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EO Product Collection, Service and Sensor Discovery using the CS-W ebRIM Catalogue

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Abstract

This is an OGC Best Practice document describing the relations that exist between several metadata conceptual models (EO Product, EO Product Collections, Sensors and Services). The specification of the linking between different artifacts is important for the process of cataloguing and discovering those artifacts.

Keywords

ogcdoc, ogc document, csw, catalogue, ebrim, sensors, discovery, eo

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1 Introduction

This document is created within the SMAAD (Semantic-web Mediated Access Across Domains) project. This European Project aims at validating the technical choices concerning metadata and discovery within the Earth Observation domain made within the Heterogeneous Mission Accessibility series of projects.

This document proposes a technical guideline for implementing the discovery of EO Product Collections, EO Services and EO Sensors.

This document contains an analysis of the minimal EO Product collection and EO Services metadata that is to be supplied for meaningful and concise descriptions of EO Product Collections and EO Services and documents the effects on the existing CIM extension Package of the ebRIM Application Profile of CSW.

1.1 Document contributor contact points

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1.2 Revision history

Date	Release	Editor	Primary clauses modified	Description
2011-10-06	1.0	S. Smolders, F. Houbie	All	Initial version
2012-03-30	1.1	F. Houbie	All	Add Sensor linking information

1.3 Future work

This document is a description of the relations that exist between different metadata models and their cataloguing process. Evolutions in the metadata models or catalogue specifications could have impact on the content of this document.

1.4 Forward

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

2 References

The following documents provide background reference. In the body of the text these documents are referenced as listed below.

[RD01] ISO 19115:2003 Geographic Information – Metadata

[RD02] ISO 19119, Geographic Information – Services (ISO 19119:2005) 21/06/2006, http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=39890

[RD03] ISO 19139, Geographic Information – Metadata XML (ISO 19139:2007), http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=32557

[RD04] OGC 09-163r2, OGC Catalogue Services Specification 2.0, Extension Package for ebRIM Application Profile: SensorML, Version 0.0.3, 02/04/2010.

[RD05] OGC 06-131r6, OGC Catalogue Services Specification 2.0, Extension Package for ebRIM Application Profile: Earth Observation Products, Version 1.0.0, 10/02/2010 http://portal.opengeospatial.org/files/?artifact_id=28152

[RD06] OGC 07-038r3, OGC Cataloguing of ISO Metadata (CIM) – Using the ebRIM profile of CS-W, Version 0.1.12

[RD07] OGC 07-045, OpenGIS Catalogue Services Specification 2.0.2 – ISO Metadata Application Profile, Version 1.0, 19/07/2007, http://portal.opengeospatial.org/files/?artifact_id=21460

[RD08] DRAFT HMA EO Product Collection and Service Discovery using the ISO Metadata Application Profile of CSW 2.0.1, OGC 07-025 (not published)

[RD09] OGC 04-038r4 OpenGIS Catalogue Services Specification 2.0.1 (with Corrigendum) ISO Metadata Application Profile

[RD10] OGC 10-168 DRAFT, OGC SensorML Encoding Standard, Version 2.0.0, 2011-06-27

[RD11] ISO 19115/Cor.1:2006, Geographic information – Metadata, Technical Corrigendum 1

[RD12] INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119, INSPIRE Drafting Team Metadata and European Commission Joint Research Centre, V. 1.2, 2010-06-16

[RD13] ISO 19119:2005/PDAM 1 - Extensions of the service metadata model http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=44268

[RD14] INSPIRE Metadata Regulation, 03/12/2008, COMMISSION REGULATION (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008R1205:EN:NOT

[RD15] Corrigendum to INSPIRE Metadata Regulation 15.12.200, Corrigendum to INSPIRE Metadata Regulation published in the Official Journal of the European Union, L 328, page 83, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008R1205R%2802%29:EN:NOT

[RD16] ISO 19115-2:2009 - Geographic information -- Metadata -- Part 2: Extensions for imagery and gridded data

[RD17] ISO 19139-2, Geographic Information – Metadata – XML Schema Implementation – Part 2: Extensions for imagery and gridded data – DRAFT

[RD18] OGC 11-043 DRAFT, Sensor Model Language 2.0 Extensions for Earth Observation Instruments and Platforms, Version: 1.0.0, 2011-04-15

[RD19] OGC 08-167 Semantic Annotation of OGC standards, Version 2.1 2011-07-27

[RD20] OGC 10-157 Earth Observation Metadata profile of Observations & Measurements, Version 1.0.0, 2011-06-02

3 Terms and definitions

dataset
identifiable collection of data (ISO19115)

dataset series
collection of datasets sharing the same product specification (ISO19115)

EO product collection
An EO product collection is equivalent to a dataset series as defined within the ISO 19XXX series of standards. It is a collection of datasets sharing the same product specification.

In the Earth Observation context, a collection typically corresponds to datasets (i.e. products) derived from data acquired by a single sensor onboard a satellite or series of satellites and having the same operation mode. Examples of EO Product Collections are “TerraSAR-X spotlight mode ” or “ESA ENVISAT MERIS Full Resolution L1+2”

EO Service
Web Service that operates on the above mentioned EO product collections.

