [OR11] and RDF Turtle [OR12].

This document makes no assumptions as to the "service" interfaces through which the metadata are accessed and applies equally well to a Service Oriented Architecture as well as a Resource Oriented or RESTful Architecture.

GeoJSON is a format for encoding collections of simple geographical features along with their non-spatial attributes using JSON. GeoJSON objects may represent a geometry, a feature, or a collection of features. GeoJSON supports the following geometry types derived from the OGC Simple Features specification: Point, LineString, Polygon, MultiPoint, MultiLineString, MultiPolygon, and GeometryCollection. Features in GeoJSON contain a geometry object and additional properties, and a feature collection represents a list of features.

JSON is human readable and easily parseable. However, JSON is schemaless. JSON and GeoJSON documents do not include an explicit definition of the structure of the JSON objects contained in them. Therefore, this standard is based on a normative JSON-LD context which allows each property to be explicitly defined as a URI. Furthermore, the JSON encoding is defined using JSON Schema [OR7] which allows validation of instances against these schemas.



KEYWORDS

The following are keywords to be used by search engines and document catalogues.

ogcdoc, ogc documents, Earth Observation, EO, EO Collection, EO Dataset, EO Dataset Series, EO Product, GeoJSON, JSON, JSON-LD, Linked Data, Metadata

¹See section 4.1 and \[OR4].



SECURITY CONSIDERATIONS

No security considerations have been made for this document.



SUBMITTING ORGANIZATIONS

The following organizations submitted this Document to the Open Geospatial Consortium (OGC):

- CGI
- Con terra GmbH
- ESA – European Space Agency
- EUMETSAT
- Spacebel s.a.



SUBMITTERS

All questions regarding this submission should be directed to the editor or the submitters:

NAME	AFFILIATION
Yves Coene	Spacebel s.a.
Uwe Voges	con terra GmbH
Olivier Barois	ESA
Andrea Della Vecchia	ESA
John Taylor	CGI
Michael Schick	EUMETSAT

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- CEOS/WGISS
- DLR
- NASA
- VITO

Note: this does not imply a complete endorsement by these organisations.



SCOPE



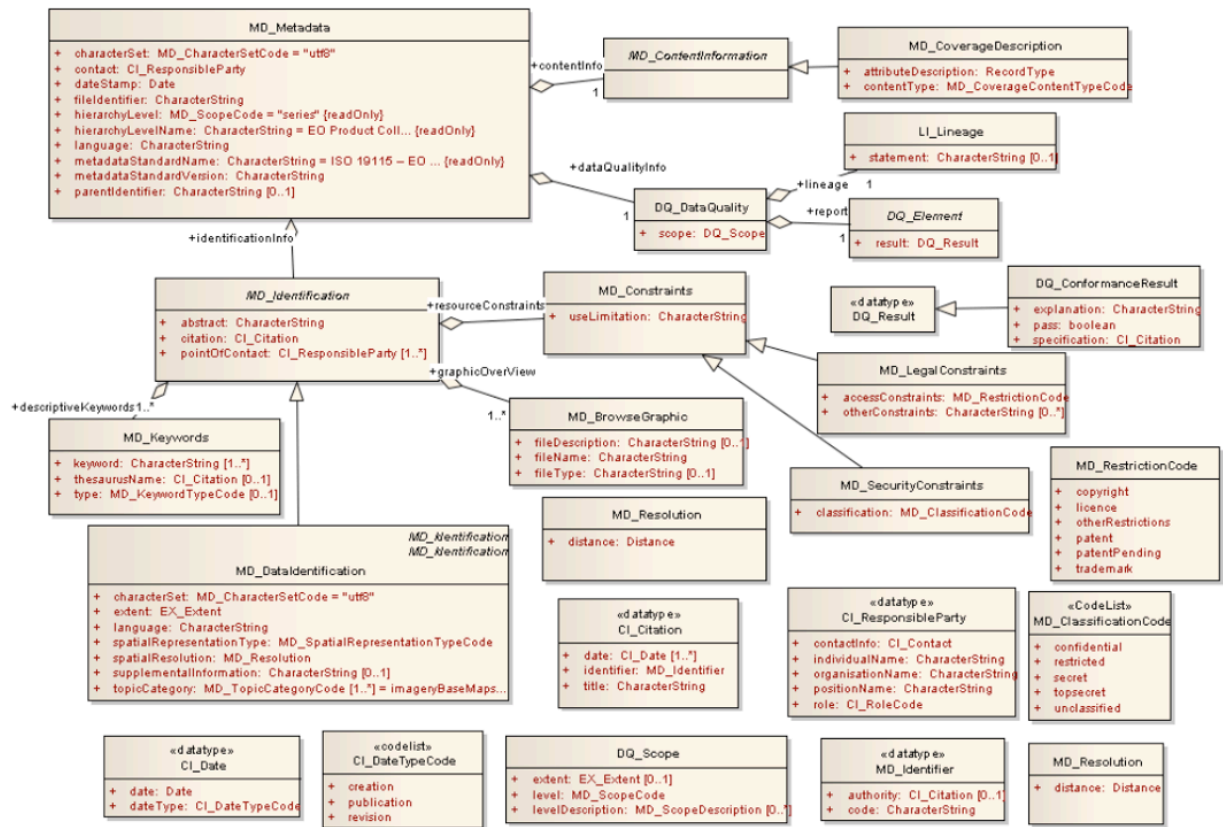
This OGC Best Practice defines a GeoJSON [NR2] and JSON-LD [NR13] encoding of Earth Observation (EO) metadata for collections (a.k.a. dataset series). The Best Practice provides document models for the exchange of information describing EO collections, both within and between different organisations.

EO collections are collections of datasets sharing the same product specification. These collections are also called dataset series as they may be mapped to 'dataset series' following the terminology defined in ISO 19113, ISO 19114, and ISO 19115. An EO collection typically corresponds to a series of EO datasets (also called EO products) derived from data acquired:

- Either from an instrument in a dedicated mode on board a single satellite platform; or
- by a series of instruments, possibly from different satellite platforms, but in this case working in the same instrument mode.

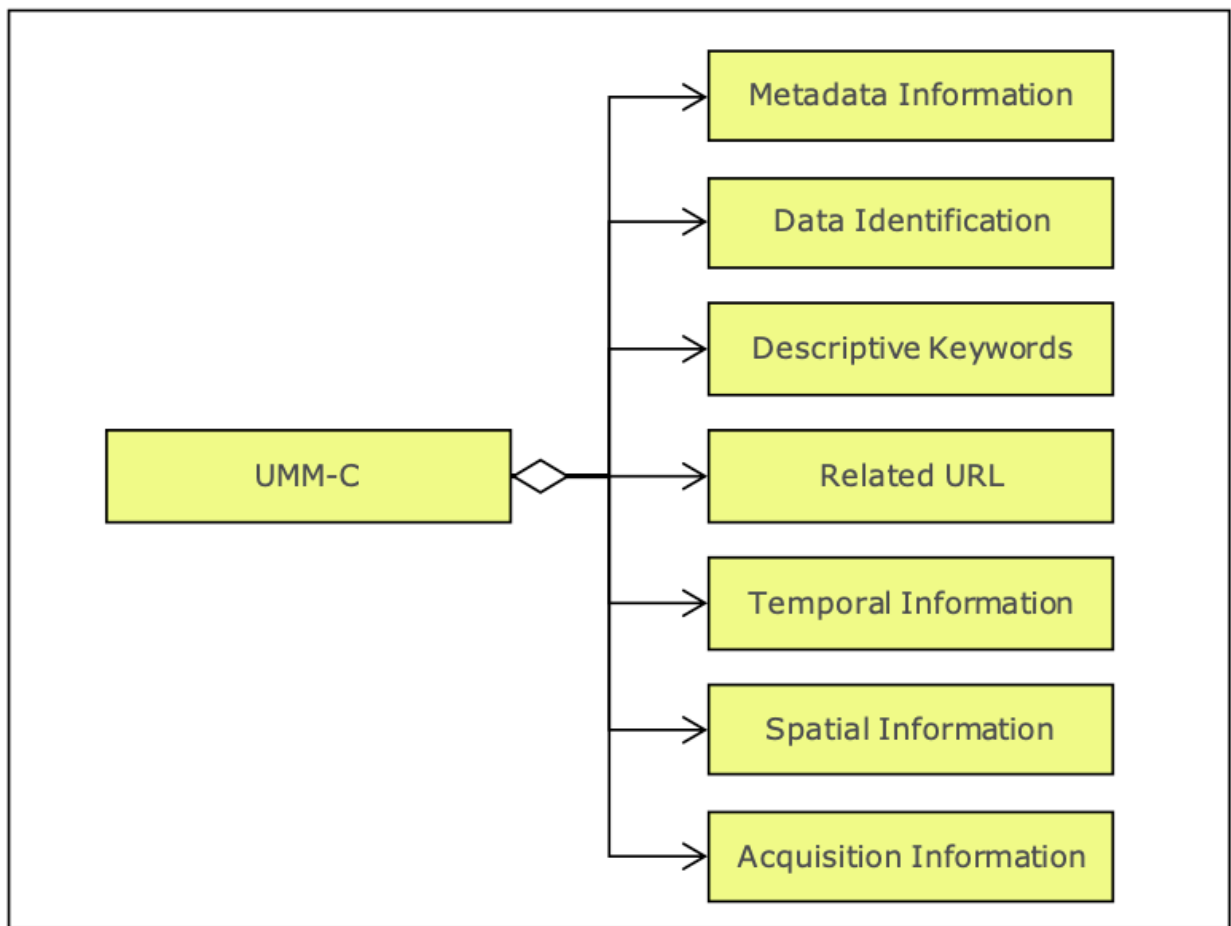
Examples of EO dataset series are, for instance, datasets stemming from satellite platforms such as 'TerraSAR-X spotlight mode,' 'ESA Envisat MERIS Full Resolution L1+2,' or 'SPOT multispectral 10 m resolution.' However, there is a tendency to group products into dataset series following other kinds of criteria such as range of resolution or product quality (e.g., snow collections or cloud-free collections).

Figure 1 – EO Collection Metadata Simlified Conceptual Model from [OR19]



The implementation is derived from the conceptual models defined in OGC 11-035r1 [OR19], itself based on ISO19115:2003 [OR22], ISO19139:2007 [OR27] and ISO19139-2 [OR28], and the Unified Metadata Model for Collections (UMM-C) [OR2].

Figure 2 — Unified Metadata Model for Collections [OR2]



1.1. DESIGN APPROACH AND RATIONALE

This section is non-normative.

The response encoding defined in the current document satisfies the following design goals.

- Feature-based GeoJSON model: The model maximises reuse of pre-existing standardized property names. Wherever possible, existing properties from the GeoJSON [NR2] and OWS Context [NR5] Feature objects are used for modeling EO Collection properties instead of proposing new property names. Existing properties are extended where needed (e.g., links).
- Simplicity: This document does not describe the full information models or XML encodings referred to above. The original metadata models should be referred to for these details. This Best Practice intends to provide a simpler, overarching exchange format integrating comments from the Committee on Earth Observation Satellites

(CEOS) Working Group on Information Systems and Services (WGISS) community, which supported the submission of this Best Practice to the OGC.

- Convergence: A final design goal is to aim for future convergence of the proposed JSON-LD mapping with GeoDCAT-AP [OR15]. This requires future work.

1.2. DOCUMENT OUTLINE

Hereafter a brief outline of the document content allows readers to jump directly to the topic of their interest.

- Chapter 3 lists the normative and informative references used in this document.
- Chapter 4 defines the main terms used in the document.
- The conventions used in this document are explained in Chapter 5:.
- Chapter 6 gives an overview.
- Chapter 7 specifies the proposed GeoJSON encoding.
- Chapter 8 describes how the encoding can be extended with additional properties and describes the extension to JSON-LD which allows for describing multi-dimensional arrays as allowed by GeoJSON.
- Chapter 9 provides information about the expected MIME media types which correspond to the proposed encodings.
- Chapter 10 describes future work.

Finally, the following information was moved to the appendices.

- Annex A defines the Abstract Test Suite for the specification.
- Annex B includes normative JSON-LD @context definitions that allow interpreting the GeoJSON encoding as JSON-LD.
- Annex C.1 presents the mapping of the properties proposed in this specification to the OGC 11-035r1 and UMM-C Conceptual Models.
- Annex D contains the complete listing of examples illustrating the encodings defined in this document.
- Annex E includes the JSON schema definitions defining the GeoJSON encoding.
- Annex F explains where the schema file, context file, and examples can be found in the OGC schema repository.

- Annex G provides the revision history of this document.



CONFORMANCE



2.1. CONFORMANCE TO BASE SPECIFICATIONS ---

This section describes the compliance testing required for an implementation of this Best Practice.

2.2. CONFORMANCE CLASSES ---

The framework, concepts, and methodology for testing, and the criteria to be achieved in order to claim conformance are specified in the OGC Compliance Testing Policies and Procedures and the OGC Compliance Testing web site².

Annex A defines a set of tests and conformance classes that will support various applications with a range of different requirements. The following conformance classes are distinguished. Testing is based on data validation. In order to conform to this OGC Best Practice, an implementation shall implement all conformance classes specified in Annex A (normative).

Table 1 — Conformance classes related to data instances

CONFORMANCE CLASS	DESCRIPTION	CLAUSE
conf/feature	Single EO Collection objects.	Section 7.1
conf/properties	Properties objects.	Section 7.1.1
conf/metadata-information	MetadataInformation objects	Section 7.2
conf/data-identification	DataIdentification objects	Section 7.3
conf/data-contact	DataContact objects	Section 7.3.2
conf/attribution	Attribution objects	Section 7.3.3
conf/activity	Activity objects	Section 7.3.6
conf/association	Association objects	Section 7.3.8
conf/plan	Plan objects	Section 7.3.9

²<http://opengeospatial.org/cite>

CONFORMANCE CLASS	DESCRIPTION	CLAUSE
conf/resource-constraints	ResourceConstraint objects	Section 7.4
conf/descriptive-keywords	DescriptiveKeywords objects	Section 7.5
conf/related-url	RelatedUrl objects	Section 7.6
conf/links	Links objects	Section 7.6.1
conf/offering	Offering objects	Section 7.6.3
conf/spatial-information	Spatial information objects	Section 7.7
conf/geometry	Geometry objects	Section 7.7.1
conf/temporal-information	TemporalInformation objects	Section 7.8
conf/acquisition-information	AcquisitionInformation	Section 7.9
conf/product-information	ProductInformation	Section 7.10



TERMS AND DEFINITIONS



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

This document uses the terms defined in Sub-clause 5.3 of OGC 06-121r9 [NR6], which is based on the ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards. In particular, the word “shall” (not “must”) is the verb form used to indicate a requirement to be strictly followed to conform to this Best Practice.

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

4.1. compaction

While expansion removes context from a given input, compaction's primary function is to perform the opposite operation: to express a given input according to a particular context. Compaction applies a context that specifically tailors the way information is expressed for a particular person or application. This simplifies applications that consume JSON or JSON-LD by expressing the data in application-specific terms, and it makes the data easier to read by humans [OR4].

4.2. collection

A Collection or a Dataset Series (in short Series) defines a container for a list of Products (or datasets) that have common properties. Products inherit all the Collection properties that are not explicitly overridden.

4.3. context

A set of rules for interpreting a JSON-LD document as specified in the section “The Context” of the JSON-LD specification [NR13].

4.4. dataset

Observations obtained by satellite instruments (OGC 10-140). See granule and product.

4.5. Domain (RDF)

Domain (rdfs:domain) is used to state that any resource that has a given property is an instance of one or more classes [OR10].

4.6. embedding

Embedding is a JSON-LD feature that allows using node objects as property values [NR13].

4.7. expansion

The algorithm that removes [JSON-LD] context is called expansion [OR4].

4.8. fatal exception

A server supplies exceptions (diagnostics) in the response as appropriate. A diagnostics is fatal or non-fatal. A fatal diagnostic is generated when the execution of the request cannot proceed and no results are available. For example, if the client supplied an invalid query there might be nothing that the server can do. A non-fatal diagnostic is one where processing may be affected but the server can continue (See section 2.9 of [OR2]).

4.9. GeoJSON

A geospatial data interchange format based on Javascript Object Notation (JSON) [NR2].

4.10. identifier

A character string that may be composed of numbers and characters that is exchanged between the client and the server with respect to a specific identity of a resource.

4.11. JSON

A lightweight, text-based, language-independent data interchange format, based on the Javascript programming language.

4.12. JSON Schema

JSON Schema is a JSON media type for defining the structure of JSON data. JSON Schema provides a contract for what JSON data is required for a given application and how to interact with it [OR7].

4.13. Product

A Product or a Dataset corresponds to an identifiable collection of data under one single identifier. It is independent of a physical form or an encoding even if it is normally distributed in a single file.

4.14. Range (RDF)

Range (`rdfs:range`) is used to state that values of a property are instances of one or more classes [OR10].

4.15. RDF Triple

An RDF triple consists of three components: the subject, the predicate and the object. An RDF triple is conventionally written in the order subject, predicate, object. [OR9].

4.16. service interface

Shared boundary between an automated system or human being and another automated system or human being [ISO 19101].



5

CONVENTIONS

This section provides details and examples for any conventions used in the document. Examples of conventions are symbols, abbreviations, use of XML schema, or special notes regarding how to read the document.

5.1. ABBREVIATED TERMS

Some frequently used abbreviated terms:

API	Application Programming Interface
ATS	Abstract Test Suite
CEOS	Committee on Earth Observation Satellites
EO	Earth Observation
EOP	Earth Observation Product
GML	Geography Markup Language
HTTP	HyperText Transfer Protocol
IRI	Internationalised Resource Identifier
ISO	International Organisation for Standardisation
JSON	JavaScript Object Notation
JSON-LD	JavaScript Object Notation for Linked Data
OASIS	Organization for the Advancement of Structured Information Standards
OGC	Open Geospatial Consortium
O&M	Observations and Measurements
OWC	OGC Web Services Context
RDF	Resource Description Framework
RDFS	RDF Schema
REST	Representational State Transfer
SI	International System of Units (French: <i>Système international d'unités</i>)

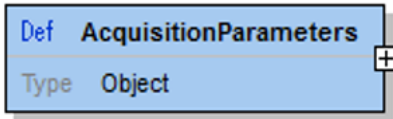
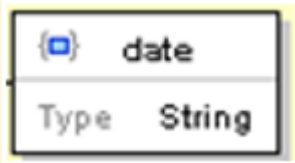
SRU	Search/Retrieval via URL
UML	Unified Modeling Language
UMM	Unified Metadata Model
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
URN	Uniform Resource Name
W3C	World Wide Web Consortium
WGISS	Working Group on Information Systems and Services
WKT	Well-Known Text
XML	eXtensible Markup Language
XSD	XML Schema Definition Language

5.2. SYMBOLS

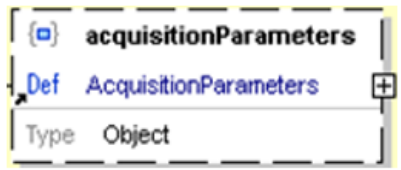
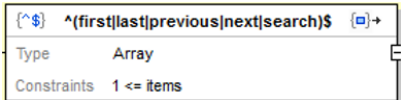
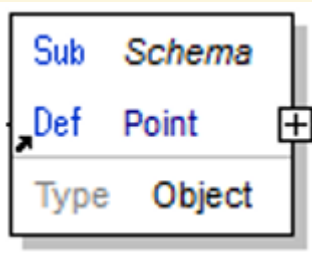
5.2.1. Symbols and abbreviated terms

The schema diagrams³ included in the document show the JSON structure expressed in JSON Schema [OR7] and documented in Annex E.1.

Table 2 – JSON Schema diagram symbols

JSON SCHEMA ENTITY	REPRESENTATION	DESCRIPTION
Definition		Definitions are shown as blue rectangles with solid borders.
Mandatory property		Mandatory properties are shown with solid borders.

³More details can be found in the online documentation of Altova XMLSpy 2016 available at <http://manual.altova.com/xmlspy/spyenterprise/index.html?viewconfig.htm>.

JSON SCHEMA ENTITY	REPRESENTATION	DESCRIPTION
Optional property		Optional properties are shown with dashed borders.
Property of type "Object" referring to a "Definition" of the Object.		The "Def" attribute inside a rectangle representing a property of type Object refers to the corresponding Object definition.
Pattern property		A pattern property defines the property's name as a regular expression. There are no minimum or maximum occurrence settings for a pattern property.
Unspecified property		A property can be implicitly specified by adding a suitable pattern property or property wildcard.
"All Of" operator		Contains one or more sub-schemas (definitions), added as children of the operator. An instance is valid if it is valid against all these sub-schemas.
"Any Of" operator		Contains one or more sub-schemas (definitions), added as children of the operator. An instance is valid if it is valid against at least one of these sub-schemas.
"One Of" operator		Contains one or more sub-schemas (definitions), added as children of the operator. An instance is valid if it is valid against exactly one of these sub-schemas.
Subschema (definitions)		The "Def" attribute inside a rectangle representing a (Sub) Schema refers to the corresponding Object definition.

5.2.2. Symbols and abbreviated terms

The data dictionary tables in the current document use the JSONPath notation [OR24]. A brief overview of this notation is included in the table below which is taken from [OR24].

XPATH	JSONPATH	DESCRIPTION
/	\$	the root object/element
.	@	the current object/element
/	. or []	child operator
//	..	recursive descent. JSONPath borrows this syntax from E4X.
*	*	wildcard. All objects/elements regardless their names.
[]	[]	subscript operator. XPath uses it to iterate over element collections and for predicates. In Javascript and JSON it is the native array operator.
	[,]	Union operator in XPath results in a combination of node sets. JSONPath allows alternate names or array indices as a set.
[]	?()	applies a filter (script) expression.

5.3. NAMESPACE ABBREVIATIONS

The following namespace abbreviations will be used in this document:

Table 3 – Namespace abbreviations

ABBREVIATION	FULL NAMESPACE URI	REFERENCE
atom	http://www.w3.org/2005/Atom/	[OR14]
dcat	http://www.w3.org/ns/dcat#	[OR13]
dct	http://purl.org/dc/terms/	[OR29]
eop	http://www.opengis.net/ont/eo-geojson/1.0/	[NR4]
foaf	http://xmlns.com/foaf/0.1/	[OR20]
gi	https://purl.org/geojson/vocab#	[OR18]
gsp	http://www.opengis.net/ont/geosparql#	[OR23]
iana	http://www.iana.org/assignments/relation/	[NR10]
locn	http://www.w3.org/ns/locn#	[OR32]
owc	http://www.opengis.net/owc/1.0/	[OR5]
prov	http://www.w3.org/ns/prov#	[OR30]
rdf	http://www.w3.org/1999/02/22-rdf-syntax-ns#	[OR11]
rdfs	http://www.w3.org/2000/01/rdf-schema#	[OR10]
schema	http://schema.org/	
skos	http://www.w3.org/2004/02/skos/core#	[OR31]
vcard	http://www.w3.org/2006/vcard/ns#	[OR17]
xs	http://www.w3.org/2001/XMLSchema-datatypes#	
xsd	http://www.w3.org/2001/XMLSchema#	

5.4. LAYOUT AND IDENTIFIERS

The normative provisions in the current document are denoted by the URI <http://www.opengis.net/spec/eoc-geojson/1.0>. All requirements and conformance classes that appear in this document are denoted by relative URIs which are relative to this base URI.

5.5. STYLE

This document applies the “double quote” guideline defined in [OR16]: “If a property requires quotes, double quotes must be used. All property names must be surrounded by double quotes. Property values of type string must be surrounded by double quotes. Other value types (like boolean or number) should not be surrounded by double quotes.”

5.6. DATA DICTIONARY TABLES

This document includes data dictionary tables with information as per sub-clause 5.5 of OGC 06-121r9 [NR6]. The following comment applies:

- Column 1 provides the JSON property name as well as the corresponding JSONPath [OR24] expression.



OVERVIEW



This specification defines a GeoJSON-based [NR2] serialization syntax for Earth Observation Collection Metadata that conforms to a subset of [NR13] syntax constraints but does not require JSON-LD processing. While other serialization forms are possible, such alternatives are not discussed by this document.

When serialized, absent properties are represented by either (a) setting the property value to null, or (b) by omitting the property declaration altogether at the option of the publisher. These representations are semantically equivalent. If a property has an array value, the absence of any items in that array shall be represented by omitting the property entirely or by setting the value to null. The appropriate interpretation of an omitted or explicitly null value is that no value has been assigned as opposed to the view that the given value is empty or nil.

JSON does not have a formal class model. JSON objects are just sets of properties. However, similar to GeoJSON, the JSON encoding described in this Best Practice features a “type” property on each JSON object.

An EO Collection Metadata Document conforming to this Best Practice is a GeoJSON document whose root value is a Feature object, and whose MIME media type corresponds to one of the media types described in chapter 9. The Feature object may or may not be part of a FeatureCollection representing an OpenSearch response document according to OGC 17-047r1 [NR3].

6.1. JAVASCRIPT OBJECT NOTATION ---

JavaScript Object Notation (JSON) is a lightweight, text-based, language-independent data interchange format that defines a small set of formatting rules for the portable representation of structured data. JSON is derived from the object literals of JavaScript, as defined in the ECMAScript Programming Language Standard [NR11] and can represent four primitive types (strings, numbers, boolean values, and null) and two structured types (objects and arrays). The ordering of the members or properties of any JSON object is considered irrelevant. Even though JSON is based on a subset of the JavaScript Programming Language it is currently well supported by nearly all programming languages, including Java, Python, and C#.

The JSON format is currently described by two competing standards, RFC7159 [NR1] and ECMA-404 [NR12]. Both standards documents are consistent, but the latter defines mainly the grammatical syntax where the former provides some additional semantic and security points.

6.2. GEOJSON FORMAT SPECIFICATION

GeoJSON [NR2] is a format for encoding collections of simple geographical features along with their non-spatial attributes using JSON. GeoJSON consists of a single object representing a geometry, feature, or collection of features. The geometries supported are Point, MultiPoint, LineString, MultiLineString, Polygon, MultiPolygon, and Geometry Collections.



GEOJSON ENCODING SPECIFICATION

7.1. REQUIREMENTS CLASS: FEATURE

REQUIREMENT CLASS: FEATURE

/req/feature

Target Type	Data instance
--------------------	---------------

Dependency	JSON [NR1]
-------------------	------------

Dependency	GeoJSON [NR2]
-------------------	---------------

Dependency	/req/geometry
-------------------	---------------

Dependency	/req/properties
-------------------	-----------------

Requirement 1:	/req/feature/properties
-----------------------	-------------------------

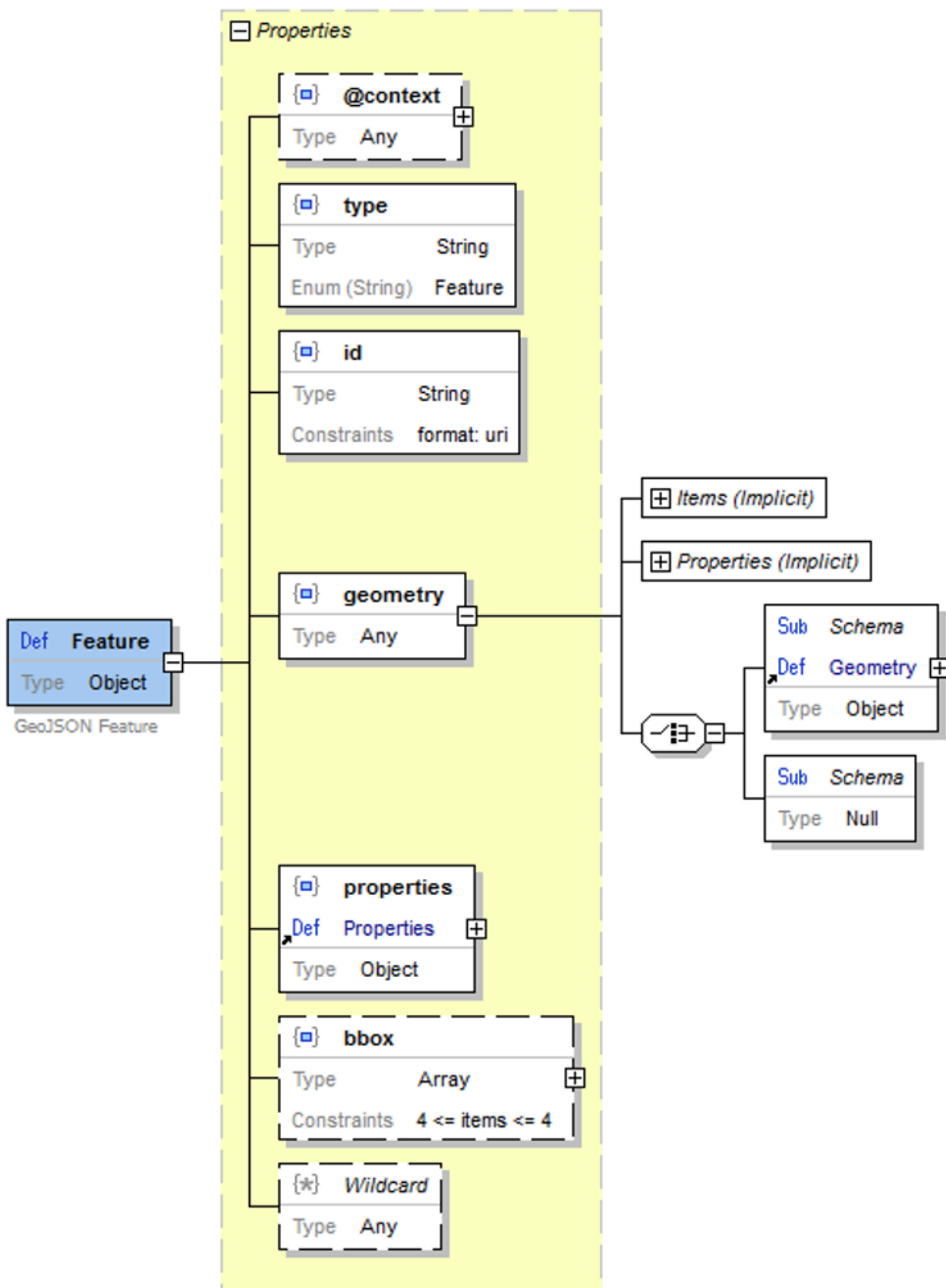
REQUIREMENT 1:

/req/feature/properties

A “Feature” object representing an EO Collection shall implement the properties shown in Table 4, with the value matching the type shown, and with the obligation shown.

The Feature object represents the EO Collection (a.k.a. EO Dataset Series). It inherits all properties of the GeoJSON Feature object. In addition, it may contain an optional @context property. The @context properties shall typically be absent in the GeoJSON encoding and implicitly refer to the normative @context defined in Annex B.

Figure 3 — Feature Schema (GeoJSON)



Complete description of Feature is given in Table 4. Most properties are inherited from the Feature object defined in [NR2].

Table 4 — Feature object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI AND USE
<code>@context</code>	Optional context property either embedding an actual context or a reference to the normative JSON-LD context defined in Annex B: "normative JSON-LD @context definition". See Annex B.1.1.	Property Zero	or one (optional)
<code>\$.type</code>	Type of the element. This property is a string with fixed value "Feature".	Property One [RD2] Range: String Fixed values: "Feature"	(mandatory)
<code>\$.id</code>	Unique identifier for the EO Collection (IRI).	Property One [RD5] Range: String	(mandatory)
<code>\$.bbox</code>	Information on the coordinate range of the geometry object representing the footprint (See [NR2]). The value is an array of length 4 (assuming the number of dimensions represented in the contained geometries is 2). Typically, south-west point and north-east point. The value defines a shape with edges that have constant longitude and latitude.	Property Zero [NR2] Domain: Feature Range: Array	or one (optional)
<code>\$.geometry</code>	Contains the description of the geometry of the feature. See section 7.7. The value shall be either a Geometry object or a JSON null value.	Property One [NR2] Domain: Feature Range: Geometry or null value (See section 7.7).	(mandatory)
<code>\$.properties</code>	Groups all other properties of the Feature not covered by the properties higher in this table as imposed by [NR2]. See section 7.1.1.	Property One [NR5] Domain: Feature Range: Property (See Table 5)	(mandatory)

Example 1: GeoJSON encoding example

```
{
  "type": "Feature",
  "id": " http://fedeo.esa.int/opensearch/request/?httpAccept=
application/geo%2Bjson&parentIdentifier=EOP%3AESAS%3AFEDEO&uid=
LANDSAT.ETM.GTC",
  "bbox": [
    -180,
    -90,
    180,
    90
  ],
  "geometry": {...},
  "properties": {...}
}
```

Example 2: GeoJSON encoding example (with explicit normative @context property)

```
{
  "@context": "https://www.opengis.net/eoc-geojson/1.0",
  "type": "Feature",
  "id": " http://fedeo.esa.int/opensearch/request/?httpAccept=
application/geo%2Bjson&parentIdentifier=EOP%3AESAS%3AFEDEO&uid=
LANDSAT.ETM.GTC",
  "bbox": [
    -180,
    -90,
    180,
    90
  ],
  "geometry": {...},
  "properties": {...}
}
```

In the remainder of the document, we will not include the @context property in the GeoJSON encoding in which case it is implied as explained in Annex B.1.1.

7.1.1. Properties

REQUIREMENT CLASS: PROPERTIES

/req/properties

Target Type	Data instance
Dependency	JSON [NR1]
Dependency	/req/acquisition-information
Dependency	/req/product-information
Dependency	/req/metadata-information

REQUIREMENT CLASS: PROPERTIES

Dependency	/req/temporal-extent
-------------------	----------------------

Dependency	/req/location
-------------------	---------------

Dependency	/req/data-identification
-------------------	--------------------------

Dependency	/req/related-url
-------------------	------------------

Dependency	/req/descriptive-keywords
-------------------	---------------------------

Requirement 2:	/req/properties/properties
-----------------------	----------------------------

Requirement 3:	/req/properties/data-identification
-----------------------	-------------------------------------

Requirement 4:	/req/properties/descriptive-keywords
-----------------------	--------------------------------------

Requirement 5:	/req/properties/related-url
-----------------------	-----------------------------

REQUIREMENT 2:

/req/properties/properties

A "Properties" object shall implement the properties shown in Table 4, with the value matching the type shown, and with the obligation shown.

REQUIREMENT 3:

/req/properties/data-identification

A "Properties" object shall implement the properties of a DataIdentification object (Table 7).

REQUIREMENT 4:

/req/properties/descriptive-keywords

A "Properties" object shall implement the properties of a DescriptiveKeywords object (Table 21).

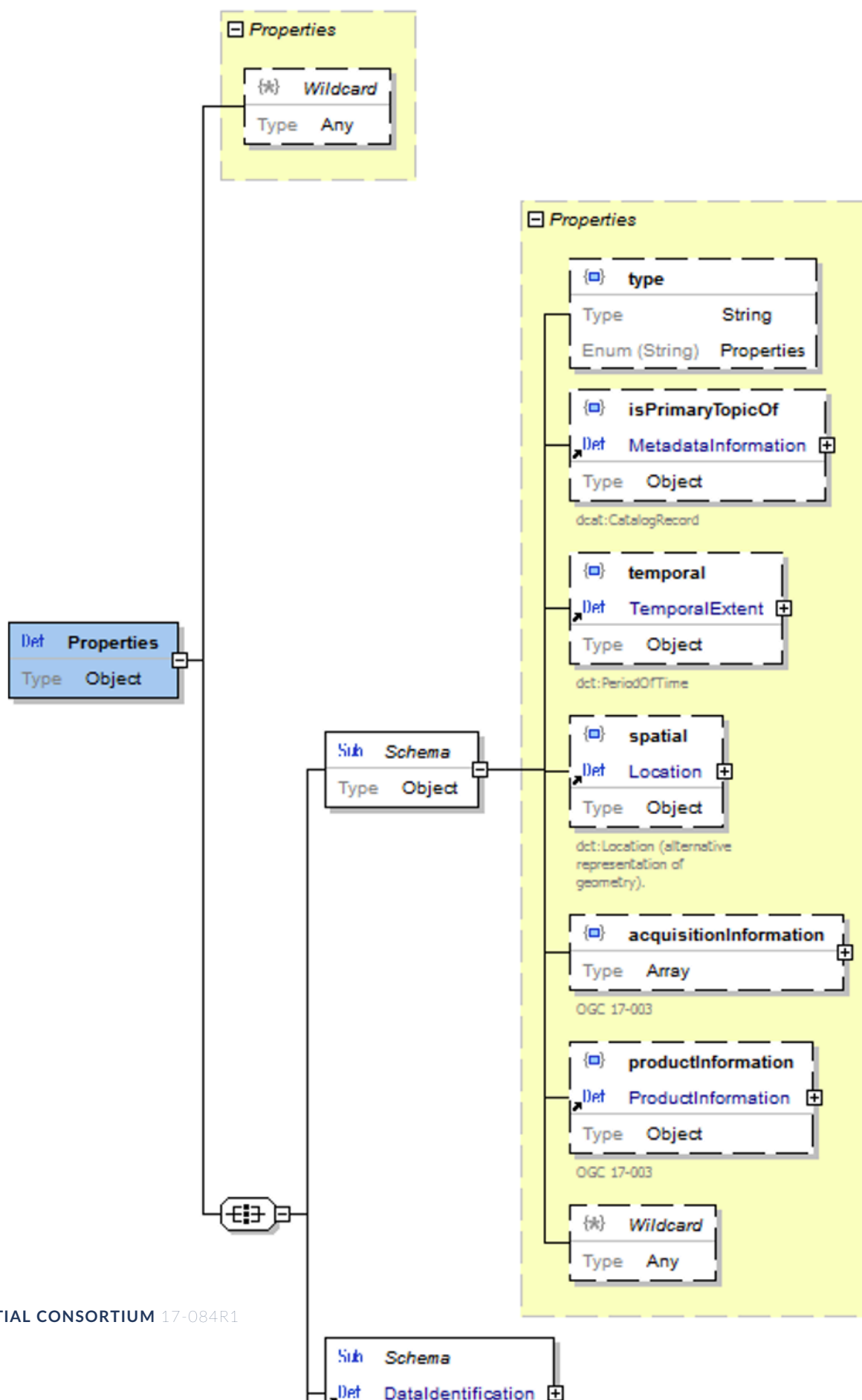
REQUIREMENT 5:

/req/properties/related-url

A "Properties" object shall implement the properties of a RelatedUrl object (Table 23).

The Properties block contains the EO Collection properties and hypermedia links to related objects. It inherits all DataIdentification, DescriptiveKeywords and RelatedUrl properties.

Figure 4 — Properties Schema



Complete description of Properties is given in Table 5.

Table 5 – Properties object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI AND USE
<code>type</code>	Type of the element. This property has the fixed value "Properties".	Domain: Zero Properties or one Range: (optional) String Fixed value: "Properties"	
<code>\$. properties. isPrimary</code>	Primary Properties related to the metadata of the EO collection, e.g., metadata dates.	Domain: Zero Property or one Range: (optional) Metadata: (See Table 6)	
<code>\$. properties. acquisitionInformation</code>	Optional product information as presented in Table 30.	Domain: One or Properties more Range: (mandatory) Array of AcquisitionInformation (See Table 30)	
<code>\$. properties. spatial</code>	Alternative encoding of Geometry (intended for JSON-LD) if compliance with GeoDCAT-AP is mandatory (See also section 8.2).	Domain: Zero Property or one Range: (optional) Location (See Table 34)	
<code>\$. properties. temporal</code>	Temporal extent of the collection. Contains same information as <code>\$.properties.date</code> (DataIdentification).	Domain: Zero Properties or one Range: (optional) TemporalExtent (See Table 29)	

Example 3: Feature Properties encoding example

```
{
  "title": "Sentinel-2 Products",
  "identifier": "EOP:ESA:Sentinel-2",
  "kind": "http://purl.org/dc/dcmitype/Collection",
  "rights": "Data are available upon fast registration",

```

```

    "abstract": "The Sentinel-2 mission is a land monitoring
constellation of two satellites that provide high resolution
optical imagery and provide continuity for the current SPOT
and Landsat missions. The mission provides a global coverage of
the Earth's land surface every 10 days with one satellite and 5
days with 2 satellites, making the data of great use in on-going
studies. The satellites are equipped with the state-of-the-art
MSI (Multispectral Imager) instrument, that offers high-resolution
optical imagery.",
    "date": "2015-06-23T00:00:00Z/",
    "updated": "2018-11-28T15:23:57Z",
    "temporal": {
        "beginningDateTime": "2015-06-23T00:00:00Z"
    },
    "isPrimaryTopicOf": {
        "updated": "2019-07-17T00:00:00Z",
        "published": "2019-07-17T00:00:00Z",
        "lang": "en"
    },
    "categories": [
        ...
    ],
    "acquisitionInformation": [
        {
            "platform": {
                "id": "https://earth.esa.int/concept/sentinel-2",
                "platformShortName": "Sentinel-2"
            },
            "instrument": {
                "id": "https://earth.esa.int/concept/s2-msi",
                "instrumentShortName": "MSI"
            }
        }
    ],
    "productInformation": {
        ...
    },
    "links": {
        ...
    }
}

```

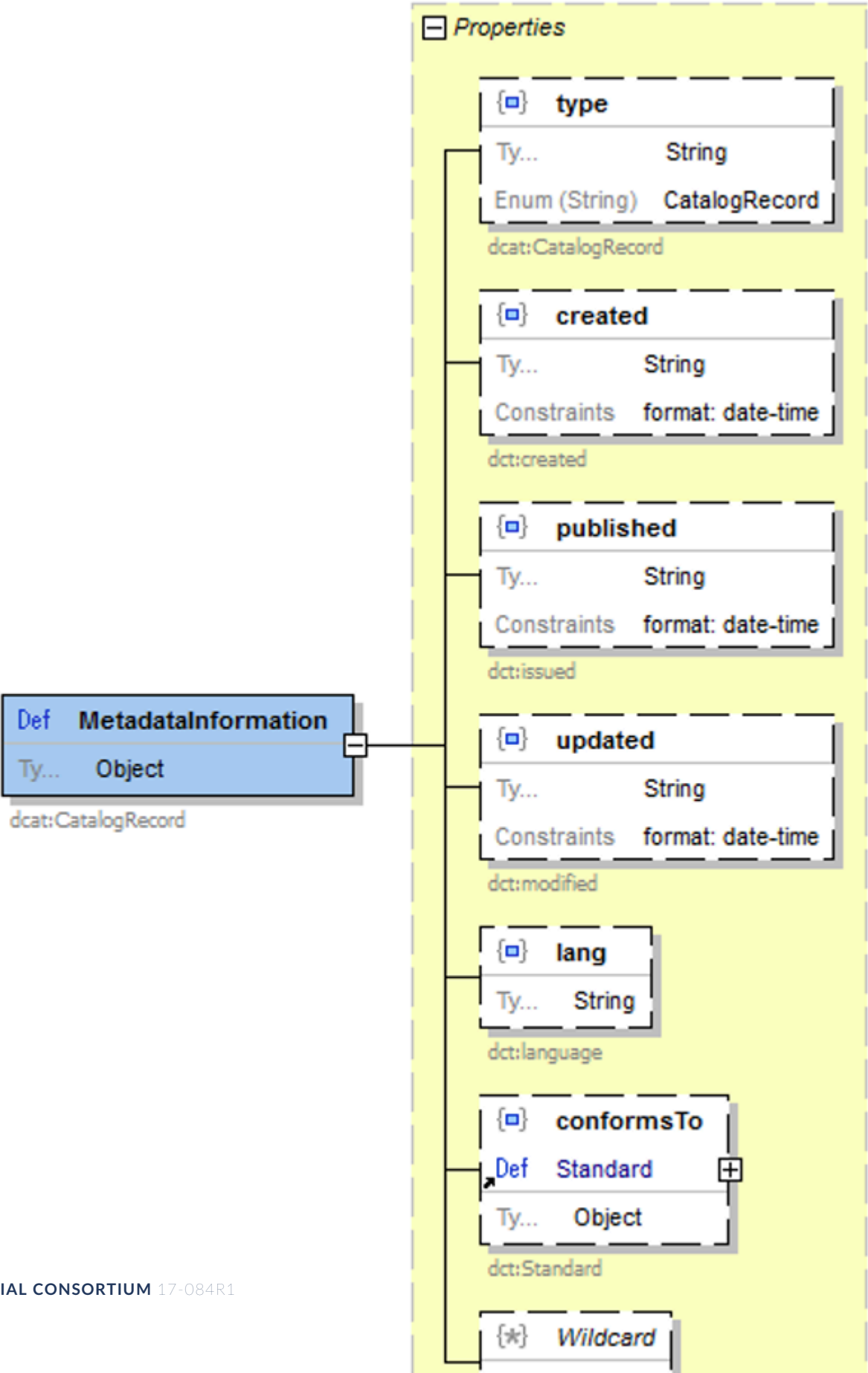
7.2. REQUIREMENTS CLASS: METADATA INFORMATION

REQUIREMENT CLASS: METADATA INFORMATION	
/req/metadata-information	
Target Type	Data instance
Dependency	JSON [NR1]
Dependency	/req/standard
Requirement 6:	/req/metadata-information/properties

REQUIREMENT 6:	
/req/metadata-information/properties	
A "MetadataInformation" object shall implement the properties shown in Table 6, with the value matching the type shown, and with the obligation shown.	

The MetadataInformation is encoded as a CatalogRecord as defined by DCAT Version 2 [OR25] with JSON property names consistent with OGC 14-055r2.

Figure 5 – MetadataInformation Schema



Complete description of MetadataInformation is given in Table 6.

Table 6 – MetadataInformation object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI AND USE
<code>type</code>	Type of the element. This property has the fixed value "CatalogRecord".	Domain: Zero	
<code>\$. properties. isPrimaryTopOf. type</code>		CatalogRecord	Range: (optional) String
<code>created</code>	Date of creation of the metadata.	Domain: Zero	
<code>\$. properties. isPrimaryTopOf. created</code>		CatalogRecord	Range: (optional) DateTime
<code>updated</code>	Date of creation or last update of the metadata. DateTime representation, as defined by RFC 3339, section 5.6.	Domain: One	
<code>\$. properties. isPrimaryTopOf. updated</code>		CatalogRecord	Range: (mandatory) DateTime
<code>published</code>	Date of first availability of the Metadata Document.	Domain: Zero	
<code>\$. properties. isPrimaryTopOf. published</code>		CatalogRecord	Range: (optional) DateTime
<code>lang</code>	Metadata language , not empty with an RFC-3066 code as defined in [NR5], e.g., "en" (English). Note that resource language is a property of the Data Identification (Table 7).	Domain: Zero	
<code>\$. properties. isPrimaryTopOf. lang</code>	see section II.7 of GeoDCAT-AP [OR15] and sections 2.2.2 and 3.1.2.4 of INSPIRE [OR33].	CatalogRecord	Range: (optional) string
<code>conform</code>	An established standard to which the metadata conforms as defined in [OR25].	Domain: Zero	
<code>\$. properties. isPrimaryTopOf. conform</code>		CatalogRecord	Range: (optional) Standard

Example 4: MetadataInformation encoding example

```
{
  "type": "CatalogRecord",
  "updated": "2019-07-17T00:00:00Z",
  "published": "2019-07-17T00:00:00Z",
  "lang": "en"
}
```

7.3. REQUIREMENTS CLASS: DATA IDENTIFICATION

REQUIREMENT CLASS: DATA IDENTIFICATION

/req/data-identification

Target Type	Data instance
--------------------	---------------

Dependency	JSON [NR1]
-------------------	------------

Dependency	/req/data-dates
-------------------	-----------------

Dependency	/req/data-contact
-------------------	-------------------

Dependency	/req/resource-constraints
-------------------	---------------------------

Dependency	/req/provenance-statement
-------------------	---------------------------

Dependency	/req/activity
-------------------	---------------

Requirement 7:	/req/data-identification/properties
-----------------------	-------------------------------------

Requirement 8:	/req/data-identification/data-dates
-----------------------	-------------------------------------

Requirement 9:	/req/data-identification/data-contact
-----------------------	---------------------------------------

Requirement 10:	/req/data-identification/resource-constraints
------------------------	---

REQUIREMENT 7:

/req/data-identification/properties

A "DataIdentification" object shall implement the properties shown in Table 7, with the value matching the type shown, and with the obligation shown.

REQUIREMENT 8:

/req/data-identification/data-dates

A "DataIdentification" object shall implement the properties of a DataDates object (Table 8).

REQUIREMENT 9:

/req/data-identification/data-contact

REQUIREMENT 9:

A "DataIdentification" object shall implement the properties of a DataContact object (Table 9).

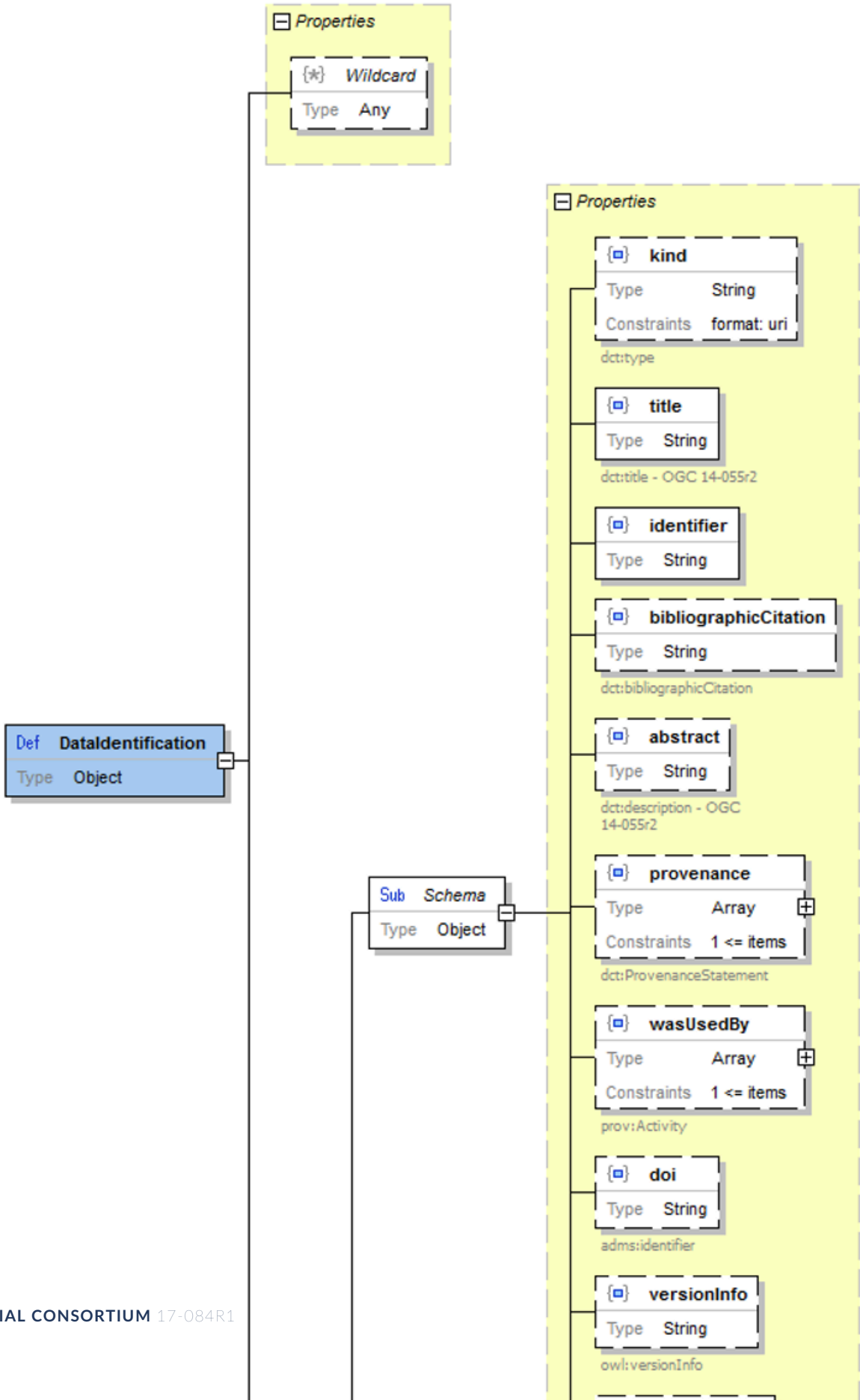
REQUIREMENT 10:

/req/data-identification/resource-constraints

A "DataIdentification" object shall implement the properties of a ResourceConstraints object (Table 18).

The DataIdentification properties are inherited by the Properties block. The DataIdentification inherits all properties of the Datadates, DataContact and ResourceConstraints object.

Figure 6 – DataIdentification Schema



Complete description of DataIdentification is given in Table 7.

Table 7 – DataIdentification object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI AND USE
<code>kind</code>	Unique identifier (URI) for the type of the resource. Defined in OGC 17-047r1, DCAT-2 and GeoDCAT-AP (dct:type). Fixed value: http://purl.org/dc/dcmitype/Collection .	Range: String	Zero or one (optional)
<code>properties. kind</code>			
<code>doi</code>	Digital Object Identifier identifying the collection (see https://www.doi.org)	Domain: String	Zero or one (optional)
<code>properties. doi</code>			
<code>title</code>	Human readable title given to the collection.	Domain: String	One (mandatory)
<code>properties. title</code>			
<code>identifier</code>	Identifier given to the collection.	Domain: String	One (mandatory)
<code>properties. identifier</code>			
<code>bibliographicCitation</code>	Bibliographic reference for the resource.	Domain: String	Zero or one (optional)
<code>properties. bibliographicCitation</code>			
<code>lang</code>	Resource language, not empty with an RFC-3066 code as defined in [NR5], e.g., "en" (English). Note that metadata language is a property of the Metadata Information (Table 6). See also section II.7 of GeoDCAT-AP [OR15] and sections 2.2.2 and 3.1.2.4 of INSPIRE Technical Guidelines [OR33].	Domain: String	Zero or one (optional)
<code>properties. lang</code>			
<code>conformsTo</code>	An established standard to which the resource conforms as defined in [OR25].	Domain: String	Zero or one (optional)
<code>properties. conformsTo</code>			
<code>abstract</code>	Description of the collection content or purpose as defined in [NR5].	Domain: String	Zero or one (optional)
<code>properties. abstract</code>			
<code>versionInfo</code>	Version number or other version designation of the service or processing application. Defined in DCAT-AP 1.2 (owl:versionInfo).	Domain: String	Zero or one (optional)
<code>properties. versionInfo</code>			
<code>provenance</code>	Encoding of provenance information.	Domain: String	Zero or more (optional)

JSON	DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
\$. prope: provei		Array of Provenar (See Table 12)	ent
\$. properties. wasUsedBy	Description of the conformity of the metadata (DQ_ConformanceResult).	Domain: Zero or Properties: more Range: (optional) Array of Activity (See Table 13)	

Example 5: DataIdentification encoding example

```
{
  "title": "LANDSAT 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated
Terrain Corrected Systematic processing (LANDSAT.ETM.GTC)",
  "identifier": "LANDSAT.ETM.GTC",
  "kind": "http://purl.org/dc/dcmitype/Collection",
  "abstract": "This dataset contains all the Landsat 7 Enhanced
Thematic Mapper high-quality ortho-rectified L1T dataset over
Kiruna, Maspalomas and Matera visibility masks. The Landsat 7 ETM
+ scenes typically covers 185 x 170 km. A standard full scene is
nominally centred on the intersection between a Path and Row (the
actual image centre can vary by up to 100m). Each band requires
50MB (uncompressed), and Band 8 requires 200MB (panchromatic band
with resolution of 15m opposed to 30m).",
  "date": "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z",
  "updated": "1999-07-01T00:00:00Z",
  "authors": [
    {
      "type": "Organization",
      "email": "mailto:eohelp@eo.esa.int",
      "name": "ESA/ESRIN",
      "phone": "tel:+39 06 94180777"
    }
  ],
  "contactPoint": [
    {
      "type": "Organization",
      "email": "mailto:eohelp@eo.esa.int",
      "name": "ESA/ESRIN",
      "uri": "http://earth.esa.int",
      "hasTelephone": [ {
        "type": "Voice",
        "hasValue": "tel:+39 06 94180777"
      } ],
      "hasAddress": {
```

```

        "country-name": "Italy",
        "postal-code": "00044",
        "locality": "Frascati",
        "street-address": "Via Galileo Galilei CP. 64"
    }
}
],
"provenance": [
{
    "type": "ProvenanceStatement",
    "label": "Forest Map 2006 is derived from the IMAGE2006
(SPOT/LISS scenes) and CORINE2006 landcover dataset. In addition,
MODIS composites are used for the Forest type classification."
}
],
"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"
            }
        }
    }
}
]
}

```

Example 6: DataIdentification encoding example (Citation)

```

{
    "title": "ESA Sea Surface Temperature Climate Change Initiative
(ESA SST CCI): GHR SST Multi-Product ensemble (GMPE)",
    "identifier": "e0659b01259145c8bfb0de6eb12c2690",
    "abstract": "The ESA Sea Surface Temperature Climate Change
Initiative (ESA SST CCI) dataset accurately maps the surface
temperature of the global oceans over the period 1991 to 2010
using observations from many satellites. The data provides an
independently quantified SST to a quality suitable for climate
research. The GHR SST Multi-Product Ensemble (GMPE) dataset is an
ensemble median of the ESA SST CCI spatially complete analysis
with other level 4 SST analysis products. Anomalies of the analyses

```

relative to the median, and the ensemble standard deviation are also provided. All the data in the GMPE files are regridded onto a common 0.25 degree regular latitude longitude grid and there are SST fields for each day. The GMPE for the ESA SST CCI long term product covers the period September 1991 to December 2010. GMPE files are also available for ESA SST CCI demonstration product 1 (which covers June to August 2007).",

"bibliographicCitation": "Fiedler, E.K.; McLaren, A.; Merchant, C. J.; Donlon, C. (2015): ESA Sea Surface Temperature Climate Change Initiative (ESA SST CCI): GHR SST Multi-Product ensemble (GMPE). NERC Earth Observation Data Centre, 24 February 2015. doi:10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA. <http://dx.doi.org/10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA>",

"doi": "10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA",

"date": "1991-09-01T00:00:00.000Z/2010-12-31T00:00:00.000Z",

"updated": "2019-09-01T00:00:00.000Z",

"published": "2014-12-03T12:00:00.000Z",

"license": [

- {
- "type": "LicenseDocument",
- "label": "Use of these data is covered by the following licence: http://licences.ceda.ac.uk/image/data_access_condition/esacci_sst_terms_and_conditions.pdf . When using these data you must cite them correctly using the citation given on the CEDA Data Catalogue record."
- }

],

"accessRights": [

- {
- "type": "RightsStatement",
- "label": "Public data: access to these data is available to both registered and non-registered users."
- }

],

"qualifiedAttribution": [

- {
- "type": "Attribution",
- "agent": [

 - {
 - "type": "Organization",
 - "email": "neodc@rl.ac.uk",
 - "name": "NERC - Earth Observation Data Centre",
 - "hasTelephone": [{

 - "type": "Voice",
 - "hasValue": "tel:+44(0)1235 446432"

- }],
- "hasAddress": {

 - "postal-code": "OX11 0QX",
 - "locality": "Harwell Oxford",
 - "street-address": "NERC Earth Observation Data Centre (NEODC)"

- }

}

```

    ],
    "role": "custodian"
  },
  {
    "type": "Attribution",
    "agent": [
      {
        "type": "Organization",
        "email": "support@ceda.ac.uk",
        "name": "Rutherford Appleton Laboratory",
        "hasTelephone": {
          "type": "Voice",
          "hasValue": "tel:01235446432"
        },
        "hasAddress": {
          "postal-code": "OX11 0QX",
          "locality": "Oxon",
          "street-address": "Centre for Environmental Data Analysis
(CEDA)"
        }
      }
    ],
    "role": "distributor"
  }
],
"provenance": [
  {
    "type": "ProvenanceStatement",
    "label": "Data were processed and supplied to the NEODC by the
ESA CCI SST project team."
  }
]
}

```

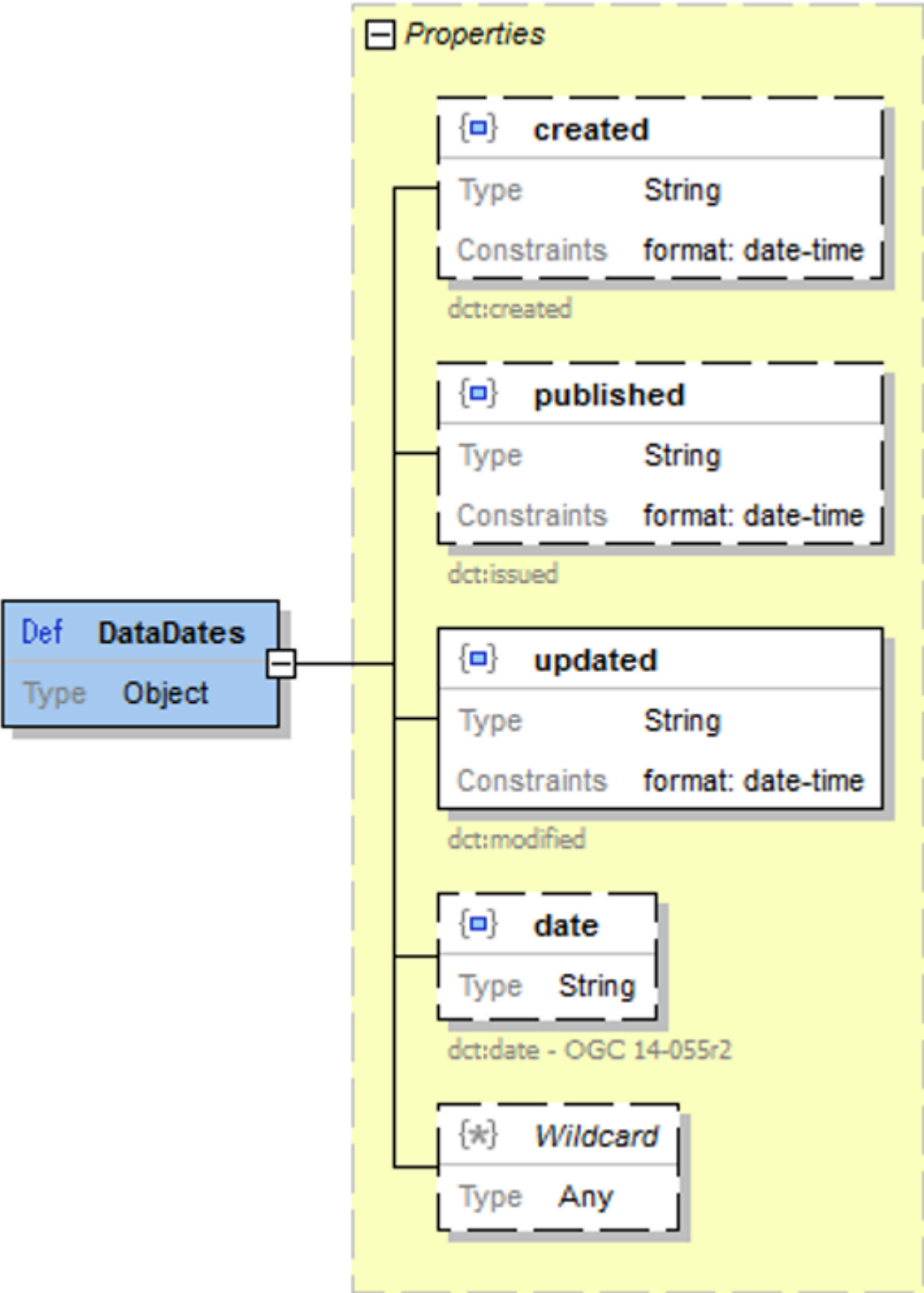
7.3.1. DataDates

REQUIREMENT 11:

/req/data-dates

A "DataDates" object shall implement the properties defined in Table 8, with the value matching the type shown, and with the obligation shown.

Figure 7 – DataDates Schema



Complete description of DataDates is given in Table 8.

Table 8 – DataDates object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI AND USE
<code>\$.properties.created</code>	created Date of creation of the resource.	Domain: Zero Properties or one Range: (optional) DateTime	
<code>\$.properties.updated</code>	updated Date of creation or last update of the resource. DateTime representation, as defined by RFC 3339, section 5.6.	Domain: One Properties (mandatory) Range: DateTime	
<code>\$.properties.published</code>	published Date of publication of the resource.	Domain: Zero Properties or one Range: (optional) DateTime	
<code>\$.properties.date</code>	date Date or range of dates relevant for the resource (RFC-3339). Formatted in one of the following ways: • <datetime> "/" <datetime> • <datetime> "/" • "/" <datetime> • <datetime> • "/" For example: "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z"	Domain: One Properties (mandatory) Range: String or DateTime	

Example 7: DataDates encoding example

```
{
  "date": "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z",
  "created": "1999-07-01T23:59:00Z",
  "published": "1999-07-02T08:00:00Z",
  "updated": "2004-01-01T08:00:00Z"
}
```

7.3.2. DataContact

REQUIREMENT CLASS: DATACONTACT	
/req/data-contact	
Target Type	Data instance
Dependency	JSON [NR1]

REQUIREMENT CLASS: DATACONTACT

Dependency	/req/agent
-------------------	------------

Dependency	/req/attribution
-------------------	------------------

Requirement 12:	/req/data-contact/properties
------------------------	------------------------------

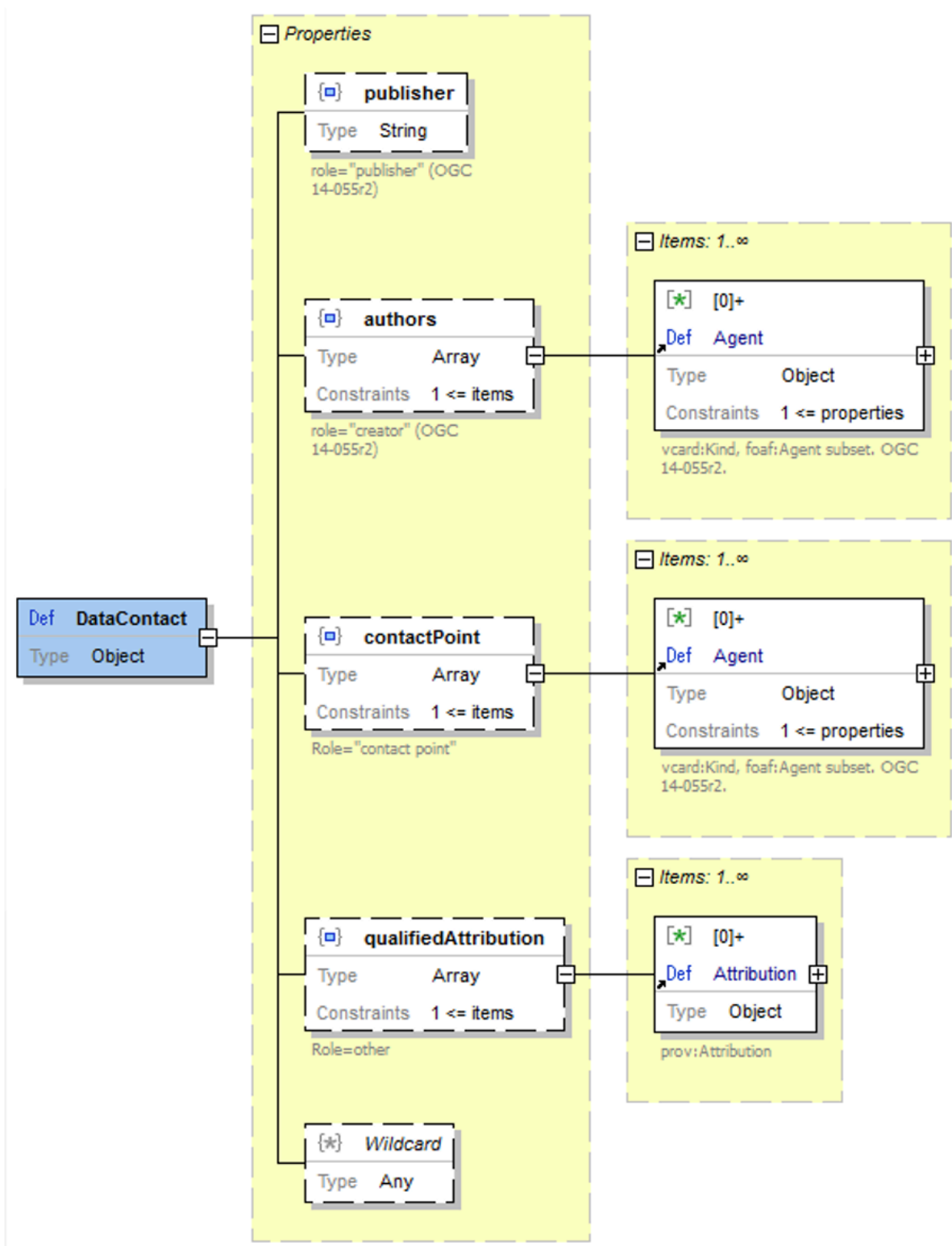
REQUIREMENT 12:

/req/data-contact/properties

A "DataContact" object shall implement the properties shown in Table 9, with the value matching the type shown, and with the obligation shown.

The DataContact properties are inherited by the DataIdentification (and Properties) block. The encoding depends on the "role" (ISO19115:2003) of the data contact. For the "publisher" and "author" roles, the OGC 14-055r2 encoding is available. Encoding for all roles is aligned with GeoDCAT-AP [OR15] §II.16.

Figure 8 — DataContact Schema



Complete description of DataContact is given in Table 9.

Table 9 – DataContact object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI AND USE
<code>\$.properties.publisher</code>	<code>publisher</code> An entity or agent responsible for publishing the metadata (role is "Publisher").	Optional Zero property or one in [NR5] (optional) Domain: Properties Range: String	
<code>\$.properties.authors</code>	<code>authors</code> Entities or persons primarily responsible for making the response document (role is "Author").	Optional Zero property or one in [NR5] (optional) Domain: Property Range: Array of Agent (See Table 11)	
<code>\$.properties.contactPoint</code>	<code>contactPoint</code> Link an EO collection to relevant organisations (role is "Point of Contact").	Optional Zero property or one in (Optional) [OR13] Domain: Properties Range: Array of Agent (See Table 11)	
<code>\$.properties.qualified</code>	<code>qualified</code> Specifies the relationship between the EO collection and the responsible organisation (role is "Resource Provider", "Custodian", "User", "Distributor", "Originator", "Principal Investigator" or "Processor").	Domain: Zero property or one in (Optional) Array of Attribut (See Table 10)	

Example 8: DataContact encoding example

```
{
  "authors": [
    {
      "type": "Organization",
      "email": "eohelp@eo.esa.int",
```

```

    "name": "ESA/ESRIN",
    "phone": "tel:+39 06 94180777"
  },
  "contactPoint": [
    {
      "type": "Organization",
      "email": "eohelp@eo.esa.int",
      "name": "ESA/ESRIN",
      "phone": "tel:+39 06 94180777",
      "uri": "http://www.earth.esa.int",
      "hasAddress": {
        "country-name": "Italy",
        "postal-code": "00044",
        "locality": "Frascati",
        "street-address": "Via Galileo Galilei CP. 64"
      }
    }
  ],
  "qualifiedAttribution": [
    {
      "type": "Attribution",
      "agent": [
        {
          "type": "Organization",
          "email": "eohelp@eo.esa.int",
          "name": "ESA/ESRIN",
          "phone": "tel:+39 06 94180777",
          "uri": "http://www.earth.esa.int",
          "hasAddress": {
            "country-name": "Italy",
            "postal-code": "00044",
            "locality": "Frascati",
            "street-address": "Via Galileo Galilei CP. 64"
          }
        }
      ],
      "role": "originator"
    }
  ]
}

```

7.3.3. Attribution

REQUIREMENT CLASS: ATTRIBUTION

/req/attribution

Target Type	Data instance
-------------	---------------

Dependency	JSON [NR1]
------------	------------

REQUIREMENT CLASS: ATTRIBUTION

Dependency /req/agent

Requirement 13: /req/attribution/properties

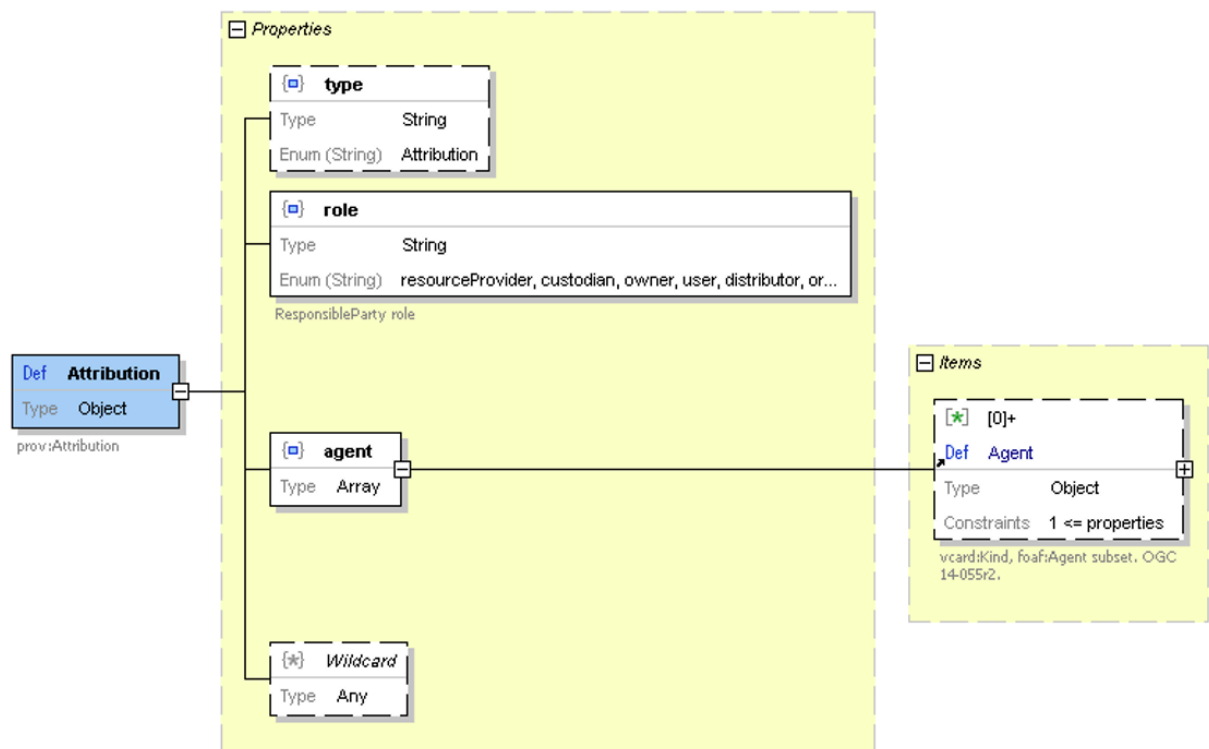
REQUIREMENT 13:

/req/attribution/properties

An “Attribution” object shall implement the properties shown in Table 10 with the value matching the type shown, and with the obligation shown.

The Attribution object represents a responsible party and its role and is based on [OR30].

Figure 9 – Attribution Schema



Complete description of Attribution is given in Table 10.

Table 10 — Attribution object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- P AND USE
type \$. properties. qualifiedAttribution[*]. type	Type of the element. This property is a string with fixed value "Attribution".	Range: String Fixed value: "Attribution"	Zero or one (optional)
role \$. properties. qualifiedAttribution[*]. role	Role of the responsible party corresponding to ISO19115:2003 responsible party role . Values: - resourceProvider - custodian - owner - user - distributor - originator - pointOfContact - principalInvestigator - processor - publisher - author	Range: String	One (mandatory)
agent \$. properties. qualifiedAttribution[*]. agent	Organisation or person fulfilling the above "role". Any properties allowed by vcard:Kind are allowed.	Range: Array of Agent (See Table 11)	One (mandatory)

Example 9: Attribution encoding example

```

{
  "type": "Attribution",
  "agent": [
    {
      "type": "Organization",
      "email": "eohelp@eo.esa.int",
      "name": "ESA/ESRIN",
      "phone": "tel:+39 06 94180777",

      "uri": "http://www.earth.esa.int",
      "hasAddress": {
        "country-name": "Italy",
        "postal-code": "00044",

```

```

        "locality": "Frascati",
        "street-address": "Via Galileo Galilei CP. 64"
      }
    ],
    "role": "originator"
  }

```

7.3.4. Agent

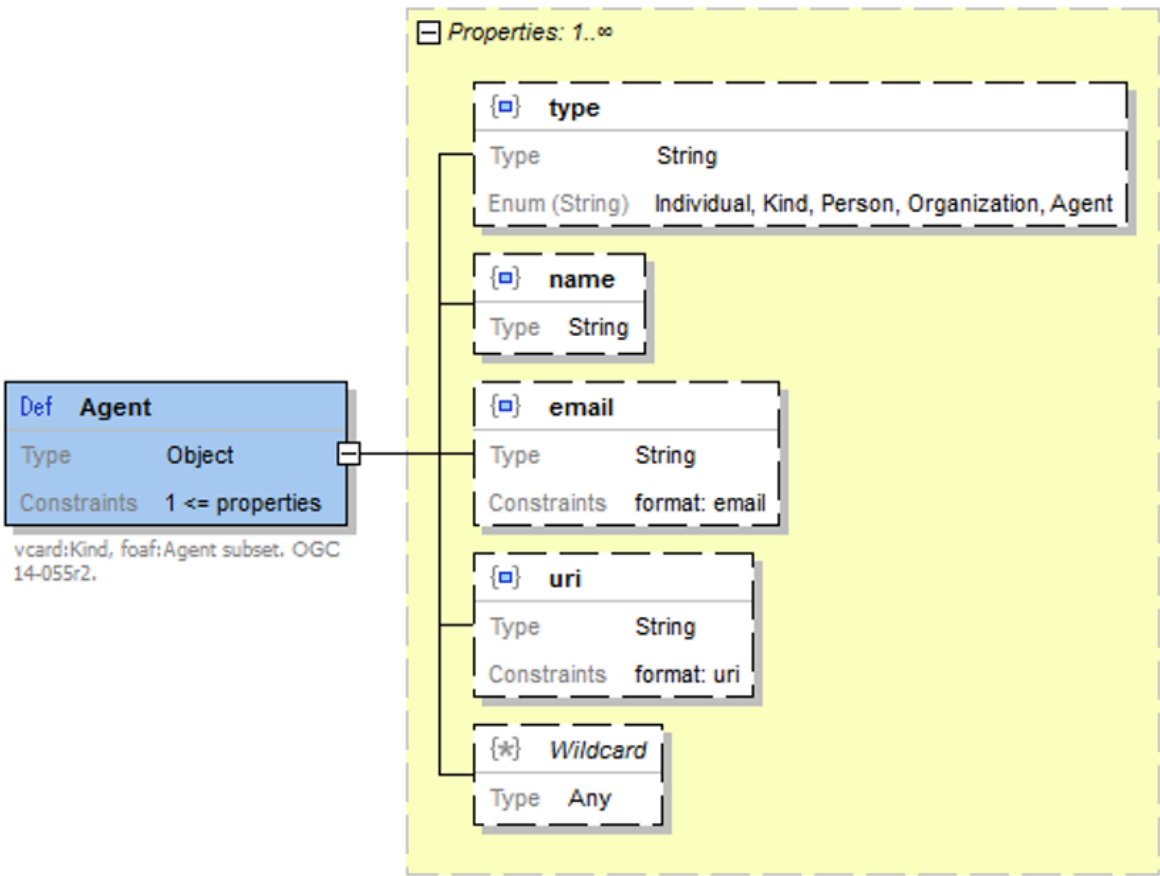
REQUIREMENT 14:

/req/agent

An “Agent” object shall implement the properties defined in Table 11, with the value matching the type shown, and with the obligation shown.

The Agent object is a parent class which can contain the properties of a person or organization entity. It is based on vcard:Kind [OR17] and foaf:Agent [OR20] (depending on the context) and some of its properties were defined/renamed in [NR5].

Figure 10 – Agent Schema



Complete description of Agent is given in Table 11.

Table 11 – Agent object properties

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLICITY AND USE
<code>type</code> <code>\$..type</code>	Type of the element. This property can have one of the following fixed values "Agent" (or "Kind"), "Person" (or "Individual"), "Organization".	Domain: Zero Agent or one String	Range: (optional)
<code>name</code> <code>\$..name</code>	Human readable name of author (or entity) as a single string. Defined in section 7.1.1.7 of [NR5].	Domain: Optional Zero property or one in [NR5] (optional)	Range: Agent String.

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- P AND USE
email \$.. email	Email of author (or entity).	Optional Zero property or one in [NR5] (optional) Domain: Agent Range: String.	
uri \$.. uri	URI associated with the author (or entity).	Optional Zero property or one in [NR5] (optional) Domain: Agent Range: String (URI).	
phone \$. properties. authors[*]. phone	Single phone number associated with the author (or entity).	Optional Zero property or one in (optional) [OR20] Domain: Agent Range: String.	
hasTelephoneNumber \$. properties. qualifiedAttribution[agent[hasTelephoneNumber \$. properties. contactPoint[hasTelephoneNumber	Phone numbers associated with the author (or entity). Can be of type "Voice", "Fax", "Cellular", "Other". Defined in [OR17].	Optional Zero or property more in (optional) [OR17] Domain: Agent Range: Array of Object.	
hasName \$. properties. qualifiedAttribution[agent[hasName \$. properties. contactPoint[hasName + \$.	Name associated with the author (or entity) in structured parts as defined in [OR17]: • given-name (optional) • family-name (optional) • additional-name (optional)	Optional Zero property or one in (optional) [OR17] Domain: Agent Range: Object.	

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
--------------------	------------	-------------------------------	------------------------

properties.			
authors[].			
hasName			
hasAddress	Address associated with the author (or entity) in structured parts as defined in [OR17]:	Optional Zero	
\$.street-address	street-address (optional)	property or one	
properties.locality	locality (optional)	in (optional)	
properties.region	region (optional)	[OR17]	
agent		Domain:	
hasAddress	country-name (optional)	Agent	
\$.postal-code	postal-code (optional)	Range:	
properties.contact		Object.	
hasAddress			

Example 10: Agent encoding example

```
{
  "type": "Agent",
  "name": "Earth Observation Helpdesk",
  "email": "EOHelp@esa.int",
  "uri": "http://earth.esa.int",
  "phone": "tel:+39 06 94180777",
  "hasTelephone": [
    {
      "type": "Voice",
      "hasValue": "tel:+39 06 94180777"
    },
    {
      "type": "Fax",
      "hasValue": "tel:+39 06 94180292"
    }
  ],
  "hasAddress": {
    "country-name": "Italy",
    "postal-code": "00044",
    "locality": "Frascati",
    "street-address": "Via Galileo Galilei CP. 64"
  }
}
```

Example 11: Agent encoding example (Individual)

```
{
  "type": "Individual",
  "name": "Christopher J. Merchant",
  "hasName": {
    "given-name": "Christopher",
    "family-name": "Merchant",
    "additional-name": "J."
  },
}
```

```

"hasAddress": {
  "locality": "Reading"
}
}

```

7.3.5. ProvenanceStatement

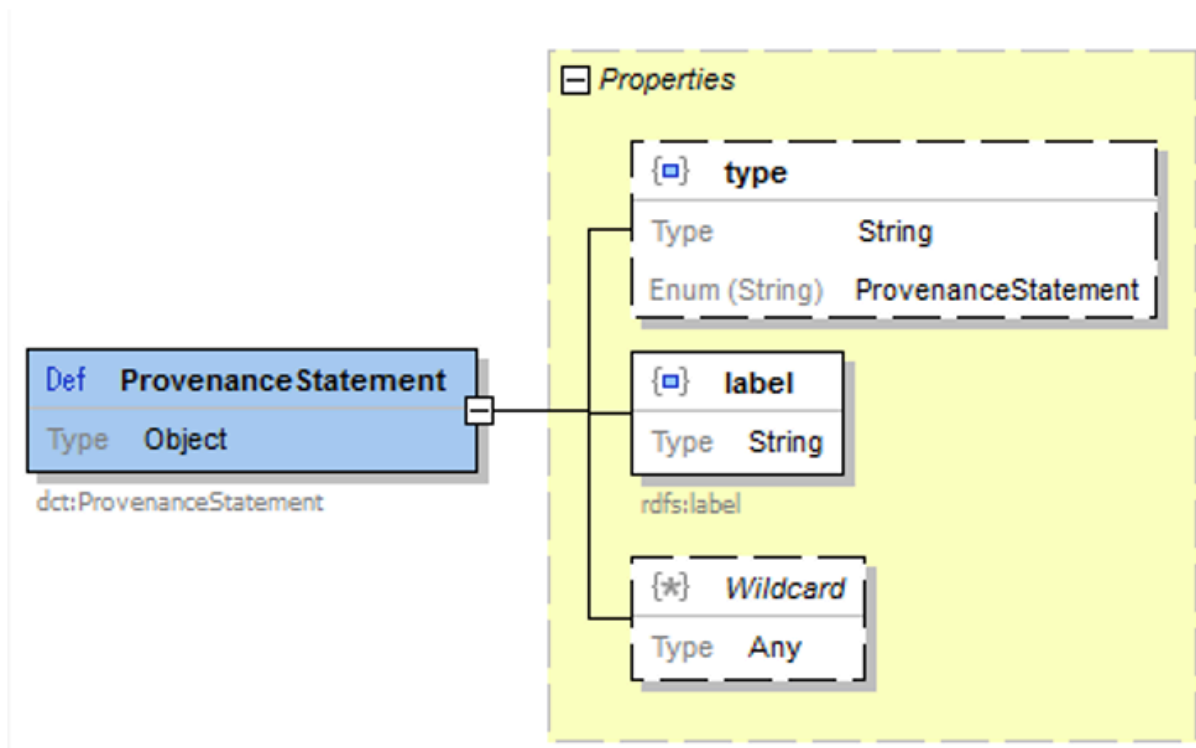
REQUIREMENT 15:

/req/provenance-statement

A "ProvenanceStatement" object shall implement the properties shown in Table 20 with the value matching the type shown, and with the obligation shown.

The proposed encoding is aligned with GeoDCAT-AP [OR15] §II.12.

Figure 11 — ProvenanceStatement Schema



Complete description of ProvenanceStatement is given in Table 12.

Table 12 — ProvenanceStatement object properties

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
<code>type</code>	Type of the element. This property has the fixed value "ProvenanceStatement".	Domain: Zero ProvenanceStatement	Range: (optional) String
<code>\$.properties.provenance[*].type</code>	Free text content of the corresponding ISO19139-2 metadata property gmd:lineage.	Property One [OR15] (mandatory)	Domain: ProvenanceStatement
<code>\$.properties.provenance[*].label</code>		Range: String.	

Example 12: ProvenanceStatement encoding example

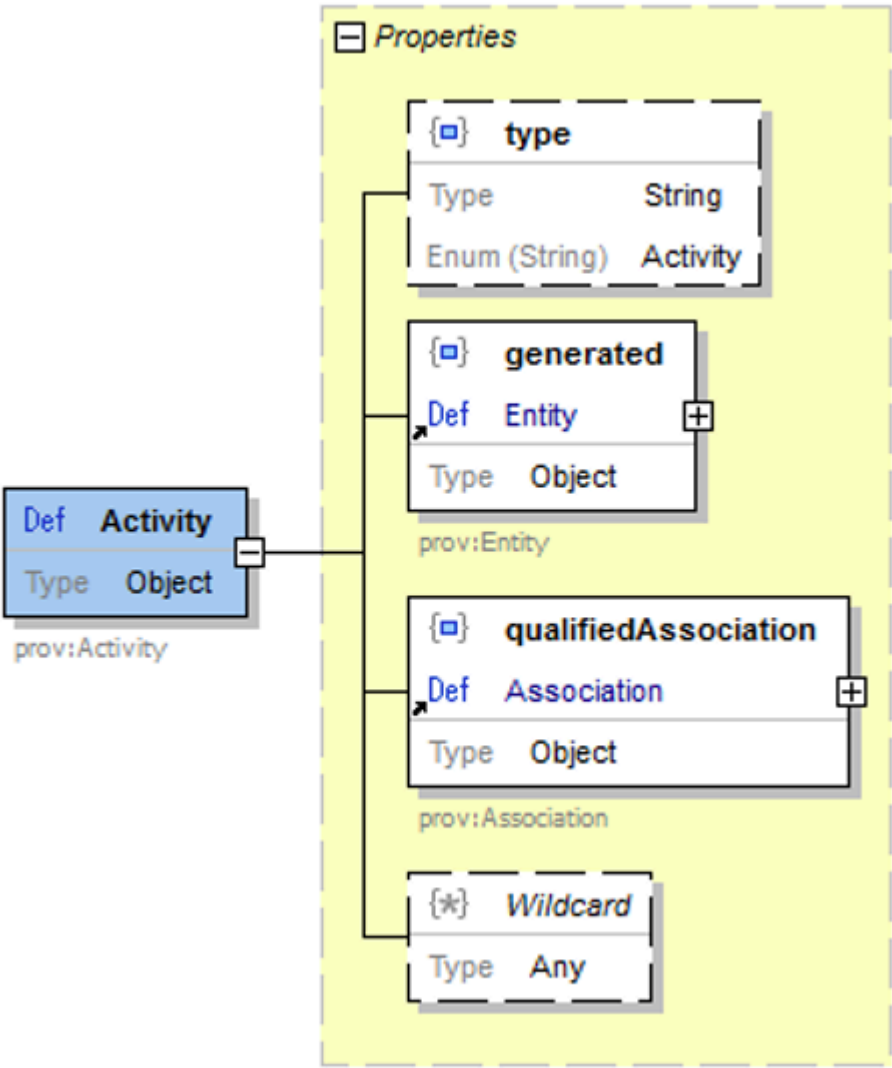
```
{
  "type": "ProvenanceStatement",
  "label": "Forest Map 2006 is derived from the IMAGE2006 (SPOT/LISS scenes) and CORINE2006 landcover dataset. In addition, MODIS composites are used for the Forest type classification."
}
```

7.3.6. Activity

REQUIREMENT CLASS: ACTIVITY	
/req/activity	
Target Type	Data instance
Dependency	JSON [NR1]
Dependency	/req/association
Dependency	/req/entity
Requirement 16:	/req/activity/properties
REQUIREMENT 16:	
/req/activity/properties	
An "Activity" object shall implement the properties shown in Table 13 with the value matching the type shown, and with the obligation shown.	