Examples of such services include catalogue services that allow discovery of EO data products, EO Product Collections, EO Sensors and EO Services, EO Feasibility Analysis services, EO Ordering services, on-line EO data access services and EO Web Map Services.

interface
named set of operations that characterize the behaviour of an entity (ISO19119)

metadata
data about data (ISO19115)

metadata element
discrete unit of metadata (ISO19115)

metadata entity
set of metadata elements describing the same aspect of data (ISO19115)

model
abstraction of some aspects of a universe of discourse (ISO19115)

operation
specification of a transformation or query that an object may be called to execute (ISO19119)

resource
asset or means that fulfils a requirement (ISO19115)

service
distinct part of the functionality that is provided by an entity through interfaces ([ISO/IEC TR 14252])

service interface
shared boundary between an automated system or human being and another automated system or human being [ISO 19101]

4 Conventions

4.1 Abbreviated terms

AP	Application Profile
CIM	Cataloguing of ISO Metadata
CSW	Catalogue Services for the Web
DLR	Deutsches Zentrum für Luft- und Raumfahrt
ebRIM	eBusiness Registry Information Model
EO	Earth Observation
ESA	European Space Agency
HMA	Heterogeneous Missions Accessibility
INSPIRE	Infrastructure for Spatial Information in Europe
ISO	International Organisation for Standardisation
OGC	Open Geospatial Consortium
TBC	To Be Confirmed
TBD	To Be Defined
UML	Unified Modelling Language
XML	eXtensible Markup Language

4.2 UML notation

Most diagrams that appear in this standard are presented using the Unified Modeling Language (UML) static structure diagram, as described in Subclause 5.2 of [OGC 06-121r3].

5 Introduction

During the Heterogeneous Missions Accessibility (HMA) series of Projects managed by the European Space Agency (ESA), the HMA stakeholders defined a minimal set of metadata elements that are required to describe a Collection of Earth Observation Products.

This EO Production Collection metadata information model was based on the ISO 19115 metadata model which was adapted for use in the EO/HMA Context in the following manner:

- It was constrained by making some optional ISO1915 elements mandatory (e.g. fileIdentifier)
- It was constrained by fixing the values for some elements (e.g. hierarchyLevel fixed to series).
- In addition some additional metadata elements were defined that were not covered in ISO19115. The names of some of these elements were taken from the ISO19115/Part 2 Draft version available at that time without however adopting the full ISO19115-Part 2 information model.

6 Metadata models

6.1 EO Product Collection minimal information model

6.1.1 EO Product Collection information model

The following simplified UML class diagram shows the metadata elements that are minimally required for describing EO Product Collections. Other elements as permitted by ISO19115 may be added to obtain a more complete description:

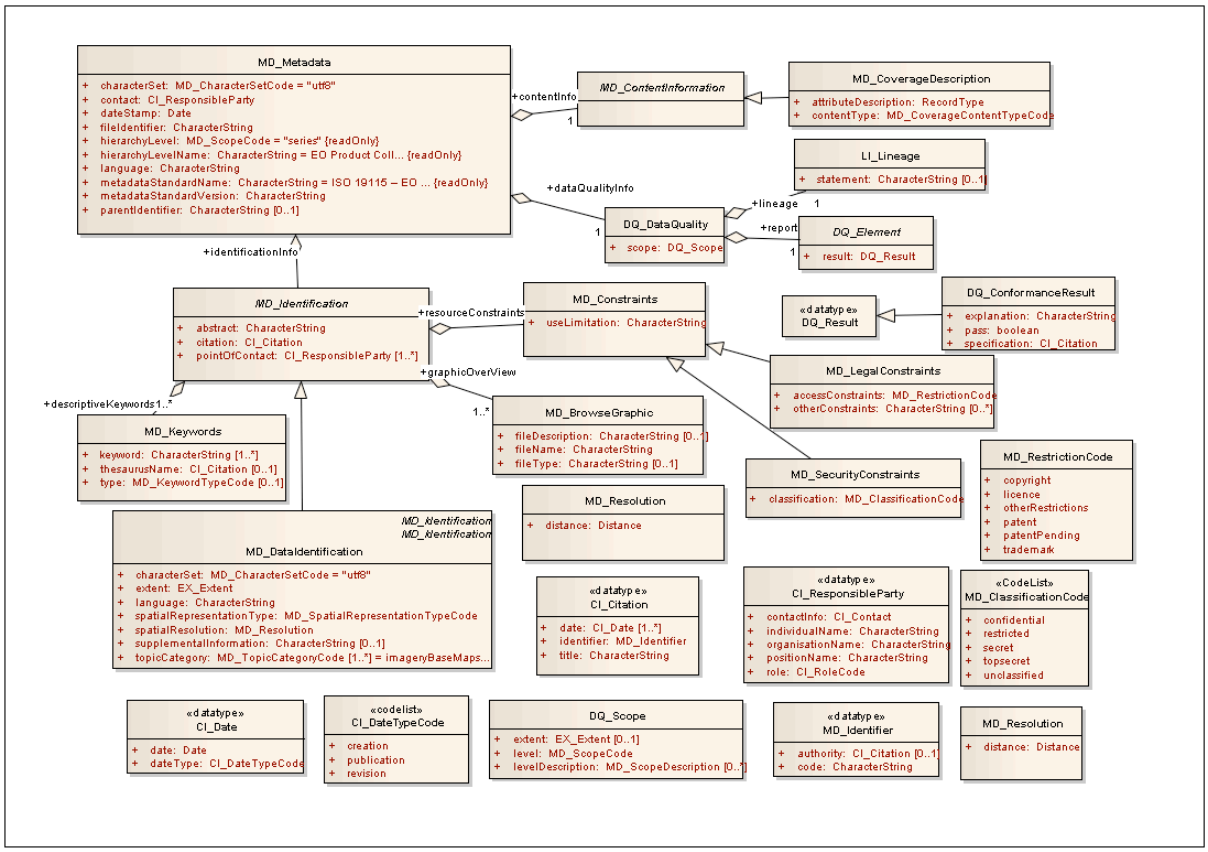

Figure 1 EO Product Collection metadata (Simplified UML class diagram – using ISO19115 elements only – not all dataTypes/codelists included)

The following tables constitute the data dictionary. It only lists the mandated metadata elements with the changes and additional constraints with respect to ISO19115 indicated in **Bold.**

The contents of the INSPIRE column indicates whether this is one of the metadata elements mandated by INSPIRE and gives the INSPIRE Metadata Element name as well as the reference to the paragraph of the Implementing Rule.