The proposed encoding is aligned with GeoDCAT-AP [OR15] §II.14 and PROV-O [OR30].

Figure 12 – Activity Schema



Complete description of Activity is given in Table 13.

Table 13 – Activity object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTIP AND USE
<code>type</code>	Type of the element. This property has the fixed value "Activity".	Domain: Zero	
<code>\$. properties. wasUsedBy[*]. type</code>		Activity or one Range: (optional) String	

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- P AND USE
<code>\$.generated</code>	Refers to the conformity result which is encoded as an Entity.	Domain: One	Activity (mandatory)
<code>\$.properties</code>		Range:	Entity
<code>\$.wasUsedBy[*].qualifiedAssociation</code>	Refers to the specification against which conformity is expressed, encoded as an Association.	Domain: One	Activity (mandatory)
		Range:	Association

Example 13: Activity encoding example

```
{
  "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"
      }
    }
  }
}
```

7.3.7. Entity

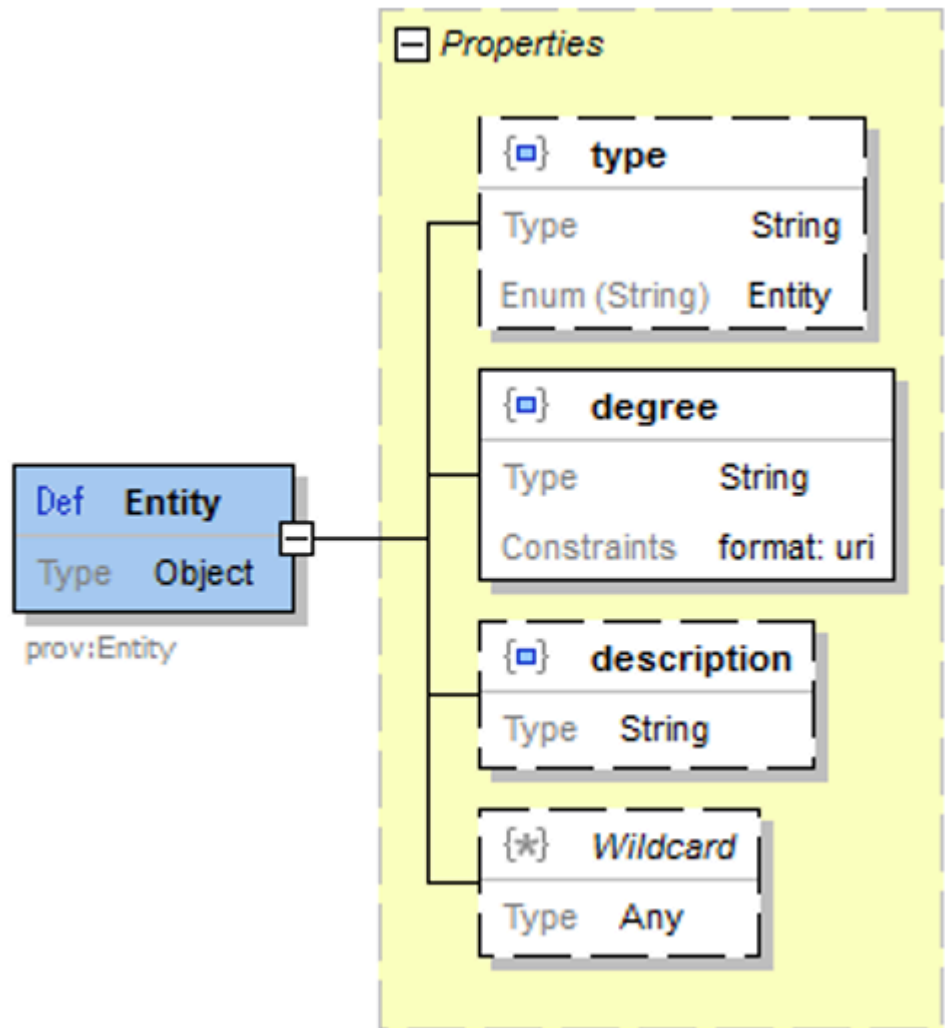
REQUIREMENT 17:

/req/entity

An “Entity” object shall implement the properties shown in Table 14 with the value matching the type shown, and with the obligation shown.

The proposed encoding is aligned with GeoDCAT-AP [OR15] §II.14 and PROV-O [OR30].

Figure 13 – Entity Schema



Complete description of Entity is given in Table 14.

Table 14 – Entity object properties

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
<code>type</code>	Type of the element. This property has the fixed value "Entity".	Domain: Zero	or one
<code>\$.properties.wasUsedBy[*].generated.type</code>		Range: String	(optional)

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLICITY AND USE
degree	URI defining the degree of conformity. The INSPIRE Registry maintains a URI set at http://inspire.ec.europa.eu/metadata-codelist/DegreeOfConformity	Domain: One	Entity (mandatory)
properties		Range: String (URI)	
wasUsedBy[*]			
generated			
description	Description of the result.	Domain: Zero or one	Entity (optional)
		Range: String	

Example 14: Entity encoding example

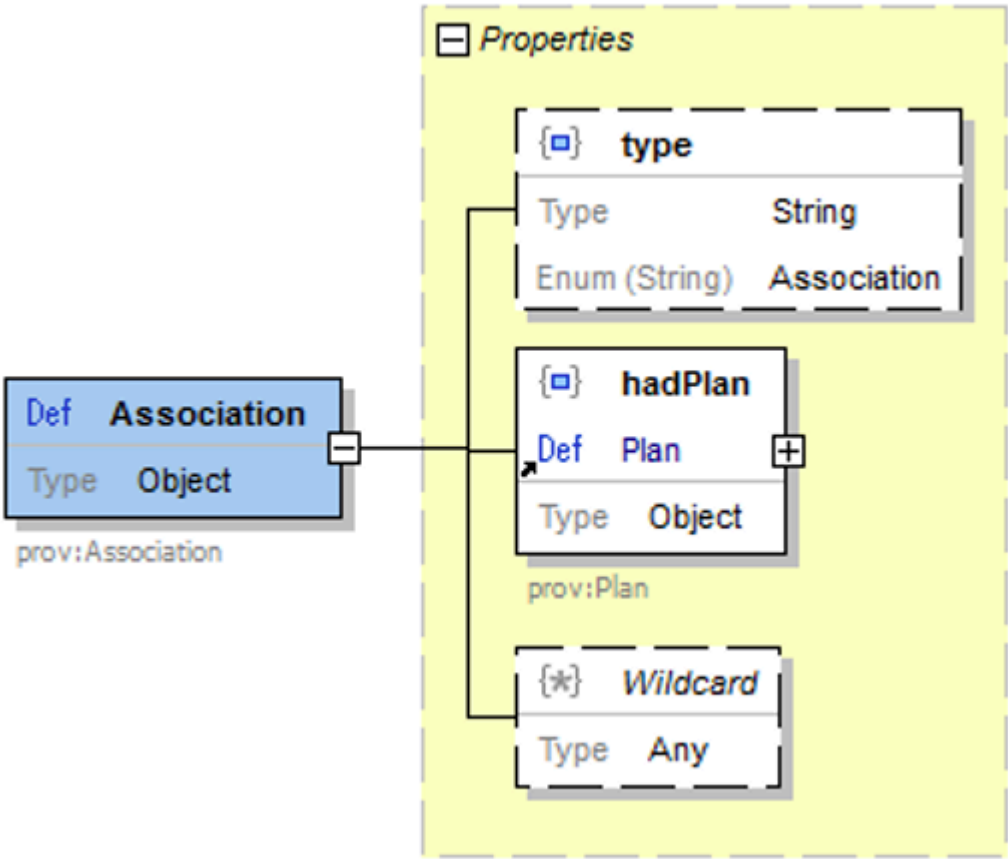
```
{
  "type": "Entity",
  "degree": "http://inspire.ec.europa.eu/metadata-codelist/DegreeOfConformity/conformant",
  "description": "See the referenced specification"
}
```

7.3.8. Association

REQUIREMENT CLASS: ASSOCIATION	
/req/association	
Target Type	Data instance
Dependency	JSON [NR1]
Dependency	/req/plan
Requirement 18:	/req/association/properties
REQUIREMENT 18:	
/req/association/properties	
An "Association" object shall implement the properties shown in Table 15 with the value matching the type shown, and with the obligation shown.	

The proposed encoding is aligned with GeoDCAT-AP [OR15] §II.14 and PROV-O [OR30].

Figure 14 – Association Schema



Complete description of Association is given in Table 15.

Table 15 – Association object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- P AND USE
<code>type</code>	Type of the element. This property has the fixed value "Association".	Domain: Zero Association or one	one
<code>\$.properties.wasUsedBy[*].qualifiedAssociation.type</code>		Range: (optional) String	
<code>\$.properties.hadPlan</code>	Set of actions or steps intended by one or more agents to achieve some goals.	Domain: One Association (mandatory)	one
<code>\$.properties.wasUsedBy[*].qualifiedAssociation.type</code>		Range: Plan	

JSON DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
qualifier hadPlan		

Example 15: Association encoding example

```
{
  "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": "2010-12-08"
    }
  }
}
```

7.3.9. Plan

REQUIREMENT CLASS: PLAN

/req/plan

Target Type Data instance

Dependency JSON [NR1]

Dependency /req/standard

Requirement 19: /req/plan/properties

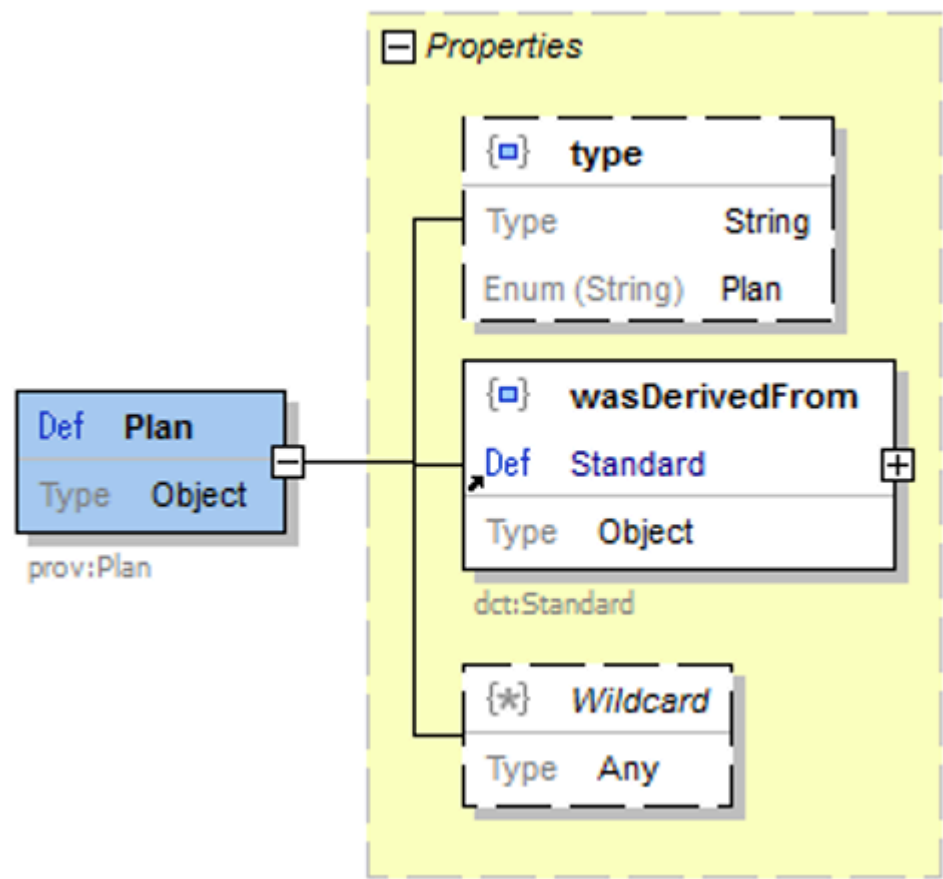
REQUIREMENT 19:

/req/plan/properties

A "Plan" object shall implement the properties shown in Table 16 with the value matching the type shown, and with the obligation shown.

The proposed encoding is aligned with GeoDCAT-AP [OR15] §II.14 and PROV-O [OR30].

Figure 15 — Plan Schema



Complete description of Plan is given in Table 16.

Table 16 — Plan object properties

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIP AND USE
type	Type of the element. This property has the fixed value "Plan".	Domain: Zero	Plan or one
\$.properties.wasUsedBy[*].qualifiedAssociation.hadPlan.type		Range: (optional)	String
\$.properties.wasDerivedFrom	Refers to the specification against which conformity is expressed, encoded as a Standard.	Range: One	Standard (mandatory)

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
wasUsed			
qualified			
hadPlan			
wasDerivedFrom			

Example 16: Plan encoding example

```
{
  "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": "2010-12-08"
  }
}
```

7.3.10. Standard

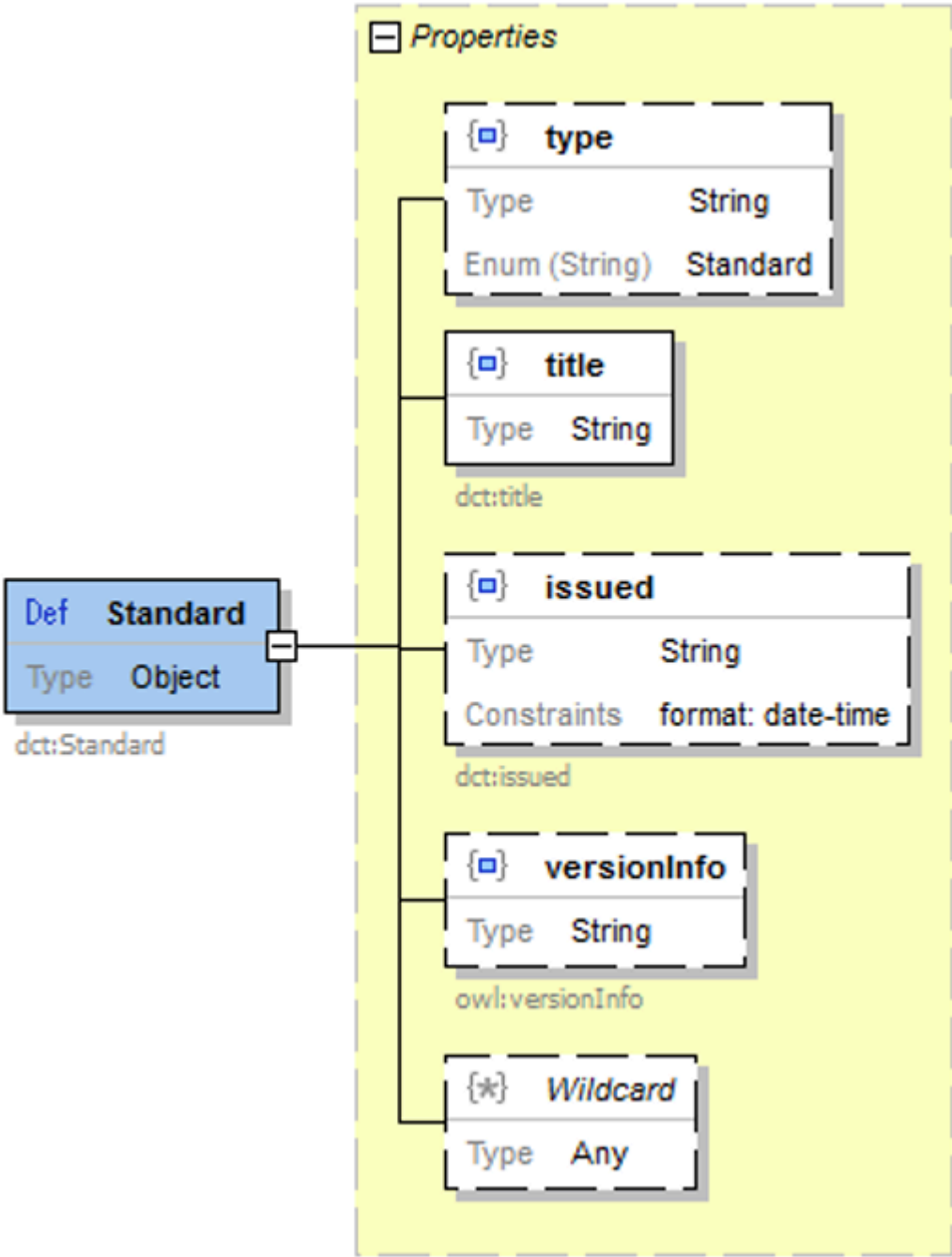
REQUIREMENT 20:

/req/standard

A “Standard” object shall implement the properties shown in Table 17 with the value matching the type shown, and with the obligation shown.

The proposed encoding is aligned with GeoDCAT-AP [OR15] §II.14.

Figure 16 – Standard Schema



Complete description of Standard is given in Table 17.

Table 17 — Standard object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- AND USE
<code>type</code>	Type of the element. This property has the fixed value "Standard".	Domain: Zero Standard or one Range: (optional) String	
<code>\$. properties. wasUsedBy[*]. qualifiedAssociation. hadPlan. wasDerivedFrom. type</code>			
<code>title</code>	/gmd:MD_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:report/ \$. gmd:DQ_DomainConsistency/gmd:result Title of the specification against which conformity is expressed.	Domain: One Standard (mandatory) Range: String	
<code>prope wasUs quali hadPl wasDe title</code>			
<code>issued</code>	Issue date of the specification against which conformity is expressed.	Domain: Zero Standard or one Range: (optional) DateTime	
<code>\$. properties. wasUsedBy[*]. qualifiedAssociation. hadPlan. wasDerivedFrom. issued</code>			
<code>version</code>	Version of the specification against which conformity is expressed.	Domain: Zero Standard or one Range: (optional) String	
<code>\$. prope wasUs quali hadPl wasDe versio</code>			

Example 17: Standard encoding example

```

{
  "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": "2010-12-08"
}

```

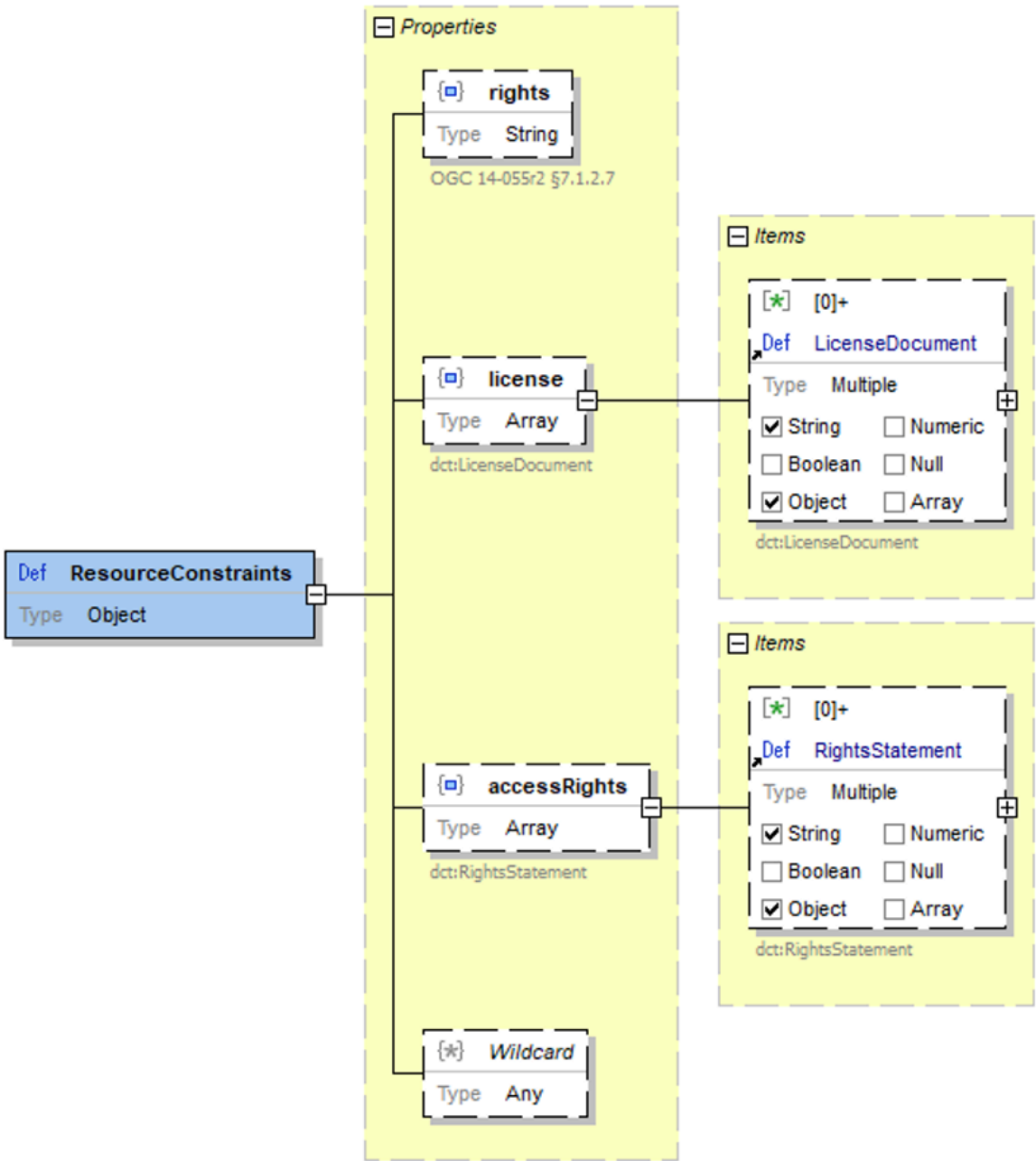
7.4. REQUIREMENTS CLASS: RESOURCE CONSTRAINTS

REQUIREMENT CLASS: RESOURCE CONSTRAINTS	
/req/resource-constraints	
Target Type	Data instance
Dependency	JSON [NR1]
Dependency	/req/license-document
Dependency	/req/rights-statement
Requirement 21:	/req/resource-constraints/properties
Requirement 24:	/req/use-constraints
Requirement 25:	/req/access-constraints

REQUIREMENT 21:	
/req/resource-constraints/properties	
A "ResourceConstraints" object shall implement the properties shown in Table 18 with the value matching the type shown, and with the obligation shown.	

The proposed encoding is aligned with DCAT Version 2 [OR25] and GeoDCAT-AP [OR15] §II.15.

Figure 17 – ResourceConstraints Schema



Complete description of ResourceConstraints is given in Table 18.

Table 18 — ResourceConstraints object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
<code>rights</code>	Information about rights held in and over the collection. See OGC 14-055r2 §7.1.2.7. Also defined in [OR25] as a statement that concerns all rights not addressed with license or properties. Rights, such as copyright statements.	Property Zero [NR5]	or one
<code>\$. properties. rights</code>		Domain: (optional) Properties Range: String	
<code>license</code>	Information about licensing terms for the EO collection distribution. For example the encoding of the corresponding ISO19139-2 metadata property gmd:useLimitation.	Domain: Zero	Distribut or one
<code>\$. prope: licen:</code>		Range: (optional) Array of LicenseE (See Table 19)	
<code>accessRights</code>	Information about access conditions for the EO collection distribution. For example the encoding of the corresponding ISO19139-2 metadata properties gmd:accessConstraints and otherConstraints.	Domain: Zero Distribution one	Range: (optional)
<code>\$. properties. accessRights</code>		Array of RightsStatement (See Table 20)	

Example 18: ResourceConstraints encoding example

```
{
  "rights": "Data are available upon fast registration",
  "license": [
    {
      "type": "LicenseDocument",
      "label": "Fast Registration with immediate access Data is
available via EOLI-SA upon registration for the (A)SAR On The
Fly Service. For information on access and use of the On-The-Fly
service please refer to the OTF FAQ page and news of 28 July 2016."
    }
  ],
  "accessRights": [
    {
      "type": "RightsStatement",
      "label": "Utilisation of this data is subject to ESA's Earth
Observation Terms and Conditions"
    }
  ]
},
```


7.4.1. LicenseDocument

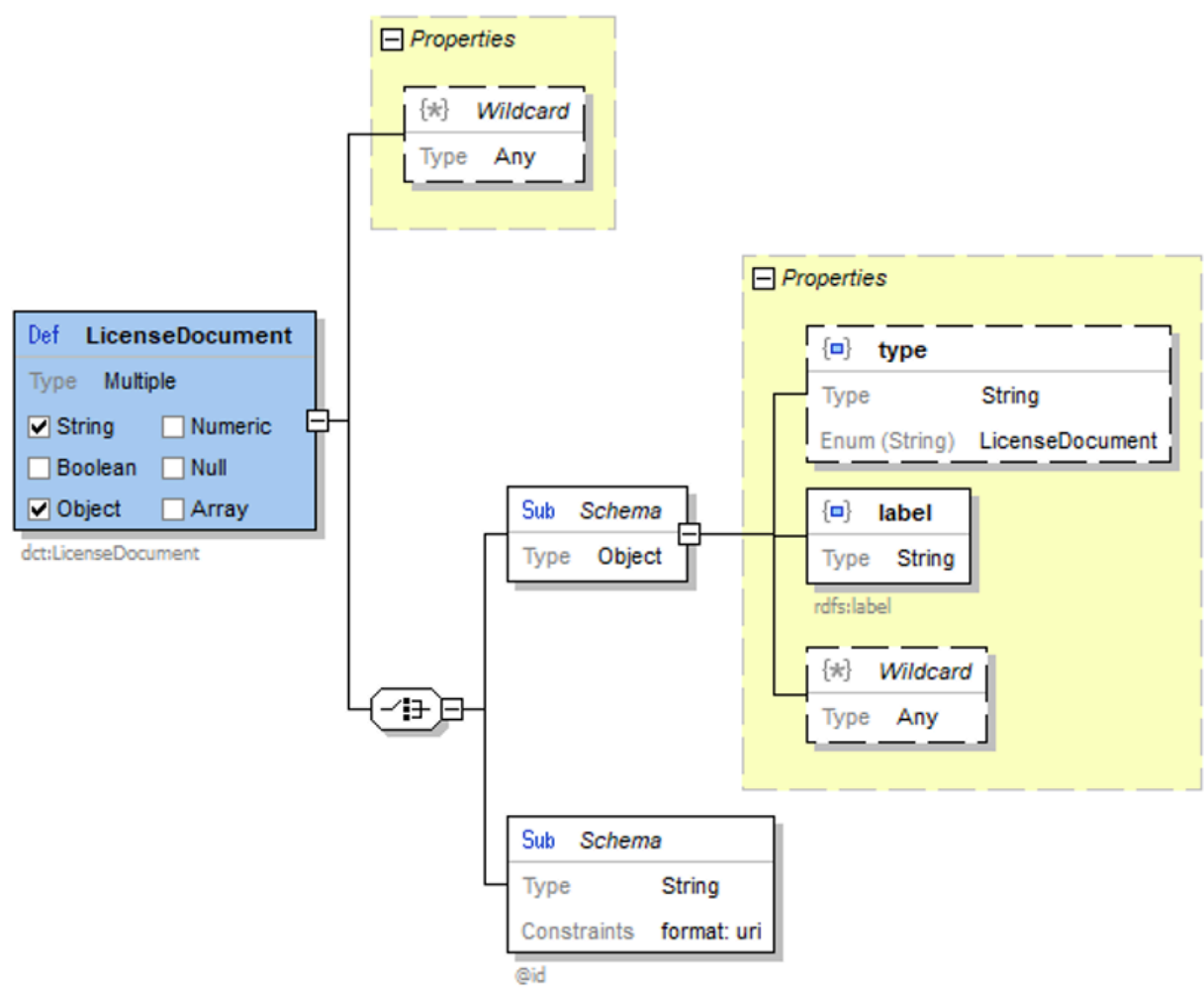
REQUIREMENT 22:

/req/license-document

A “LicenseDocument” object shall implement the properties shown in Table 19 with the value matching the type shown, and with the obligation shown.

The proposed encoding is aligned with GeoDCAT-AP [OR15] §II.15.

Figure 18 – LicenseDocument Schema



A LicenseDocument is encoded as an object or as a URI identifying such object. The complete description of the LicenseDocument object is given in Table 19.

Table 19 — LicenseDocument object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- AND USE
<code>type</code>	Type of the element. This property has the fixed value "LicenseDocument".	Domain: Zero	
<code>properties</code>		LicenseDocument	
<code>license[*].type</code>		Range: (optional) String	
<code>label</code>	Free text content of the corresponding ISO19139-2 metadata property gmd:useLimitation.	Property One	
<code>prope:</code>		[OR15] (mandatory)	
<code>licen:</code>		Domain:	
<code>label</code>		LicenseE	
		Range:	
		String.	

Example 19: LicenseDocument encoding example (Object)

```
{
  "type": "LicenseDocument",
  "label": "Fast Registration with immediate access Data is
available via EOLI-SA upon registration for the (A)SAR On The
Fly Service. For information on access and use of the On-The-Fly
service please refer to the OTF FAQ page and news of 28 July 2016."
}
```

Example 20: LicenseDocument encoding example (URI)

```
"https://creativecommons.org/licenses/by/4.0/"
```

7.4.2. RightsStatement

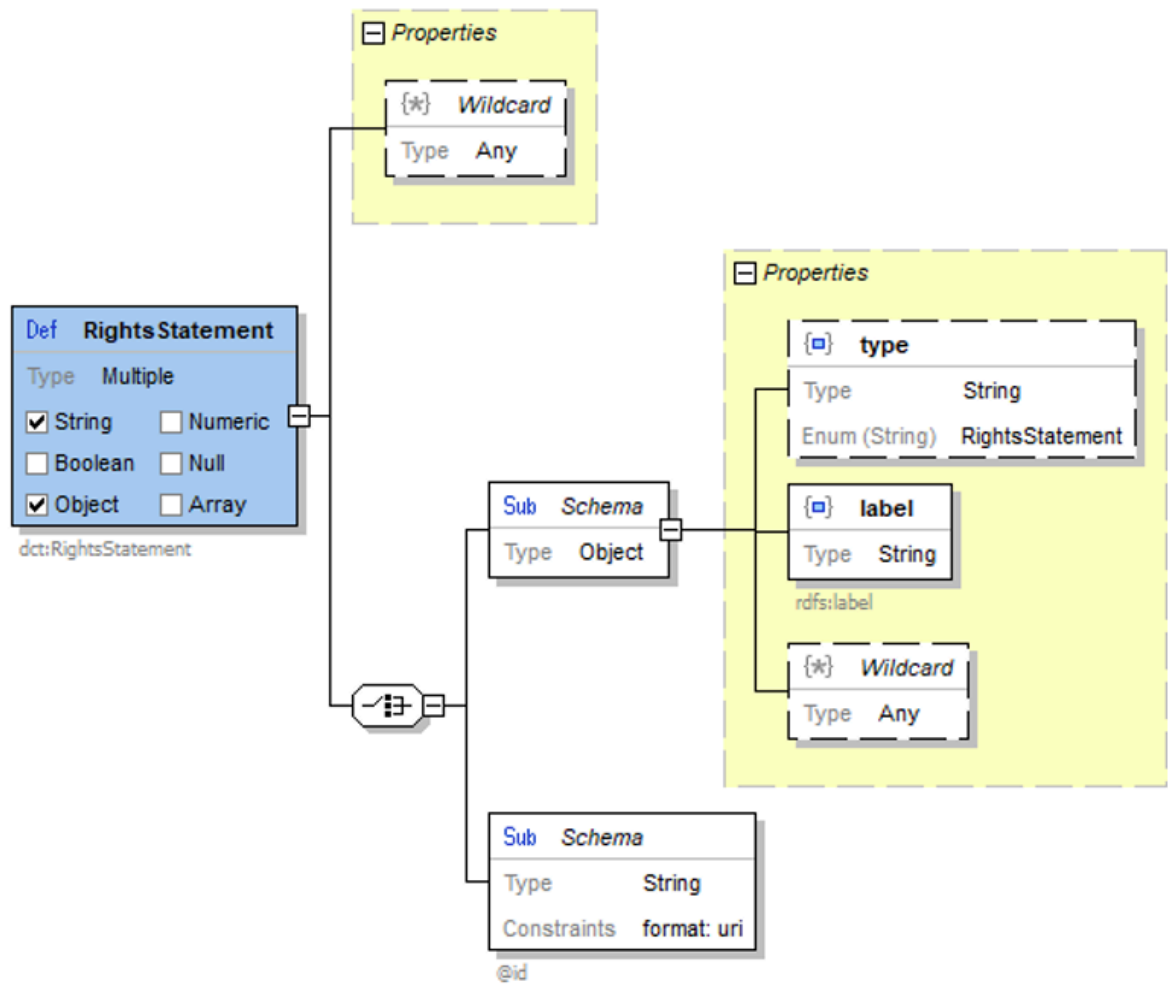
REQUIREMENT 23:

```
/req/rights-statement
```

A "RightsStatement" object shall implement the properties shown in Table 20 with the value matching the type shown, and with the obligation shown.

The proposed encoding is aligned with GeoDCAT-AP [OR15] §II.15.

Figure 19 — RightsStatement Schema



A RightsStatement is encoded as an object or as a URI identifying such object. The complete description of RightsStatement is given in Table 20.

Table 20 — RightsStatement object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTIP AND USE
\$. properties. accessRights[*]. type	Type of the element. This property has the fixed value "RightsStatement".	Domain: Zero RightsStatement Range: (optional) String	
label	Free text content of the corresponding ISO19139-2 metadata properties gmd:accessConstraints and gmd:otherConstraints.	Property One [OR15] (mandatory) Domain:	

JSON DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
\$. prope: acces: label	RightsSt: Range: String.	

Example 21: RightsStatement encoding example (Object)

```
{
  "type": "RightsStatement",
  "label": "Utilisation of this data is subject to ESA's Earth
  Observation Terms and Conditions"
}
```

Example 22: RightsStatement encoding example (URI)

```
"https://earth.esa.int/web/guest/data-access/how-to-access-eo-data/
asar-on-the-fly-faq"
```

7.4.3. Use Constraints

REQUIREMENT 24:

/req/use-constraints

Use Constraints shall be implemented through the ResourceConstraints and LicenseDocument (Section 7.4.1) objects.

Example 23: Use Constraints encoding example (Object)

```
{
  "license": [
    {
      "type": "LicenseDocument",
      "label": "Fast Registration with immediate access Data is
      available via EOLI-SA upon registration for the (A)SAR On The
      Fly Service. For information on access and use of the On-The-Fly
      service please refer to the OTF FAQ page and news of 28 July 2016."
    }
  ]
}
```

Example 24: Use Constraints encoding example (URI)

```
{
  "license": [
    "https://creativecommons.org/licenses/by/4.0/"
  ]
}
```

7.4.4. Access Constraints

REQUIREMENT 25:

/req/access-constraints

Access Constraints shall be implemented through the ResourceConstraints and RightsStatement (Section 7.4.2) objects.

Example 25: Access Constraints encoding example (Object)

```
{
  "accessRights": [
    {
      "type": "RightsStatement",
      "label": "Utilisation of this data is subject to ESA's Earth
Observation Terms and Conditions"
    }
  ]
}
```

Example 26: Access Constraints encoding example (URI)

```
{
  "accessRights": [
    "https://earth.esa.int/web/guest/data-access/how-to-access-eo-
data/asar-on-the-fly-faq"
  ]
}
```

7.5. REQUIREMENTS CLASS: DESCRIPTIVE KEYWORDS

REQUIREMENT CLASS: DESCRIPTIVE KEYWORDS

/req/descriptive-keywords	
Target Type	Data instance
Dependency	JSON [NR1]
Dependency	/req/category
Requirement 26:	/req/descriptive-keywords/properties
Requirement 34:	/req/location-keywords

REQUIREMENT CLASS: DESCRIPTIVE KEYWORDS

Requirement 36: /req/temporal-keywords

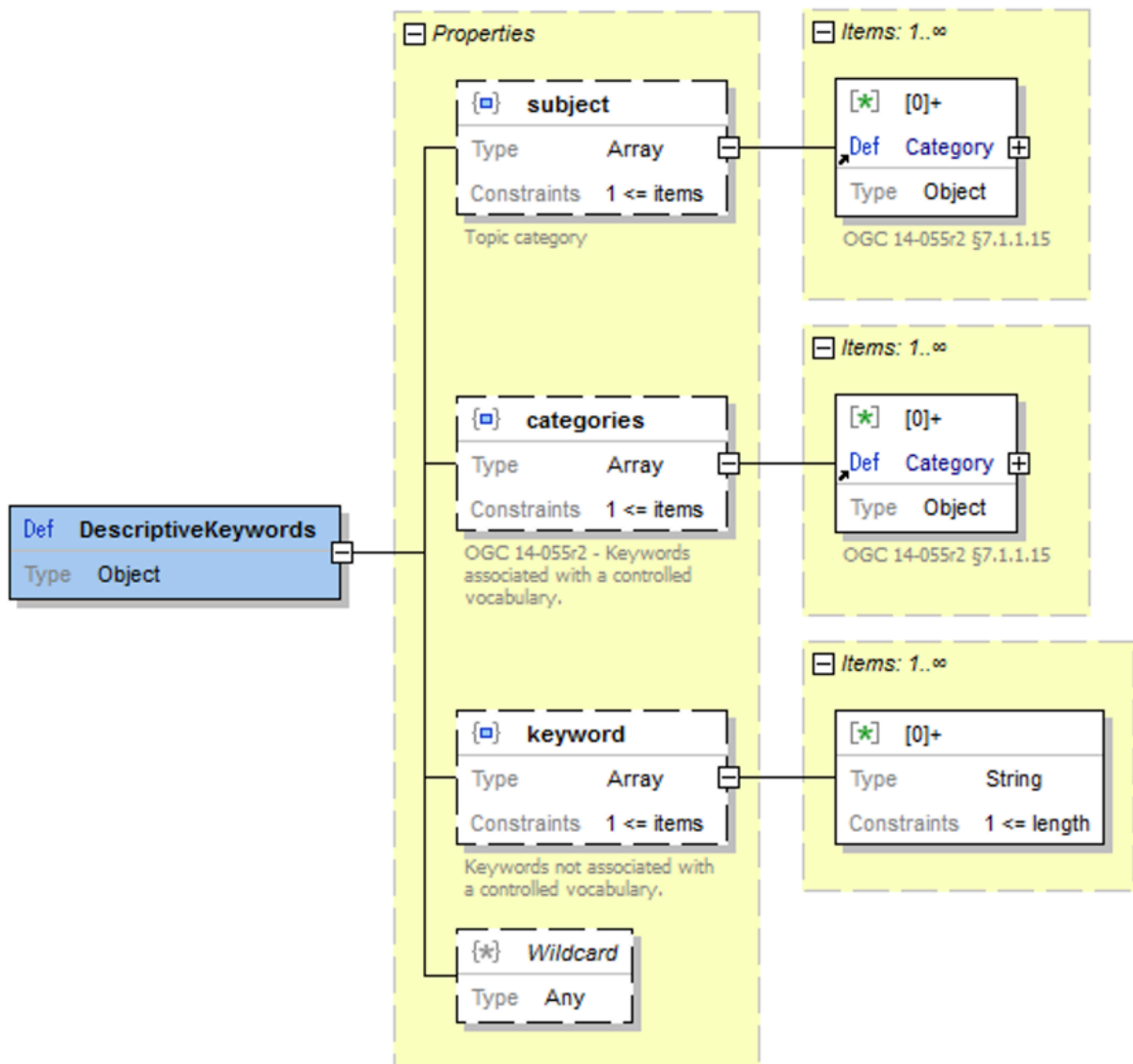
REQUIREMENT 26:

/req/descriptive-keywords/properties

A "DescriptiveKeywords" object shall implement the properties shown in Table 21 with the value matching the type shown, and with the obligation shown.

The DescriptiveKeywords properties are inherited by the Properties block. To align with GeoDCAT-AP [OR15] §II.8.1, three kinds of keywords are distinguished.

Figure 20 — DescriptiveKeywords Schema



Complete description of DescriptiveKeywords is given in Table 21.

Table 21 – DescriptiveKeywords object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI AND USE
subject	ISO topic categories related to the collection.	Property Zero	
\$. properties. subject		[OR15]	or one
		Domain:	(optional)
		Properties	
		Range:	
		Array of	
		Category	
		(See	
		Table	
		22)	
categories	Keywords belonging to a controlled vocabulary related to the collection.	Optional Zero	
\$. properties. categories		property or one	
		in [NR5]	(optional)
		Domain:	
		Properties	
		Range:	
		Array of	
		Category	
		(See	
		Table	
		22)	
keyword	Free keywords not belonging to a controlled vocabulary related to the collection. Defined in DCAT [OR13].	Property Zero	
\$. properties. keyword		[OR13]	or one
		Domain:	(optional)
		Properties	
		Range:	
		Array of	
		String	

Example 27: DescriptiveKeywords encoding example

```
{
  "categories": [
    {
      "term": "http://www.eionet.europa.eu/gemet/concept/3650",
      "scheme": "http://www.eionet.europa.eu/gemet/",
      "label": "Geology"
    },
    {
      "term": "https://gcmdservices.gsfc.nasa.gov/kms/concept/03f0c0a3-04a7-4ef8-8ec0-3c2266510815",
      "scheme": "https://gcmdservices.gsfc.nasa.gov/kms/concepts/concept_scheme/sciencekeyword",

```

```

        "label": "VISIBLE IMAGERY"
      },
      {
        "term": "https://gcmdservices.gsfc.nasa.gov/kms/concept/98dc8278-
fe0a-4e36-a638-9d7a5b0ed826",
        "scheme": "https://gcmdservices.gsfc.nasa.gov/kms/concepts/
concept_scheme/projects",
        "label": "FedEO"
      },
      {
        "term": "https://gcmdservices.gsfc.nasa.gov/kms/concept/ad598334-
f541-4be4-888c-c2dc7eb54194",
        "scheme": "https://gcmdservices.gsfc.nasa.gov/kms/concepts/
concept_scheme/CollectionDataType",
        "label": "NEAR_REAL_TIME"
      }
    ],
    "keyword": [
      "FedEO",
      "ESA LDS"
    ],
    "subject": [
      {
        "term": "http://inspire.ec.europa.eu/metadata-codelist/
TopicCategory/geoscientificInformation",
        "label": "Geoscientific Information"
      },
      {
        "term": "https://gcmdservices.gsfc.nasa.gov/kms/concept/d9cd5b7e-
e9e7-4746-bbc8-bc69f7b606c7",
        "label": "GEOSCIENTIFIC INFORMATION",
        "scheme": "https://gcmdservices.gsfc.nasa.gov/kms/concepts/
concept_scheme/isotopiccategory"
      }
    ]
  }
}

```

7.5.1. Category

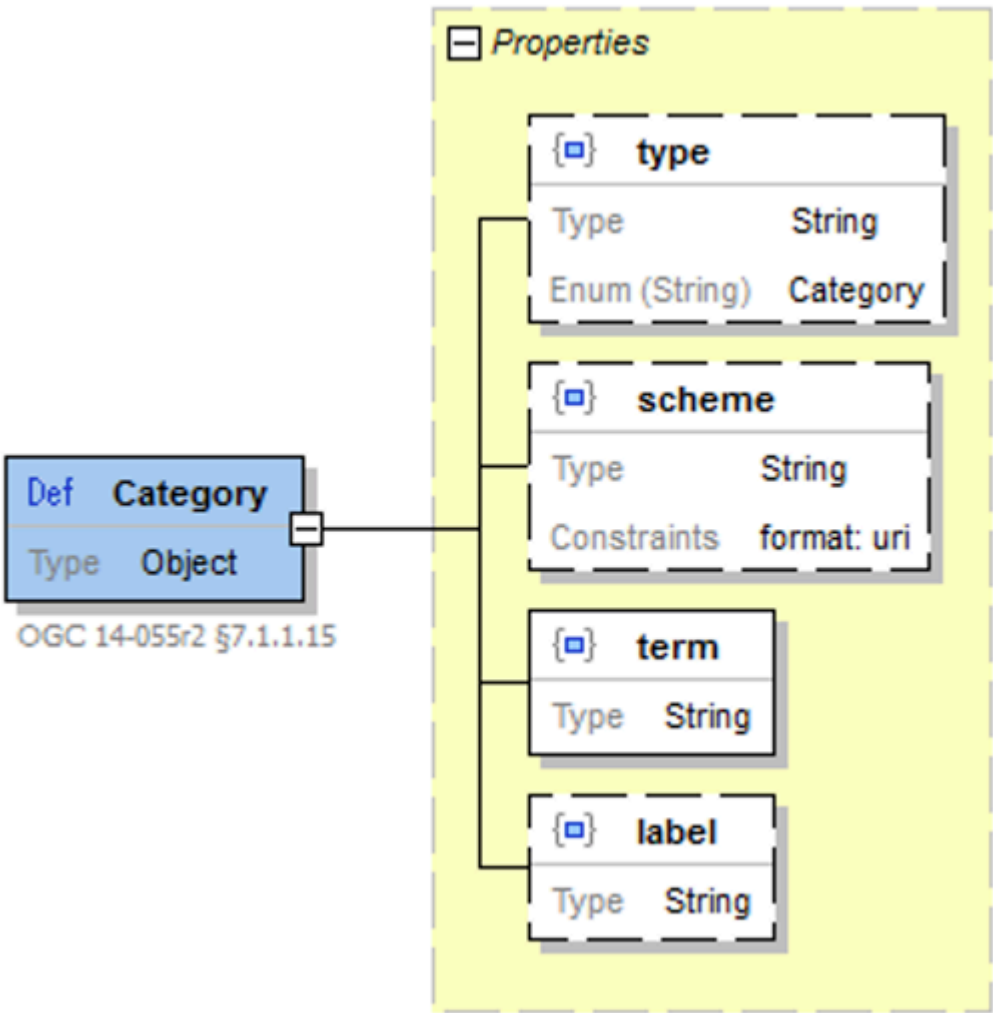
REQUIREMENT 27:

/req/category

A “Category” object shall implement the properties defined in OGC 14-055r2 [NR5], with the value matching the type shown, and with the obligation shown.