Name / Role name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE

MI_Metadata	root entity which defines metadata about a resource or resources	M	1	Following lines in this table	
fileIdentifier	unique identifier for this metadata file ***Clarification for EO Product Collection metadata:*** **This fileIdentifier is equal to the identifier of the EO Product Collection**	**M**	1	Free text	
language	language used for documenting metadata	**M**	1	ISO 639-2, other parts may be used	Metadata language Part B 10.3
characterSet	full name of the character coding standard used for the metadata set	**M**	1	MD_CharacterSetCode <<CodeList>>	
hierarchyLevel	scope to which the metadata applies.	**M**	1	**Fixed value "series"**	Part B1.3 Resourc e Type
hierarchyLevelName	name of the hierarchy level for which the metadata is provided.	**M**	1	**Fixed value "EO Product Collection"**	
contact	party responsible for the EO Product Collection	M	1	CI_ResponsibleParty <<DataType>>	Metadata point of contact Part B 10.1
dateStamp	date that the metadata was created	M	1	Date	Metadata date Part B10.2
metadataStandardName	name of the metadata standard (including profile name) used	M	1	**Fixed value of OGC 11-035**	
metadataStandardVersion	version of the metadata standard (version of the profile) used	M	1	Free text	
Role name: identificationInfo	basic information about the resource(s) to which the metadata applies	M	1	MD_DataIdentification	
Role name: contentInfo	**describes the coverage and image data characteristics**	O	1	MD_ContentInformation <<Abstract>> MD_Coverage Description	
Role name dataQualityInfo	provides an overall assessment of quality of a resource (s)	**M**	1	DQ_DataQuality	Required for Lineage - B 6.1

Table 1 Metadata entity set information (EO Product Collection Mandatory elements only)

Name / Role name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
CI_Responsible Party	identification of, and means of communication with, person(s) and organizations associated with the dataset	**M**	1		

individualName	name of the responsible person- surname, given name, title separated by a delimiter	**M**	1	Free text	
organisationName	name of the responsible organization	**M**	1	Free text	
positionName	role or position of the responsible person	**M**	1	Free Text	
contactInfo	contactInfo	**M**	1	CI_Contact <<DataType>>	
Role	function performed by the responsible party	**M**	1	CI_RoleCode <<CodeList>> INSPIRE schematron rules mandates pointOfContact	Responsible Party Role Part B 9.2

Table 2 CI_ResponsibleParty (EO Product Collection Mandatory elements only)

Name / Role name	**Definition**	**Obligation/ Condition**	**Maximum occurrence**	**Domain**	**INSPIRE**
MD_Identification					
citation	citation data for theresource(s)	M	1	CI_Citation<<DataType>>	
abstract	brief narrative summary ofthe content of the resource(s)	M	1	Free text	Part B1.2 Resource Abstract
language	language(s) used within thedataset	M	N	ISO 639-2,other parts may be used	Part B 1.7 Resource Language
pointOfContact	identification of, and meansof communication with, person(s) andorganization(s) associated with the resource(s)	**M**	N	CI_ResponsibleParty<<DataType>>	Responsible Party Part B.9.1 and Responsible Party Role Part B 9.2
Role name: graphicOverview	Reference to an image that illustrates the EO Product Collection.	**M**	N	MD_BrowseGraphic	
Role name: resourceConstraints	provides information aboutconstraints whichapply to the resource(s)	**M**	1	MD_Constraints	Required for Part B.8.2 and B.8.1
Role name: descriptiveKeywords[1]	provides category keywords,their type, and reference source	**M**	N	MD_Keywords	Required for Parts B 3.1 and B.3.2

[1] compositeType is stored in ISO19115 using Keywords of Type Temporal that identifies a identifies a time period related to the dataset

characterSet	full name of the charactercoding standard used for the dataset	**M**	1	MD_CharacterSetCode<<CodeList>>	
topicCategory	main theme(s) of the dataset	**M**	N	**Fixed value is imageryBaseMapsEarthCover**	Part B2.1 Topic category
spatialRepresentationType	method used to spatially represent geographic information	**M**	1	MD_SpatialRepresentationTypeCodeList **Default value is grid**	
spatialResolution	factor which provides a general understanding of the density of spatial data in the dataset	**M**	1	MD_Resolution	Spatial Resolution (Part B 6.2)
extent	extent information including the bounding box, bounding polygon, vertical, and temporal extent	**M**	1	EX_Extent	Required for Geographic Bounding Box Part B4.1) And Temporal Extent (Part B.5.1) Minimally 1 temporal property needs to be provided.