The Category block contains the properties of a keyword and is defined in [NR5].

Figure 21 – Category Schema



Complete description of Category is given in Table 22.

Table 22 – Category object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- AND USE
<code>\$. properties. categories[*]. type</code>	Type of the element. This property has the fixed value "Category".	Domain: Zero Category or one Range: (optional) String Fixed value: "Category"	

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
\$.properties.categories.schema	Identification of the code-list defining the keyword. Defined in section 7.1.1.15 of [NR5].	Optional Zero property or one in [NR5] (optional)	Domain: Category Range: String (URI).
\$.properties.categories[*].term	Identification of the keyword. See also [OR22] for using of URI as string value.	Mandatory one property (mandatory) in [NR5]	Domain: Category Range: String
\$.properties.categories.label	Human readable representation of the keyword.	Optional Zero property or one in [NR5] (optional)	Domain: Category Range: String

Example 28: Category encoding example

```
{
  "type": "Category",
  "scheme": "http://www.eionet.europa.eu/gemet/",
  "term": "http://www.eionet.europa.eu/gemet/concept/4612",
  "label": "Land cover"
}
```

7.6. REQUIREMENTS CLASS: RELATED URL

REQUIREMENT CLASS: RELATED URL

/req/related-url

Target Type	Data instance
Dependency	JSON [NR1]
Dependency	/req/offering

REQUIREMENT CLASS: RELATED URL

Dependency /req/links

Requirement 28: /req/related-url/properties

REQUIREMENT 28:

/req/related-url/properties

A “RelatedUrl” object shall implement the properties shown in Table 23, with the value matching the type shown, and with the obligation shown.

Figure 22 – RelatedUrl Schema

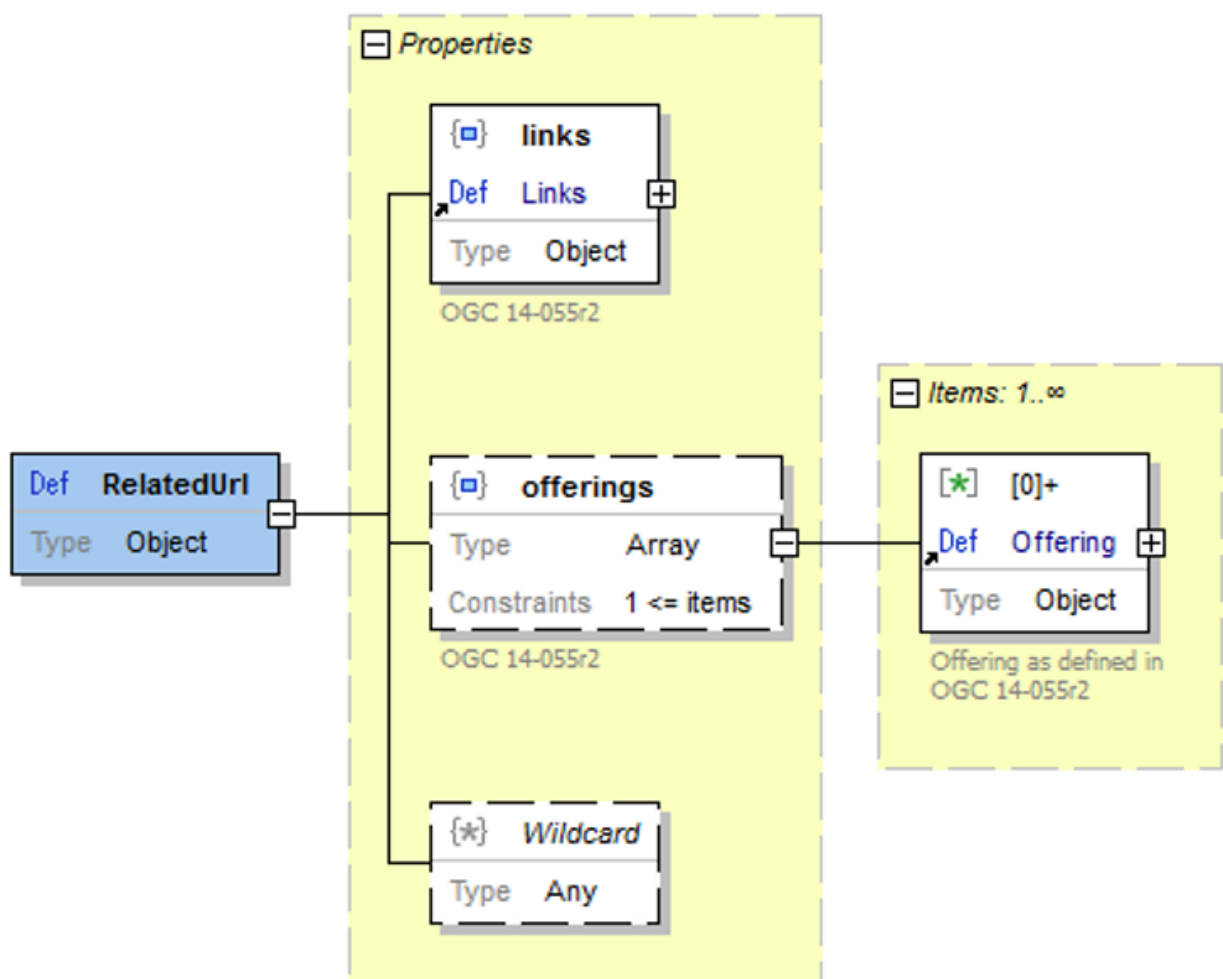


Table 23 — RelatedUrl object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTIPLICITY AND USE
<code>links</code>	Refers to related, actionable resources including quicklook, original or alternative metadata representations etc... See Table 24.	Domain: One Properties: (mandatory) Range: Links. (See Table 24)	
<code>\$. properties. links</code>			
<code>\$. properties. offer:</code>	offerings Service or online content offering for the resource targeted at OGC compliant clients. See OGC 14-055r2 [NR5].	Domain: Zero or Properties: more Range: (optional) Array of Offering (See Table 26).	

Example 29: RelatedUrl encoding example

```
{
  "offerings": [
    {
      "code": "http://www.opengis.net/spec/owc-geojson/1.0/req/wps",
      "operations": [
        {
          "code": "Execute",
          "method": "POST",
          "href": "http://185.52.193.7/wps-proxy/"
        }
      ]
    }
  ],
  "links": {
    "alternates": [
      {
        "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=application/atom%2Bxml&parentIdentifier=EOP%3AESA%3AFEDEO%3ACOLLECTIONS&uid=EOP%3AESA%3ASentinel-2&recordSchema=server-choice",
        "type": "application/atom+xml",
        "title": "Atom format"
      },
      {
        "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=application/vnd.iso.19139%2Bxml&parentIdentifier=EOP%3AESA%3AFEDEO%3ACOLLECTIONS&uid=EOP%3AESA%3ASentinel-2&recordSchema=iso",
        "type": "application/vnd.iso.19139+xml",
        "title": "ISO 19139 metadata"
      }
    ]
  }
}
```

```

    {
      "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19139-2%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso19139-2",
      "type": "application/vnd.iso.19139-2+xml",
      "title": "ISO 19139-2 metadata"
    },
    {
      "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/iso19115%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso19115",
      "type": "application/iso19115+xml",
      "title": "ISO MENDS metadata"
    },
    {
      "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19115-3%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso19115-3",
      "type": "application/vnd.iso.19115-3+xml",
      "title": "ISO 19115-3 metadata"
    },
    {
      "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/dif10%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=dif10",
      "type": "application/dif10+xml",
      "title": "DIF-10 metadata"
    },
    {
      "href": "http://fedeo.esa.int/opensearch/request/?
httpAccept=application/xml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=dc",
      "type": "application/xml",
      "title": "Dublin Core metadata"
    },
    {
      "href": "http://fedeo.esa.int/opensearch/request/?
httpAccept=application/rdf%2Bxml&parentIdentifier=EOP:ESA:FEDEO:
COLLECTIONS&uid=EOP:ESA:Sentinel-2&recordSchema=iso",
      "type": "application/rdf+xml",
      "title": "RDF/XML format"
    },
    {
      "href": "http://fedeo.esa.int/opensearch/request/?
httpAccept=application/ld%2Bjson&parentIdentifier=EOP:ESA:FEDEO:
COLLECTIONS&uid=EOP:ESA:Sentinel-2&recordSchema=iso",
      "type": "application/ld+json",
      "title": "JSON-LD format"
    },
    {
      "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
text/turtle&parentIdentifier=EOP:ESA:FEDEO:COLLECTIONS&uid=EOP:ESA:
Sentinel-2&recordSchema=iso",
      "type": "text/turtle",

```

```

        "title": "Turtle format"
      },
    ],
    "describedby": [
      {
        "href": "https://sentinel.esa.int/web/sentinel/missions/sentinel-2",
        "type": "text/html",
        "title": "ESA Sentinel Online"
      }
    ],
    "search": [
      {
        "href": "http://fedeo.esa.int/opensearch/description.xml?parentIdentifier=EOP:ESA:SCIHUB:S2&sensorType=OPTICAL&startDate=2015-06-23T00:00:00Z&endDate=",
        "type": "application/opensearchdescription+xml"
      }
    ],
    "previews": [
      {
        "href": "http://fedeo.esa.int/opensearch/images/esa.png",
        "type": "image/png",
        "title": "Quicklook"
      }
    ]
  ]
}

```

7.6.1. Links

REQUIREMENT CLASS: LINKS

/req/related-url

Target Type	Data instance
--------------------	---------------

Dependency	JSON [NR1]
-------------------	------------

Dependency	/req/link
-------------------	-----------

Requirement 29:	/req/links/properties
------------------------	-----------------------

REQUIREMENT 29:

/req/links/properties

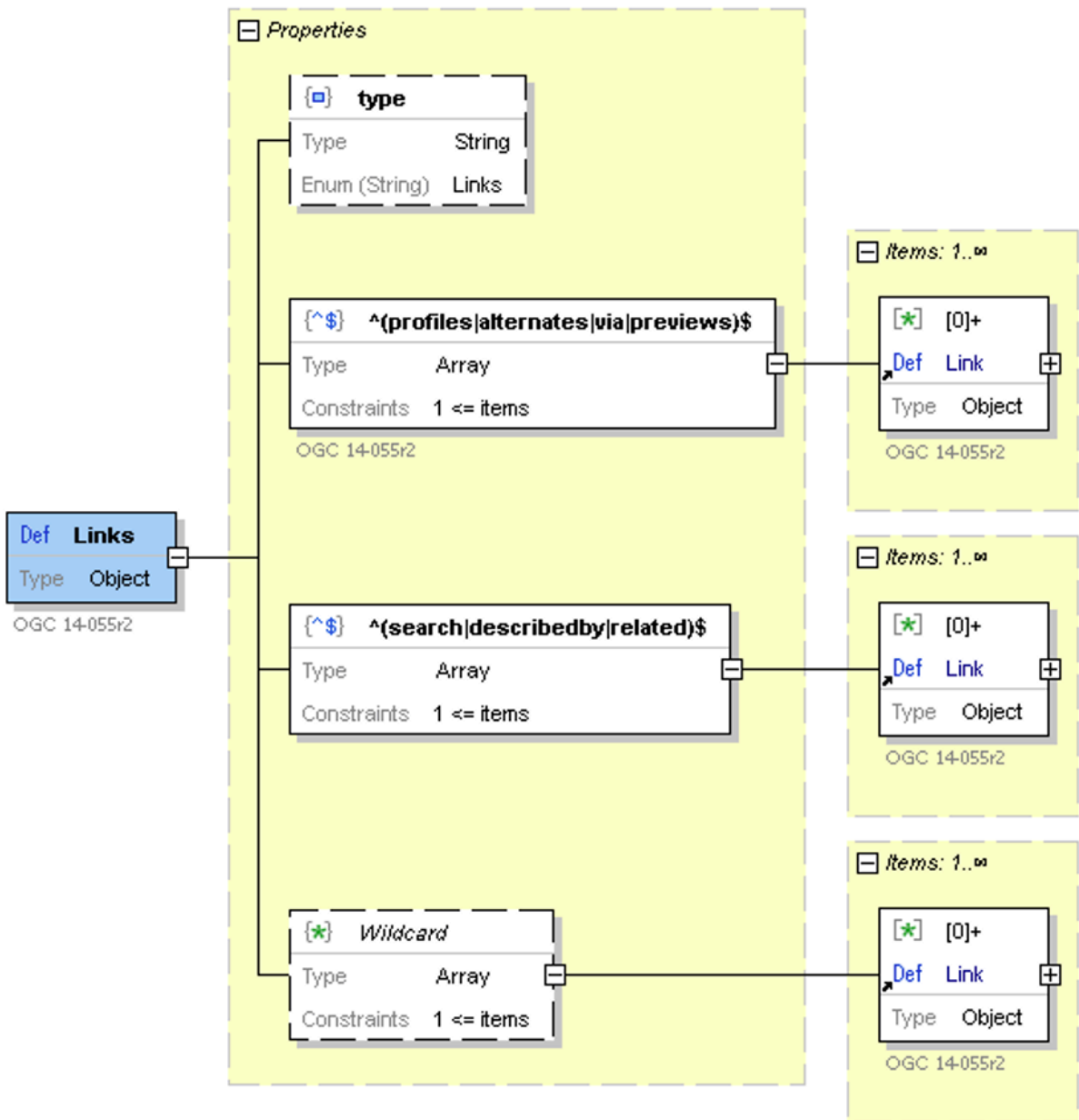
A "Links" object shall implement the properties shown in Table 24, with the value matching the type shown, and with the obligation shown.

The Links block contains references to related resources as hypermedia links. They include specification references and references to alternative representations of the metadata. For the GeoJSON encoding of the Links object, we use the property names adopted by section 7.1.2 of the GeoJSON encoding for OWS Context OGC 14-055r2 [NR5].

The Links object is a map containing descriptions of potential Links. The key is the “relation” as defined in [NR10] or a relation defined in [NR5].

The Link objects are grouped in arrays according to the “relation” they represent. Implementers may add additional properties if additional “relations” need to be represented. For consistency, all relations refer to arrays of Link objects and not to single Link objects. This allows to have similar references with different media types included for the same relation. The general pattern is thus **\$.properties.links.relation[*].href**. It should be noted that also in Atom, multiple Atom links are allowed by the response syntax, whatever the value of the “rel” attribute. Clients shall use the combination of “rel” and “type” attribute to select the proper Link.

Figure 23 — Links Schema



Complete description of Links is given in Table 24.

Table 24 — Links object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- AND USE
<code>type</code> <code>\$.properties.links.type</code>	Type of the element. This property has the fixed value "Links".	Range: String Fixed value: Links	Zero or one (optional)
<code>profiles</code> <code>\$.properties.links.profiles</code>	Specification references identifying which specifications the metadata document complies with. Is defined by [NR5] §7.1.1.1.	Property [NR5]. Range: array of Link as defined in Table 25.	Zero or one (optional)
<code>via</code> <code>\$.properties.links.via</code>	Reference to a description of the resource of which the response document is derived (e.g., source of information). Is defined by [NR5] §7.1.1.14.	Range: array of Link as defined in Table 25.	Zero or one (optional)
<code>alternate</code> <code>\$.properties.links.alternate</code>	Reference to a description of the resource in an alternative format. Is defined by [NR5] §7.1.2.	Range: array of Link as defined in Table 25.	Zero or one (optional)
<code>related</code> <code>\$.properties.links.related</code>	Reference to the location of a related resource. Is also used to return results of correlated search as per OGC 13-068.	Range: array of Link as defined in Table 25.	Zero or one (optional)
<code>previews</code> <code>\$.properties.links.previews</code>	Reference to a quick-look or browse image representing the resource. Is defined by [NR5] §7.1.2.10.	Range: array of Link as defined in Table 25.	Zero or one (optional)
<code>search</code> <code>\$.properties.links.search</code>	Reference to a formal interface description (e.g., an OpenSearch Description Document, OpenAPI Document or SPARQL Service Description) of the search interface that can be used to find resources (EO products) belonging to the collection represented by the feature.	Range: array of Link as defined in Table 25.	Zero or one (optional)

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
describe	Reference to a description of the resource or documentation or (human readable) information related to the resource. Such link can also be used to associate the response document with the corresponding JSON Schema file as defined in section 8.2 of [OR7].	Range: array of Link as defined in Table 25.	Zero or one (optional)

Example 30: Search Link encoding example (OpenSearch and OpenAPI)

```
{
  "search": [
    {
      "href": "http://fedeo.esa.int/opensearch/description.xml?parentIdentifier=LANDSAT.ETM.GTC",
      "type": "application/opensearchdescription+xml"
    },
    {
      "href": "http://fedeo.esa.int/opensearch/description.json?parentIdentifier=LANDSAT.ETM.GTC",
      "type": "application/openapi+json;version=3.0"
    }
  ]
}
```

Example 31: Search Link encoding example (SPARQL)

```
{
  "search": [
    {
      "href": "https://www.foodie-cloud.org/sparql",
      "type": "application/rdf+xml;profile=\"http://www.w3.org/ns/sparql-service-description#\""
    }
  ]
}
```

The example below refers to a description of the resource on an HTML documentation page and a Jupyter Notebook footnote: <https://jupyter.org/> .

Example 32: Describedby Link encoding example

```
{
  "describedby": [
    {
      "href": "https://earth.esa.int/web/guest/data-access/browse-data-products/-/asset_publisher/y8Qb/content/landsat-7-etm-enhanced-thematic-mapper-plus-geolocated-terrain-corrected-systematic-processing-over-kiruna-and-masplomas",
      "type": "text/html"
    },
    {
      "href": "https://earth.esa.int/web/guest/data-access/browse-data-products/-/asset_publisher/y8Qb/content/landsat-7-etm-enhanced-"
    }
  ]
}
```

```

thematic-mapper-plus-geolocated-terrain-corrected-systematic-
processing-over-kiruna-and-masplomas.ipynb",
  "type": "application/x-ipynb+json"
}
]
}

```

7.6.2. Link

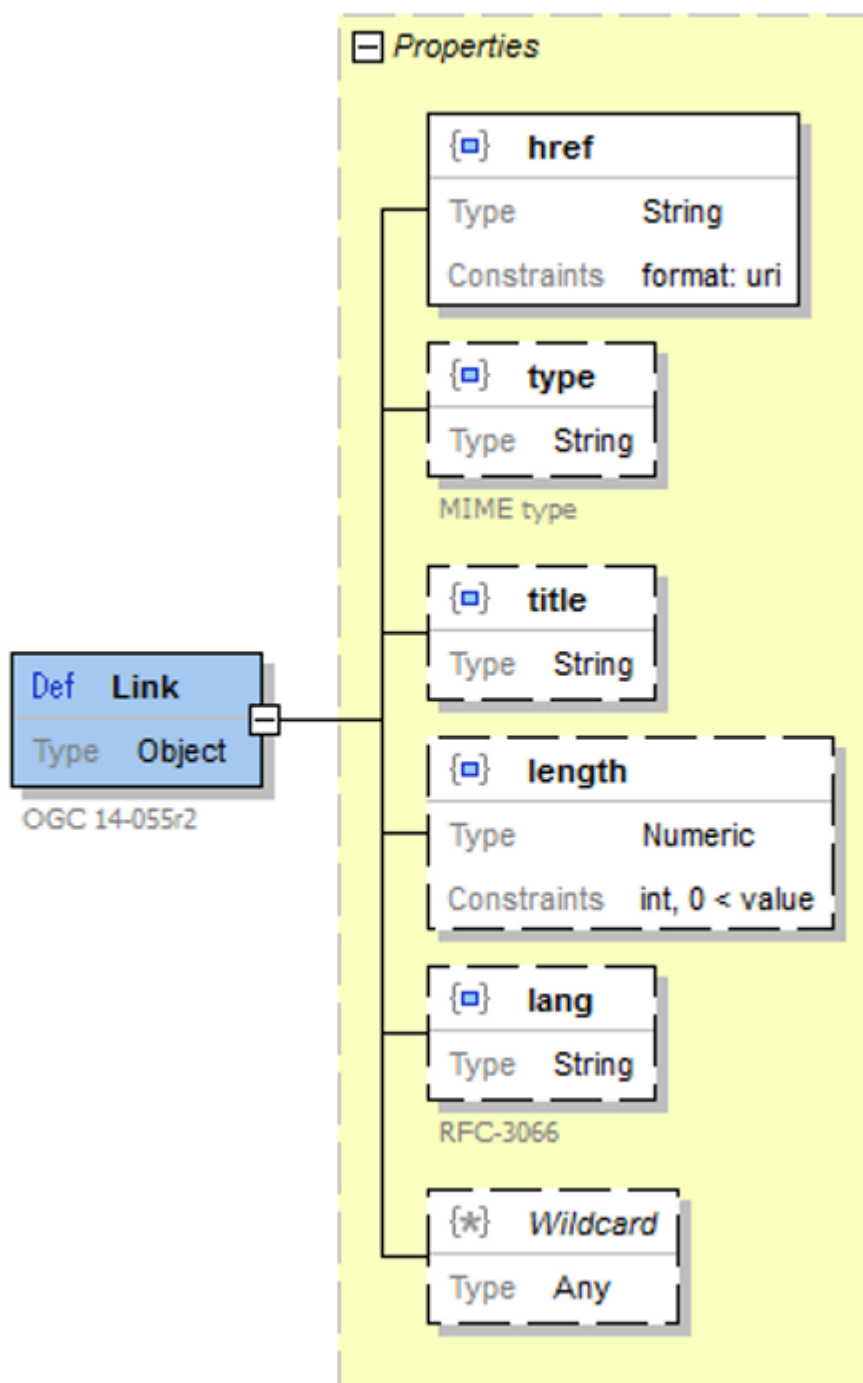
REQUIREMENT 30:

/req/link

A "Link" object shall implement the properties shown in Table 25, with the value matching the type shown, and with the obligation shown.

The Link block contains the properties of a hypermedia link to a resource identified by its URI [NR5].

Figure 24 — Link Schema



For the GeoJSON encoding of each Link object, we use the encoding defined in section 7.1.10 of the GeoJSON encoding for OWS Context OGC 14-055r2 [NR5]. The equivalent JSON-LD encoding is consistent with section 6.1.2.2 of OGC 15-053 [OR6]. Complete description of Link is given in Table 25.

Table 25 — Link object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- AND USE
href	URI describing the related resource. Is defined by [NR5] §7.1.10.	Range: One String (URI)	(mandatory)
\$. properties. links. []. href			
type	Hint about the type of the representation that is expected to be returned when the value of href is dereferenced.	Range: Zero String (contains a media type).	or one (optional)
\$. properties. links. []. type			
title	Human readable information about the link. Is defined by [NR5] §7.1.10.	Range: Zero String (optional)	or one (optional)
\$. properties. links. []. title			
length	Hint about the content length (in bytes) of the representation that is expected to be returned when the value of href is dereferenced. Is defined by [NR5] §7.1.10.	Range: Zero Integer (optional)	or one (optional)
\$. properties. links. []. length			
lang	Language of the resource pointed to by the href attribute. String type, not empty with an RFC-3066 code. Is defined by [NR5] §7.1.10.	Range: Zero String (optional)	or one (optional)
\$. properties. links. []. lang			

7.6.3. Offering

REQUIREMENT CLASS: OFFERING

/req/offering

Target Type Data instance

Dependency JSON [NR1]

REQUIREMENT CLASS: OFFERING

Dependency	OGC 14-055r2 [NR5]
-------------------	--------------------

Dependency	/req/operation
-------------------	----------------

Requirement 31:	/req/offering/properties
------------------------	--------------------------

REQUIREMENT 31:

/req/offering/properties

An “Offering” object shall implement the properties defined in OGC 14-055r2 [NR5], with the value matching the type shown, and with the obligation shown.

The Offering block is fully defined in OGC 14-055r2 [NR5]. It describes a service or inline content offering for the EO product and is intended to be consumed by clients that support OGC standards. In the context of the current specification, an Offering can be used to describe:

- View services allowing visualisation via OGC WMS or WMTS service interfaces;
- Reference to download or ordering services according to specific OGC protocols (e.g., WCS); and
- Reference to processing resources including WPS or hosted processing services.

Figure 25 – Offering Schema

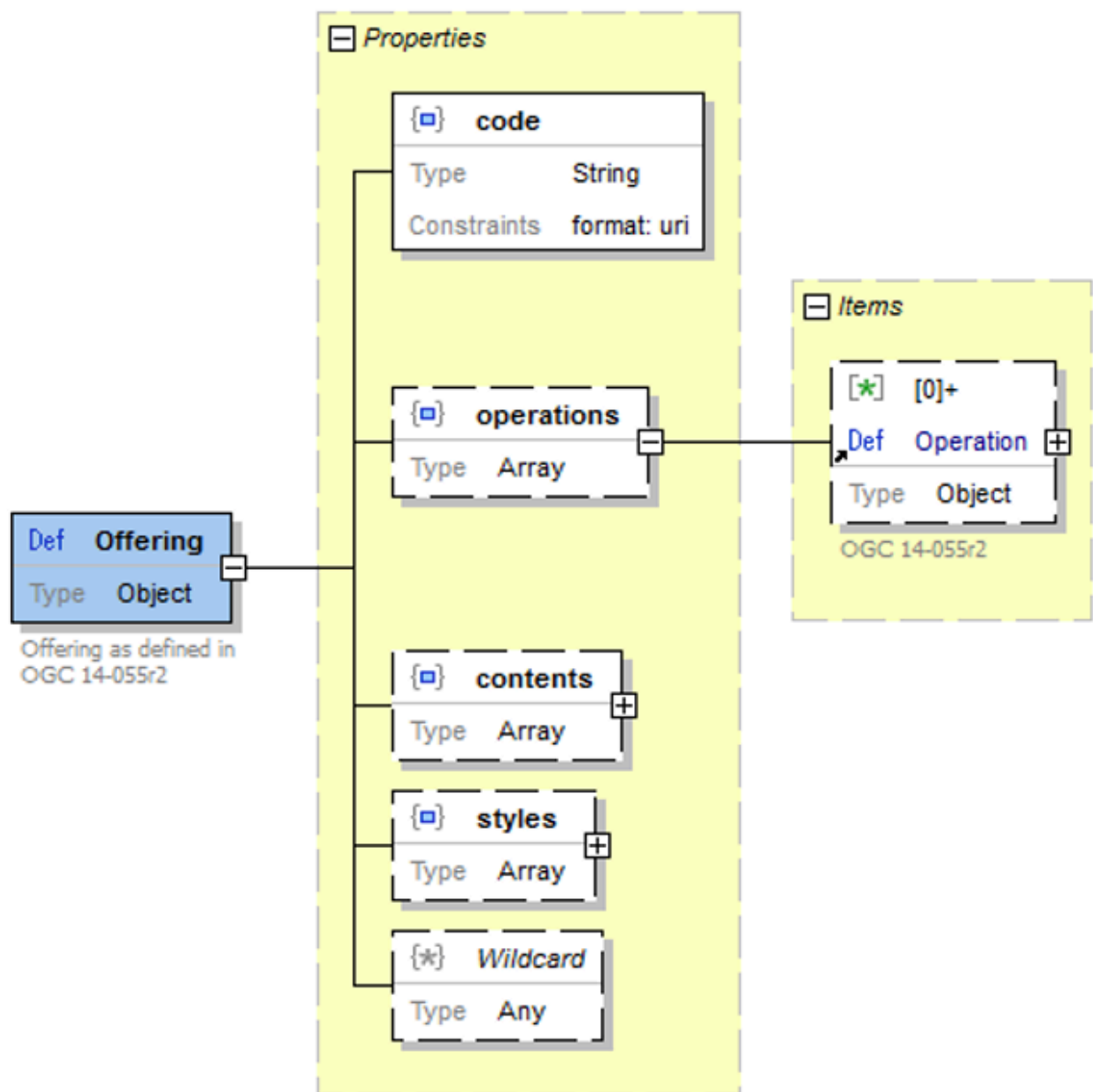


Table 26 – Offering object properties

JSON PROPER	DEFINITION	DATA TYPE AND VALUES	MULTIP AND USE
type \$. properties.	Type of the element. This property has the fixed value "Offering".	Domain: Zero Offering or one Range: (optional) String	

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLE AND USE
<code>offerings[*].type</code>	code URI identifying the type of offering, e.g., requirement class identifier (URI) defining the offering listed in §7.2 to 7.12 of [NR5]. Is defined by [NR5] §7.1.3.1.	Domain: One Offering (mandatory) Range: String (URI)	
<code>operationArray</code>	array of operations used to invoke the service. Is defined by [NR5] §7.1.3.2.	Domain: Zero or more Range: (optional) array of Operation.	
<code>contents</code>	Array of contents (inline or by reference). Is defined by [NR5] §7.1.3.3 and §7.1.5.	Domain: Zero or more Range: (optional) array of Object	
<code>styles</code>	Array of style sets. Is defined by [NR5] §7.1.3.4 and §7.1.6.	Domain: Zero or more Range: (optional) array of Object	

A number of examples for typical offerings (e.g., WMS, WPS) are included below.

Example 33: JSON encoding example (WMS)

```
{
  "code": "http://www.opengis.net/spec/owc-geojson/1.0/req/wms",
  "operations": [
    {
      "code": "GetCapabilities",
      "method": "GET",
      "type": "application/xml",
      "href": "http://eumetview.eumetsat.int/geoserv/wms?REQUEST=GetCapabilities&version=1.3.0&service=WMS"
    }
  ]
}
```

Example 34: JSON encoding example (WCS)

```
{
  "code": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs",
  "operations": [
    {
      "code": "GetCapabilities",
      "method": "GET",
```



```

    "href": "http://131.176.196.55/wcs?service=WCS&Request=
GetCapabilities"
  },
  {
    "code": "DescribeCoverage",
    "method": "GET",
    "type": "application/xml",
    "href": "http://131.176.196.55/wcs?service=WCS&Request=
DescribeCoverage&version=2.0.0&CoverageId=LE7_RGB"
  }
]
}

```

Example 35: JSON encoding example (WPS)

```

{
  "code": "http://www.opengis.net/spec/owc-geojson/1.0/req/wps",
  "operations": [
    {
      "code": "GetCapabilities",
      "method": "GET",
      "type": "application/xml",
      "href": "http://tep.esa.int/wps/processing?REQUEST=
GetCapabilities&SERVICE=WPS",
      "result": {
        "type": "application/xml",
        "content": "<wps:Capabilities>...</wps:Capabilities>"
      }
    }
  ]
}

```

7.6.4. Operation

REQUIREMENT 32:

/req/operation

An "Operation" object shall implement the properties of "Operation" defined in OGC 14-055r2 [NR5], with the value matching the type shown, and with the obligation shown.

The Operation block is fully defined in OGC 14-055r2 [NR5]. It describes an operation of a service or inline content offering for the EO collection and is intended to be consumed by OGC-compliant clients. The "code" property identifies the OGC operation name, e.g., GetCapabilities, GetMap etc.

Figure 26 – Operation Schema

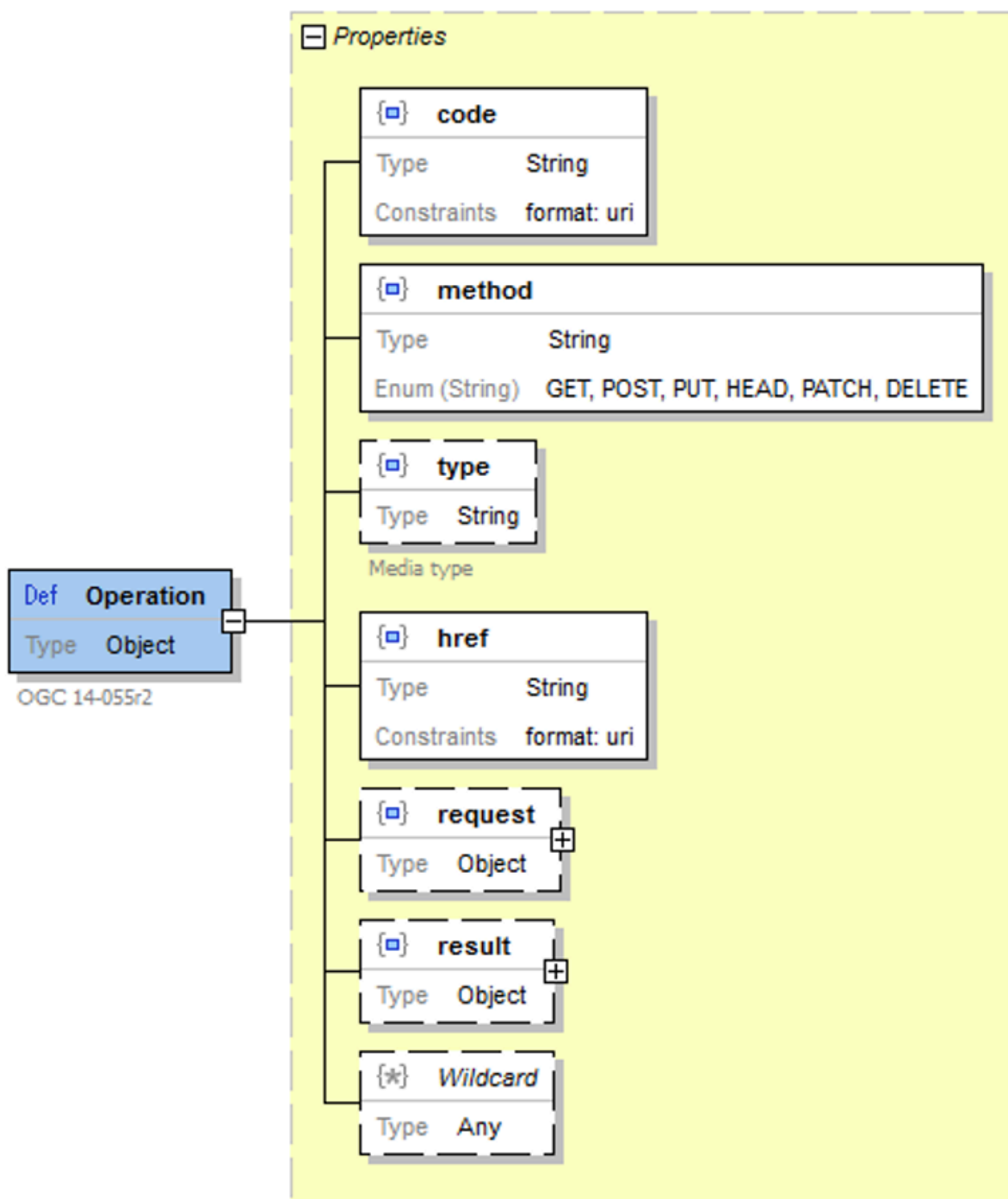


Table 27 — Operation object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTIPLICITY AND USE
<code>code</code>	URI identifying the type of operation. Typically, the OGC Service request type, e.g., "GetCapabilities" or "GetMap". Is defined by [NR5] §7.1.4.1.	Domain: One	Operation (mandatory)
<code>properties</code>		Range:	String
<code>offerings[]</code>			
<code>operations[]</code>			
<code>code</code>			
<code>method</code>	Code identifying the HTTP verb type of Operation. Examples: GET, POST, PUT, HEAD, PATCH, DELETE. Is defined by [NR5] §7.1.4.2.	Domain: One	Operation (mandatory)
<code>properties</code>		Range:	String
<code>offerings[]</code>			
<code>operations[]</code>			
<code>type</code>	MIME type of the expected results. Is defined by [NR5] §7.1.4.3.	Domain: Zero or one	Range: (optional)
<code>properties</code>		Range:	String
<code>offerings[]</code>			
<code>operations[]</code>			
<code>type</code>			
<code>href</code>	Service request URL. Is defined by [NR5] §7.1.4.4.	Domain: One	Operation (mandatory)
<code>properties</code>		Range:	String
<code>offerings[]</code>			
<code>operations[]</code>			
<code>href</code>			(URL)
<code>request</code>	Optional request body content. Is defined by [NR5] §7.1.4.5.	Domain: Zero or one	Range: (optional)
<code>properties</code>		Range:	Object
<code>offerings[]</code>			
<code>operations[]</code>			
<code>request</code>			
<code>result</code>	Optional result payload of the operation. Is defined by [NR5] §7.1.4.6.	Domain: Zero or one	Range: (optional)
<code>properties</code>		Range:	Object
<code>offerings[]</code>			
<code>operations[]</code>			
<code>result</code>			
<code>*</code>		Any other element	

For examples, we refer to the examples of Offering given in section 7.6.3.

7.7. REQUIREMENTS CLASS: SPATIAL INFORMATION

REQUIREMENT CLASS: SPATIAL INFORMATION

/req/spatial-information

Target Type	Data instance
--------------------	---------------

Dependency	JSON [NR1]
-------------------	------------

Dependency	/req/category
-------------------	---------------

Dependency	/req/geometry
-------------------	---------------

Requirement 34:	/req/location-keywords
------------------------	------------------------

7.7.1. Spatial Extent

The spatial information is encoded as a Geometry object as defined by GeoJSON. There are requirements for Position, Point, MultiPoint, LineString, MultiLineString, Polygon, MultiPolygon, Geometry Collection described in OGC 17-003r2 [NR4]. Although these geometry objects are relevant for EO Products, for EO Collections, the most common geometry object is a Polygon. For the detailed definition of the geometry objects and corresponding examples, we refer to [NR4].

REQUIREMENT CLASS: SPATIAL EXTENT

/req/geometry

Target Type	Data instance
--------------------	---------------

Dependency	GeoJSON [NR2]
-------------------	---------------

Dependency	/req/point
-------------------	------------

Dependency	/req/multi-point
-------------------	------------------

Dependency	/req/linestring
-------------------	-----------------

Dependency	/req/multi-linestring
-------------------	-----------------------

Dependency	/req/polygon
-------------------	--------------

Dependency	/req/multi-polygon
-------------------	--------------------

REQUIREMENT CLASS: SPATIAL EXTENT

Requirement 33: /req/geometry/properties

REQUIREMENT 33:

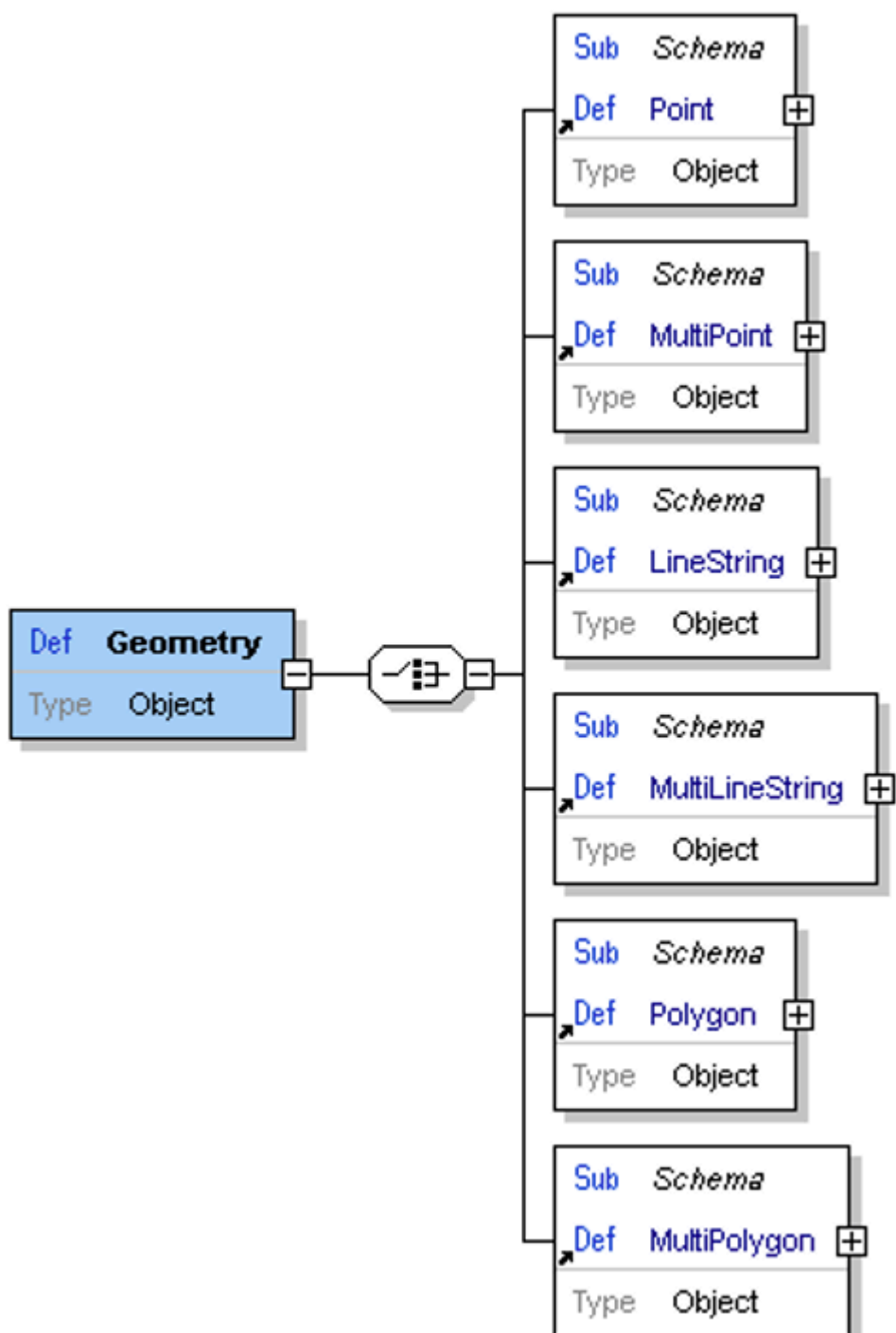
/req/geometry/properties

Objects in a data instance that describe 0-D, 1-D, or 2-D geometries with positions in the WGS-84 system shall be encoded using the GeoJSON geometry encoding [NR2].

7.7.1.1. Geometry

The Geometry object contains a type property and coordinates property. The object can be any of the specialisations described below. The expected value for the coordinates property depends on the type of the geometry.

Figure 27 — Geometry Schema (GeoJSON)



Complete description of the Geometry properties is given in Table 28. The possible specializations are explained in [NR4].