Table 3 DataIdentification Information (EO Product Collection Mandatory elements only)

Name / Role name	**Definition**	**Obligation/ Condition**	**Maximum occurrence**	**Domain**	**INSPIRE**
CI_Citation	standardized resource reference				
date	reference date for the cited resource Both creation and revision dates should be included	M	N	CI_Date	Date of publication (Part B 5.2) Date of last revision (Part B 5.3) Date of creation (Part B 5.4)
title	Name by which the cited resource is known	M	1	Free Text	Part B1.1 Resource title

identifier	value uniquely identifying an object within a namespace	**M**	1	MD_Identifier	Part B1.5 Unique Resource Identifier

Table 4 CI_Citation (EO Product Collection Mandatory elements only)

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
CI_Date	reference date and event used to describe it	Use obligation/condition from referencing object	Use maximum occurrence from referencing object		
date	reference date for the cited resource	M	1	CI_Citation <<DataType>>	
dateType	event used for reference date	M	1	CI_DateType Code <<CodeList>> Creation, revision and publication	

Table 5 CI_Date (EO Product Collection Mandatory elements only)

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
MD_Resolution	level of detail expressed as a ground distance				
distance	ground sample distance	**M**	1	Distance (ISO/TS 19103)	

Table 6 MD_resolution (EO Product Collection Mandatory elements only)

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
MD_Keywords[2]	keywords, their type and reference source	Use obligation from referencing object	Use maximum occurrence from referencing object		
keyword[3]	commonly used word(s) or formalised word(s) or phrase(s) used to describe the subject For INSPIRE the use of one keyword expressing the INSPIRE Data theme is required. Relevant INSPIRE data themes concerning EO Product collections are "Land cover" and "Orthoimagery"	M	N	Free Text	Part B 3.1

[2] See INSPIRE metadata technical guidance for description on how to use the descriptive keywords to encode the INSPIRE data theme.

type	subject matter used to group similar keywords	O	1	MD_Keyword TypeCode <<CodeList>>	
thesaurusName	name of the formally registered thesaurus or a similar authoritative source of keywords	O	1	CI_Citation <<Data Type>>	Part B 3.2

Table 7 MD_Keywords

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
DQ_DataQuality	quality information for the data specified by a data quality scope	Use obligation from referencing object	Use maximum occurrence from referencing object		
Scope	the specific data to which the data quality information applies	M	1	DQ_Scope	
Role name: Report	quantitative quality information for the data specified by the scope	M	1	DQ_Element	Required for Part B 7.1/B 7.2
Role name: lineage	non-quantitative quality information about the lineage of the data specified by the scope	M	1	LI_Lineage	Required for Part B 6.1

Table 8 DQ_DataQuality

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
DQ_Element	aspect of quantitative quality information	Use obligation from referencing object	Use maximum occurrence from referencing object		
Result	value (or set of values) obtained from applying a data quality measure or the outcome of evaluating the obtained value (or set of values) against a specified acceptable conformance quality level	M	N	DQ_Result	Required for Part B7.1/B7.2

Table 9 DQ_Element

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
DQ_Result	generalization of more specific result classes	Use obligation from referencing object	Use maximum occurrence from referencing object		

[3] See [RD19] for best practice proposal for using Semantic Annotation in ISO19115 Metadata

DQ_ConformanceResult	Information about the outcome of evaluating the obtained value (or set of values) against a specified acceptable conformance quality level	Use obligation from referencing object	Use maximum occurrence from referencing object		
specification	citation of product specification or user requirement against which data is being evaluated	M	1	CI_Citation	Part B 7.1
explanation	explanation of the meaning of conformance for this result	M	1	Free Text	
Pass	indication of the conformance result where 0 = fail and 1 = pass	M	1	true/false (as per INSPIRE ISO19139 instead of ISO19115 0,1)	Part B 7.2

Table 10 DQ_Result

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
LI_Lineage	information about the events or source data used in constructing the data specified by the scope or lack of knowledge about lineage	Use obligation from referencing object	Use maximum occurrence from referencing object		
statement	general explanation of the data producer's knowledge about the lineage of a dataset	M	1	Free Text	Part B 6.1
LI_ProcessStep.description	information about an event or transformation in the life of a dataset including the process used to maintain the d ataset	C as statement is provided	N	Free Text	

Table 11 LI_Lineage

Name / Role name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
MD_Constraints	restrictions on the access and use of a resource or metadata	Use obligation from referencing object	Use maximum occurrence from referencing Object		
useLimitation	limitation affecting the fitness for use of the resource or metadata. Example, "not to be used for navigation"	M	1	Free Text	Condition applying to access and use Part B 8.1
MD_LegalConstRaints	restrictions and legal prerequisites for accessing and using the resource or metadata	Use obligation from referencing object	N		

accessConstraints	access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource or metadata	M	1	MD_RestrictionCode <<CodeList>>	Limitations on public access Part B 8.2
otherConstraints	other restrictions and legal prerequisites for accessing and using the resource or metadata	C / accessConstraints equal "otherRestrictions"?	N	Free Text	Limitations on public access Part B 8.2
MD_SecurityConstraints	or metadata for national security or similar security concerns	Use obligation from referencing object	Use maximum occurrence from referencing object		
Classification	name of the handling restrictions on the resource or metadata	M	1	MD_ClassificationCode <<CodeList>>	Limitations on public access Part B 8.2

Table 12 MD_Constraints/LegalConstraints

6.1.2 Non ISO 19115 elements for eo product collection discovery

In addition to the ISO19115 subset described above, [RD08] also defined a set of metadata elements for EO Product Collection Discovery that could not be directly mapped on ISO19115. That information can be described in other metadata documents, like a sensorML XML file. ISO19115:2003 does not have a generic metadata element to provide additional documentation, but define a rather precise structure of metadata elements with well-defined semantic.

To represent the platform and instrument identifiers and allow linking to sensorML description, it is required to use some extensions from ISO19115-2 metadata model. The sensorML document will be based on the Annex A of [RD04] which describes the profile of sensorML for Earth Observation domain.