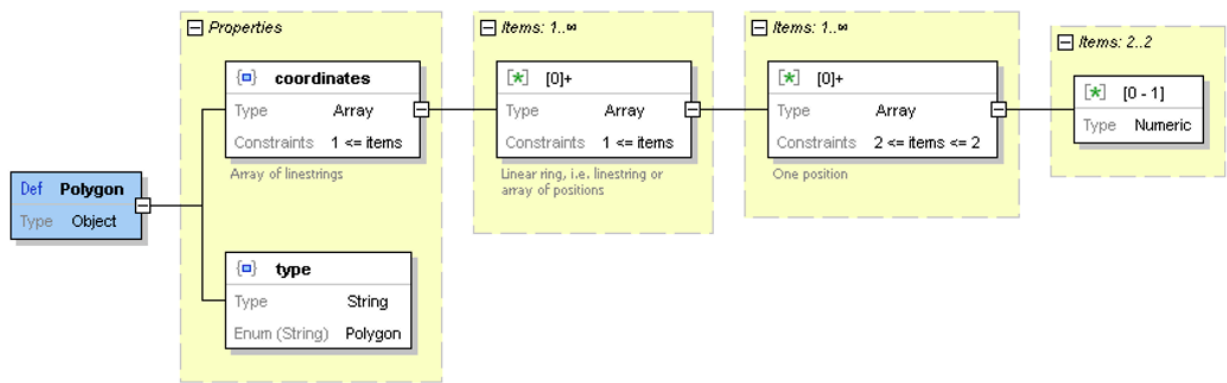
Table 28 — Geometry object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI AND USE
<code>type</code>	Type of the geometry representing the footprint. Can be one of the geometry types: Point, LineString, Polygon, MultiPoint, MultiLineString or MultiPolygon.	Property One	One (mandatory)
<code>geometry.type</code>		String	[OR33]
<code>coordinates</code>	Array with structure determined by the geometry type to be represented. Note that a position (array of numbers) is indicated by longitude, latitude (in that order).	Property One	One (mandatory)
<code>geometry.coordinates</code>		See section 3.1 of [NR2].	[OR33]

Note that consumers that wish to use the standard JSON-LD Processing Algorithms may need to use an alternative representation for the geometry objects as explained in section 8.2 and avoid the use of multi-dimensional arrays.

7.7.1.2. Polygon

Figure 28 — Polygon Schema



Note that according to [NR2], Polygon rings shall follow the right-hand rule for orientation (counter-clockwise external rings, clockwise internal rings).

Example 36: GeoJSON Polygon encoding example

```
{
  "type": "Feature",
  "id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/geo%2Bjson&parentIdentifier=EOP%3AESA%3AFEDEO
%3ACOLLECTIONS&uid=EOP%3AESA%3ASentinel-2",
```

```

"geometry": {
  "type": "Polygon",
  "coordinates": [
    [
      [
        -180,
        -90
      ],
      [
        180,
        -90
      ],
      [
        180,
        90
      ],
      [
        -180,
        90
      ],
      [
        -180,
        -90
      ]
    ]
  ]
},
"properties": { }
}

```

7.7.2. Location Keywords

REQUIREMENT 34:

/req/location-keywords

A "LocationKeywords" object shall implement the properties shown in Table 21 (section 7.5 "Descriptive Keywords"), with the value matching the type shown, and with the obligation shown.

This encoding applies to keywords of type "place." /gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:type/gmd:MD_KeywordTypeCode[@codeListValue="place"]

Example 37: Location Keywords encoding example (GCMD)

```

{
  "categories": [
    {
      "term": "https://gcmdservices.gsfc.nasa.gov/kms/
concept/51e3593f-4b42-4141-972e-96666c479f9c",
      "scheme": " https://gcmdservices.gsfc.nasa.gov/kms/concepts/
concept_scheme/locations",

```



```

        "label": "GLOBAL"
      }
    ]
  }
}

```

Example 38: Location Keywords encoding example (INSPIRE)

```

{
  "categories": [
    {
      "term": "http://publications.europa.eu/resource/authority/
country/BEL",
      "scheme": "http://publications.europa.eu/resource/authority/
country"
    }
  ]
}

```

7.8. REQUIREMENTS CLASS: TEMPORAL INFORMATION

REQUIREMENT CLASS: TEMPORAL INFORMATION

/req/temporal-information

Target Type	Data instance
--------------------	---------------

Dependency	JSON [NR1]
-------------------	------------

Requirement 35:	/req/temporal-extent
------------------------	----------------------

Requirement 36:	/req/temporal-keywords
------------------------	------------------------

7.8.1. Temporal Extent

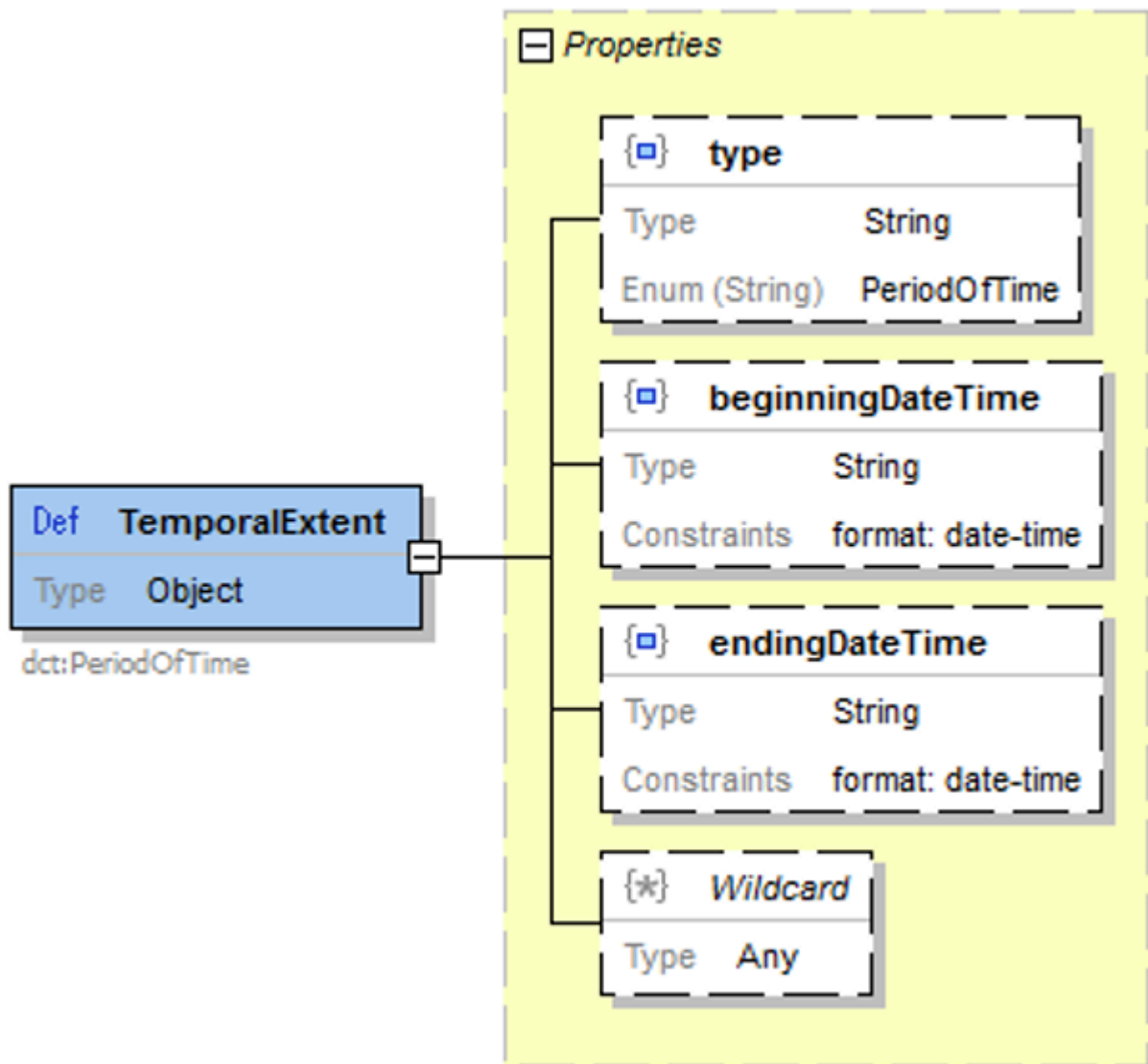
REQUIREMENT 35:

/req/temporal-extent

A "TemporalExtent" object shall implement the properties shown in Table 29, with the value matching the type shown, and with the obligation shown.

The TemporalExtent object contains the properties related to the start and end time of the acquisition of the data.

Figure 29 — TemporalExtent Schema



Complete description of the TemporalExtent properties is given in Table 29.

Table 29 — TemporalExtent object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- VALUE AND USE
<code>\$.properties.temporal.type</code>	Type of the element. This property has the fixed value "PeriodOfTime".	Domain: Zero PeriodOfTime Range: (optional) String Fixed	

JSON PROPERTIES	DEFINITION	DATA TYPE AND VALUES	MULTIPLE USE
<code>beginningDateTime</code>	Acquisition start date time DateTime representation, as defined by RFC 3339, section 5.6footnote::[rfc3339]. A String matching RFC 3339 section 5.6. yyyy-MM-ddThh:mm:ss[.S] (Z/(+/-)th:tm) where yyyy = Four digit year, MM = Two digit month (01 = January), dd = Two digit day of month (01 = first day), hh = Hour of day (00 – 23), mm = Minute of hour (00 – 59), ss = Second of minute (00 – 59), S = fraction of seconds with any precision. Times are in UTC (ending with the mandatory Z character) or defined with an offset w.r.t. UTC: th = Time offset hours (00 – 23), tm = Time offset minutes (00 – 59).]	Domain: Zero PeriodOfTime Range: (optional) DateTime	
<code>endingDateTime</code>	Acquisition end date time DateTime representation, as defined by RFC 3339, section 5.6footnote::[rfc3339]	Domain: Zero PeriodOfTime Range: (optional) DateTime	

Example 39: TemporalExtent encoding example

```
{
  "beginningDateTime": "2015-06-23T00:00:00Z",
  "endingDateTime": "2018-11-28T15:23:57Z"
}
```

7.8.2. Temporal Keywords

REQUIREMENT 36:

/req/temporal-keywords

A "TemporalKeywords" object shall implement the properties shown in Table 21 (section 7.5 "Descriptive Keywords"), with the value matching the type shown, and with the obligation shown.

This encoding applies to keywords of type "temporal." /gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gmd:type/MD_KeywordTypeCode[@codeListValue="temporal"]

Example 40: Temporal Keywords encoding example

```
{
  "categories": [
    {
      "term": "https://gcmdservices.gsfc.nasa.gov/kms/concept/99ef187e-6940-4c10-8d65-00d4426d493b ",
      "scheme": " https://gcmdservices.gsfc.nasa.gov/kms/concepts/concept_scheme/temporalresolutionrange ",
      "label": "Diurnal"
    }
  ]
}
```

}

7.9. REQUIREMENTS CLASS: ACQUISITION INFORMATION

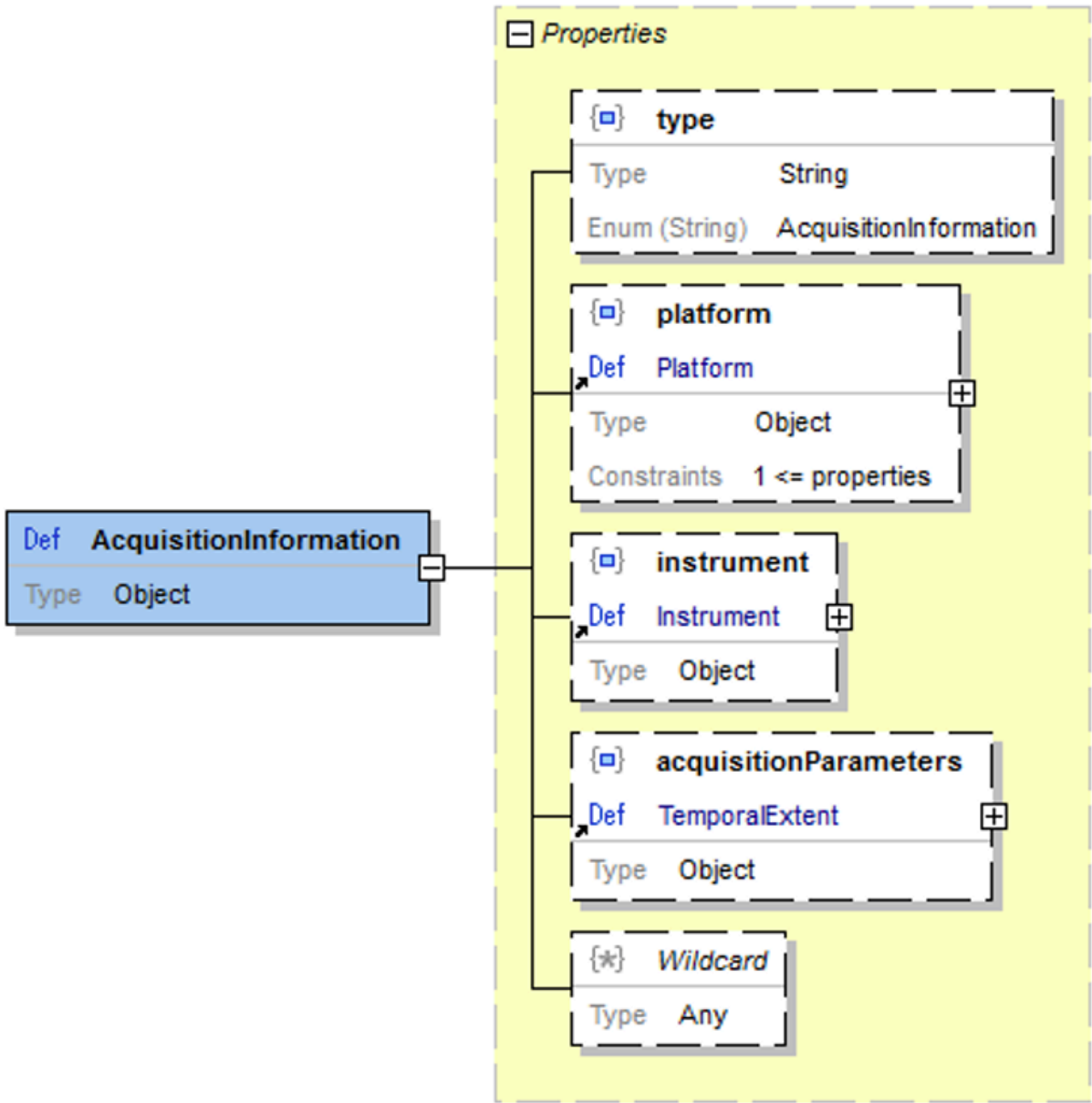
The acquisition information applicable to EO Collections is a subset of the acquisition information applicable to EO products. The encoding of this subset is identical to the encoding defined in OGC 17-003r2 [NR4] and is repeated here for convenience of the reader.

REQUIREMENT CLASS: ACQUISITION INFORMATION	
/req/acquisition-information	
Target Type	Data instance
Dependency	JSON [NR1]
Dependency	/req/platform
Dependency	/req/instrument
Dependency	/req/temporal-extent
Requirement 37:	/req/acquisition-information/properties

REQUIREMENT 37:	
/req/acquisition-information/properties	
An “AcquisitionInformation” object shall implement the properties shown in Table 30, with the value matching the type shown, and with the obligation shown.	

The AcquisitionInformation block can appear multiple times and contains information about the platform (i.e., satellite), the instrument and the acquisition parameters.

Figure 30 – AcquisitionInformation Schema



The complete description of the AcquisitionInformation properties is given in Table 30. It is a subset of the properties defined in OGC 17-003r2 [NR4].

Table 30 — AcquisitionInformation object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- AND USE
<code>\$..platform</code>	The Platform used for the acquisition. If more than one platform is used for creating the product, then the AcquisitionInformation object occurs more than once.	Domain: Zero or one AcquisitionInformation Range: (optional) Platform See Table 31	
<code>\$..instrument</code>	The Instrument/Sensor used for the acquisition. If more than one instrument is used for creating the product, then the AcquisitionInformation object occurs more than once.	Domain: Zero or one AcquisitionInformation Range: (optional) Instrument See Table 32	
<code>\$..acquisitionParameters</code>	Parameters limited to the temporal extent. Use of <code>\$.properties.temporal</code> to encode temporal extent of the collection is preferred. If both are used, then the <code>acquisitionParameters</code> is interpreted as begin and end time of the observation activity	Domain: Zero or one AcquisitionInformation Range: (optional) TemporalExtent See Table 29	

Example 41: AcquisitionInformation encoding example

```
{
  "platform": {
    "id": "https://earth.esa.int/concept/sentinel-2",
    "platformShortName": "Sentinel-2"
  },
  "instrument": {
    "id": "https://earth.esa.int/concept/s2-msi",
    "instrumentShortName": "MSI"
  },
  "acquisitionParameters": {
    "beginningDateTime": "2015-06-23T00:00:00Z"
  }
}
```

7.9.1. Platform

The encoding of platform information is identical to the encoding defined in OGC 17-003r2 [NR4] but is repeated here for convenience of the reader.

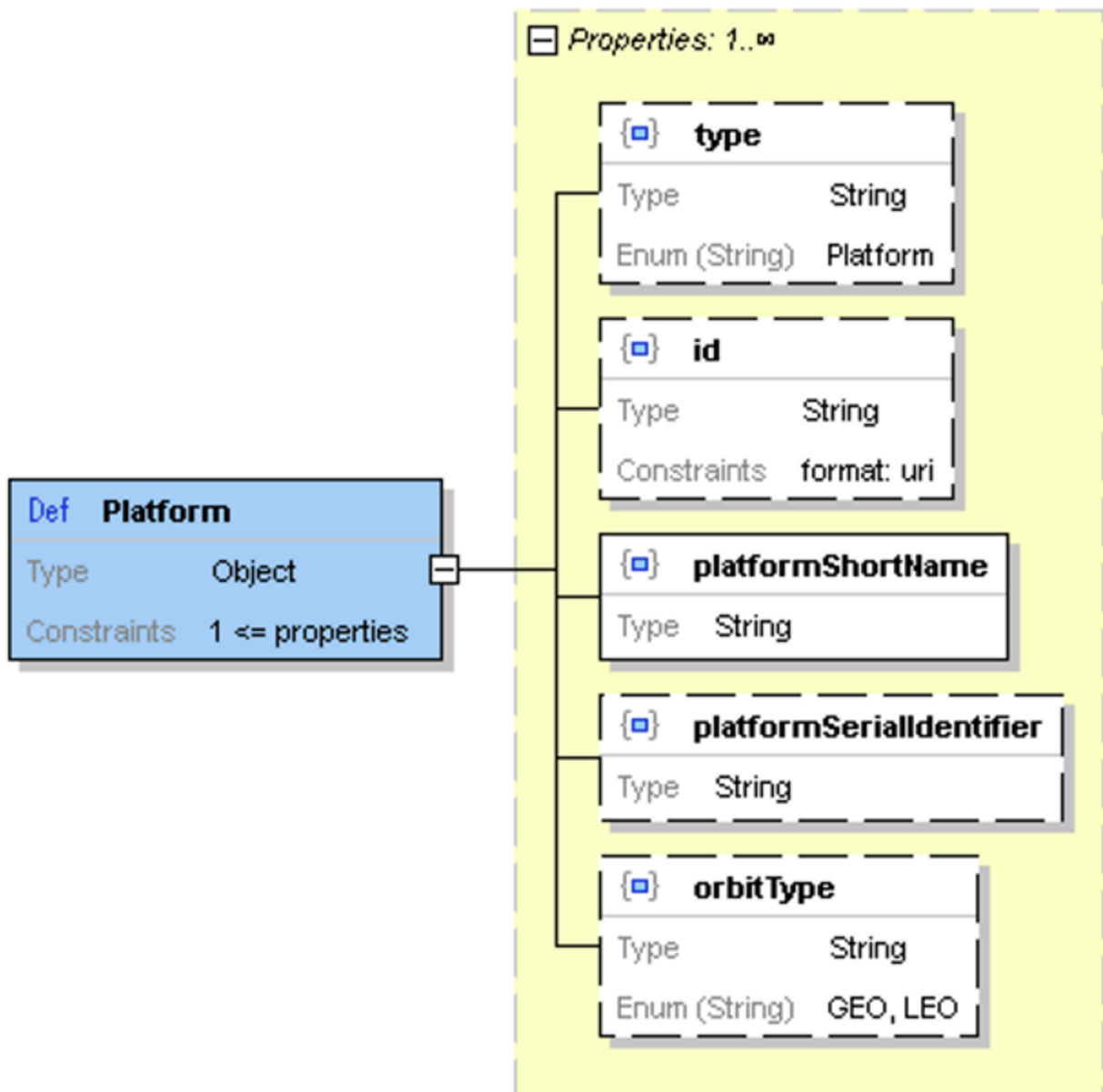
REQUIREMENT 38:
/req/platform

REQUIREMENT 38:

A “Platform” object shall implement the properties shown in Table 31, with the value matching the type shown, and with the obligation shown.

The Platform block contains the properties of the platform that was used to perform the observation.

Figure 31 — Platform Schema



Complete description of the Platform properties is given in Table 31.

Table 31 — Platform object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- AND USE
<code>type</code>	Type of the object. This property has the fixed value "Platform".	Range:	Zero
<code>\$. acquisitionInformation[*]. platform. type</code>		String	or one (optional)
<code>id</code>	URI of platform. E.g., http://gcmdservices.gsfc.nasa.gov/kms/concept/a1498dff-002d-4d67-9091-16822c608221 for ENVISAT	Range:	Zero
<code>\$. acquisitionInformation[*]. platform. id</code>		String (URI)	or one (Optional)
<code>platformShortName</code>	Platform short name (e.g., "Seasat" or "ENVISAT")	Domain:	One Platform (mandatory)
<code>\$. acquisitionInformation[*]. platform. platformShortName</code>		Range:	String
<code>platformSerialIdentifier</code>	Platform serial identifier (e.g., for Seasat : 1).	Domain:	Zero Platform or one
<code>\$. acquisitionInformation[*]. platform. platformSerialIdentifier</code>		Range:	(Optional) String
<code>orbitType</code>	High level characterisation of main mission types taken from a codelist	Domain:	Zero Platform or one
<code>\$. acquisitionInformation[*]. platform. orbitType</code>		Range:	(Optional) String Values: GEO, LEO

Example 42: Platform encoding example

```
{
  "id": "http://gcmdservices.gsfc.nasa.gov/kms/
concept/1bffe898-f4a2-458e-92c5-cd7c9c1cd5f0",
  "platformShortName": "Seasat",
  "platformSerialIdentifier": "1",
  "orbitType": "LEO"
}
```

7.9.2. Instrument

The encoding of instrument information is identical to the encoding defined in OGC 17-003r2 [NR4] but is repeated here for convenience of the reader.

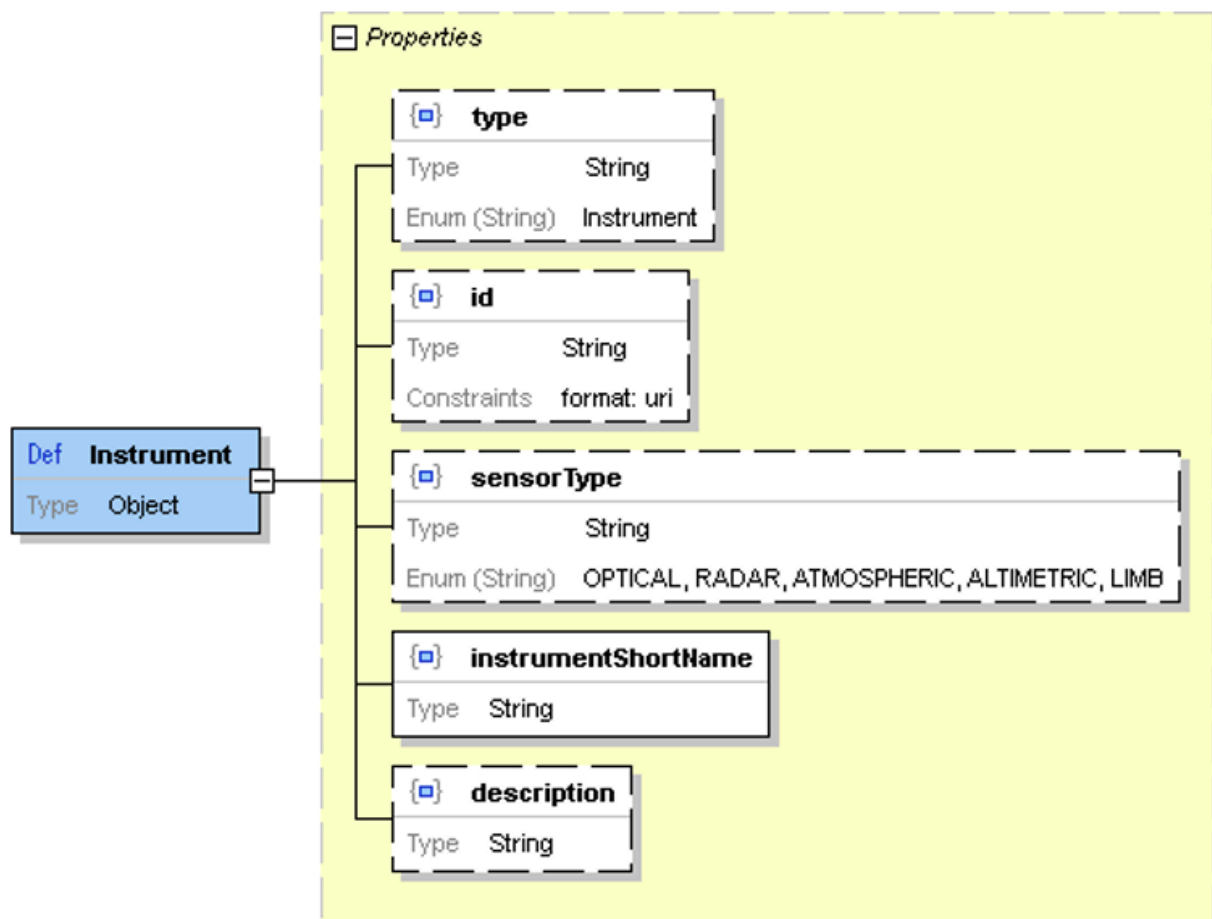
REQUIREMENT 39:

/req/instrument

An “Instrument” object shall implement the properties shown in Table 32, with the value matching the type shown, and with the obligation shown.

The Instrument block contains the properties of the instrument that was used to perform the observation.

Figure 32 — Instrument Schema



A complete description of the Instrument properties is given in Table 32.

Table 32 — Instrument object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI- PLE AND USE
<code>type</code>	Type of the object. This property has the fixed value "Instrument".	String	Zero
<code>\$.. acquisitionInformation[*]. instrument. type</code>		Fixed value: "Instrument"	or one (optional)
<code>id</code>	URI of instrument. E.g., http://gcmdservices.gsfc.nasa.gov/kms/concept/912c3308-23bc-4e12-b7fb-9d82e9fc5fe9 for ENVISAT ASAR	Domain: String (URI)	Zero or one (optional)
<code>\$.. acquisitionInformation[*]. instrument. sensorType</code>	Sensor type based on codelist Values: • OPTICAL • RADAR • ALTIMETRIC • ATMOSPHERIC • LIMB	Domain: String	Zero or one (optional)
<code>instrumentShortName</code>	Instrument (Sensor) name	Domain: String	One (mandatory)
<code>\$.. acquisitionInformation[*]. instrument. description</code>	Instrument description	Domain: String	Zero or one (optional)

Example 43: Instrument encoding example

```
{
  "id": "http://gcmdservices.gsfc.nasa.gov/kms/
concept/a37282d4-322c-4dd0-8edc-36099b9b586c",
  "sensorType": "RADAR",
  "instrumentShortName": "SAR"
}
```

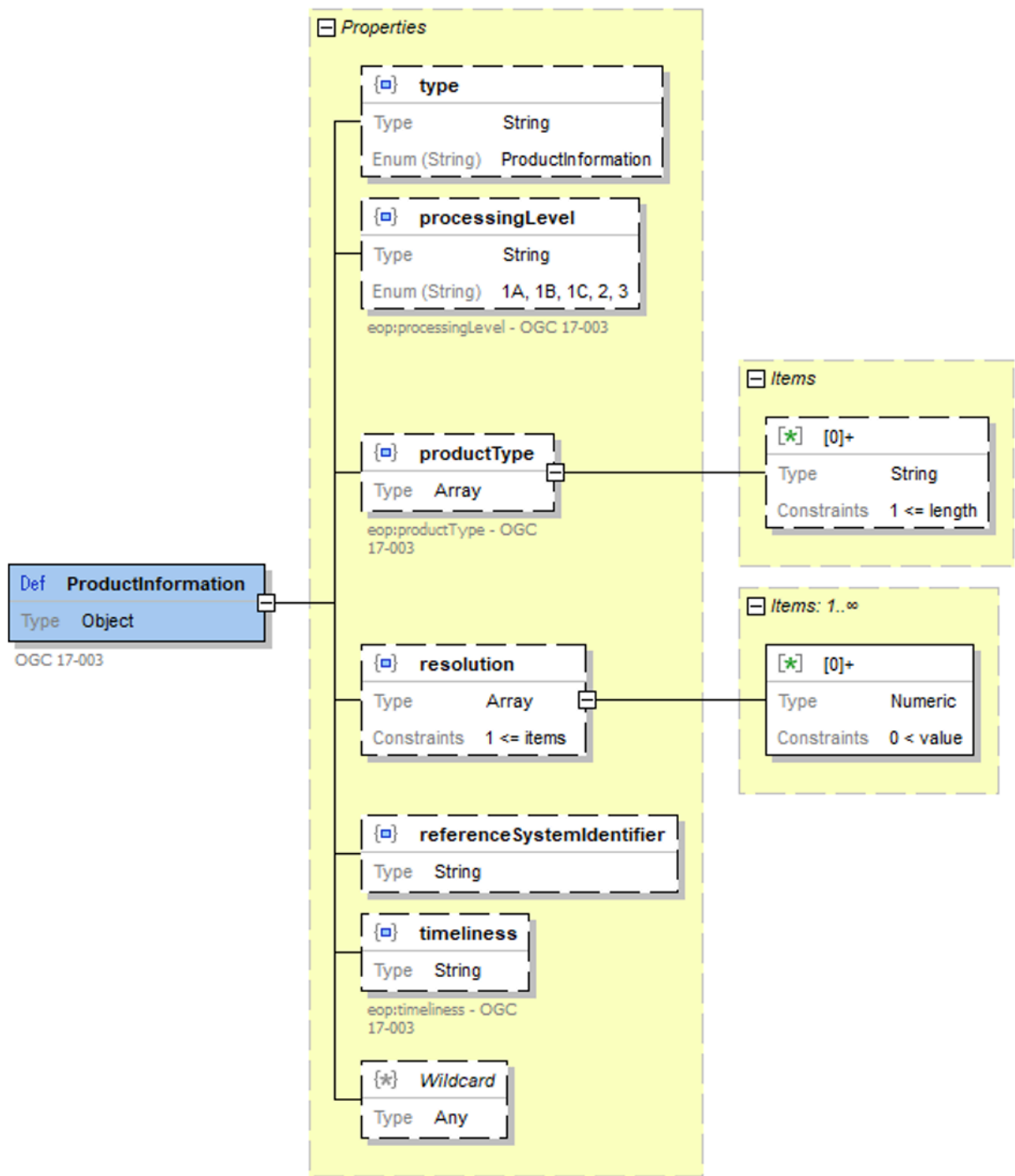
7.10. REQUIREMENTS CLASS: PRODUCT INFORMATION

The product information applicable to EO Collections is a subset of the product information applicable to EO products. The encoding of this subset is borrowed from the encoding defined in OGC 17-003r2 [NR4].

REQUIREMENT CLASS: PRODUCT INFORMATION	
/req/product-information	
Target Type	Data instance
Dependency	JSON [NR1]
Requirement 40:	/req/product-information/properties
REQUIREMENT 40:	
/req/product-information/properties	
A "ProductInformation" object shall implement the properties shown in Table 33, with the value matching the type shown, and with the obligation shown.	

The ProductInformation block contains the common properties related to the product belonging to the collection which is the result of the observation and acquisition of the data.

Figure 33 — ProductInformation Schema



The complete description of the AcquisitionInformation properties is given in Table 33. It groups a subset of properties defined in OGC 17-003r2 [NR4].

Table 33 — ProductInformation object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND VALUES	MULTI AND USE
<code>type</code>	Type of the object. This property has the fixed value "ProductInformation".	Domain: Zero	
<code>\$. properties. productInformation. type</code>		ProductInformation	
		Range: (optional)	
		String	
		Fixed	
		value:	
		"ProductInformation"	
<code>processingLevel</code>	Processing level applied to the product.	Domain: Zero	
<code>\$. properties. productInformation. processingLevel</code>		ProductInformation	
		Range: (optional)	
		String	
		"1A",	
		"1B",	
		"1C", "2",	
		"3"	
<code>productTypes</code>	Describes the product types available within the collection.	Domain: Zero	
<code>\$. properties. productInformation. productTypes</code>		ProductInformation	
		Range: (optional)	
		Array of	
		String	
<code>resolutions</code>	Product resolutions. A single collection may contain products of different resolutions, e.g., the VITO CGS_S2_FAPAR collection includes products with 10m and 20m resolution. Unit of measure is SI base unit (m) without prefix.	Domain: Zero	
<code>\$. properties. productInformation. resolutions</code>		ProductInformation	
		Range: (optional)	
		Array of	
		Double	
<code>timeliness</code>	Timeliness of the product, such as "near real time", "rush". Possible values are mission specific and shall refer to mission/ground segment dedicated code space. Example of values could be "NTC", "NOMINAL", "NTC" or "STC"	Domain: Zero	
<code>\$. properties. productInformation. timeliness</code>		ProductInformation	
		Range: (optional)	
		String	
<code>referenceSystemIdentifier</code>	Indicates if product is geo-referenced, (in which case should point to a code space for the CRS), when not supplied it is assumed that the product is provided in "raw" satellite frame of reference E.g., http://www.opengis.net/def/crs/EPSG/0/4326	Domain: Zero	
<code>\$. properties. productInformation. referenceSystemIdentifier</code>		ProductInformation	
		Range: (Optional)	
		String	
		(URI)	

Example 44: ProductInformation encoding example

```
{
  "referenceSystemIdentifier": "http://www.opengis.net/def/crs/
  EPSG/0/32631",
  "timeliness": "NOMINAL",
  "processingLevel": "3",
  "resolution": [ 10, 20 ],
  "productType": [ "FAPAR" ],

```

}



EXTENSIBILITY



8.1. ADDITIONAL PROPERTIES ---

In the current EO Collection metadata GeoJSON(-LD) Encoding Standard, an “extension” is any property, or object type not defined by the current document. Consuming implementations that encounter unfamiliar extensions shall not stop processing or signal an error and shall continue processing the items as if those properties were not present. Note that support for extensions can vary across implementations and no normative processing model for extensions is defined. Accordingly, implementations that rely too heavily on the use of extensions may experience reduced interoperability with other implementations.

For extensions, JSON-LD [NR13] is used as the primary mechanism for defining and disambiguating extensions. Implementations that wish to fully support extensions should use JSON-LD mechanisms.

It is important to note that the JSON-LD Processing Algorithms [OR4], as currently defined, will silently ignore any property not defined in a JSON-LD @context. Implementations that publish EO OpenSearch Response documents containing extension properties should provide a @context definition for all extensions.

8.2. JSON-SPECIFIC CONSTRUCTS ---

It is important to note that there are valid JSON constructs which cannot be used within a JSON-LD document. For instance, JSON-LD forbids “arrays of arrays” as used by the GeoJSON specification. While implementations are free to use such constructs as extensions within an EO Dataset Metadata document, consumers that use the standard JSON-LD Processing Algorithms will be required to either ignore such extensions or map those to alternative compatible constructs prior to applying the JSON-LD algorithms. Complex geometries can be converted to GeoSPARQL [OR23] “Well-Known Text” representations as illustrated in the non-normative example below.

Example 45: JSON-LD encoding example using GeoSPARQL

```
{
  "@context": {
    "gj": "https://purl.org/geojson/vocab#",
    "gsp": "http://www.opengis.net/ont/geosparql#"
  },
  "@type": [
    "gj:Feature",
    "gsp:Feature"
  ],
```



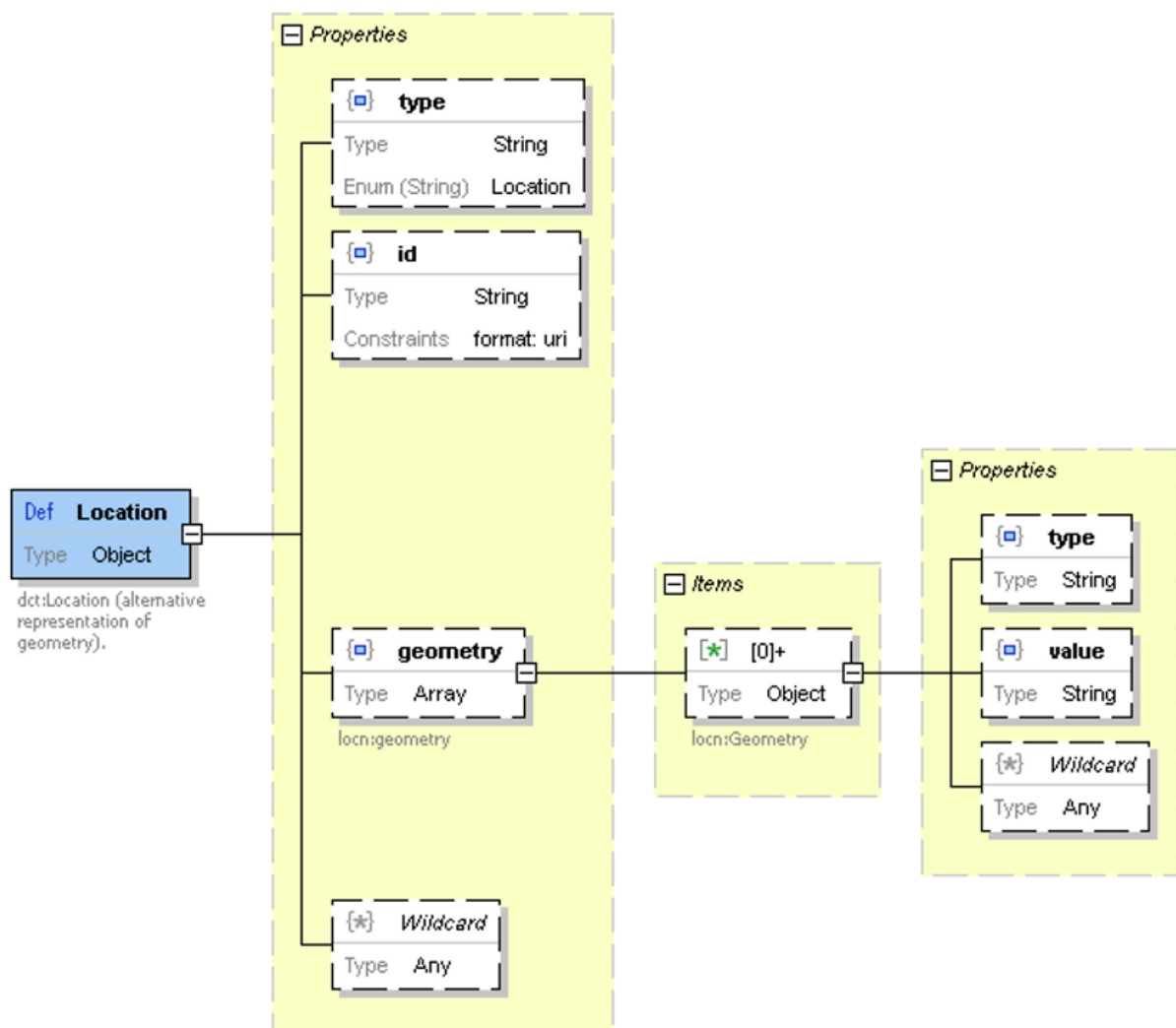
```

"@id": "http://fedeo.esa.int/opensearch/request/?parentIdentifier=
SEA_GEC_1P&uid=SE1_OPER_SEA_GEC_1P_19780927T010430_19780927T010445_
001316_0000_2267_9B4F",
"gsp:hasGeometry": {
  "@type": "gsp:Geometry",
  "gsp:asWKT": "Polygon((-2.682513, 63.261372, -2.695740, 61.997604,
0.005087, 61.965195, 0.135472, 63.227173, -2.682513, 63.261372))"
},
...
}

```

Other implementations may encode geometries as recommended by the GeoDCAT-AP specification [OR15] §II.10.

Figure 34 – Location Schema



Complete description of Location is given in Table 34.

Table 34 — Location object properties

JSON PROPERTY	DEFINITION	DATA TYPE AND MULTIPLICITY VALUES	AND USE
type \$.properties. spatial.type	Type of the object. This property has the fixed value "Location".	Range: String Fixed value: "Location"	Zero or one (optional)
id \$.properties. spatial.type	URI of location object.	Range: String (URI)	Zero or one (optional)
geometry \$. properties.spatial. geometry	Associates the resource with the corresponding geometry encoded as a typed literal (in WKT, GML or GeoJSON). See also [OR32].	Range: array of LOCN Geometry Objects [OR32].	One or more (mandatory)
*			

Example 46: JSON encoding example using Location

```
{
  "@context": {
    "...": {
      "type": "Feature",
      "geometry": null,
      "properties": {
        "spatial": {
          "geometry": [
            {
              "type": "gsp:gmlLiteral",
              "value": "<gml:Envelope srsName=\"http://www.opengis.net/def/crs/OGC/1.3/CRS84\"><gml:lowerCorner>-180 -90</gml:lowerCorner><gml:upperCorner>180 90</gml:upperCorner></gml:Envelope>"
            },
            {
              "type": "gsp:wktLiteral",
              "value": "POLYGON ((-180 -90, -180 90, 180 90, 180 -90, -180 -90))"
            }
          ],
          "type": "https://www.iana.org/assignments/media-types/application/vnd.geo+json",
          "value": "{\n  \"type\": \"Polygon\",\n  \"crs\": {\n    \"type\": \"name\",\n    \"properties\": {\n      \"name\": \"urn:ogc:def:crs:OGC:1.3:CRS84\"\n    }\n  },\n  \"coordinates\": [[[-180,-90],[-180,90],[180,90],[180,-90],[-180,-90]]]\n}"
        }
      }
    }
  }
}
```

Example 47: JSON-LD encoding example using Location

```
{
```

```

"@context": {
  "dcat": "http://www.w3.org/ns/dcat#",
  "dct": "http://purl.org/dc/terms/",
  "gsp": "http://www.opengis.net/ont/geosparql#",
  "locn": "http://www.w3.org/ns/locn#",
  ...
},

  "dct:spatial": {
    "@type": "dct:Location",
    "locn:geometry": [
      {
        "@type": "gsp:gmlLiteral",
        "@value": "<gml:Envelope srsName=\"http://www.opengis.net/def/crs/OGC/1.3/CRS84\"><gml:lowerCorner>-180 -90</gml:lowerCorner><gml:upperCorner>180 90</gml:upperCorner></gml:Envelope>"
      },
      {
        "@type": "gsp:wktLiteral",
        "@value": "POLYGON ((-180 -90, -180 90, 180 90, 180 -90, -180 -90))"
      },
      {
        "@type": "https://www.iana.org/assignments/media-types/application/vnd.geo+json",
        "@value": "{\"type\":\"Polygon\",\"crs\":{\"type\":\"name\",\"properties\":{\"name\":\"urn:ogc:def:crs:OGC:1.3:CRS84\"}},\"coordinates\":[[[-180,-90],[-180,90],[180,90],[180,-90],[-180,-90]]]}"
      }
    ]
  }
}

```



MEDIA TYPES FOR ANY DATA ENCODING(S)

When EO OpenSearch Responses are delivered using HTTP, the following MIME media types shall be used:

Table 35 – Media types

MEDIA TYPE	DESCRIPTION
#1 application/geo+json	GeoJSON representation with implicit normative context or normative context linked via a http://www.w3.org/ns/json-ld#context HTTP Link Header. See examples in annexes D.1.*.2.
#2 application/ld+json;profile="http://www.w3.org/ns/json-ld#compacted"	GeoJSON-LD representation compacted according to the normative context and with all context information within the body of the document. See examples in annexes D.1.*.3.
#3 application/ld+json	GeoJSON-LD representation with all context information within the body of the document. See examples in annexes D.1.*.4.
#4 application/ld+json;profile="http://www.opengis.net/spec/eoc-geojson/1.0"	GeoJSON-LD representation ^a with all context information within the body of the document. See examples in annexes D.1.*.4.
#5 text/turtle;profile="http://www.opengis.net/spec/eoc-geojson/1.0"	Turtle [OR12] representation ^a equivalent to representation #4.
#6 application/rdf+xml;profile="http://www.opengis.net/spec/eoc-geojson/1.0"	RDF/XML [OR11] representation equivalent to representation #4. See example in Annex D.1.2.5.

^a Uses "profile" to indicate RDF vocabulary as proposed in "Negotiating Profiles in HTTP", draft-svensson-accept-profile-00, available at <http://profilenegotiation.github.io/I-D-Accept—Schema/I-D-accept-schema>.



10

FUTURE WORK (NON-NORMATIVE)

Several future enhancements of this proposed document are possible. Obvious enhancements are as follows.

- Improve alignment with GeoDCAT-AP specification [OR15].
- Refactor and refine JSON Schema [OR7] in Annex for documentation and structural validation by referring to external JSON schemas.
- Extend JSON schema to allow properties such as “abstract”, “license”, “accessRights” etc. to contain rich text, e.g., “text/markdown” instead of or in addition to “text/plain”. Consider use of mime-bundle JSON object as defined by Jupyter Notebook format⁴.
- Include annex with W3C Shapes Constraint Language (SHACL)⁵ or Shape Expressions (ShEx)⁶ to formally define the structure of the JSON-LD response elements.
- Add alternative GeoJSON Feature encoding compatible with OGC API — Features — Part 1: Core (OGC 17-069r3⁷), i.e. different encoding of links (e.g., \$.links instead of \$.properties.links), use of “id” which is not a URI (currently “identifier”) etc., add “self” link (currently “id”).

⁴<https://github.com/jupyter/nbformat/blob/master/nbformat/v4/nbformat.v4.schema.json>

⁵Shapes Constraint Language (SHACL), W3C Recommendation 20 July 2017, <https://www.w3.org/TR/shacl/>.

⁶Shape Expressions (ShEx) Primer, Draft Community Group Report 14 July 2017, <http://shex.io/shex-primer/>

⁷<http://docs.openeospatial.org/is/17-069r3/17-069r3.html>



ANNEX A (NORMATIVE) ABSTRACT TEST SUITE



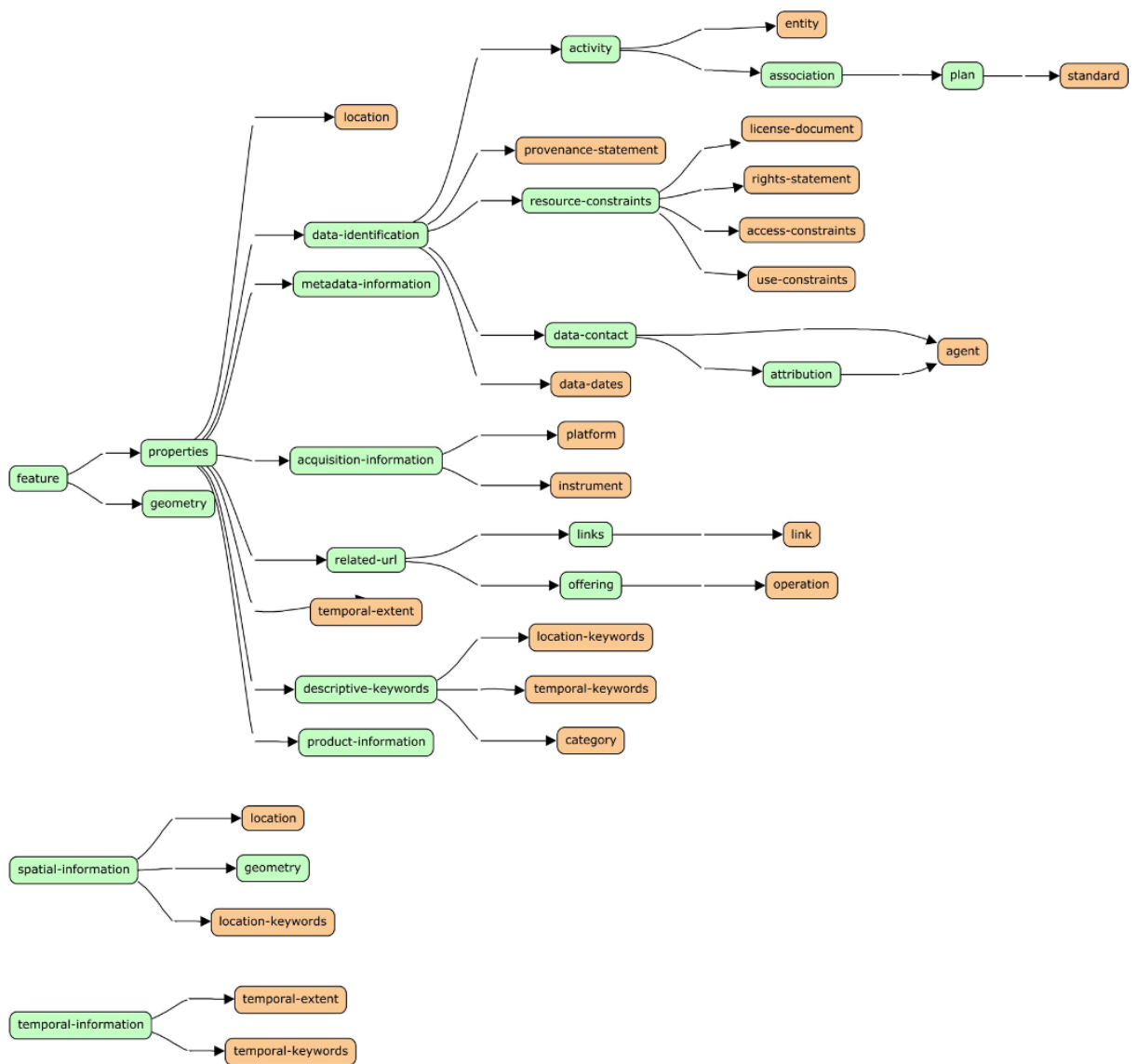
ANNEX A (NORMATIVE) ABSTRACT TEST SUITE

A.1. INTRODUCTION

Conformance is tested using a set of JSON Schema [OR7] definitions which formalize the requirements described above. Strictly, each object definition is a “JSON Schema,” so a JSON schema document may include multiple, sometimes nested, “JSON Schemas,” providing the definition of the objects. Using JSON References, JSON schema supports inclusion of schemas defined in a JSON schema document into new schemas defined in the same or another document, so standard JSON objects may be defined once and re-used in multiple contexts, and a set of related object definitions may be composed from multiple documents.

The dependencies of the requirement classes (green) and requirements (orange) correspond to the dependencies of the JSON Schema definitions as shown in the Figure below. Arrows indicate dependencies.

Figure A.1 — Conformance and requirements class dependencies



A.2. CONFORMANCE CLASS: /CONF/FEATURE

CONFORMANCE CLASS

Re /req/feature

Depends Schema Validator

TE /conf/earthobservation

Re: req/feature/properties,
[req/geometry],
[req/properties].

Te: Verify that the JSON instance document is a valid Feature object.

pu

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

tyr

A.3. CONFORMANCE CLASS: /CONF/PROPERTIES

~~CONFORMANCE CLASS~~ CONF/PROPERTIES CLASS

Re /req/properties

Dep: JSON Schema Validator

TEST Conf/properties

Re: req/properties/properties,
req/properties/data-identification,
req/properties/decriptive-keywords,
req/properties/related-url,
[req/acquisition-information],
[req/product-information],
[req/metadata-information],
req/temporal-extent,
req/location,
[req/data-identification],
[req/descriptive-keywords],
[req/related-url].

Te: Verify that the JSON instance document is a valid Properties object.

pu

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

tyr

A.4. CONFORMANCE CLASS: /CONF/METADATA-INFORMATION

CONF/METADATA-INFORMATION CLASS

Re /req/metadata-information

Dep JSON Schema Validator

TEST onf/metadata-information

Req req/metadata-information/properties
req/standard

Te: Verify that the JSON instance document is a valid MetadataInformation object.

pu

Test Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

typ

A.5. CONFORMANCE CLASS: /CONF/DATA-IDENTIFICATION

CONF/DATA-IDENTIFICATION CLASS

Re /req/data-identification

Dep JSON Schema Validator

TEST onf/data-identification

Req req/data-identification/properties
req/data-identification/data-dates
req/data-identification/data-contact
req/data-identification/resource-constraints
req/data-dates
[req/data-contact]
[req/resource-constraints]
req/provenance-statement
[req/activity]

Te: Verify that the JSON instance document is a valid DataIdentification object.
 pu
 Testmethod Validate the JSON instance document using the appropriate object definition from
 methodJSON Schema (Annex E). Pass if no errors reported. Fail otherwise.
 Te: Capability
 typ

A.6. CONFORMANCE CLASS: /CONF/DATA-CONTACT

~~CONFORMANCE~~ CLASS

Re /req/data-contact

DepJSON Schema Validator

TESTonf/data-contact

Required: data-contact/properties
 req/agent
 [req/attribution]

Te: Verify that the JSON instance document is a valid DataContact object.
 pu
 TestValidate the JSON instance document using the appropriate object definition from the JSON
 methodSchema (Annex E). Pass if no errors reported. Fail otherwise.
 Te: Capability
 typ

A.7. CONFORMANCE CLASS: /CONF/ATTRIBUTION

~~CONFORMANCE~~ CLASS

Re /req/attribution

DepJSON Schema Validator

TESTonf/attribution

Required: attribution/properties

req/agent
Te: Verify that the JSON instance document is a valid Attribution object.
pu
Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.
Te: Capability
tyr

A.8. CONFORMANCE CLASS: /CONF/ACTIVITY

CONFORMANCE CLASS

Re /req/activity
Dep: JSON Schema Validator

TEST

req/activity
Requirement: [req/association]
req/entity
Te: Verify that the JSON instance document is a valid Activity object.
pu
Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.
Te: Capability
tyr

A.9. CONFORMANCE CLASS: /CONF/ASSOCIATION

CONFORMANCE CLASS

Re /req/association
Dep: JSON Schema Validator

TEST

req/association
Requirement: [req/plan]

Te: Verify that the JSON instance document is a valid Association object.

pu

TestValidate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

ty

A.10. CONFORMANCE CLASS: /CONF/PLAN

CONFORMANCE CLASS

Re /req/plan

DepJSON Schema Validator

TEST

Req/plan/properties
req/standard

Te: Verify that the JSON instance document is a valid Plan object.

pu

TestValidate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

ty

A.11. CONFORMANCE CLASS: /CONF/RESOURCE-CONSTRAINTS

CONFORMANCE CLASS

Re /req/resource-constraints

DepJSON Schema Validator

TEST

Req/resource-constraints/properties
req/standard
req/license-document
req/rights-statement

req/use-constraints
req/access-constraints

Te: Verify that the JSON instance document is a valid ResourceConstraints object.

pu

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

tyr

A.12. CONFORMANCE CLASS: /CONF/DESCRIPTIVE-KEYWORDS

CONFORMANCE CLASS /CONF/DESCRIPTIVE-KEYWORDS

Re /req/descriptive-keywords

Dep: JSON Schema Validator

TEST /conf/descriptive-keywords

Req: req/descriptive-keywords/properties
req/category
req/location-keywords
req/temporal-keywords

Te: Verify that the JSON instance document is a valid DescriptiveKeywords object.

pu

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

tyr

A.13. CONFORMANCE CLASS: /CONF/RELATED-URL

CONFORMANCE CLASS /CONF/RELATED-URL

Re /req/related-url

Dep: JSON Schema Validator

TEST /conf/related-url

Requ~~ired~~ related-url/properties
[req/offering]
[req/links]

Te: Verify that the JSON instance document is a valid RelatedUrl object.

pu

TestValidate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

typ

A.14. CONFORMANCE CLASS: /CONF/LINKS

CONFORMANCE CLASS

Re /req/links

Dep: JSON Schema Validator

TEST /conf/links

Requ~~ired~~ links/properties,
req/link

Te: Verify that the JSON instance document is a valid Links object.

pu

TestValidate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

typ

A.15. CONFORMANCE CLASS: /CONF/OFFERING

CONFORMANCE CLASS

Re /req/offering

Dep: JSON Schema Validator

TE /conf/offering

Re: Offering/properties,
req/operation

Te: Verify that the JSON instance document is a valid Offering object as defined in OGC 14-pu 055r2 [NR5].

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability
tyr

A.16. CONFORMANCE CLASS: /CONF/SPATIAL-INFORMATION

CONFORMANCE CLASS

Re /req/spatial-information

Dep: JSON Schema Validator

TEST

Re: Category
[req/geometry]
req/location-keywords

Te: Verify that the JSON instance document is a valid SpatialInformation.
pu

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability
tyr

A.17. CONFORMANCE CLASS: /CONF/GEOMETRY

CONFORMANCE CLASS

Re /req/geometry

Dep: JSON Schema Validator

TEST /conf/geometry

Re: req/geometry/properties

Te: Verify that any objects within the document with a "type" property that matches one of the pu types from GeoJSON conforms to the GeoJSON format [NR2].

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

tyr

A.18. CONFORMANCE CLASS: /CONF/TEMPORAL-INFORMATION

CONFORMANCE CLASS /CONF/TEMPORAL-INFORMATION

Re: /req/temporal-information

Dep: JSON Schema Validator

TEST /conf/temporal-information

Re: req/temporal-extent
req/temporal-keywords

Te: Verify that the JSON instance document is a valid TemporalInformation object.

pu

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

tyr

A.19. CONFORMANCE CLASS: /CONF/ACQUISITION-INFORMATION

CONFORMANCE CLASS /CONF/ACQUISITION-INFORMATION

Re: /req/acquisition-information

Dep: JSON Schema Validator

TEST `conf/acquisition-information`

Re: `req/acquisition-information/properties`,
`req/platform`,
`req/instrument`,
`req/temporal-extent`.

Te: Verify that the JSON instance document is a valid `AcquisitionInformation` object.

pu

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

typ

A.20. CONFORMANCE CLASS: `/CONF/PRODUCT-INFORMATION`

CONFORMANCE CLASS `/CONF/PRODUCT-INFORMATION`

Re `/req/product-information`

Dep: JSON Schema Validator

TEST `conf/product-information`

Re: `req/product-information/properties`

Te: Verify that the JSON instance document is a valid `ProductInformation` object.

pu

Test: Validate the JSON instance document using the appropriate object definition from the JSON Schema (Annex E). Pass if no errors reported. Fail otherwise.

Te: Capability

typ



ANNEX B (INFORMATIVE) INTERPRETING JSON AS JSON-LD

B

ANNEX B

(INFORMATIVE)

INTERPRETING JSON AS JSON-LD

The JSON-LD encoding proposed in this annex supports a seamless transition from GeoJSON based implementations to JSON-LD based implementations with a minimum number of edits. The GeoJSON encoding proposed can be interpreted as JSON-LD by JSON-LD-aware implementations through the use of the normative @context document provided in this annex.

B.1. INTRODUCTION

B.1.1. JSON-LD

The serialized GeoJSON form of an EO Dataset Series document shall be consistent with what would be produced by the standard JSON-LD 1.0 Processing Algorithms and API [OR4] Compaction Algorithm using, at least, the normative JSON-LD @context definition provided in “Annex B: normative JSON-LD @context definition.” Implementations may augment the provided @context with additional @context definitions but shall not override or change the normative context. Implementations may also use additional properties and values not defined in the JSON-LD @context with the understanding that any such properties will likely be unsupported and ignored by consuming implementations that use the standard JSON-LD algorithms. See the Extensibility section for more information on handling extensions within EO Dataset Series documents.

JSON-LD uses the special @context property to define the processing context. The value of the @context property is defined by the JSON-LD specification. Implementations producing EO Collection metadata documents should include a @context property with a value that includes a reference to the normative JSON-LD @context definition using the URL “<https://www.opengis.net/spec/eoc-geojson/1.0>.” Implementations may use the alternative URL “<http://www.opengis.net/spec/eoc-geojson/1.0>” instead.

When a JSON-LD enabled EO Collection metadata implementation encounters a GeoJSON document identified using the “application/geo+json” MIME media type, and that document does not contain a @context property whose value includes a reference to the normative JSON-LD @context definition, the implementation shall assume that the normative @context definition still applies.

Alternatively, implementations can refer to the normative JSON-LD context document via an HTTP Link header as described in section 6.8 of the JSON-LD specification [NR13]. This allows the GeoJSON documents to be unambiguously machine readable as JSON-LD.

Example 48: Referencing a JSON-LD context from a GeoJSON document

```
GET /document.json HTTP/1.1
Host: example.com
Accept: application/ld+json,application/geo+json,*/*;q=0.1

=====

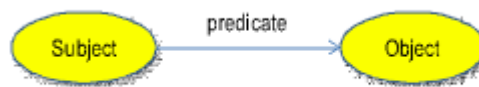
HTTP/1.1 200 OK
...
Content-Type: application/geo+json
Link: <https://www.opengis.net/spec/eoc-geojson/1.0>; rel="http://
www.w3.org/ns/json-ld#context"; type="application/ld+json"

{
  . . .
}
```

B.1.2. Semantic Web and JSON-LD

The W3C Semantic Web Activity is defining a collection of technologies that enables a “Web of data” where information is easily shared and reused across applications. Some key pieces of this technology stack are the RDF (Resource Description Framework), RDFS (RDF Schema) data models [OR9, OR10] and JSON-LD [NR13]. The JSON-LD encoding proposed in the current document can be interpreted as the proposed encoding in RDF for EO Collection metadata. Each JSON(-LD) property proposed corresponds to an RDF predicate which is represented with a URI.

Figure B.1 — RDF Triple



RDF is a data model built on edge-node “graphs.” Each link in a graph consists of three things (with many aliases depending on the mapping from other types of data models):

- Subject (start node, instance, entity, feature);
- Predicate (verb, property, attribute, relationship, link); and
- Object (value, end node, non-literal values can be used as a Subject).

Any of the three values in a single triple can be represented via a URI (with an optional fragment identifier). Subjects and objects are called nodes. Objects can also be represented as a literal value.

Note that the same node may play the role of a Subject in some edges, and the role of the Object in others.

All proposed properties are defined (via a normative @context document) with an URI from existing, well-known, vocabularies where available, e.g., Dublin Core (dct:), GeoJSON-LD (gj:), Atom (atom:), OGC Web Context (owc:) etc.

In the proposed specification, the "id" JSON property (or "@id" JSON-LD property) corresponds to a URI representing a Subject or Object.

B.2. JSON-LD @CONTEXT DEFINITION

B.2.1. JSON-LD 1.1

The current annex provides the normative JSON-LD @context which is implied by the GeoJSON encoding as explained above. It is available at <http://bp.schemas.opengis.net/17-084r1/eoc-geojson/1.0/eoc-geojson.jsonld> (See Annex F:).

JSON-LD 1.1 [OR21] aware clients can apply a JSON-LD 1.1 @context to interpret the GeoJSON encoding as JSON-LD.

```
{
  "@context": "http://bp.schemas.opengis.net/17-084r1/eoc-geojson/1.0/eoc-geojson.jsonld"
}
```

The context relies on JSON-LD 1.1 specific features, in particular "scoped contexts" and "nested properties." The expressiveness of JSON-LD 1.0 @context is too limited to isolate the required context information to support compacting and expansion in a single external context document. It would require inserting inline contexts in the GeoJSON encoding.

```
{
  "@context": {
    "@version": 1.1,
    "dct": "http://purl.org/dc/terms/",
    "atom": "http://www.w3.org/2005/Atom/",
    "iana": "http://www.iana.org/assignments/relation/",
    "os": "http://a9.com/-/spec/opensearch/1.1/",
    "eop": "http://www.opengis.net/ont/eo-geojson/1.0/",
    "owc": "http://www.opengis.net/ont/owc/1.0/",
    "gj": "https://purl.org/geojson/vocab#",
    "gsp": "http://www.opengis.net/ont/geosparql#",
    "vcard": "http://www.w3.org/2006/vcard/ns#",
    "skos": "http://www.w3.org/2004/02/skos/core#",
    "dcat": "http://www.w3.org/ns/dcat#",
    "xsd": "http://www.w3.org/2001/XMLSchema#",
    "prov": "http://www.w3.org/ns/prov#",
    "locn": "http://www.w3.org/ns/locn#",
  }
}
```



```

"foaf": "http://xmlns.com/foaf/0.1/",
"schema": "http://schema.org/",
"rdfs": "http://www.w3.org/2000/01/rdf-schema#",
"adms": "http://www.w3.org/ns/adms#",
"owl": "http://www.w3.org/2002/07/owl#",
"id": "@id",
"type": "@type",
"href": "@id",
"title": "dct:title",
"identifier": "dct:identifier",
"issued": "dct:issued",
"rights": "dct:rights",
"license": {
  "@id": "dct:license",
  "@context": {
    "label": "rdfs:label"
  }
},
"LicenseDocument": "dct:LicenseDocument",
"accessRights": {
  "@id": "dct:accessRights",
  "@context": {
    "label": "rdfs:label"
  }
},
"RightsStatement": "dct:RightsStatement",
"provenance": {
  "@id": "dct:provenance",
  "@context": {
    "label": "rdfs:label"
  }
},
"ProvenanceStatement": "dct:ProvenanceStatement",
"wasUsedBy": {
  "@id": "prov:wasUsedBy",
  "@context": {
    "generated": "prov:generated",
    "description": "dct:description",
    "qualifiedAssociation": "prov:qualifiedAssociation",
    "degree": {
      "@id": "dct:type",
      "@type": "@id"
    }
  }
},
"hadPlan": {
  "@id": "prov:hadPlan",
  "@context": {
    "wasDerivedFrom": "prov:wasDerivedFrom"
  }
},
"Activity": "prov:Activity",
"Association": "prov:Association",
"Entity": "prov:Entity",

```

```

"Plan": "prov:Plan",
"Standard": "dct:Standard",
"lang": {
  "@id": "dct:language",
  "@type": "@id",
  "@context": {
    "@base": "http://id.loc.gov/vocabulary/iso639-1/"
  }
},
"kind": {
  "@id": "dct:type",
  "@type": "@id"
},
"doi": {
  "@id": "adms:identifier",
  "@type": "@id",
  "@context": {
    "@base": "https://doi.org/"
  }
},
"isPrimaryTopicOf": "foaf:isPrimaryTopicOf",
"CatalogRecord": "dcat:CatalogRecord",
"updated": "dct:modified",
"published": "dct:issued",
"created": "dct:created",
"versionInfo": "owl:versionInfo",
"versionNotes": "adms:versionNotes",
"bibliographicCitation": "dct:bibliographicCitation",
"conformsTo": "dct:conformsTo",
"creator": "dct:creator",
"abstract": "dct:description",
"subtitle": "dct:description",
"subject": "dct:subject",
"date": "dct:date",
"geometry": "gj:geometry",
"Location": "dct:Location",
"temporal": "dct:temporal",
"PeriodOfTime": "dct:PeriodOfTime",
"spatial": {
  "@id": "dct:spatial",
  "@context": {
    "type": "@type",
    "value": "@value",
    "id": "@id",
    "geometry": "locn:geometry"
  }
},
"keyword": "dcat:keyword",
"categories": "dcat:theme",
"distribution": {
  "@id": "dcat:distribution",
  "@context": {
    "label": "rdfs:label"
  }
}

```

```

},
"Distribution": "dcat:Distribution",
"links": {
  "@id": "owc:links",
  "@context": {
    "@vocab": "http://www.iana.org/assignments/relation/",
    "type": "atom:type",
    "data": "iana:enclosure",
    "profiles": "iana:profile",
    "previews": "iana:icon",
    "alternates": "iana:alternate"
  }
},
"Links": "owc:Links",
"offerings": {
  "@id": "dcat:endpointDescription",
  "@context": {
    "@vocab": "http://www.opengis.net/ont/owc/1.0/",
    "code": {
      "@id": "owc:code",
      "@type": "@id"
    }
  }
},
"operations": {
  "@id": "owc:operations",
  "@context": {
    "href": "owc:href",
    "code": "owc:code",
    "type": "owc:type"
  }
},
"contents": {
  "@id": "owc:contents",
  "@context": {
    "type": "owc:type"
  }
},
"Link": "atom:link",
"beginningDateTime": "dcat:startDate",
"endingDateTime": "dcat:endDate",
"length": "atom:length",
"Category": "skos:Concept",
"label": "skos:prefLabel",
"term": "@id",
"scheme": "skos:inScheme",
"hasGeometry": "gsp:hasGeometry",
"asWKT": "gsp:asWKT",
"Feature": "dcat:Dataset",
"FeatureCollection": "gj:FeatureCollection",
"GeometryCollection": "gj:GeometryCollection",
"LineString": "gj:LineString",
"MultiLineString": "gj:MultiLineString",
"MultiPoint": "gj:MultiPoint",

```

```

"MultiPolygon": "gj:MultiPolygon",
"Point": "gj:Point",
"Polygon": "gj:Polygon",
"bbox": {
  "@container": "@list",
  "@id": "gj:bbox"
},
"coordinates": {
  "@container": "@list",
  "@id": "gj:coordinates"
},
"features": {
  "@container": "@set",
  "@id": "gj:features"
},
"properties": "@nest",
"acquisitionParameters": "@nest",
"acquisitionInformation": {
  "@id": "prov:wasGeneratedBy",
  "@context": {
    "AcquisitionInformation": "prov:Activity",
    "beginningDateTime": "prov:startedAtTime",
    "endingDateTime": "prov:endedAtTime"
  }
},
"uri": "@id",
"Platform": "eop:Platform",
"platform": {
  "@id": "prov:used",
  "@context": {
    "@vocab": "http://www.opengis.net/ont/eo-geojson/1.0/",
    "orbitType": {
      "@type": "@id",
      "@context": {
        "@base": "http://www.opengis.net/ont/eo-geojson/1.0/"
      }
    }
  }
},
"Instrument": "eop:Instrument",
"instrument": {
  "@id": "prov:used",
  "@context": {
    "@vocab": "http://www.opengis.net/ont/eo-geojson/1.0/",
    "description": "dct:description",
    "sensorType": {
      "@type": "@id",
      "@context": {
        "@base": "http://www.opengis.net/ont/eo-geojson/1.0/"
      }
    }
  }
},
"ProductInformation": "eop:ProductInformation",

```

```

"productInformation": {
  "@id": "eop:productInformation",
  "@context": {
    "@vocab": "http://www.opengis.net/ont/eo-geojson/1.0/",
    "referenceSystemIdentifier": {
      "@type": "@id"
    }
  }
},
"authors": {
  "@id": "dct:creator",
  "@context": {
    "@vocab": "http://xmlns.com/foaf/0.1/",
    "Kind": "foaf:Agent",
    "Individual": "foaf:Person",
    "email": "foaf:mbox",
    "name": "foaf:name",
    "hasTelephone": null,
    "hasName": "@nest",
    "given-name": "givenName",
    "family-name": "familyName",
    "additional-name": null,
    "hasAddress": null,
    "uri": {
      "@id": "foaf:page",
      "@type": "@id"
    }
  }
},
"qualifiedAttribution": {
  "@id": "prov:qualifiedAttribution",
  "@context": {
    "@vocab": "http://www.w3.org/2006/vcard/ns#",
    "Attribution": "prov:Attribution",
    "agent": "prov:agent",
    "role": {
      "@id": "dct:type",
      "@type": "@id",
      "@context": {
        "@base": "http://inspire.ec.europa.eu/metadata-codelist/ResponsiblePartyRole/"
      }
    },
    "Agent": "vcard:Kind",
    "Person": "vcard:Individual",
    "email": "vcard:hasEmail",
    "name": "vcard:fn",
    "phone": null,
    "hasValue": {
      "@type": "@id"
    }
  },
  "uri": {
    "@id": "hasURL",
    "@type": "@id"
  }
}

```


Example 50: Extract of modified @context from section B.2.1 (modelling as `gj:Feature`).

```
  "Feature": "gj:Feature",  
  
  "features": {  
    "@container": "@set",  
    "@id": "gj:features"  
  },
```

In the case of `dcat:dataset`, it might be useful to also apply the alternative representation of geographical extent using the `dct:spatial` relation as presented in section 8.2. This allows to comply with the corresponding representation defined in GeoDCAT-AP [OR15].



ANNEX C (NORMATIVE) VOCABULARY MAPPING



ANNEX C

(NORMATIVE)

VOCABULARY MAPPING

C.1. VOCABULARY TO XML MAPPING

The table below maps the JSON and Vocabulary Properties to the equivalent property in the original OGC 11-035r1 and ISO metadata encoding [OR19], [OR27], [OR28]. It also maps the properties to the equivalent UMM-C Model [OR1], [OR2].

The JSON property name included in column 1 corresponds to the JSON-LD property name included in column 2, compacted according to the normative JSON-LD context provided in annex B.2 of the current document.

Table C.1 — Vocabulary to XML Mapping

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY REFERENCE	VOCABULARY PROPERTY REFERENCE	OGC 11-035r1, ISO19139, ISO19139-2	UMM-C [OR2], [OR1]	COMMENT
@context	@context			[NR13]		
\$.@context						
abstract	dct:description	[NR5]	[OR3]	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:abstract/gco:CharacterString (source: UMM-C)	Data Identification Abstract [R] (\$2.2.5)	Table 7: DataIdentification object properties
\$.properties.abstract						
accessRights	dct:accessRights	[OR15]	[OR15]	/gmd:MD_Metadata/gmd:identificationInfo/*/gmd:resourceConstraints/*/gmd:accessConstraints	Data Identification Access Constraints (\$2.2.16)	Table 18: ResourceConstraints object properties
\$.properties.accessRights						
AcquisitionInformation	prov:Activity (class)	[NR4]	[OR30]		Acquisition Information (\$2.7)	Table 30: AcquisitionInformation object properties
acquisitionInformation	prov:wasGeneratedBy	[NR4]	[OR30]	/gmi:MI_Metadata/gmi:acquisitionInformation/	Acquisition Information (\$2.7)	Table 4: Properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFE	UMM-C [OR2], [OR1]	COMMENT
\$. properties. acquisitionInformation				gmi:MI_ AcquisitionInformation		object properties
Activity	prov:Activity (class)	[OR30]			Use Constraints (\$2.2.15)	Table 13: Activity object properties
agent	prov:agent	[OR30]				Table 10: Attribution object properties
\$. properties. qualifiedAttribution[*]. agent						
Agent	vcad:Kind (class)	[NR5] [OR17]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty		Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties
\$. properties. qualified/ agent[*] \$. properties. contactPoi						
Agent	foaf:Agent (class)	[NR5] [OR20]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty		Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties
\$. properties. authors[*]						
alternates	iana: alternate	[NR5] [NR10]			Related URL ... (\$2.4, \$2.8)	Table 24: Links object properties
\$. properties. links. alternates						
Association	prov: Association (class)	[OR15], [OR30]			Use Constraints (\$2.2.15)	Table 15: Association object properties
Attribution	prov: Attribution (class)	[OR15] /gmi:MI_Metadata/ [OR30] gmd:contact/gmd:CI_ ResponsibleParty			Data Identification Data Contact (\$2. 2.9)	Table 10: Attribution object properties
authors	dct:creator	[NR5] [OR13]	/gmi:MI_Metadata/ gmd:contact/ gmd:CI_ResponsibleParty or /gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:CI_Citation/ gmd:citedResponsibleParty/ gmd:CI_ResponsibleParty/		Data Identification Data Contact (\$2. 2.9)	Table 9: DataContact object properties See [OR15] Table 9: ResponsibleParty role = "Author"
\$. properties. authors						

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
			or /gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:pointOfContact/ gmd:CI_ResponsibleParty/ (Source: UMM-C)		
bbox \$.bbox	gjbbox	[NR2] [OR1]		Spatial Information Spatial Extent [R] (\$2.6.2)	Table 4: Feature object properties
beginningDateTime \$.properties.temporal.beginningDateTime	time startDate	[NR4] [OR25]	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:temporalElement/gmd:EX_TemporalExtent	Temporal Information Temporal Extent (\$2.5.1) RangeDateTime BeginningDateTime Temporal Information Temporal Extent SingleDateTime Temporal Information Temporal Extent PeriodicDateTime StartDate	Table 29: Temporal Extent object properties
beginningDate \$.properties.acquisition.acquisition.beginningDate	prov: startedAtTime	[NR4] [OR3]	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:temporalElement/gmd:EX_TemporalExtent / gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:status/gmd:MD_ProgressCode / gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:status/gmd:MD_ProgressCode/ @codeListValue	Temporal Information Temporal Extent (\$2.5.1) RangeDateTime BeginningDateTime Temporal Information Temporal Extent SingleDateTime Temporal Information Temporal Extent PeriodicDateTime StartDate Data Identification Collection Progress [R] (\$2.2.13) ^a	
bibliographicCitation	bibliographicCitation	[OR25]		Data Identification Publication	Table 7: DataIdentification

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFE	UMM-C [OR2], [OR1]	COMMENT
\$. properties. bibliographicCitation					Reference (§2.2.18)	object properties
categories	dc:theme	[NR5]	[OR15]	/gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:descriptiveKeywords/ gmd:MD_Keywords/ gmd:keyword/ gco:CharacterString (Source: UMM-C)	Descriptive Keywords Science Keywords [R] (§2.3.2) Spatial Information Location Keywords (§2.6.4) Temporal Information Temporal Keywords (§2.5.2) Acquisition Information Project (§2.7.3) Data Identification Collection Data Type (§2.2.10)	Table 21: DescriptiveKeywords object properties See also section 7.7.2.
Category	skos: Concept (Class)	[NR5]	[OR31]	/gmi:MI_Metadata/gmd: identificationInfo/gmd: descriptiveKeywords/ gmd:MD_Keywords	Descriptive Keywords (§2.3)	Table 22: Category object properties
code	owc:code	[NR5]	[NR5]			Table 26: Offering object properties
code	owc:code	[NR5]	[NR5]			Table 27: Operation object properties
conformsTo	dct: conformsTo		[OR15]	/gmd: MD_Metadata/gmd: metadataStandardName/ gco:CharacterString		Table 6: MetadataInformation object properties
conformsTo	dct: conformsTo		[OR15]			Table 7: DataIdentification object properties
contactPoint	dc: contactPoint	[NR5]	[OR15]	/gmi:MI_Metadata/ gmd:contact/ gmd:CI_ResponsibleParty	Data Identification Data Contact (§2.2.9)	Table 9: DataContact object

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
\$. properties. contactPoint			or /gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:CI_Citation/ gmd:citedResponsibleParty/ gmd:CI_ResponsibleParty/ or /gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:pointOfContact/ gmd:CI_ResponsibleParty/ (Source: UMM-C)		properties See [OR15] Table 9: ResponsibleParty role = "Point of Contact"
\$. properties. offerings[*]. contents	contents owc: contents	[NR5] [NR5]		Related URL ... (§2.4, §2.8)	
\$. geometry. coordinates	coordinates gml: coordinates	[NR2] [OR18]	/gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification / gmd:extent/gmd: EX_Extent/gmd: geographicElement/ gmd:EX_ GeographicBoundingBox	Spatial Information Spatial Extent [R] (§2.6.2)	
\$. properties. isPrimaryTopicOf. created	created dct:created		N/A	Metadata Information / Metadata Date (§2. 1.2) (CREATE)	Table 6: MetadataInformation object properties
\$. properties. created	created dct:created		gmd:citation/gmd: CI_Citation/gmd:date/ gmd:CI_Date/gmd:date / gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd:citation/gmd: CI_Citation/gmd: date/gmd:CI_Date/ gmd:dateType/gmd: CI_DateTypeCode codeListValue : creation (See [OR33] §2.3.4).	Data Identification Data Dates (§2.2. 7)	Table 8: DataDates object properties
\$. properties.	data iana: enclosure	[NR5] [NR10]		Related URL ... (§2.4, §2.8)	Table 24: Links object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
links. data date \$. properties. date	dct:date	[NR5]	[OR3] /gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:date/gmd:CI_Date/gmd:date/gco:DateTime	Data Identification Data Dates (\$2.2.7) Data Identification Collection Progress (\$2.2.13)	Table 7: DataIdentification object properties
degree \$. properties. wasUsedBy[*]. generated. degree	dct:type	[OR15]	/\\dataQualityInfo/*/report/*/result/*/pass	Related URL ... (\$2.4, \$2.8)	Table 14: Entity object properties
describedby \$. properties. links. describedby	iana: describedby	[NR10]		Related URL ... (\$2.4, \$2.8)	Table 24: Links object properties
description \$. properties. wasUsedBy[*]. generated. description	dct: description	[OR15]	/\\dataQualityInfo/*/report/*/result/*	RelatedURL/ Description (\$2.4)	Table 14: Entity object properties
description \$.. acquisition instrument descriptive	dct: description	[OR15]			Table 32: Instrument object properties
doi \$. properties. doi	adms: identifier	[OR25]	/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:code/gco:CharacterString where / gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/	Data Identification DOI (\$2.2.4) [R]	Table 7: DataIdentification object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFE	UMM-C [OR2], [OR1]	COMMENT
				gmd:identifier/ gmd:MD_Identifier/ gmd:description/ gco:CharacterString = DOI (source: UMM-C)		
email \$. properties. qualified/ agent[*]. email \$. properties. contactPoint. email	vcard: hasEmail	[NR5] [OR17]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_Respons ibleParty	Data Identification Data Contact (§2.2.9)	Table 11: Agent object properties	
email \$. properties. authors[*]. email	foaf:mbox	[NR5] [OR20]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_Respons ibleParty	Data Identification Data Contact (§2.2.9)	Table 11: Agent object properties	
endingDateTime \$. properties. temporal. endingDate	dc:temporal endDate	[OR25]	/gmi:MI_Metadata/gmd:ident ificationInfo/gmd:MD_DataI dentification/ gmd:extent/gmd:EX_Extent/ gmd:temporalElement/gmd:EX _TemporalExtent	Temporal Information TemporalExtent (\$2.5.1) RangeDateTime endingDateTime Temporal Information TemporalExtent SingleDateTime Temporal Information TemporalExtent PeriodicDateTime EndDate	Table 29: TemporalExtent object properties	
endingDateTime \$. properties. acquisitionInformation. acquisitionParameters. endingDateTime	prov: endedAtTime	[OR30]	/gmi:MI_Metadata/gmd:ident ificationInfo/gmd:MD_DataI dentification/ gmd:extent/gmd:EX_Extent/ gmd:temporalElement/gmd:EX _TemporalExtent / gmi:MI_Metadata/gmd:ident ificationInfo/gmd:MD_DataI dentification/ gmd:status/gmd:	Temporal Information TemporalExtent (\$2.5.1) RangeDateTime endingDateTime Temporal Information TemporalExtent SingleDateTime Temporal		

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFE	UMM-C [OR2], [OR1]	COMMENT
				MD_ProgressCode / gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd:status/gmd: MD_ProgressCode/ @codeListValue	Information TemporalExtent PeriodicDateTime EndDate Data Identification Collection Progress [R] (\$2.2.13) ^a	
Entity	prov:Entity (Class)	[OR15]	VV/dataQualityInfo/*/ [OR30] report/*/result/*/pass		Quality (\$2.2.14)	Table 14: Entity object properties
Feature	gjc:Feature (Class) or dcat:Dataset (class)	[NR2] [OR18] [OR13]				Table 4: Feature object properties
generated \$. properties wasUsedBy[generated	prov: generated	[OR15] [OR30]	/gmi:MI_Metadata/gmd: dataQualityInfo/*/report/ */result/*/pass		Use Constraints (\$2.2.15) and/or Quality (\$2.2.14)	Table 13: Activity object properties
geometry \$. geometry	gjc:geometry	[NR2] [OR18]	/gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification / gmd:extent/gmd: EX_Extent/gmd: geographicElement/ gmd:EX_ GeographicBoundingBox		Spatial Information Spatial Extent [R] (\$2.6.2)	Table 4: Feature object properties
geometry \$. properties spatial. geometry	locn: geometry	[OR15] [OR32]			Spatial Information Spatial Extent [R] (\$2.6.2)	Table 34: Location object properties
hadPlan \$. properties. wasUsedBy[*]. qualifiedAssociation. hadPlan	prov: hadPlan	[OR15] [OR30]	dataQualityInfo/*/report/ */result/*/specification		Quality (\$2.2.14)	Table 15: Association object properties
hasAddress \$. properties qualified/ agent[*]. hasAddress \$. properties	vcad: hasAddress	[OR17]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty		Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFE	UMM-C [OR2], [OR1]	COMMENT
contactPoint						
hasAddress						
hasAddress	null			[OR20] /gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties
properties						
authors[*]						
hasAddress						
hasName	vcard: hasName			[OR17] /gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties
\$.						
properties						
qualified						
agent[*]						
hasName						
\$.						
properties						
contactPoint						
hasName						
hasName	@nest			[OR20] /gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties
\$.						
properties						
authors[*]						
hasName						
hasTelephone	vcard: hasTelephone			[OR17] /gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties
\$.						
properties						
qualified						
agent[*]						
hasTelephone						
\$.						
properties						
contactPoint						
hasTelephone						
hasTelephone	null (Use phone property instead).			[OR20] /gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties
\$.						
properties						
authors[*]						
hasTelephone						
href	@id			[NR5] [NR13]	Related URL (\$2.4)	Table 25: Link object properties
\$.						
properties						
links						
[].href						
href	owc:href			[NR5] [NR5]	Related URL (\$2.4)	Table 27: Operation object properties
\$.						
properties						
offerings[*]						

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
operations[*]. href					
id \$.id	@id	[NR2] [NR13]		ShortName, Native_ID, Concept_ID, DOI (\$2.2)	Table 4: Feature object properties
identifier \$. properties. identifier	dct:identifier	[OR3]		Data Identification ShortName [R] (\$2.2.1)	Table 7: DataIdentification object properties
Individual \$. properties. qualified/ agent[*] \$. properties. contactPoint	vcard: Individual (class)	[OR17]		DataCenter/ ContactPerson (\$2. 2.8)	Table 11: Agent object properties
Individual \$. properties. authors[*]	foaf:Person (class)	[OR20]		DataCenter/ ContactPerson (\$2. 2.8)	Table 11: Agent object properties
instrument \$.. acquisition instrument	prov:used	[NR4] [OR30]		Acquisition Information Instrument [R] (\$2. 7.2)	Table 30: AcquisitionInformation object properties
Instrument \$. properties. instrument	eop: Instrument	[NR4] [NR4]		Acquisition Information Instrument [R] (\$2. 7.2)	Table 32: Instrument object properties
instrumentShape \$.. acquisition instrument instrument	eop: instrumentShape	[NR4] [NR4]		Acquisition Information Instrument [R] (\$2. 7.2)	Table 32: Instrument object properties
isPrimaryTopicOf \$. properties. isPrimaryTopicOf	isPrimaryTopicOf	[OR15]		Data Identification (\$2.2)	Table 4: Properties object properties
issued \$. properties. wasUsedBy/ qualified/ hadPlan.	dct:issued	[OR15] VV/dataQualityInfo/ */report/*/result/*/ specification/*/date/*/ date		Quality (\$2.2.14) or Use Constraints (\$2.2.15)	Table 17: Standard object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
wasDerived issued						
keyword \$. properties. keyword	dc:keyword	[OR13]	gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString	Descriptive Keywords Ancillary Keywords (\$2.3.3)	Table 21: DescriptiveKeywords object properties	
kind \$. properties. kind	dct:type	[OR15]	gmd:MD_Metadata/gmd:hierarchyLevel		Table 7: DataIdentification object properties	
Kind \$. properties. qualifiedAttribution[*]. agent[*] \$. properties. contactPoint[*]	vcard:Kind	[OR17]		DataContact (\$2.2.9)	Table 11: Agent object properties	
Kind \$. properties. authors[*]	foaf:Agent	[OR20]		DataContact (\$2.2.9)	Table 11: Agent object properties	
label \$. properties. categories[*]. label	skos:prefLabel	[NR5] [OR31]	gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword	Descriptive Keywords (\$2.3)	Table 22: Category object properties	
label \$. properties. license[label + \$. properties. accessRight label \$. properties. provenance label	rdfs:label	[OR15]	gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd:MD_LegalConstraints/gmd:useLimitation/gco:CharacterString / gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd:	Data Identification Use Constraints (\$2.2.15) Data Identification Access Constraints Description (\$2.2.16)	Table 19: LicenseDocument object properties Table 20: RightsStatement object properties Table 12: ProvenanceStatement object properties	

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY REFERENCE	VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2	UMM-C [OR2], [OR1]	COMMENT
				MD_LegalConstraints/ gmd:otherConstraints/ gco:CharacterString		
lang \$. properties. isPrimaryTopicOf. lang	dct:language	[OR3], [OR15], [OR25]	gmi:MI_Metadata/gmd: language	Metadata Information Metadata Language (\$2.1.1)	Table 6: MetadataInformation object properties	
lang \$. properties. lang	dct:language [NR5]	[OR3], [OR15], [OR15]	/gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:language/ gco:CharacterString (Source: UMM-C)	Data Identification Data Language (\$2.2.6)	Table 7: DataIdentification object properties	
lang \$. properties. links. *[*].lang	dct:language [NR5]	[OR3]		RelatedURL/ Description (\$2.4)	Table 25: Link object properties	
length \$. properties. links. *[*]. length	atom:length [NR5]	[OR14]		RelatedURL/ GetData/ (\$2.4)	Table 25: Link object properties	
license \$. properties. license	dct:license	[OR15], [OR25]	gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd: resourceConstraints/gmd: MD_LegalConstraints/ gmd:useLimitation/gco: CharacterString	Data Identification Use Constraints (\$2.2.15)	Table 18: ResourceConstraints object properties	
LicenseDocument dct: LicenseDocument (class)		[OR15], [OR25]	/gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd: resourceConstraints/gmd: MD_LegalConstraints/ gmd:useLimitation/gco: CharacterString	UseConstraints/ LicenseUrl/Linkage (\$2.2.15)	Table 19: LicenseDocument object properties	
LineString	gml:LineString [NR2]	[OR18]		SpatialExtent/ HorizontalSpatialDomain/ Geometry/Lines (\$2.6.2)		