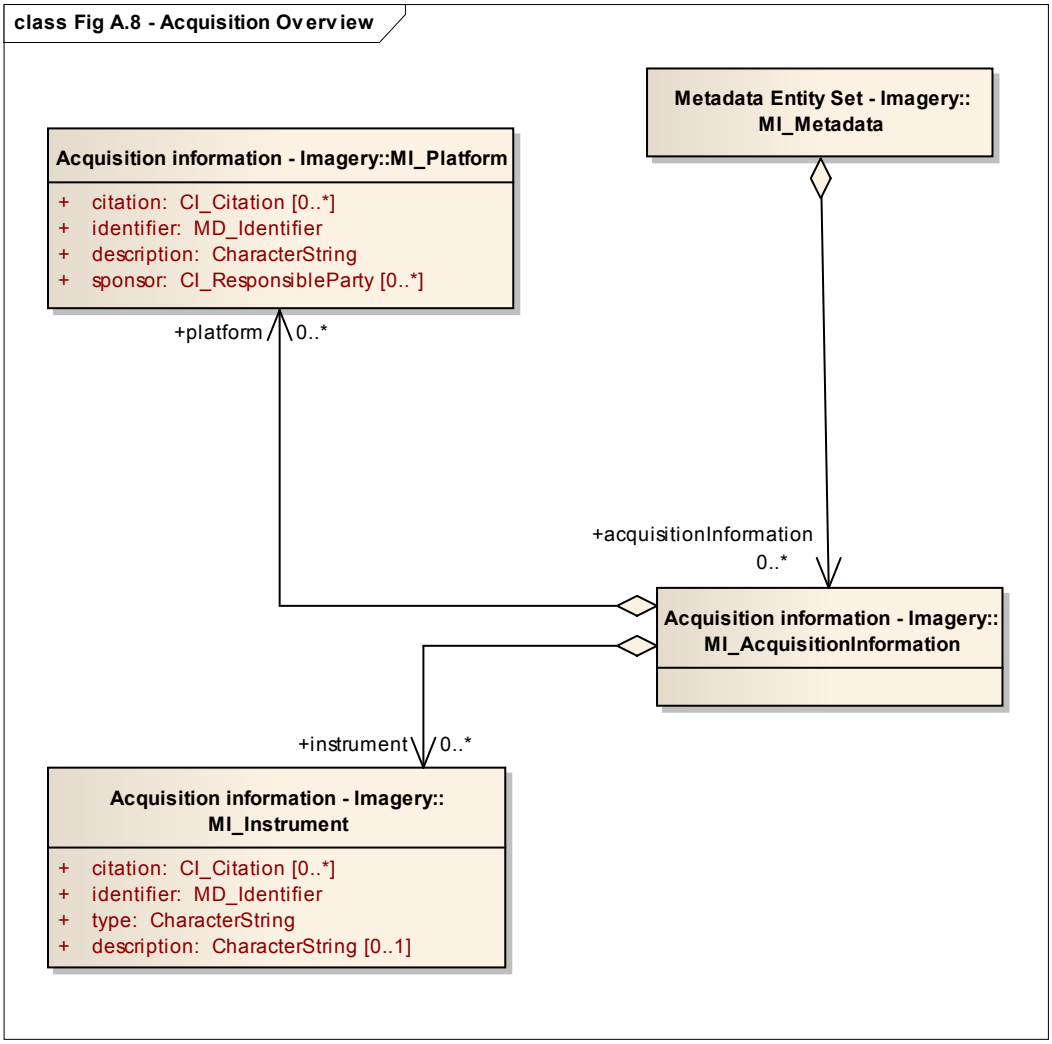

Figure 2 EO Product Collection metadata (Simplified UML class diagram – using ISO19115 -2 extension for Platform & Instrument elements only)

PropertyName	Proposed Cardinality	Description	Potential mapping on ISO19115	Potential mapping on ISO 19115-2	SensorML extensions for EO instruments and platforms Mapping

platformShortName	1	Platform short name (ex. PHR)		MI_Metadata.acquisitionInformation > MI_AcquisitionInformation.platform > MI_Platform.identifier MD_Identifier.code	unique identifier of the platform which is specified via the "gml:identifier" property of the SensorML System in the form of a URI. TBD if the identifier or the corresponding shortname property is used for making the link.
platformSerialIdentifier	0..1	Platform serial identifier (ex. for PHR : 1A)		To be combined with Shortname in the aforementioned code element	To be combined with Shortname in the aforementioned code element?
instrumentShortName[4]	1	Instrument / Sensor name		MI_Metadata.acquisistionInformation> MI_AcquisitionInformation.instrument > MI_Instrument.identifier > MD_Identifier.code	Gml :identifier property of the SensorML System which is specified in the form of a URI.
acquiredBy/Sensor/sensorType	1	Sensor type. This field should contain an enumeration ("optical", "radar", "altimetric", "atmospheric")		MI_Metadata.acquisitionInformation > MI_AcquisitionInformation.instrument > MI_Instrument.type	OGC-EO/0/SensorType

The most relevant observations are:

- The distinction that is made between the platformShortName and platformSerialIdentifier does not map well on ISO19115-2 and SensorML. Both properties should be combined to obtain a unique identification of a platform instance

- For cross-model linkage it is better to use identifiers than shortnames for identifying platforms and instruments

- In Earth Observation domain, an Instrument can be configured with specific parameters. It can be seen as a customization of a generic Instrument for a specific usage. In SensorML, this is described as a specific System (called Instrument Mode) referencing the generic Instrument ID.

  ```
  <sml:SensorML
  ```