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
Link	atom:link (Class)		[OR14]	Related URL ... (§2.4, §2.8)	Table 25: Link object properties
links	owc:links		[NR5] [OR5]	Related URL ... (§2.4, §2.8)	Table 4: Properties object properties
links	owc:links		[NR5] [OR5]	Related URL ... (§2.4, §2.8)	Table 4: Feature object properties
Links	owc:Links (Class)			Related URL ... (§2.4, §2.8)	Table 24: Links object properties
Location	dct:Location (Class)			SpatialExtent (§2.6.2)	Table 34: Location object properties
method \$. properties. offerings[*]. operations[*]. method	owc:method		[NR5] [NR5]		Table 27: Operation object properties
MultiLineString	gj: MultiLineString		[NR2] [OR18]	SpatialExtent/ HorizontalSpatialDomain/ Geometry/Lines (§2.6.2)	
MultiPoint	gj:MultiPoint		[NR2] [OR18]	/Collection/ Spatial/ HorizontalSpatialDomain/ Geometry/Point (§2.6.2)	
MultiPolygon	gj: MultiPolygon		[NR2] [OR18]	SpatialExtent/ HorizontalSpatialDomain/ Geometry/ GPolygons (§2.6.2)	
name \$. properties. qualifiedAttribution[*]. agent[*]. name \$. properties.	vcard:fn		[NR5] [OR17]	gmi:MI_Metadata/ gmd:contact/gmd:CI_ResponsibleParty	Data Identification Data Contact (§2.9) Table 11: Agent object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFE	UMM-C [OR2], [OR1]	COMMENT
contactPoint[*]. name						
name	foaf:name	[NR5]	[OR20]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties
properties. authors[*] name						
offerings	dc:at:	[NR5]	[OR25]		Related URL ... (\$2.4, \$2.8)	Table 23: RelatedUrl object properties
properties. offerings						
operations	owc: operations	[NR5]	[NR5]		RelatedURL/ GetService (\$2.4)	Table 26: Offering object properties
properties. offerings[operations						
orbitType	eop: orbitType	[NR4]	[NR4]		Platform/ Characteristics (\$2. 7.1)	Table 31: Platform object properties
\$. acquisitionInformation[*]. platform. orbitType						
Organization	vcad: Organization (Class)		[OR17]		DataCenter (\$2.2. 8)	Table 11: Agent object properties
\$. properties. qualified/ agent[*] \$. properties. contactPoi						
Organization	foaf: Organization (Class)		[OR20]		DataCenter (\$2.2. 8)	Table 11: Agent object properties
\$. properties. authors[*]						
PeriodOfTime	dct: PeriodOfTime (Class)		[OR15]		TemporalExtent (\$2.5.1)	Table 29: TemporalExtent object properties
Person	vcad: Individual (Class)		[OR17]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties
\$. properties. qualifiedAttribution[*]. agent[*] \$. properties. contactPoint[*]						

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFE	UMM-C [OR2], [OR1]	COMMENT
Person \$. properties. authors[*]	foaf:Person (Class)	[OR2C]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties	
phone \$. properties. qualifiedAttribution[*]. agent[*] \$. properties. contactPoint[*]	null (Use hasTelephone property)	[OR17]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties	
phone \$. properties. authors[*]	foaf:phone	[OR2C]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (\$2. 2.9)	Table 11: Agent object properties	
Plan	prov:Plan	[OR30]			Table 16: Plan object properties	
platform \$.. acquisition platform	prov:used	[NR4] [OR3C]	/gmi:MI_Metadata/gmi: acquisitionInformation/ gmi: MI_AcquisitionInformation gmi:platform/gmi:MI_ Platform	Acquisition Information Platform [R] (\$2.7. 1)	Table 30: AcquisitionInformation object properties	
Platform	eop: Platform	[NR4] [NR4]		Platform (\$2.7.1)	Table 31: Platform object properties	
platformSeries \$.. acquisition platform. platformSeries	eop: platformSeries	[NR4] [NR4]		Platform/ Characteristics (\$2. 7.1)	Table 31: Platform object properties	
platformShortName \$.. acquisitionInformation[*]. platform. platformShortName	eop: platformShortName	[NR4] [NR4]		Platform/ ShortName (\$2.7. 1)	Table 31: Platform object properties	
Point		[NR2] [OR18]		SpatialExtent/ HorizontalSpatialDomain/ Geometry/Points (\$2.6.2)		
Polygon		[NR2] [OR18]		SpatialExtent/ HorizontalSpatialDomain/ Geometry/Points (\$2.6.2)		

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
				Geometry/ GPolygons (\$2.6.2)	
previews \$. properties. links. previews	iana:icon	[NR5] [NR10]		Related URL ... (\$2.4, \$2.8)	Table 24: Links object properties
processingLevel \$. properties. productInformation. processingLevel	eop: processingLevel	[NR4] [NR4]	/gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd:processingLevel/ gmd:MD_Identifier/ gmd:code/gco: CharacterString /gmi: MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd:processingLevel/ gmd:MD_Identifier/ gmd:description/gco: CharacterString	Data Identification Processing Level [R] (\$2.2.11)	Table 33: ProductInformation object properties
productInformation \$. properties. productInformation	eop: productInformation	[NR4] [NR4]		Data Identification – Acquisition Information – Spatial Information – Temporal Information	Table 4: Properties object properties
ProductInformation	eop: ProductInformation (Class)	[NR4] [NR4]		Processing Level – Collection Data Type – Spatial Representation Information	Table 33: ProductInformation object properties
productType \$. properties. productInformation. productType	eop: productType	[NR4] [NR4]		Entry Title	Table 33: ProductInformation object properties
profiles \$. properties. links. profiles	iana:profile	[NR5] [NR10]			Table 24: Links object properties
properties \$. properties	@nest	[NR2] [OR18]			Table 4: Feature object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFE	UMM-C [OR2], [OR1]	COMMENT
Properties	- (Class)					
\$. properties. provenance	dct:	[OR15]	/gmi:MI_Metadata/gmd:	Data Identification	Table 7:	DataIdentification object properties
	provenance		dataQualityInfo/gmd:	Quality (§2.2.14)		
			DQ_DataQuality/gmd:			
			lineage/gmd:LI_Lineage/ gmd:statement/gco: CharacterString			
ProvenanceStatement	ProvenanceStatement (Class)	[OR15]		Data Identification Quality (§2.2.14)	Table 12: ProvenanceStatement object properties	
\$. properties. isPrimary1 published	dct:issued	[NR4] [OR13]	N/A	Metadata Information / Metadata Date / CREATE (§2.1.2)	Table 6: MetadataInformation object properties	
\$. properties. published	dct:issued	[OR13]	gmd:citation/gmd: CI_Citation/gmd:date/ gmd:CI_Date/gmd:date / gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd:citation/gmd: CI_Citation/gmd: date/gmd:CI_Date/ gmd:dateType/gmd: CI_DateTypeCode codeListValue : publication (See [OR33] §2.3.4).	Data Identification Data Dates (§2.2.7)	Table 8: DataDates object properties	
publisher ^b	dct:	[NR5] [OR15]	/gmi:MI_Metadata/ gmd:contact/gmd: CI_ResponsibleParty or / gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd:CI_Citation/gmd: citedResponsibleParty/ gmd:CI_ResponsibleParty/ or /gmi: MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd:pointOfContact/ gmd:CI_ResponsibleParty/	Data Identification Data Contact (§2.2.9)	See [OR15] Table 9: ResponsibleParty role = “Publisher” Table 9: DataContact object properties	
	publisher					

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
qualifiedAssociation \$.qualifiedAssociation properties. wasUsedBy[*]. qualifiedAssociation	qualifiedAssociation qualifiedAssociation (Other) qualifiedAssociation	[OR15] [OR30]	\\dataQualityInfo/ report/*/result/*/ specification/*/title \\dataQualityInfo/ report/*/ result*/specification/*/ date*/date	Quality (§2.2.14)	Table 13: Activity object properties
qualifiedAttribute \$.qualifiedAttribute properties. qualifiedAttribute	qualifiedAttribute qualifiedAttribute (Other) qualifiedAttribute	[OR15]	/gmi:MI_Metadata/ gmd:contact/ gmd:CI_ResponsibleParty or /gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification gmd:CI_Citation/ gmd:citedResponsibleParty gmd:CI_ResponsibleParty/ or /gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification gmd:pointOfContact/ gmd:CI_ResponsibleParty/ or mi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification gmd:pointOfContact/ gmd:CI_ResponsibleParty/ or /gmi:MI_Metadata/ gmd:distributionInfo/ gmd:MD_Distribution/ gmd:distributor/ gmd:MD_Distributor/ gmd:distributorContact/ gmd:CI_ResponsibleParty/ or /gmi:MI_Metadata/ gmd:dataQualityInfo/ gmd:DQ_DataQuality/ gmd:lineage/ gmd:LI_Lineage/ gmd:processStep/ gmd:LI_ProcessStep/ gmd:processor (Source: UMM-C)	Data Identification Data Center (§2.2.8) – DISTRIBUTOR, ORIGINATOR, PROCESSOR. Data Identification Data Contact (§2. 2.9)	See [OR15] Table 9: ResponsibleParty role is NOT “Point of Contact”, “Publisher”, “Author”. Table 9: DataContact object properties
referenceSystemIdentifier \$.referenceSystemIdentifier properties. productInformation. referenceSystemIdentifier	referenceSystemIdentifier referenceSystemIdentifier	[NR4] [NR4]		Spatial Extent / HorizontalSpatialDomain/ Geometry/ CoordinateSystem	Table 33: ProductInformation object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON PROPERTY	VOCABULARY PROPERTY	OGC 11-035R1, ISO19139, ISO19139-2 REFE	UMM-C [OR2], [OR1]	COMMENT
					Or GranuleSpatialRepresentation	
related \$. properties. links. related	iana:related	[NR5] [NR10]			Related URL ... (§2.4, §2.8)	Table 24: Links object properties
request \$. properties. offerings[*]. operations[*]. request	owc:request	[NR5] [NR5]				Table 27: Operation object properties
resolution \$. properties. productInfo. resolution	eop: resolution	[NR4] [NR4]			Platform/ Instrument/ Characteristics/ Unit	Table 33: ProductInformation object properties
result \$. properties. offerings[*]. operations[*]. result	owc:result	[NR5] [NR5]				Table 27: Operation object properties
rights \$. properties. rights	dct:rights	[NR5] [OR3] [OR25]	/gmd:MD_Metadatas/ gmd:identificationInfo/*/ gmd:resourceConstraints		UseConstraints (\$2.2.15) or Access Constraints (\$2.2. 16)	Table 18: ResourceConstraints object properties
RightsStatement	dct: RightsStatement	[OR3], [OR25]	/gmd:MD_Metadatas/ gmd:identificationInfo/*/ gmd:resourceConstraints		UseConstraints (\$2.2.15) or Access Constraints (\$2.2. 16)	Table 20: RightsStatement object properties
role \$. properties. qualified/ role	dct:type	[OR15]	gmd:CI_ResponsibleParty/ gmd:role/gmd:CI_ RoleCode		DataCenter/Roles or DataCenter/ ContactPerson/ Roles or DataCenter/ ContactGroup/ Roles (\$2.2.8)	Table 10: Attribution object properties
scheme \$. properties. categories[*]. scheme	skos: inScheme	[NR5] [OR31]	gmi:MI_Metadatas/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:descriptiveKeywords/ gmd:MD_Keywords/ gmd:thesaurusName/		Descriptive Keywords (\$2.3)	Table 22: Category object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
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gmx:Anchor See also
OGC 08-167r2 [OR22].

search \$. properties. links. search	iana:search	[NR10]		Related URL ... (\$2.4, \$2.8)	Table 24: Links object properties
sensorType \$.. acquisitionInformation[*]. instrument. sensorType	eop: sensorType	[NR4] [NR4]		Platform/ Instrument/ Technique (\$2.7)	Table 32: Instrument object properties
spatial \$. properties. spatial	dct:spatial	[OR15]		Spatial Extent (\$2. 6.2)	Table 4: Properties object properties
Standard	dct:Standard (class)	[OR15]	dataQualityInfo/*/report/ */result/*/specification		Table 17: Standard object properties
subject \$. properties. subject	dct:subject	[OR15]	/gmd: MD_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/ gmd:topicCategory/gmd: MD_TopicCategoryCode	Descriptive Keywords ISO Topic Category (\$2.3.1)	Table 21: DescriptiveKeywords object properties
term \$. properties. categories[*]. term	@id	[NR5] [NR13]	/gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:descriptiveKeywords/ gmd:MD_Keywords/ gmd:keyword/ gmx:Anchor See also OGC 08-167r2 [OR22].	Descriptive Keywords (\$2.3)	Table 22: Category object properties
timeliness \$. properties. productInfo. timeliness	eop: timeliness	[NR4] [NR4]		Data Identification Collection Data Type (\$2.2.10)	Table 33: ProductInformation object properties
title \$. properties. title \$. properties. wasUsedBy[*].	dct:title	[NR5] [OR3]	/gmi:MI_Metadata/ gmd:fileIdentifier/ [OR13] gco:CharacterString and /gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:citation /	Data Identification Entry Title [R] (\$2. 2.3)	Table 7: DataIdentification object properties Table 17: Standard object

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2	UMM-C [OR2], [OR1]	COMMENT
qualifiedAssociation. hadPlan. wasDerivedFrom. title \$. properties. links. *[*]. title			gmd:CI_Citation/ gmd:title/ gco:CharacterString (UMM-C)		properties Table 25: Link object properties
type	@type	[NR2] [NR13]			All tables except Table 25: Link object properties.
type \$. properties. links. *[*].type	atom:type	[NR5] [OR14]		Related URL ... (§2.4)	Table 25: Link object properties
type \$. properties offerings[contents[type	owc:type	[NR5] [NR5]		RelatedURL/ GetData/ MimeType or RelatedURL/ GetService/ MimeType (§2.4)	Table 26: Offering object properties
type \$. properties. offerings[*]. operations[*]. type	owc:type	[NR5] [NR5]		RelatedURL/ GetData/ MimeType or RelatedURL/ GetService/ MimeType (§2.4)	Table 27: Operation object properties
up \$. properties links.up	iana:up	[NR10]		Related URL ... (§2.4, §2.8)	Table 24: Links object properties
updated \$. properties. isPrimaryTopicOf. updated	dct:modified	[NR5] [OR3], [OR13] [OR33]	/gmd:MD_Metadata/ gmd:dateStamp (See §2.2.4).	Metadata Information Metadata Date (§2. 1.2)	Table 6: MetadataInformation object properties
updated \$. properties updated	dct:modified	[NR5] [OR13]	gmd:citation/gmd: CI_Citation/gmd:date/ gmd:CI_Date/gmd:date / gmi:MI_Metadata/gmd: identificationInfo/gmd: MD_DataIdentification/	Data Identification Data Dates (§2.2. 7)	Table 8: DataDates object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
			gmd:citation/gmd: CI_Citation/gmd: date/gmd:CI_Date/ gmd:dateType/gmd: CI_DateTypeCode codeListValue : revision (See [OR33] §2.3.4).		
uri \$. properties. qualifiedAttribution[*]. agent[*]. uri \$. properties. contactPoint[*]. email	vcard: hasURL	[NR5] [OR17]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (§2. 2.9)	Table 11: Agent object properties
uri \$. properties. authors[*] uri	foaf:page	[NR5] [NR1C]	/gmi:MI_Metadata/ gmd:contact/gmd:CI_ ResponsibleParty	Data Identification Data Contact (§2. 2.9)	Table 11: Agent object properties
versionInfo \$. properties. versionInfo \$. properties. wasUsedBy[*]. qualifiedAssociation. hadPlan. wasDerivedFrom. versionInfo \$. properties. meta. conformsTo. versionInfo	owl: versionInfo		/gmi:MI_Metadata/ gmd:identificationInfo/ gmd:MD_DataIdentification/ gmd:citation/ gmd:CI_Citation/ gmd:edition (Source: UMM-C) /gmd: MD_Metadata/gmd: metadataStandardVersion/ gco:CharacterString	Data Identification Version (§2.2.2)	Table 7: DataIdentification object properties Table 17: Standard object properties
via \$. properties. links.via	iana:via	[NR5] [NR1C]		Related URL ... (§2.4, §2.8)	Table 24: Links object properties
wasDerivedFrom \$. properties. wasUsedBy[*].	prov: wasDerivedFrom	[OR15] [OR30]	DataQualityInfo/*report/ */result/*/specification	N/A	Table 16: Plan object properties

JSON PROPERTY	VOCABULARY PROPERTY	JSON VOCABULARY PROPERTY REFERENCE	OGC 11-035R1, ISO19139, ISO19139-2 REFERENCE	UMM-C [OR2], [OR1]	COMMENT
qualifiedAssociation. hadPlan. wasDerivedFrom					
wasUsedBy \$. properties wasUsedBy	prov: wasUsedBy	[OR15]		N/A	Table 7: Data Identification object properties
			/gmi:MI_Metadata/ gmd:dataQualityInfo/ gmd:DQ_DataQuality/ gmd:report/ gmd:DQ_QuantitativeAttributeAccuracy/ gmd:evaluationMethodDescription/ gco:CharacterString (Source: UMM-C)	Data Identification Quality (§2.2.14)	
				Data Identification Metadata Association (§2.2. 17)	
				Data Identification Purpose (§2.2.19)	
				Descriptive Keywords Additional Attributes (§2.3.4)	
			/gmi:MI_Metadata/ gmd:distributionInfo/ gmd:MD_Distribution/ gmd:distributor/gmd: MD_Distributor/gmd: distributorTransferOptions/ gmd: MD_DigitalTransferOptions/ gmd:online/gmd:CI_ OnlineResource	Related URL ... (§2.4, §2.8)	See UMM Common (links to service, DOI, etc...

^a Collection-Progress can be derived from the TemporalExtent: "Planned" (current date earlier than start date of temporal extent), "Active" (current date within temporal extent), "Completed" (current date later than end date of temporal extent).

^b The definition of this property in OGC 14-055r2 [NR50] (i.e. its range) is in conflict with W3C DCAT. OGC 14-055r2 requires a string, while DCAT requires a foaf:Agent.



ANNEX D (INFORMATIVE) ENCODING EXAMPLES



ANNEX D

(INFORMATIVE)

ENCODING EXAMPLES

Extracts of the following examples were used in the body of the document. The current Annex includes the complete examples in their original XML format and in the proposed encodings.

The following tools were very useful to improve readability and check the examples.

- XMLSpy (<http://www.altova.com>)
- <http://json-ld.org/playground/> (JSON-LD 1.0).
- <http://jsonld.biothings.io/> (JSON-LD 1.1).
- <http://www.markus-lanthaler.com/jsonld/playground/> (JSON-LD 1.1)
- <http://rdf-translator.appspot.com/>
- <http://geojsonlint.com/>
- <http://jsonpath.com/>
- <https://www.freeformatter.com/xpath-tester.html>

D.1. METADATA EXAMPLES

D.1.1. Example 1: Landsat.ETM.ETC

D.1.1.1. OGC 11-035r1

```
<?xml version="1.0" encoding="UTF-8"?>
<gmi:MI_Metadata xmlns:gmi="http://www.isotc211.org/2005/gmi" 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:gco="http://www.isotc211.org/2005/gco" xmlns:geo="http:
//a9.com/-/opensearch/extensions/geo/1.0/" xmlns:georss="http://
www.georss.org/georss" xmlns:gmw="http://www.isotc211.org/2005/gmw"
xmlns:os="http://a9.com/-/spec/opensearch/1.1/" 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/" xmlns:xlink="http://www.
w3.org/1999/xlink">
  <gmd:fileIdentifier xmlns:gmd="http://www.isotc211.org/2005/gmd">
    <gco:CharacterString>LANDSAT.ETM.GTC</gco:CharacterString>
  </gmd:fileIdentifier>
  <gmd:language xmlns:gmd="http://www.isotc211.org/2005/gmd">
    <gmd:LanguageCode codeList="http://standards.iso.org/ittf/
PubliclyAvailableStandards/ISO_19139_Schemas/resources/codelist/
gmxCodelists.xml#LanguageCode" codeListValue="eng">eng</gmd:
LanguageCode>
  </gmd:language>
  <gmd:hierarchyLevel xmlns:gmd="http://www.isotc211.org/2005/gmd">
    <gmd:MD_ScopeCode codeList="http://standards.iso.org/ittf/
PubliclyAvailableStandards/ISO_19139_Schemas/resources/codelist/
gmxCodelists.xml#MD_ScopeCode" codeListValue="series">series</gmd:
MD_ScopeCode>
  </gmd:hierarchyLevel>
  <gmd:contact xmlns:gmd="http://www.isotc211.org/2005/gmd">
    <gmd:CI_ResponsibleParty>
      <gmd:organisationName>
        <gco:CharacterString>ESA/ESRIN</gco:CharacterString>
      </gmd:organisationName>
      <gmd:positionName>
        <gco:CharacterString>Earth Observation helpdesk</gco:
CharacterString>
      </gmd:positionName>
    </gmd:contactInfo>
    <gmd:CI_Contact>
      <gmd:phone>
        <gmd:CI_Telephone>
          <gmd:voice>
            <gco:CharacterString>39 06 94180777</gco:CharacterString>
          </gmd:voice>
          <gmd:facsimile>
            <gco:CharacterString>+39 06 94180292</gco:CharacterString>
          </gmd:facsimile>
        </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:CI_Address>
      </gmd:address>
    </gmd:CI_Contact>
  </gmd:contact>

```

```

        </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>http://www.earth.esa.int</gmd:URL>
        </gmd:linkage>
      </gmd:CI_OnlineResource>
    </gmd:onlineResource>
  </gmd:CI_Contact>
</gmd:contactInfo>
  <role xmlns="http://www.isotc211.org/2005/gmd">
    <gmd:CI_RoleCode codeList="http://standards.iso.org/
itff/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
codelist/gmxCodelists.xml#CI_RoleCode" codeListValue=
"pointOfContact">pointOfContact</gmd:CI_RoleCode>
  </role>
</gmd:CI_ResponsibleParty>
</gmd:contact>
<gmd:dateStamp xmlns:gmd="http://www.isotc211.org/2005/gmd"/>
<gmd:metadataStandardName xmlns:gmd="http://www.isotc211.org/2005/
gmd">
  <gco:CharacterString>ISO19115</gco:CharacterString>
</gmd:metadataStandardName>
<gmd:metadataStandardVersion xmlns:gmd="http://www.isotc211.
org/2005/gmd">
  <gco:CharacterString>2005/Cor.1:2006</gco:CharacterString>
</gmd:metadataStandardVersion>
<gmd:identificationInfo xmlns:gmd="http://www.isotc211.org/2005/
gmd">
  <gmd:MD_DataIdentification>
    <gmd:citation>
      <gmd:CI_Citation>
        <gmd:title>
          <gco:CharacterString>Landsat 7 ETM+ (Enhanced Thematic Mapper
Plus) Geolocated Terrain Corrected Systematic processing</gco:
CharacterString>
        </gmd:title>
        <gmd:alternateTitle>
          <gco:CharacterString>(LANDSAT.ETM.GTC)</gco:CharacterString>
        </gmd:alternateTitle>
        <gmd:date>
          <gmd:CI_Date>
            <gmd:date>
              <gco>Date>1999-12-01</gco>Date>
            </gmd:date>
            <gmd:dateType>
              <gmd:CI_DateTypeCode codeList="http://www.isotc211.org/2005/
resources/Codelist/gmxCodelists.xml#CI_DateTypeCode" codeListValue=
"creation"/>

```

```

        </gmd:dateType>
    </gmd:CI_Date>
</gmd:date>
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Maspalomas and Matera Landsat 7 ETM density maps The Landsat 7 ETM
+ scenes typically covers 185 x 170 km. A standard full scene is
nominally centred on the intersection between a Path and Row (the
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            <gmd:alternateTitle>
              <gmx:Anchor xlink:href="http://gcmdservices.gsfc.nasa.gov/
kms/concept/3cc4a1e8-3b94-4567-90b3-32137aec2d9e">LANDSAT</gmx:
Anchor>
            </gmd:alternateTitle>
            <gmd:date>
              <gmd:CI_Date>
                <gmd:date>
                  <gco:Date>1972-07-23</gco:Date>
                </gmd:date>
                <gmd:dateType>
                  <gmd:CI_DateTypeCode codeList="http://www.isotc211.
org/2005/resources/Codelist/gmxCodeLists.xml#CI_DateTypeCode"
codeListValue="creation"/>
                </gmd:dateType>
              </gmd:CI_Date>
            </gmd:date>
            </gmd:CI_Citation>
          </gmi:citation>
          <gmi:identifier>
            <gmd:MD_Identifier xmlns:gmd="http://www.isotc211.org/2005/
gmd">
              <gmd:code>
                <gmx:Anchor xlink:href="https://earth.esa.int/web/
guest/missions/3rd-party-missions/historical-missions/landsat-
tmets">LANDSAT</gmx:Anchor>
              </gmd:code>
            </gmi:identifier>
          </gmi:MI_Platform>
        </gmi:platform>
      </gmi:operation>
    </gmi:MI_AcquisitionInformation>
  </gmi:acquisitionInformation>
</gmd:distributionInfo>
</gmd:MD_Distribution>
</gmd:transferOptions>
</gmd:MD_DigitalTransferOptions>

```

```

        </gmd:MD_Identifier>
        </gmi:identifier>
        <gmi:description>
            <gmx:Anchor xlink:href="https://earth.esa.int/image/image_
gallery?img_id=26471">LANDSAT</gmx:Anchor>
        </gmi:description>
        <gmi:sponsor>
            <gmd:CI_ResponsibleParty xmlns:gmd="http://www.isotc211.
org/2005/gmd">
                <gmd:organisationName>
                    <gco:CharacterString>NOAA</gco:CharacterString>
                </gmd:organisationName>
                <gmd:role/>
            </gmd:CI_ResponsibleParty>
        </gmi:sponsor>
        <gmi:sponsor>
            <gmd:CI_ResponsibleParty xmlns:gmd="http://www.isotc211.
org/2005/gmd">
                <gmd:organisationName>
                    <gco:CharacterString> NASA</gco:CharacterString>
                </gmd:organisationName>
                <gmd:role/>
            </gmd:CI_ResponsibleParty>
        </gmi:sponsor>
        <gmi:sponsor>
            <gmd:CI_ResponsibleParty xmlns:gmd="http://www.isotc211.
org/2005/gmd">
                <gmd:organisationName>
                    <gco:CharacterString> USGS</gco:CharacterString>
                </gmd:organisationName>
                <gmd:role/>
            </gmd:CI_ResponsibleParty>
        </gmi:sponsor>
        <gmi:instrument>
            <gmi:MI_Instrument>
                <gmi:citation>
                    <gmd:CI_Citation xmlns:gmd="http://www.isotc211.org/2005/
gmd">
                        <gmd:title>
                            <gmx:Anchor xlink:href="https://earth.esa.int/web/
guest/data-access/browse-data-products?p_p_id=datasetlist_WAR_
ospportlet&instruments=ETM">ETM</gmx:Anchor>
                        </gmd:title>
                        <gmd:alternateTitle>
                            <gmx:Anchor xlink:href="http://gcmdservices.gsfc.nasa.gov/
kms/concept/4dbe7764-a2ea-4a19-b754-696c35ac3205">ETM+</gmx:Anchor>
                        </gmd:alternateTitle>
                        <gmd:date>
                            <gmd:CI_Date>
                                <gmd:date>
                                    <gco>Date>1972-07-23</gco>Date>
                                </gmd:date>
                                <gmd:dateType>

```



```

        <gmd:CI_DateTypeCode codeList="http://www.isotc211.
org/2005/resources/Codelist/gmxCodeLists.xml#CI_DateTypeCode"
codeListValue="creation"/>
        </gmd:dateType>
        </gmd:CI_Date>
    </gmd:date>
    <gmd:identifier>
        <gmd:MD_Identifier>
            <gmd:code>
                <gmx:Anchor xlink:href="https://earth.esa.int/web/
guest/data-access/browse-data-products?p_p_id=datasetlist_WAR_
ospportlet&instruments=ETM">ETM</gmx:Anchor>
            </gmd:code>
        </gmd:MD_Identifier>
    </gmd:identifier>
    </gmd:CI_Citation>
</gmi:citation>
<gmi:type>
    <gmi:MI_SensorTypeCode/>
</gmi:type>
<gmi:description>
    <gco:CharacterString>Enhanced Thematic Mapper Plus</gco:
CharacterString>
</gmi:description>
</gmi:MI_Instrument>
</gmi:instrument>
</gmi:MI_Platform>
</gmi:platform>
</gmi:MI_AcquisitionInformation>
</gmi:acquisitionInformation>
</gmi:MI_Metadata>

```

D.1.1.2. GeoJSON

```

{
  "type": "Feature",
  "id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/geo%2Bjson&parentIdentifier=EOP%3AESAS%3AFEDeo
%3ACOLLECTIONS&uid=LANDSAT.ETM.GTC",
  "geometry": {
    "type": "Polygon",
    "coordinates": [
      [
        [
          -180,
          -90
        ],
        [
          180,
          -90
        ],
        [

```



```

        180,
        90
    ],
    [
        -180,
        90
    ],
    [
        -180,
        -90
    ]
]
],
},
"properties": {
    "title": "LANDSAT 7 ETM+ (Enhanced Thematic Mapper Plus)
Geolocated Terrain Corrected Systematic processing (LANDSAT.ETM.
GTC)",
    "kind": "http://purl.org/dc/dcmitype/Collection",
    "identifier": "LANDSAT.ETM.GTC",
    "abstract": "This dataset contains all the Landsat 7 Enhanced
Thematic Mapper high-quality ortho-rectified L1T dataset over
Kiruna, Maspalomas and Matera visibility masks. The Landsat 7 ETM
+ scenes typically covers 185 x 170 km. A standard full scene is
nominally centred on the intersection between a Path and Row (the
actual image centre can vary by up to 100m). Each band requires
50MB (uncompressed), and Band 8 requires 200MB (panchromatic band
with resolution of 15m opposed to 30m).",
    "date": "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z",
    "updated": "2003-12-31T00:00:00Z",
    "temporal": {
        "beginningDateTime": "1999-07-01T00:00:00Z",
        "endingDateTime": "2003-12-31T00:00:00Z"
    },
    "isPrimaryTopicOf": {
        "type": "CatalogRecord",
        "updated": "2019-07-17T00:00:00Z",
        "published": "1999-07-01T00:00:00Z",
        "lang": "en"
    },
    "categories": [
        {
            "term": "http://www.eionet.europa.eu/gemet/concept/3650",
            "label": "Geology"
        },
        {
            "term": "http://gcmdservices.gsfc.nasa.gov/kms/concept/03f0c0a3-
04a7-4ef8-8ec0-3c2266510815",
            "label": "Science Keywords > Earth Science > Spectral/
Engineering > Visible Wavelengths > Visible Imagery"
        },
        {
            "term": "http://gcmdservices.gsfc.nasa.gov/kms/concept/c7a09e9f-
3c99-4b31-a521-313c379ba2b4",

```

```

    "label": "LANDSAT-7"
  },
  "offerings": [
    {
      "code": "http://www.opengis.net/spec/owc-geojson/1.0/req/wps",
      "operations": [
        {
          "code": "Execute",
          "method": "POST",
          "href": "http://185.52.193.7/wps-proxy/"
        }
      ]
    },
    {
      "code": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs",
      "operations": [
        {
          "code": "GetCapabilities",
          "method": "GET",
          "href": "http://131.176.196.55/wcs?service=WCS&Request=
GetCapabilities"
        },
        {
          "code": "DescribeCoverage",
          "method": "GET",
          "type": "application/xml",
          "href": "http://131.176.196.55/wcs?service=WCS&Request=
DescribeCoverage&version=2.0.0&CoverageId=LE7_RGB"
        }
      ]
    }
  ],
  "license": [
    {
      "type": "LicenseDocument",
      "label": "Fast Registration with immediate access Data is
available via EOLI-SA upon registration for the On The Fly Service.
For information on access and use of the On-The-Fly service please
refer to the OTF FAQ page and news of 28 July 2016."
    }
  ],
  "accessRights": [
    {
      "type": "RightsStatement",
      "label": "Utilisation of this data is subject to ESA's Earth
Observation Terms and Conditions"
    }
  ],
  "links": {
    "profiles": [
      {
        "href": "http://www.opengis.net/spec/owc-geojson/1.0/req/core"
      }
    ]
  }
}

```

```

    {
      "href": "http://www.opengis.net/spec/eoc-geojson/1.0/req/core"
    }
  ],
  "alternates": [
    {
      "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/atom%2Bxml&parentIdentifier=EOP%3AESAS%3AFEDEO
%3ACOLLECTIONS&uid=LANDSAT.ETM.GTC&recordSchema=server-choice",
      "type": "application/atom+xml",
      "title": "Atom format"
    },
    {
      "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19139-2%2Bxml&parentIdentifier=EOP%3AESAS%3AFEDEO
%3ACOLLECTIONS&uid=LANDSAT.ETM.GTC&recordSchema=iso19139-2",
      "type": "application/vnd.iso.19139-2+xml",
      "title": "ISO 19139-2 metadata"
    }
  ],
  "describedby": [
    {
      "href": "https://earth.esa.int/web/guest/data-access/browse-
data-products/-/asset_publisher/y8Qb/content/landsat-7-etm-enhanced-
thematic-mapper-plus-geolocated-terrain-corrected-systematic-
processing-over-kiruna-and-masplomas",
      "type": "text/html",
      "title": "Described by"
    }
  ],
  "search": [
    {
      "href": "http://fedeo.esa.int/opensearch/description.xml?
parentIdentifier=LANDSAT.ETM.GTC&sensorType=OPTICAL&startDate=1999-
07-01T00:00:00Z&endDate=2003-12-31T00:00:00Z",
      "type": "application/opensearchdescription+xml"
    }
  ],
  "previews": [
    {
      "href": "http://fedeo.esa.int/opensearch/images/esa.png",
      "type": "image/png",
      "title": "Quicklook"
    }
  ]
},
"acquisitionInformation": [
  {
    "type": "AcquisitionInformation",
    "platform": {
      "type": "Platform",
      "id": "http://gcmdservices.gsfc.nasa.gov/kms/concept/c7a09e9f-
3c99-4b31-a521-313c379ba2b4",
      "platformShortName": "Landsat",

```

```

    "platformSerialIdentifier": "7"
  },
  "instrument": {
    "type": "Instrument",
    "id": "http://gcmdservices.gsfc.nasa.gov/kms/concept/4dbe7764-
a2ea-4a19-b754-696c35ac3205",
    "instrumentShortName": "ETM",
    "sensorType": "OPTICAL"
  },
  "acquisitionParameters": {
    "beginningDateTime": "1999-07-01T00:00:00Z",
    "endingDateTime": "2003-12-31T00:00:00Z"
  }
}
]
}
}

```

D.1.1.3. JSON-LD (Compacted)

The example below is identical to the example in the previous section, only a @context property is added.

```

{
  "@context": "http://bp.schemas.opengis.net/17-084r1/eoc-geojson/1.
0/eoc-geojson.jsonld",
  "type": "Feature",
  ... same content as example in previous section ...
}

```

D.1.1.4. JSON-LD (Expanded)

```

{
  "@context": {
    "@version": 1.1,
    "dct": "http://purl.org/dc/terms/",
    "atom": "http://www.w3.org/2005/Atom/",
    "iana": "http://www.iana.org/assignments/relation/",
    "os": "http://a9.com/-/spec/opensearch/1.1/",
    "eop": "http://www.opengis.net/ont/eo-geojson/1.0/",
    "owc": "http://www.opengis.net/ont/owc/1.0/",
    "gj": "https://purl.org/geojson/vocab#",
    "gsp": "http://www.opengis.net/ont/geosparql#",
    "vcard": "http://www.w3.org/2006/vcard/ns#",
    "skos": "http://www.w3.org/2004/02/skos/core#",
    "dcat": "http://www.w3.org/ns/dcat#",
    "xsd": "http://www.w3.org/2001/XMLSchema#",
    "prov": "http://www.w3.org/ns/prov#",
  }
}

```

```

    "locn": "http://www.w3.org/ns/locn#",
    "foaf": "http://xmlns.com/foaf/0.1/",
    "schema": "http://schema.org/",
    "rdfs": "http://www.w3.org/2000/01/rdf-schema#",
    "adms": "http://www.w3.org/ns/adms#",
    "owl": "http://www.w3.org/2002/07/owl#"
  },
  "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/geo%2Bjson&parentIdentifier=EOP%3AESA%3AFEDEO
%3ACOLLECTIONS&uid=LANDSAT.ETM.GTC",
  "@type": "dcat:Dataset",
  "dct:accessRights": {
    "@type": "dct:RightsStatement",
    "rdfs:label": "Utilisation of this data is subject to ESA's Earth
Observation Terms and Conditions"
  },
  "dct:date": "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z",
  "dct:description": "This dataset contains all the Landsat 7
Enhanced Thematic Mapper high-quality ortho-rectified L1T dataset
over Kiruna, Maspalomas and Matera visibility masks. The Landsat 7
ETM+ scenes typically covers 185 x 170 km. A standard full scene is
nominally centred on the intersection between a Path and Row (the
actual image centre can vary by up to 100m). Each band requires
50MB (uncompressed), and Band 8 requires 200MB (panchromatic band
with resolution of 15m opposed to 30m).",
  "dct:identifier": "LANDSAT.ETM.GTC",
  "dct:license": {
    "@type": "dct:LicenseDocument",
    "rdfs:label": "Fast Registration with immediate access Data is
available via EOLI-SA upon registration for the On The Fly Service.
For information on access and use of the On-The-Fly service please
refer to the OTF FAQ page and news of 28 July 2016."
  },
  "dct:modified": "2003-12-31T00:00:00Z",
  "dct:temporal": {
    "dcat:endDate": "2003-12-31T00:00:00Z",
    "dcat:startDate": "1999-07-01T00:00:00Z"
  },
  "dct:title": "LANDSAT 7 ETM+ (Enhanced Thematic Mapper Plus)
Geolocated Terrain Corrected Systematic processing (LANDSAT.ETM.
GTC)",
  "dct:type": {
    "@id": "http://purl.org/dc/dcmitype/Collection"
  },
  "owc:links": {
    "iana:alternate": [
      {
        "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/atom%2Bxml&parentIdentifier=EOP%3AESA%3AFEDEO
%3ACOLLECTIONS&uid=LANDSAT.ETM.GTC&recordSchema=server-choice",
        "dct:title": "Atom format",
        "atom:type": "application/atom+xml"
      }
    ]
  }
}

```

```

    "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19139-2%2Bxml&parentIdentifier=EOP%3AESAS%3AFEDEO
%3ACOLLECTIONS&uid=LANDSAT.ETM.GTC&recordSchema=iso19139-2",
    "dct:title": "ISO 19139-2 metadata",
    "atom:type": "application/vnd.iso.19139-2+xml"
  },
],
  "iana:describedby": {
    "@id": "https://earth.esa.int/web/guest/data-access/browse-data-
products/-/asset_publisher/y8Qb/content/landsat-7-etm-enhanced-
thematic-mapper-plus-geolocated-terrain-corrected-systematic-
processing-over-kiruna-and-masplomas",
    "dct:title": "Described by",
    "atom:type": "text/html"
  },
  "iana:icon": {
    "@id": "http://fedeo.esa.int/opensearch/images/esa.png",
    "dct:title": "Quicklook",
    "atom:type": "image/png"
  },
  "iana:profile": [
    {
      "@id": "http://www.opengis.net/spec/owc-geojson/1.0/req/core"
    },
    {
      "@id": "http://www.opengis.net/spec/eoc-geojson/1.0/req/core"
    }
  ],
  "iana:search": {
    "@id": "http://fedeo.esa.int/opensearch/description.xml?
parentIdentifier=LANDSAT.ETM.GTC&sensorType=OPTICAL&startDate=1999-
07-01T00:00:00Z&endDate=2003-12-31T00:00:00Z",
    "atom:type": "application/opensearchdescription+xml"
  },
},
"dc:endpointDescription": [
  {
    "owc:code": {
      "@id": "http://www.opengis.net/spec/owc-geojson/1.0/req/wps"
    },
    "owc:operations": {
      "owc:code": "Execute",
      "owc:href": "http://185.52.193.7/wps-proxy/",
      "owc:method": "POST"
    }
  },
  {
    "owc:code": {
      "@id": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs"
    },
    "owc:operations": [
      {
        "owc:code": "GetCapabilities",

```

```

        "owc:href": "http://131.176.196.55/wcs?service=WCS&Request=
GetCapabilities",
        "owc:method": "GET"
    },
    {
        "owc:code": "DescribeCoverage",
        "owc:href": "http://131.176.196.55/wcs?service=WCS&Request=
DescribeCoverage&version=2.0.0&CoverageId=LE7_RGB",
        "owc:method": "GET",
        "owc:type": "application/xml"
    }
]
},
"dc:theme": [
    {
        "@id": "http://www.eionet.europa.eu/gemet/concept/3650",
        "skos:prefLabel": "Geology"
    },
    {
        "@id": "http://gcmdservices.gsfc.nasa.gov/kms/concept/03f0c0a3-
04a7-4ef8-8ec0-3c2266510815",
        "skos:prefLabel": "Science Keywords > Earth Science > Spectral/
Engineering > Visible Wavelengths > Visible Imagery"
    },
    {
        "@id": "http://gcmdservices.gsfc.nasa.gov/kms/concept/c7a09e9f-
3c99-4b31-a521-313c379ba2b4",
        "skos:prefLabel": "LANDSAT-7"
    }
],
"prov:wasGeneratedBy": {
    "@type": "prov:Activity",
    "prov:endedAtTime": "2003-12-31T00:00:00Z",
    "prov:startedAtTime": "1999-07-01T00:00:00Z",
    "prov:used": [
        {
            "@id": "http://gcmdservices.gsfc.nasa.gov/kms/concept/4dbe7764-
a2ea-4a19-b754-696c35ac3205",
            "@type": "eop:Instrument",
            "eop:instrumentShortName": "ETM",
            "eop:sensorType": {
                "@id": "eop:OPTICAL"
            }
        }
    ],
    {
        "@id": "http://gcmdservices.gsfc.nasa.gov/kms/concept/c7a09e9f-
3c99-4b31-a521-313c379ba2b4",
        "@type": "eop:Platform",
        "eop:platformSerialIdentifier": "7",
        "eop:platformShortName": "Landsat"
    }
]
},

```

```

"foaf:isPrimaryTopicOf": {
  "@type": "dcat:CatalogRecord",
  "dct:issued": "1999-07-01T00:00:00Z",
  "dct:language": {
    "@id": "http://id.loc.gov/vocabulary/iso639-1/en"
  },
  "dct:modified": "2019-07-17T00:00:00Z"
},
"gj:geometry": {
  "@type": "gj:Polygon",
  "gj:coordinates": {
    "@list": [
      {
        "@list": [
          {
            "@list": [
              -180,
              -90
            ]
          },
          {
            "@list": [
              180,
              -90
            ]
          },
          {
            "@list": [
              180,
              90
            ]
          },
          {
            "@list": [
              -180,
              90
            ]
          },
          {
            "@list": [
              -180,
              -90
            ]
          }
        ]
      }
    ]
  }
}

```


D.1.2. Example 2: Sentinel-2

D.1.2.1. GeoJSON

```
{
  "@context": "http://bp.schemas.opengis.net/17-084r1/eoc-geojson/1.0/eoc-geojson.jsonld",
  "type": "Feature",
  "id": "http://fedeo.esa.int/opensearch/request/?httpAccept=application/geo%2Bjson&parentIdentifier=EOP%3AESASentinel-2",
  "geometry": {
    "type": "Polygon",
    "coordinates": [
      [
        [
          -180,
          -90
        ],
        [
          180,
          -90
        ],
        [
          180,
          90
        ],
        [
          -180,
          90
        ],
        [
          -180,
          -90
        ]
      ]
    ]
  },
  "properties": {
    "title": "Sentinel-2 Products",
    "kind": "http://purl.org/dc/dcmitype/Collection",
    "identifier": "EOP:ESA:Sentinel-2",
    "rights": "Data are available upon fast registration",
    "abstract": "The Sentinel-2 mission is a land monitoring constellation of two satellites that provide high resolution optical imagery and provide continuity for the current SPOT and Landsat missions. The mission provides a global coverage of the Earth's land surface every 10 days with one satellite and 5 days with 2 satellites, making the data of great use in on-going studies. The satellites are equipped with the state-of-the-art
```

```

MSI (Multispectral Imager) instrument, that offers high-resolution
optical imagery.",
  "date": "2015-06-23T00:00:00Z/",
  "updated": "2019-07-28T15:23:57Z",
  "temporal": {
    "beginningDateTime": "2015-06-23T00:00:00Z"
  },
  "isPrimaryTopicOf": {
    "type": "CatalogRecord",
    "updated": "2019-07-17T00:00:00Z",
    "published": "2019-07-17T00:00:00Z",
    "lang": "en"
  },
  "categories": [
    {
      "term": "http://www.eionet.europa.eu/gemet/concept/4599",
      "label": "land"
    },
    {
      "term": "http://www.eionet.europa.eu/gemet/concept/4612",
      "label": "land cover"
    },
    {
      "term": "http://www.eionet.europa.eu/gemet/concept/1391",
      "label": "chlorophyll"
    },
    {
      "term": "http://www.eionet.europa.eu/gemet/concept/5496",
      "label": "natural disaster"
    },
    {
      "term": "http://gcmdservices.gsfc.nasa.gov/kms/concept/e5815f58-8232-4c7f-b50d-ea71d73891a9",
      "label": "EARTH SCIENCE > LAND SURFACE > LAND USE/LAND COVER"
    },
    {
      "term": "http://gcmdservices.gsfc.nasa.gov/kms/concept/ec0e2762-f57a-4fdc-b395-c8d7d5590d18",
      "label": "EARTH SCIENCE > HUMAN DIMENSIONS > NATURAL HAZARDS"
    },
    {
      "term": "https://earth.esa.int/concept/sentinel-2",
      "label": "Sentinel-2"
    },
    {
      "term": "https://earth.esa.int/concept/s2-msi",
      "label": "MSI"
    }
  ],
  "keyword": [
    "FedEO",
    "SCIHUB"
  ],
  "qualifiedAttribution": [

```

```

{
  "type": "Attribution",
  "agent": [
    {
      "type": "Organization",
      "email": "eohelp@eo.esa.int",
      "name": "ESA/ESRIN",
      "hasTelephone": [
        {
          "type": "Voice",
          "hasValue": "tel:+39 06 94180777"
        },
        {
          "type": "Fax",
          "hasValue": "tel:+39 06 94180292"
        }
      ],
      "uri": "http://www.earth.esa.int",
      "hasAddress": {
        "country-name": "Italy",
        "postal-code": "00044",
        "locality": "Frascati",
        "street-address": "Via Galileo Galilei CP. 64"
      }
    }
  ],
  "role": "originator"
},
"acquisitionInformation": [
  {
    "platform": {
      "id": "https://earth.esa.int/concept/sentinel-2",
      "platformShortName": "Sentinel-2",
      "platformSerialIdentifier": "A"
    },
    "instrument": {
      "id": "https://earth.esa.int/concept/s2-msi",
      "instrumentShortName": "MSI",
      "sensorType": "OPTICAL"
    }
  }
],
"productInformation": {
  "referenceSystemIdentifier": "epsg:4326",
  "processingLevel": "1C"
},
"links": {
  "alternates": [
    {
      "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=application/atom%2Bxml&parentIdentifier=EOP%3AESA%3AFEDEO%3ACOLLECTIONS&uid=EOP%3AESA%3ASentinel-2&recordSchema=server-choice",

```

```

    "type": "application/atom+xml",
    "title": "Atom format"
  },
  {
    "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19139%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso",
    "type": "application/vnd.iso.19139+xml",
    "title": "ISO 19139 metadata"
  },
  {
    "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19139-2%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso19139-2",
    "type": "application/vnd.iso.19139-2+xml",
    "title": "ISO 19139-2 metadata"
  },
  {
    "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/iso19115%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso19115",
    "type": "application/iso19115+xml",
    "title": "ISO MENDS metadata"
  },
  {
    "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19115-3%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso19115-3",
    "type": "application/vnd.iso.19115-3+xml",
    "title": "ISO 19115-3 metadata"
  },
  {
    "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/dif10%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=dif10",
    "type": "application/dif10+xml",
    "title": "DIF-10 metadata"
  },
  {
    "href": "http://fedeo.esa.int/opensearch/request/?
httpAccept=application/xml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=dc",
    "type": "application/xml",
    "title": "Dublin Core metadata"
  },
  {
    "href": "http://fedeo.esa.int/opensearch/request/?
httpAccept=application/rdf%2Bxml&parentIdentifier=EOP:ESA:FEDEO:
COLLECTIONS&uid=EOP:ESA:Sentinel-2&recordSchema=iso",
    "type": "application/rdf+xml",
    "title": "RDF/XML format"
  },
  {
  }

```

```

    "href": "http://fedeo.esa.int/opensearch/request/?
httpAccept=application/ld%2Bjson&parentIdentifier=EOP:ESA:FEDEO:
COLLECTIONS&uid=EOP:ESA:Sentinel-2&recordSchema=iso",
    "type": "application/ld+json",
    "title": "JSON-LD format"
  },
  {
    "href": "http://fedeo.esa.int/opensearch/request/?httpAccept=
text/turtle&parentIdentifier=EOP:ESA:FEDEO:COLLECTIONS&uid=EOP:ESA:
Sentinel-2&recordSchema=iso",
    "type": "text/turtle",
    "title": "Turtle format"
  }
],
  "describedby": [
    {
      "href": "https://sentinel.esa.int/web/sentinel/missions/
sentinel-2",
      "type": "text/html",
      "title": "ESA Sentinel Online"
    }
  ],
  "search": [
    {
      "href": "http://fedeo.esa.int/opensearch/description.xml?
parentIdentifier=EOP:ESA:SCIHUB:S2&sensorType=OPTICAL&startDate=
2015-06-23T00:00:00Z&endDate=",
      "type": "application/opensearchdescription+xml"
    }
  ],
  "previews": [
    {
      "href": "http://fedeo.esa.int/opensearch/images/esa.png",
      "type": "image/png",
      "title": "Quicklook"
    }
  ]
}
}
}
}

```

D.1.2.2. JSON-LD (Compacted)

The example below is identical to the example in the previous section, only a @context property is added.

```

{
  "@context": "http://bp.schemas.opengis.net/17-084r1/eoc-geojson/1.
0/eoc-geojson.jsonld",
  "type": "Feature",
  ... same content as example in previous section ...
}

```

```
}
```

D.1.2.3. JSON-LD (Expanded)

```
{
  "@context": {
    "@version": 1.1,
    "dct": "http://purl.org/dc/terms/",
    "atom": "http://www.w3.org/2005/Atom/",
    "iana": "http://www.iana.org/assignments/relation/",
    "os": "http://a9.com/-/spec/opensearch/1.1/",
    "eop": "http://www.opengis.net/ont/eo-geojson/1.0/",
    "owc": "http://www.opengis.net/ont/owc/1.0/",
    "gj": "https://purl.org/geojson/vocab#",
    "gsp": "http://www.opengis.net/ont/geosparql#",
    "vcard": "http://www.w3.org/2006/vcard/ns#",
    "skos": "http://www.w3.org/2004/02/skos/core#",
    "dcat": "http://www.w3.org/ns/dcat#",
    "xsd": "http://www.w3.org/2001/XMLSchema#",
    "prov": "http://www.w3.org/ns/prov#",
    "locln": "http://www.w3.org/ns/locn#",
    "foaf": "http://xmlns.com/foaf/0.1/",
    "schema": "http://schema.org/",
    "rdfs": "http://www.w3.org/2000/01/rdf-schema#",
    "adms": "http://www.w3.org/ns/adms#",
    "owl": "http://www.w3.org/2002/07/owl#"
  },
  "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/geo%2Bjson&parentIdentifier=EOP%3AESA%3AFEDEO
%3ACOLLECTIONS&uid=EOP%3AESA%3ASentinel-2",
  "@type": "dcat:Dataset",
  "dct:date": "2015-06-23T00:00:00Z/",
  "dct:description": "The Sentinel-2 mission is a land monitoring
constellation of two satellites that provide high resolution
optical imagery and provide continuity for the current SPOT
and Landsat missions. The mission provides a global coverage of
the Earth's land surface every 10 days with one satellite and 5
days with 2 satellites, making the data of great use in on-going
studies. The satellites are equipped with the state-of-the-art
MSI (Multispectral Imager) instrument, that offers high-resolution
optical imagery.",
  "dct:identifier": "EOP:ESA:Sentinel-2",
  "dct:modified": "2019-07-28T15:23:57Z",
  "dct:rights": "Data are available upon fast registration",
  "dct:temporal": {
    "dcat:startDate": "2015-06-23T00:00:00Z"
  },
  "dct:title": "Sentinel-2 Products",
  "dct:type": {
    "@id": "http://purl.org/dc/dcmitype/Collection"
  },
  "eop:productInformation": {
```

```

    "eop:processingLevel": "1C",
    "eop:referenceSystemIdentifier": {
      "@id": "epsg:4326"
    }
  },
  "owc:links": {
    "iana:alternate": [
      {
        "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/atom%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=server-
choice",
        "dct:title": "Atom format",
        "atom:type": "application/atom+xml"
      },
      {
        "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19139%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso",
        "dct:title": "ISO 19139 metadata",
        "atom:type": "application/vnd.iso.19139+xml"
      },
      {
        "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19139-2%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso19139-2",
        "dct:title": "ISO 19139-2 metadata",
        "atom:type": "application/vnd.iso.19139-2+xml"
      },
      {
        "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/iso19115%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso19115",
        "dct:title": "ISO MENDS metadata",
        "atom:type": "application/iso19115+xml"
      },
      {
        "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/vnd.iso.19115-3%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=iso19115-3",
        "dct:title": "ISO 19115-3 metadata",
        "atom:type": "application/vnd.iso.19115-3+xml"
      },
      {
        "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/dif10%2Bxml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=dif10",
        "dct:title": "DIF-10 metadata",
        "atom:type": "application/dif10+xml"
      },
      {
        "@id": "http://fedeo.esa.int/opensearch/request/?
httpAccept=application/xml&parentIdentifier=EOP%3AESASentinel-2&recordSchema=dc",

```

```

    "dct:title": "Dublin Core metadata",
    "atom:type": "application/xml"
  },
  {
    "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/rdf%2Bxml&parentIdentifier=EOP:ESA:FEDEO:
COLLECTIONS&uid=EOP:ESA:Sentinel-2&recordSchema=iso",
    "dct:title": "RDF/XML format",
    "atom:type": "application/rdf+xml"
  },
  {
    "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
application/ld%2Bjson&parentIdentifier=EOP:ESA:FEDEO:
COLLECTIONS&uid=EOP:ESA:Sentinel-2&recordSchema=iso",
    "dct:title": "JSON-LD format",
    "atom:type": "application/ld+json"
  },
  {
    "@id": "http://fedeo.esa.int/opensearch/request/?httpAccept=
text/turtle&parentIdentifier=EOP:ESA:FEDEO:COLLECTIONS&uid=EOP:ESA:
Sentinel-2&recordSchema=iso",
    "dct:title": "Turtle format",
    "atom:type": "text/turtle"
  }
],
"iana:describedby": {
  "@id": "https://sentinel.esa.int/web/sentinel/missions/sentinel-
2",
  "dct:title": "ESA Sentinel Online",
  "atom:type": "text/html"
},
"iana:icon": {
  "@id": "http://fedeo.esa.int/opensearch/images/esa.png",
  "dct:title": "Quicklook",
  "atom:type": "image/png"
},
"iana:search": {
  "@id": "http://fedeo.esa.int/opensearch/description.xml?
parentIdentifier=EOP:ESA:SCIHUB:S2&sensorType=OPTICAL&startDate=
2015-06-23T00:00:00Z&endDate=",
  "atom:type": "application/opensearchdescription+xml"
}
},
"dc:keyword": [
  "FedEO",
  "SCIHUB"
],
"dc:theme": [
  {
    "@id": "http://www.eionet.europa.eu/gemet/concept/4599",
    "skos:prefLabel": "land"
  },
  {
    "@id": "http://www.eionet.europa.eu/gemet/concept/4612",

```



```

    "skos:prefLabel": "land cover"
  },
  {
    "@id": "http://www.eionet.europa.eu/gemet/concept/1391",
    "skos:prefLabel": "chlorophyll"
  },
  {
    "@id": "http://www.eionet.europa.eu/gemet/concept/5496",
    "skos:prefLabel": "natural disaster"
  },
  {
    "@id": "http://gcmdservices.gsfc.nasa.gov/kms/concept/e5815f58-8232-4c7f-b50d-ea71d73891a9",
    "skos:prefLabel": "EARTH SCIENCE > LAND SURFACE > LAND USE/LAND COVER"
  },
  {
    "@id": "http://gcmdservices.gsfc.nasa.gov/kms/concept/ec0e2762-f57a-4fdc-b395-c8d7d5590d18",
    "skos:prefLabel": "EARTH SCIENCE > HUMAN DIMENSIONS > NATURAL HAZARDS"
  },
  {
    "@id": "https://earth.esa.int/concept/sentinel-2",
    "skos:prefLabel": "Sentinel-2"
  },
  {
    "@id": "https://earth.esa.int/concept/s2-msi",
    "skos:prefLabel": "MSI"
  }
],
"prov:qualifiedAttribution": {
  "@type": "prov:Attribution",
  "dct:type": {
    "@id": "http://inspire.ec.europa.eu/metadata-codelist/ResponsiblePartyRole/originator"
  },
  "prov:agent": {
    "@type": "vcard:Organization",
    "vcard:hasAddress": {
      "vcard:country-name": "Italy",
      "vcard:locality": "Frascati",
      "vcard:postal-code": "00044",
      "vcard:street-address": "Via Galileo Galilei CP. 64"
    },
    "vcard:hasEmail": "eohelp@eo.esa.int",
    "vcard:fn": "ESA/ESRIN",
    "vcard:hasTelephone": [
      {
        "@type": "vcard:Voice",
        "vcard:hasValue": {
          "@id": "tel:+39 06 94180777"
        }
      }
    ]
  }
},

```

```

    {
      "@type": "vcard:Fax",
      "vcard:hasValue": {
        "@id": "tel:+39 06 94180292"
      }
    }
  ],
  "vcard:hasURL": {
    "@id": "http://www.earth.esa.int"
  }
},
"prov:wasGeneratedBy": {
  "prov:used": [
    {
      "@id": "https://earth.esa.int/concept/s2-msi",
      "eop:instrumentShortName": "MSI",
      "eop:sensorType": {
        "@id": "eop:OPTICAL"
      }
    },
    {
      "@id": "https://earth.esa.int/concept/sentinel-2",
      "eop:platformSerialIdentifier": "A",
      "eop:platformShortName": "Sentinel-2"
    }
  ]
},
"foaf:isPrimaryTopicOf": {
  "@type": "dcat:CatalogRecord",
  "dct:issued": "2019-07-17T00:00:00Z",
  "dct:language": {
    "@id": "http://id.loc.gov/vocabulary/iso639-1/en"
  },
  "dct:modified": "2019-07-17T00:00:00Z"
},
"gj:geometry": {
  "@type": "gj:Polygon",
  "gj:coordinates": {
    "@list": [
      {
        "@list": [
          {
            "@list": [
              -180,
              -90
            ]
          },
          {
            "@list": [
              180,
              -90
            ]
          }
        ]
      }
    ]
  }
},

```

```

    {
      "aList": [
        180,
        90
      ]
    },
    {
      "aList": [
        -180,
        90
      ]
    },
    {
      "aList": [
        -180,
        -90
      ]
    }
  ]
}

```



ANNEX E (NORMATIVE)

ANNEX E: JSON SCHEMAS

ANNEX E

(NORMATIVE)

ANNEX E: JSON SCHEMAS

E.1. SCHEMAS FOR EOC JSON VALIDATION

JSON Schema [OR7] representation (Draft 04) is used to define the schemas. This specification is supported by several tools (including Altova XML Spy 2016, JSONBuddy 3.5 and also Web-based tools⁸) and is also used to define data types in the OpenAPI specification⁹. It does not allow to easily model composition of schemas or inheritance without relaxing the schemas. Therefore, the property "additionalProperties" is set to true in some schema definitions to allow using the "allOf" operator to model inheritance.

The schemas below assume that numbers are not surrounded by double quotes as per the JSON Style Guidelines [OR16].

The file is available at <http://bp.schemas.opengis.net/17-084r1/eoc-geojson/1.0/eoc-geojson-schema.json> (See Annex F:).

E.1.1. eoc-geojson-schema.json

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "GeoJSON encoding of EO Collection metadata",
  "description": "Definition of document with EO Collection metadata in GeoJSON encoding. Note that numbers in the instance should not be surrounded by double-quotes to validate against this schema. ",
  "$ref": "#/definitions/Feature",
  "definitions": {
    "Point": {
      "title": "Point",
      "type": "object",
      "properties": {
        "coordinates": {
          "title": "coordinates",
```

⁸E.g., <https://jsonschemalint.com/#/version/draft-04/markup/json> or <http://www.jsonschemavalidator.net/>

⁹<https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>

```

    "description": "One position (longitude, latitude)",
    "type": "array",
    "minItems": 2,
    "maxItems": 2,
    "items": {
      "type": "number"
    }
  },
  "type": {
    "type": "string",
    "enum": [
      "Point"
    ]
  }
},
"required": [
  "coordinates",
  "type"
],
"additionalProperties": false
},
"MultiPoint": {
  "title": "point",
  "type": "object",
  "properties": {
    "coordinates": {
      "title": "coordinates",
      "description": "Array of positions",
      "type": "array",
      "minItems": 1,
      "items": {
        "description": "One position",
        "type": "array",
        "minItems": 2,
        "maxItems": 2,
        "items": {
          "type": "number"
        }
      }
    }
  }
},
"type": {
  "type": "string",
  "enum": [
    "MultiPoint"
  ]
}
},
"required": [
  "coordinates",
  "type"
],
"additionalProperties": false
},
"LineString": {

```

```

"title": "LineString",
"type": "object",
"properties": {
  "coordinates": {
    "title": "coordinates",
    "description": "Array of positions",
    "type": "array",
    "minItems": 2,
    "items": {
      "description": "One position",
      "type": "array",
      "minItems": 2,
      "maxItems": 2,
      "items": {
        "type": "number"
      }
    }
  }
},
"type": {
  "type": "string",
  "enum": [
    "LineString"
  ]
},
"required": [
  "coordinates",
  "type"
],
"additionalProperties": false
},
"MultiLineString": {
  "title": "MultiLineString",
  "type": "object",
  "properties": {
    "coordinates": {
      "title": "coordinates",
      "description": "Array of linestring",
      "type": "array",
      "minItems": 1,
      "items": {
        "description": "Linestring, i.e. array of positions",
        "type": "array",
        "minItems": 2,
        "items": {
          "description": "Position (longitude, lattitude)",
          "type": "array",
          "minItems": 2,
          "maxItems": 2,
          "items": {
            "type": "number"
          }
        }
      }
    }
  }
}
}

```

```

    },
    "type": {
      "type": "string",
      "enum": [
        "MultiLineString"
      ]
    }
  },
  "required": [
    "coordinates",
    "type"
  ],
  "additionalProperties": false
},
"Polygon": {
  "title": "Polygon",
  "type": "object",
  "properties": {
    "coordinates": {
      "title": "coordinates",
      "description": "Array of linestrings",
      "type": "array",
      "minItems": 1,
      "items": {
        "description": "Linear ring, i.e. linestring or array of
positions",
        "type": "array",
        "minItems": 1,
        "items": {
          "description": "One position",
          "type": "array",
          "minItems": 2,
          "maxItems": 2,
          "items": {
            "type": "number"
          }
        }
      }
    }
  }
},
"type": {
  "type": "string",
  "enum": [
    "Polygon"
  ]
}
},
"required": [
  "coordinates",
  "type"
],
"additionalProperties": false
},
"MultiPolygon": {
  "title": "MultiPolygon",

```



```

    "type": "object",
    "properties": {
      "coordinates": {
        "title": "coordinates",
        "description": "Array of Polygons",
        "type": "array",
        "minItems": 1,
        "items": {
          "description": "Array of linestrings",
          "type": "array",
          "minItems": 1,
          "items": {
            "description": "Linear ring, i.e. linestring or array of
positions",
            "type": "array",
            "items": {
              "description": "One position",
              "type": "array",
              "minItems": 2,
              "maxItems": 2,
              "items": {
                "type": "number"
              }
            }
          }
        }
      },
      "type": {
        "type": "string",
        "enum": [
          "MultiPolygon"
        ]
      }
    },
    "required": [
      "coordinates",
      "type"
    ],
    "additionalProperties": false
  },
  "Geometry": {
    "title": "Geometry",
    "type": "object",
    "oneOf": [
      {
        "$ref": "#/definitions/Point"
      },
      {
        "$ref": "#/definitions/MultiPoint"
      },
      {
        "$ref": "#/definitions/LineString"
      }
    ]
  }

```

```

    "$ref": "#/definitions/MultiLineString"
  },
  {
    "$ref": "#/definitions/Polygon"
  },
  {
    "$ref": "#/definitions/MultiPolygon"
  }
],
{
  "Links": {
    "title": "Links",
    "description": "OGC 14-055r2",
    "type": "object",
    "properties": {
      "type": {
        "type": "string",
        "enum": [
          "Links"
        ]
      }
    }
  },
  "patternProperties": {
    "^(profiles|alternates|via|previews)$": {
      "description": "OGC 14-055r2",
      "type": "array",
      "minItems": 1,
      "items": {
        "$ref": "#/definitions/Link"
      }
    },
    "^(search|describedby|related)$": {
      "type": "array",
      "minItems": 1,
      "items": {
        "$ref": "#/definitions/Link"
      }
    }
  },
  "additionalProperties": {
    "type": "array",
    "minItems": 1,
    "items": {
      "$ref": "#/definitions/Link"
    }
  }
},
{
  "Properties": {
    "title": "Properties",
    "type": "object",
    "allOf": [
      {
        "type": "object",
        "properties": {

```

```

    "type": {
      "type": "string",
      "enum": [
        "Properties"
      ]
    },
    "isPrimaryTopicOf": {
      "$ref": "#/definitions/MetadataInformation"
    },
    "temporal": {
      "$ref": "#/definitions/TemporalExtent"
    },
    "spatial": {
      "$ref": "#/definitions/Location"
    },
    "acquisitionInformation": {
      "description": "OGC 17-003",
      "type": "array",
      "items": {
        "$ref": "#/definitions/AcquisitionInformation"
      }
    },
    "productInformation": {
      "$ref": "#/definitions/ProductInformation"
    }
  }
},
{
  "$ref": "#/definitions/DataIdentification"
},
{
  "$ref": "#/definitions/DescriptiveKeywords"
},
{
  "$ref": "#/definitions/RelatedUrl"
}
],
{
  "Feature": {
    "description": "GeoJSON Feature",
    "type": "object",
    "properties": {
      "@context": {},
      "type": {
        "title": "type",
        "type": "string",
        "enum": [
          "Feature"
        ]
      }
    },
    "id": {
      "type": "string",
      "format": "uri"
    }
  },

```

```

    "geometry": {
      "oneOf": [
        {
          "$ref": "#/definitions/Geometry"
        },
        {
          "type": "null"
        }
      ]
    },
    "properties": {
      "$ref": "#/definitions/Properties"
    },
    "bbox": {
      "type": "array",
      "minItems": 4,
      "maxItems": 4,
      "items": {
        "type": "number"
      }
    }
  },
  "required": [
    "type",
    "id",
    "geometry",
    "properties"
  ]
},
"Link": {
  "description": "OGC 14-055r2",
  "type": "object",
  "properties": {
    "href": {
      "type": "string",
      "format": "uri"
    },
    "type": {
      "description": "MIME type",
      "type": "string"
    },
    "title": {
      "type": "string"
    },
    "length": {
      "type": "integer",
      "minimum": 0,
      "exclusiveMinimum": true
    },
    "lang": {
      "description": "RFC-3066",
      "type": "string"
    }
  }
},

```

```

    "required": [
      "href"
    ],
  },
  "Offering": {
    "title": "Offering",
    "description": "Offering as defined in OGC 14-055r2",
    "type": "object",
    "properties": {
      "code": {
        "type": "string",
        "format": "uri"
      },
      "operations": {
        "type": "array",
        "items": {
          "$ref": "#/definitions/Operation"
        }
      },
      "contents": {
        "type": "array"
      },
      "styles": {
        "type": "array"
      }
    },
    "required": [
      "code"
    ]
  },
  "Operation": {
    "description": "OGC 14-055r2",
    "type": "object",
    "properties": {
      "code": {
        "type": "string"
      },
      "method": {
        "type": "string",
        "enum": [
          "GET",
          "POST",
          "PUT",
          "HEAD",
          "PATCH",
          "DELETE"
        ]
      },
      "type": {
        "description": "Media type",
        "type": "string"
      },
      "href": {
        "type": "string",

```

```

        "format": "uri"
      },
      "request": {
        "type": "object"
      },
      "result": {
        "type": "object"
      }
    },
    "required": [
      "code",
      "method",
      "href"
    ]
  },
  "Agent": {
    "description": "vcard:Kind, foaf:Agent subset. OGC 14-055r2.",
    "type": "object",
    "minProperties": 1,
    "properties": {
      "type": {
        "type": "string",
        "enum": [
          "Individual",
          "Kind",
          "Person",
          "Organization",
          "Agent"
        ]
      },
      "name": {
        "type": "string"
      },
      "email": {
        "type": "string",
        "format": "email"
      },
      "uri": {
        "type": "string",
        "format": "uri"
      }
    }
  },
  "Category": {
    "description": "OGC 14-055r2 §7.1.1.15",
    "type": "object",
    "properties": {
      "type": {
        "type": "string",
        "enum": [
          "Category"
        ]
      }
    }
  },
  "scheme": {

```

```

        "type": "string",
        "format": "uri"
    },
    "term": {
        "type": "string"
    },
    "label": {
        "type": "string"
    }
},
"required": [
    "term"
],
"additionalProperties": false
},
"DescriptiveKeywords": {
    "type": "object",
    "properties": {
        "subject": {
            "description": "Topic category",
            "type": "array",
            "minItems": 1,
            "items": {
                "$ref": "#/definitions/Category"
            }
        },
        "categories": {
            "description": "OGC 14-055r2 - Keywords associated with a
controlled vocabulary.",
            "type": "array",
            "minItems": 1,
            "items": {
                "$ref": "#/definitions/Category"
            }
        }
    },
    "keyword": {
        "description": "Keywords not associated with a controlled
vocabulary.",
        "type": "array",
        "minItems": 1,
        "items": {
            "type": "string",
            "minLength": 1
        }
    }
},
>DataContact": {
    "type": "object",
    "properties": {
        "publisher": {
            "description": "role=\"publisher\" (OGC 14-055r2)",
            "type": "string"
        }
    },

```

```

"authors": {
  "description": "role=\"creator\" (OGC 14-055r2)",
  "type": "array",
  "minItems": 1,
  "items": {
    "$ref": "#/definitions/Agent"
  }
},
"contactPoint": {
  "description": "Role=\"contact point\"",
  "type": "array",
  "minItems": 1,
  "items": {
    "$ref": "#/definitions/Agent"
  }
},
"qualifiedAttribution": {
  "description": "Role=other",
  "type": "array",
  "minItems": 1,
  "items": {
    "$ref": "#/definitions/Attribution"
  }
}
},
"MetadataInformation": {
  "description": "dcat:CatalogRecord",
  "type": "object",
  "properties": {
    "type": {
      "description": "dcat:CatalogRecord",
      "type": "string",
      "enum": [
        "CatalogRecord"
      ]
    },
    "created": {
      "description": "dct:created",
      "type": "string",
      "format": "date-time"
    },
    "published": {
      "description": "dct:issued",
      "type": "string",
      "format": "date-time"
    },
    "updated": {
      "description": "dct:modified",
      "type": "string",
      "format": "date-time"
    },
    "lang": {
      "description": "dct:language",

```



```

    "type": "string"
  },
  "conformsTo": {
    "$ref": "#/definitions/Standard"
  }
},
"DataIdentification": {
  "type": "object",
  "allOf": [
    {
      "type": "object",
      "properties": {
        "kind": {
          "description": "dct:type",
          "type": "string",
          "format": "uri"
        },
        "title": {
          "description": "dct:title - OGC 14-055r2",
          "type": "string"
        },
        "identifier": {
          "type": "string"
        },
        "bibliographicCitation": {
          "description": "dct:bibliographicCitation",
          "type": "string"
        },
        "abstract": {
          "description": "dct:description - OGC 14-055r2",
          "type": "string"
        },
        "provenance": {
          "description": "dct:ProvenanceStatement",
          "type": "array",
          "minItems": 1,
          "items": {
            "$ref": "#/definitions/ProvenanceStatement"
          }
        },
        "wasUsedBy": {
          "description": "prov:Activity",
          "type": "array",
          "minItems": 1,
          "items": {
            "$ref": "#/definitions/Activity"
          }
        },
        "doi": {
          "description": "adms:identifier",
          "type": "string"
        },
        "versionInfo": {

```

```

        "description": "owl:versionInfo",
        "type": "string"
    },
    "versionNotes": {
        "description": "adms:versionNotes",
        "type": "string"
    }
},
"required": [
    "title",
    "identifier"
],
},
{
    "$ref": "#/definitions/DataContact"
},
{
    "$ref": "#/definitions/ResourceConstraints"
},
{
    "$ref": "#/definitions/DataDates"
}
]
},
"Attribution": {
    "description": "prov:Attribution",
    "type": "object",
    "properties": {
        "type": {
            "type": "string",
            "enum": [
                "Attribution"
            ]
        }
    },
    "role": {
        "description": "ResponsibleParty role",
        "type": "string",
        "enum": [
            "resourceProvider",
            "custodian",
            "owner",
            "user",
            "distributor",
            "originator",
            "pointOfContact",
            "principalInvestigator",
            "processor",
            "publisher",
            "author"
        ]
    },
    "agent": {
        "type": "array",
        "items": {

```

```

        "$ref": "#/definitions/Agent"
    }
}
},
"required": [
    "role",
    "agent"
]
},
"AcquisitionParameters": {
    "type": "object",
    "allOf": [
        {
            "$ref": "#/definitions/TemporalExtent"
        }
    ]
},
"TemporalExtent": {
    "type": "object",
    "properties": {
        "type": {
            "type": "string",
            "enum": [
                "PeriodOfTime"
            ]
        },
        "beginningDateTime": {
            "type": "string",
            "format": "date-time"
        },
        "endingDateTime": {
            "type": "string",
            "format": "date-time"
        }
    }
},
"AcquisitionInformation": {
    "type": "object",
    "properties": {
        "type": {
            "type": "string",
            "enum": [
                "AcquisitionInformation"
            ]
        },
        "platform": {
            "$ref": "#/definitions/Platform"
        },
        "instrument": {
            "$ref": "#/definitions/Instrument"
        },
        "acquisitionParameters": {
            "$ref": "#/definitions/TemporalExtent"
        }
    }
}

```

```

    }
  },
  "Platform": {
    "type": "object",
    "minProperties": 1,
    "properties": {
      "type": {
        "type": "string",
        "enum": [
          "Platform"
        ]
      },
      "id": {
        "type": "string",
        "format": "uri"
      },
      "platformShortName": {
        "type": "string"
      },
      "platformSerialIdentifier": {
        "type": "string"
      },
      "orbitType": {
        "type": "string",
        "enum": [
          "GEO",
          "LEO"
        ]
      }
    },
    "required": [
      "platformShortName"
    ],
    "additionalProperties": false
  },
  "Instrument": {
    "type": "object",
    "properties": {
      "type": {
        "type": "string",
        "enum": [
          "Instrument"
        ]
      },
      "id": {
        "type": "string",
        "format": "uri"
      },
      "sensorType": {
        "type": "string",
        "enum": [
          "OPTICAL",
          "RADAR",
          "ATMOSPHERIC",

```

```

        "ALTIMETRIC",
        "LIMB"
    ],
    },
    "instrumentShortName": {
        "type": "string"
    },
    "description": {
        "type": "string"
    }
},
"required": [
    "instrumentShortName"
],
"additionalProperties": false
},
"ProductInformation": {
    "description": "OGC 17-003",
    "type": "object",
    "properties": {
        "type": {
            "type": "string",
            "enum": [
                "ProductInformation"
            ]
        },
        "processingLevel": {
            "description": "eop:processingLevel - OGC 17-003",
            "type": "string",
            "enum": [
                "1A",
                "1B",
                "1C",
                "2",
                "3"
            ]
        },
        "productType": {
            "description": "eop:productType - OGC 17-003",
            "type": "array",
            "items": {
                "type": "string",
                "minLength": 1
            }
        },
        "resolution": {
            "type": "array",
            "minItems": 1,
            "items": {
                "type": "number",
                "minimum": 0,
                "exclusiveMinimum": true
            }
        }
    },
    },

```

```

    "referenceSystemIdentifier": {
      "type": "string"
    },
    "timeliness": {
      "description": "eop:timeliness - OGC 17-003",
      "type": "string"
    }
  },
  "RelatedUrl": {
    "type": "object",
    "properties": {
      "links": {
        "$ref": "#/definitions/Links"
      },
      "offerings": {
        "description": "OGC 14-055r2",
        "type": "array",
        "minItems": 1,
        "items": {
          "$ref": "#/definitions/Offering"
        }
      }
    }
  },
  "required": [
    "links"
  ],
  "Location": {
    "description": "dct:Location (alternative representation of geometry).",
    "type": "object",
    "properties": {
      "type": {
        "type": "string",
        "enum": [
          "Location"
        ]
      }
    },
    "id": {
      "type": "string",
      "format": "uri"
    },
    "geometry": {
      "description": "locn:geometry",
      "type": "array",
      "items": {
        "description": "locn:Geometry",
        "type": "object",
        "properties": {
          "type": {
            "type": "string"
          },
          "value": {

```

```

        "type": "string"
      }
    }
  }
},
"ResourceConstraints": {
  "type": "object",
  "properties": {
    "rights": {
      "description": "OGC 14-055r2 §7.1.2.7",
      "type": "string"
    },
    "license": {
      "description": "dct:LicenseDocument",
      "type": "array",
      "items": {
        "$ref": "#/definitions/LicenseDocument"
      }
    },
    "accessRights": {
      "description": "dct:RightsStatement",
      "type": "array",
      "items": {
        "$ref": "#/definitions/RightsStatement"
      }
    }
  }
},
"LicenseDocument": {
  "description": "dct:LicenseDocument",
  "type": [
    "object",
    "string"
  ],
  "oneOf": [
    {
      "type": "object",
      "properties": {
        "type": {
          "type": "string",
          "enum": [
            "LicenseDocument"
          ]
        },
        "label": {
          "description": "rdfs:label",
          "type": "string"
        }
      }
    },
    {
      "required": [
        "label"
      ]
    }
  ]
}

```

```

    },
    {
      "description": "@id",
      "type": "string",
      "format": "uri"
    }
  ]
},
"RightsStatement": {
  "description": "dct:RightsStatement",
  "type": [
    "object",
    "string"
  ],
  "oneOf": [
    {
      "type": "object",
      "properties": {
        "type": {
          "type": "string",
          "enum": [
            "RightsStatement"
          ]
        },
        "label": {
          "description": "rdfs:label",
          "type": "string"
        }
      }
    },
    {
      "description": "@id",
      "type": "string",
      "format": "uri"
    }
  ]
},
"ProvenanceStatement": {
  "title": "dct:provenance",
  "description": "dct:ProvenanceStatement",
  "type": "object",
  "properties": {
    "type": {
      "type": "string",
      "enum": [
        "ProvenanceStatement"
      ]
    },
    "label": {
      "description": "rdfs:label",
      "type": "string"
    }
  }
}

```



```

    }
  },
  "required": [
    "label"
  ]
},
"Activity": {
  "description": "prov:Activity",
  "type": "object",
  "properties": {
    "type": {
      "type": "string",
      "enum": [
        "Activity"
      ]
    },
    "generated": {
      "$ref": "#/definitions/Entity"
    },
    "qualifiedAssociation": {
      "$ref": "#/definitions/Association"
    }
  },
  "required": [
    "generated",
    "qualifiedAssociation"
  ]
},
"Entity": {
  "description": "prov:Entity",
  "type": "object",
  "properties": {
    "type": {
      "type": "string",
      "enum": [
        "Entity"
      ]
    },
    "degree": {
      "type": "string",
      "format": "uri"
    },
    "description": {
      "type": "string"
    }
  },
  "required": [
    "degree"
  ]
},
"Association": {
  "description": "prov:Association",
  "type": "object",
  "properties": {

```

```

    "type": {
      "type": "string",
      "enum": [
        "Association"
      ]
    },
    "hadPlan": {
      "$ref": "#/definitions/Plan"
    }
  },
  "required": [
    "hadPlan"
  ]
},
"Plan": {
  "description": "prov:Plan",
  "type": "object",
  "properties": {
    "type": {
      "type": {
        "type": "string",
        "enum": [
          "Plan"
        ]
      }
    },
    "wasDerivedFrom": {
      "$ref": "#/definitions/Standard"
    }
  },
  "required": [
    "wasDerivedFrom"
  ]
},
"Standard": {
  "description": "dct:Standard",
  "type": "object",
  "properties": {
    "type": {
      "type": {
        "type": "string",
        "enum": [
          "Standard"
        ]
      }
    },
    "title": {
      "description": "dct:title",
      "type": "string"
    },
    "issued": {
      "description": "dct:issued",
      "type": "string",
      "format": "date-time"
    },
    "versionInfo": {
      "description": "owl:versionInfo",
      "type": "string"
    }
  }
}

```

```

    }
  },
  "required": [
    "title"
  ]
},
"DataDates": {
  "type": "object",
  "properties": {
    "created": {
      "description": "dct:created",
      "type": "string",
      "format": "date-time"
    },
    "published": {
      "description": "dct:issued",
      "type": "string",
      "format": "date-time"
    },
    "updated": {
      "description": "dct:modified",
      "type": "string",
      "format": "date-time"
    },
    "date": {
      "description": "dct:date - OGC 14-055r2",
      "type": "string"
    }
  },
  "required": [
    "updated"
  ]
}
}
}
}

```



ANNEX F (NORMATIVE) SCHEMAS AND EXAMPLES



ANNEX F (NORMATIVE) SCHEMAS AND EXAMPLES

The following schemas, context file and selected examples are provided in the OGC schema repository:

- `eoc-geojson-schema.json`
- `eoc-geojson.jsonld`
- `example-1-landsat.json`
- `example-1-landsat.jsonld`
- `example-2-sentinel-2.json`
- `example-2-sentinel-2.jsonld`

They are available at <http://bp.schemas.opengis.net/17-084r1/eoc-geojson/1.0>.



ANNEX G (INFORMATIVE) REVISION HISTORY



ANNEX G (INFORMATIVE) REVISION HISTORY

Table — Revision history

DATE	VERSION	EDITOR	SECTION	DESCRIPTION
			MODIFIED	
1/11/2010	0.1.0	Y. Coene	All	Initial version shared with CGI and ESA members of the SWG for initial comments.
13/12/2010	0.9.0 D1	Y. Coene	All	Revised version to be published on OGC SWG Web pages for feedback.
20/02/2011	0.9.0 D2	Y. Coene	All	Metadata Information requirements class separated. Data Identification requirements class extended with additional subsections corresponding to GeoDCAT-AP encoding to allow for OGC 13-026r9 queryable mapping onto metadata properties in OGC 17-047r1.
18/07/2011	0.9.0 D5	Y. Coene	All	Completion of incomplete sections. Further alignment with GeoDCAT-AP, and use of additional DCAT Version 2 properties. First version of ATS in Annex A. Update of mapping tables in Annex C.
26/07/2019		Y. Coene	All	platform and instrument (prov:used), . acquisitionInformation (prov:wasGeneratedBy), AcquisitionInformation (prov:Activity) encodings aligned with DCAT Version 2 Example 47. acquisitionParameters property added to AcquisitionInformation for compatibility with OGC 17-003 encoding. Dates interpreted as prov:startedAtTime. bibliographicCitation (dct: bibliographicCitation) property added to dcat:Dataset as in Example 47 of DCAT Version 2. Mappable to UMM-S "ServiceCitation" and UMM-C "PublicationReference".
03/09/2019	0.9.0 D6	Y. Coene	Annex C	Comments from Sirko Schindler (DLR, 28/08/2019) addressed:
			5.4	Namespace corrected ("eoc" instead of "os").
			7.3.1	Definition in table reformatted.
			7.3.3	Reference to definition of Agent added.
			7.3.4	Agent example and table extended with vcard properties.
			7.4	URI allowed for LicenseDocument and RightsStatement and examples added.

DATE	VERSION	EDITOR	SECTION	DESCRIPTION	MODIFIED
			10	Reference (footnote) to ShEx added as alternative for SHACL.	
			B.2.1	"@type": "@id" added for url (vcard:hasURL) mapping. Mapping for \$.properties.wasUsedBy.generated.description added. Mapping for vcard and foaf properties related to Agent updated/completed.	
			Annex C	Range of properties removed from table. Mapping for all Agent related properties (vcard and foaf) revised.	
24/10/2019	0.9.0	D7 Y. Coene	Annex C.1	Added references to UMM-C §2.2.1 (identifier), §2.2.5 (abstract), §2.5.1 (beginningDateTime, endingDateTime) traceability table.	
24/01/2020	0.9.0	D8 Y. Coene	Annex C.1	Integrated GeoJSON UMM-C mapping table provided by Michael Morahan (NASA, 01/11/2019). Explanation added that Collection_Progress (UMM-C) can be derived from temporal extent as agreed during CEOS WGISS SLT telco 5/12/2019.	20191101
			Examples 3 and 5.	"kind" property added to example.	
			2.2	List of conformance classes aligned with Annex A subsections.	
			3.1	OGC 17-047r1 reference added to be referred to from chapter 6 to address the comments from Allan Doyle (NASA, 3/10/2019).	
			3.2	References for JSON-LD 1.1 and DCAT Version 2 updated.	
			6	Paragraphs 1 and 4 of chapter 6 updated addressing the comments from Allan Doyle (NASA, 3/10/2019).	
			7.1.1	Example extended with additional properties from corresponding table.	
			7.6.1	"describedby" example extended with Jupyter Notebook example.	
			7.10	productType and resolution arrays added to diagram, table and example addressing the comments from Martine Paepen (VITO, 11/12/2019).	
			Annex B.2.1	@context mapping for GeoJSON coordinates updated according to Example 84 in JSON-LD 1.1 W3C Candidate Recommendation 12 December 2019. dcat:startDate and dcat:endDate used instead of schema:startDate and schema:endDate. Updated with latest content of @context source file.	
			Annex C.1	productType and resolution added addressing the comments from Martine Paepen (VITO, 11/12/2019). dcat:startDate and dcat:endDate used instead of schema:startDate and schema:endDate.	

DATE	VERSION	EDITOR	SECTION	DESCRIPTION
			MODIFIED	
			1	Annex D. JSON-LD examples regenerated with JSON-LD Playground and current version of @context.
			1	Annex E. Schema for MultiPoint corrected.
30/01/2020	0.0 D9	Y. Coene		Changes applied as agreed during SWG teleconference on 30/01/2020:
			7.6.1	Examples with "search" link added for OpenAPI and SPARQL.
			10	Added use of rich text instead of plain text for properties such as "abstract" to future work.
			10	Added GeoJSON Feature encoding inline with OGC API – Features – Part 1: Core (OGC 17-069r3) to future work.
			Annex E	Annex E.2 removed. Annex E.1 contains a standalone JSON schema for validating document instances.
			Annex F	List of files update as JSON schema is provided as a standalone schema.
20/05/2020	0.0 D10	Y. Coene	All	Remaining (green) editor notes removed. Occurrences of OGC 17-003 replaced by OGC 17-003r2.
			3.1	URL added for NR3 and NR4.
			3.2	References OR21 (JSON-LD) and OR25 (DCAT Version 2) updated to current versions.
			7.3.4	definition of "name" property improved (to explain difference with hasName). hasName, given-name, family-name, additional-name added, taken from https://www.w3.org/2006/vcard/ns . Subproperties of hasAddress listed in table for clarity. Example added of the use of hasName property.
			B.2.1	JSON-LD @context updated to take into account changes in section 7.3.4 related to Agent properties (encoded in FOAF and VCARD depending on the context).
			C.1	Rows for hasName property added in mapping table. Mapping for "name" changed into "vcard:fn".
			D.1.2.4	vcard:hasName replaced by vcard:fn in expanded example.