[4] In ISO 19115-2, only Platform and Instrument properties exist to reference external document.


```
   xmlns:sml="http://www.opengis.net/sensorML/1.0.1"
   xmlns:swe="http://www.opengis.net/swe/1.0.1"
   xmlns:gml="http://www.opengis.net/gml"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xmlns:xlink="http://www.w3.org/1999/xlink"
 xsi:schemaLocation="http://www.opengis.net/sensorML/1.0.1
../OGC/sensorML/sensorML.xsd" version="1.0.1">
   <!-- -->
   <sml:member
xlink:role="urn:ogc:def:dictionary:CEOS:documentRoles:v01#instrument_configur
ation">
      <!-- -->
      <sml:System gml:id="SPOT5_HRG_PA-XS">
         <!-- ================================================ -->
         <!--                  System Description              -->
         <!-- ================================================ -->
         <gml:description>
            The PA+XS mode is used to acquire 5m resolution multispectral
images by pan sharpening
            the 10m resolution multispectral data with the 5m resolution
panchromatic data.
         </gml:description>
         <!-- ================================================ -->
         <!--                  System Identifiers              -->
         <!-- ================================================ -->
         <sml:identification>
            <sml:IdentifierList>
               <sml:identifier name="Configuration UID">
                  <sml:Term
definition="urn:ogc:def:property:CEOS:eop:InstrumentMode">

<sml:value>urn:ogc:id:CEOS:instrument:SPOT5:HRG:PA+XS:v01</sml:value>
                  </sml:Term>
               </sml:identifier>
               <sml:identifier name="Instrument UID">
                  <sml:Term
definition="urn:ogc:def:property:CEOS:eop:InstrumentID">

<sml:value>urn:ogc:id:CEOS:instrument:SPOT5:HRG1:v01</sml:value>
                  </sml:Term>
               </sml:identifier>
               <sml:identifier name="Short Name">
                  <sml:Term definition="urn:ogc:def:property:OGC:shortName">
                     <sml:value>SPOT5 HRG Mode PA+XS</sml:value>
                  </sml:Term>
               </sml:identifier>
            </sml:IdentifierList>
         </sml:identification>
```

- The processing information could potentially be added in an unstructured manner within a single descriptive field LI_ProcessStep.description of ISO19115. The ISO19115-Part 2 provided LE_ProcessStep provides additional fields to better structure the processing information

6.2 EO Services minimal information model

During the Heterogeneous Missions Accessibility Project series of ESA, the HMA stakeholders also defined the minimal set of metadata elements that are required to describe the different Web Service Instances that are being deployed throughout the Ground Segments of the GMES Contributing Missions.

These Web Services include Catalogue Services for discovery of EO Products, EO

Product Collections and EO Services, Ordering Services, Feasibility Analysis, Web Map Services and Web Coverage Services.

The information model employed was based on the ISO 19119 metadata model which was adapted for use in the EO Context in the following manner:

- a number of optional elements are not included in this minimum element set. These elements mainly relate to the chaining of operations and the parameters that are associated with the operations.
- a number of optional elements have been declared mandatory.

It is to note that the original document defined a set of minimal elements required for EO Service discovery hereby not excluding the use of additional optional ISO19119 metadata elements for obtaining a more complete description of EO Services.

The information model proposed in this section started from the information model proposed in OGC07-025 but applies the following changes:

- Using the latest corrigenda: ISO 19119:2005, Amendment 1 [RD13].
- With the adoption of the INSPIRE Directive and the INSPIRE Metadata Implementing Rules, it is desirable for EO Services metadata to contain all the minimal information elements required by the INSPIRE Metadata Implementing Rule and following the INSPIRE technical guidelines. The Elements mandated by INSPIRE have been added to the minimal set of ISO19119 elements.
- Minor corrections to elements occurring in the original table.

6.2.1 EO Services information model

The following simplified UML class diagram shows the minimal elements that are required for describing EO Product Collections. Other elements as permitted by ISO19119 may be added to obtain a more complete description:

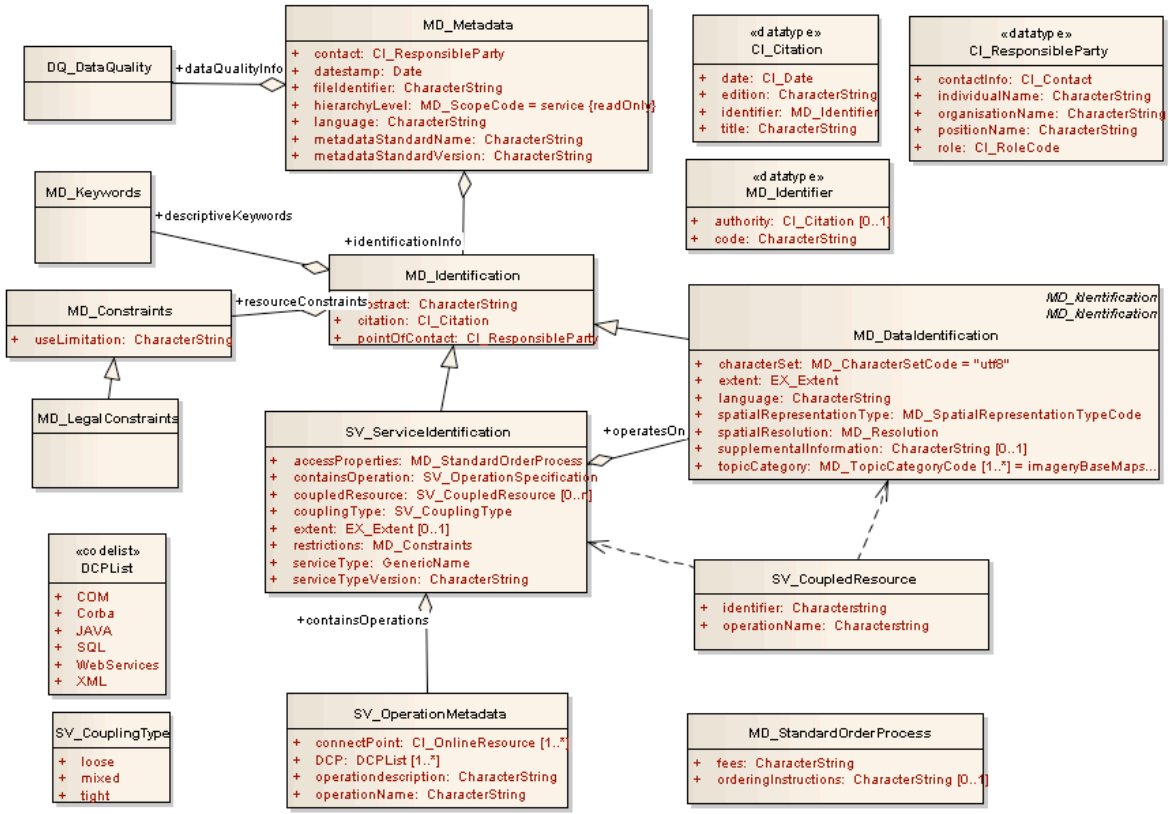

Figure 2 EO Services Minimal Information Model

The following tables constitute the data dictionary. The tables are based on the corresponding ISO19115/19119 tables with changes/additional constraints with respect to ISO19119 are highlighted in Bold.

The contents of the INSPIRE column indicates whether this is one of the metadata elements mandated by INSPIRE and gives the INSPIRE Metadata Element name as well as the reference to the paragraph of the Implementing Rule.

Name / Role Name	**Definition**	**Obligation/ Condition**	**Maximum occurrence**	**Domain**	**INSPIRE**
MD_Metadata	root entity which defines metadata about a resource or resources	M	1	Following lines in this table	
fileIdentifier	unique identifier for this metadata file	M	1	Free text	
language	language used for documenting metadata	**M**	1	ISO 639-2, other parts may be used	Metadata language Part B 10.3
hierarchyLevel	scope to which the metadata applies.	**M**	1	Fixed value "service"	Part B1.3 Resourc e Type
hierarchyLevel Name	name of the hierarchy level for which the metadata is provided.	**M**	1	**Fixed value "EO Service"**	

contact	party responsible for the EO Service	**M**	1	CI_ResponsibleParty <<DataType>>	Metadata point of contact Part B 10.1
dateStamp	date that the metadata was created	M	1	Date	Metadata date Part B10.2
metadataStandardName[1]	name of the metadata standard (including profile name) used	**M**	1	**Fixed value of OGC 11-035**	
metadataStandardVersion	version of the metadata standard (version of the profile) used	**M**	1	Free text	
Role name: identificationInfo	basic information about the resource(s) to which the metadata applies	M	1	**SV_ServiceIdentification**	
Role name dataQualityInfo	provides overall assessment of quality of a resource(s)	M	N	DQ_DataQuality	Required for Lineage - B 6.1

Table 13 Metadata entity set information (EO Services Mandatory elements only)

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
CI_Responsible Party	identification of, and means of communication with, person(s) and organizations associated with the dataset	M	1		
individualName	name of the responsible person- surname, given name, title separated by a delimiter	**M**	1	Free text	
organisationName	name of the responsible organization	**M**	1	Free text	
positionName	role or position of the responsible person	**M**	1	Free Text	
contactInfo	contactInfo	**M**	1	CI_Contact <<DataType>>	
Role	function performed by the responsible party	M	1	CI_RoleCode <<CodeList>>	Responsible Party Role Part B 9.2

Table 14 CI_ResponsibleParty (EO Services Collection Mandatory elements only)

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
MD_Identification					
Citation	citation data for the resource(s)	M	1	CI_Citation <<DataType>>	
abstract	brief narrative summary of the content of the resource(s)	M	1	Free text	Part B1.2 Resource Abstract

pointOfContact	identification of, and means of communication with, person(s) and organization(s) associated with the resource(s)	M	1	CI_ResponsibleParty <<DataType>>	Responsible Party Part B.9.1 and Responsible Party Role Part B 9.2
Role name: resourceConstrain ts	provides information about constraints which apply to the resource(s)	M	N	MD_Constraints	Required for Part B.8.2 and B.8.1
Role name: descriptiveKeywords	provides category keywords, their type, and reference source	M	N	MD_Keywords	Required for Parts B 3.1 and B.3.2
Extent	the geographic/temporal region where the service is valid. including the bounding box, bounding polygon, vertical, or temporal extent of the service	C/ if couplingType equals “mixed” or "tight"	1	EX_Extent	Required for Geographic Bounding Box Part B4.1) And Temopral Extent (Part B.5.1) Optional for Services
accessProperties	Information about the availability of the service, including, - Fees - Planned available date and time - Ordering instructions - Turnaround	O	1	MD_StandardOrderProcess	
restrictions	Legal and security constraints on accessing the service and distributing data generated by the service.	O	1	MD_Constraints	
serviceType	A service type name from a registry of services. For example, the values of the nameSpace and name attributes of GeneralName may be "OGC " and "catalogue."	**M**	1	GenericName	Spatial data service type Part B 2.2
serviceTypeVersion	Provides for searching based on the version of serviceType. For example, we may only be interested in OGC Catalogue V1.1 services. If version is maintained as a separate attribute, users can easily search for all services of a type regardless of the version.	O	N	Free Text	
coupledResource	further description of the data coupling in the case of tightly coupled services	O	N	SV_CoupledResource	

couplingType	type of coupling between service and associated data (if exists)	M	1	SV_Coupling Type <<CodeList>>	
Role name: containsOperations	Provides information about the operations that comprise the service	M	N	SV_OperationMetadata	
Role name: operatesOn	Provides information on the datasets that the service operates on	O	N	MD_DataIdentification	Coupled Resource Part B 1.6 Implemented by Reference

Table 15 ServiceIdentification Information

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
SV_CoupledResource	further description of the data coupling in the case of tightly coupled services				
operationName	name of the service operation	M	1	Free Text	
identifier	name of the identifier of a given tightly coupled dataset	M	1	Free Text	
scopedName	e.g. the name of the layer in the WMS or the featureTypeName of the WFS	M	1	Free text	

Table 16 SV_CoupledResource

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
SV_OperationMetadata	describes the signature of one and only one method provided by the service.				
operationName	name of the service operation	M	1	Free Text	
DCP	Distributed Computing Platforms on which the operation has been implemented	M	N	DCPList	
operationDescription	Free text description of the intent of the operation and the results of the operation.	M	1	Free Text	
connectPoint	Handle for accessing the service interface	M	N	CI_OnlineResource	

Table 17 SV_OperationMetadata

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE

MDStandardORderProcess	describes the signature of one and only one method provided by the service.				
Fees	fees and terms for retrieving the resource. Include monetary units	M	1	Free Text	
orderingInstructions	general instructions, terms and services provided by the distributor	0	1	Free Text	

Table 18 MD_StandardOrderProcess

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
MDIdentifier	value uniquely identifying an object within a namespace				
authority	person or party responsible for maintenance of the namespace	O	1	CI_Citation	
Code	alphanumeric value identifying an instance in the namespace	M	1	Free Text	

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
CI_Citation	standardized resource reference				
Date	reference date for the cited resource Both creation and revision dates should be included	M	N	CI_Date	Date of publication (Part B 5.2) Date of last revision (Part B 5.3) Date of creation (Part B 5.4)
title	Name by which the cited resource is known	M	1	Free Text	Part B1.1 Resource title
identifier	value uniquely identifying an object within a namespace	M	1	MD_Identifier	Part B1.5 Unique Resource Identifier

Table 19 CI_Citation

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE

CI_Date	reference date and event used to describe it	Use obligation/condition from referencing object	Use maximum occurrence from referencing object		
Date	reference date for the cited resource	M	1	CI_Citation <<DataType>>	
dateType	event used for reference date	M	1	CI_DateType Code <<CodeList>> Creation, revision and publication	

Table 20 CI_Date

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
MD_Keywords[5]	keywords, their type and reference source	Use obligation from referencing object	Use maximum occurrence from referencing object		
keyword[6]	commonly used word(s) or formalised word(s) or phrase(s) used to describe the subject	M	N	Free Text	Part B 3.1
Type	subject matter used to group similar keywords	O	1	MD_Keyword TypeCode <<CodeList>>	
thesaurusName	name of the formally registered thesaurus or a similar authoritative source of keywords	O	1	CI_Citation <<Data Type>>	Part B 3.2

Table 21 MD_Keywords

Name / Role Name	Definition	Obligation/ Condition	Maximum occurrence	Domain	INSPIRE
MD_Constraints	restrictions on the access and use of a resource or metadata	Use obligation from referencing object	Use maximum occurrence from referencing Object		
useLimitation	limitation affecting the fitness for use of the resource or metadata. Example, “not to be used for navigation”	M	1	Free Text	Condition applying to access and use Part B 8.1

[5] One of the keywords used should indicate the spatial data service type

[6] See [RD19] for best practice proposal for using Semantic Annotation in ISO19115 Metadata

MD_LegalConst Raints	restrictions and legal prerequisites for accessing and using the resource or metadata	Use obligation from referencing object	N		
accessConstrai nts	access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on	M	1	MD_Restrictio nCode <<CodeList>>	Limitatio ns on public access Part B 8.2
	obtaining the resource or metadata				
otherConstraint s	Other restrictions and legal prerequisites for accessing and using the resource or metadata	C / accessCon straints equal "otherRestri ctions"?	N	Free Text	Limitatio ns on public access Part B 8.2
MD_SecurityCo nstraints	or metadata for national security or similar security concerns	Use obligation from referencing object	Use maximum occurrence from referencing object		
classification	name of the handling restrictions on the resource or metadata	M	1	MD_Classifica tionCode <<CodeList>>	Limitatio ns on public access Part B 8.2

Table 22 MD_Constraints/LegalConstraints

6.2.2 INSPIRE mapping notes

The table in section **Error! Reference source not found.** includes mapping notes for EO Services.

6.3 SensorML minimal information model

6.3.1 SensorML Discovery Profile

The SensorML data model specifies a majority of its elements as optional. It allows expressing the same information in several, differently structured ways. This open and flexible structure was one of the main aims of the SensorML design in order to make it possible to apply the data model to nearly any type of sensor. For ensuring that SensorML documents which are intended for discovery purposes can be reliably handled by automatic harvesting mechanisms, it is necessary to create a profile for SensorML that define the information which shall be contained in a SensorML document as well as the structure in which the metadata shall be encoded. This profile called Discovery Profile of SensorML is currently specified in the OGC document 09-163r2, SensorML Extension Package for ebRIM.

To constrain the flexibility of the SensorML data model, a set of Schematron rules have been defined. These rules check that the mandatory information are present in an instance of SensorML (System or Component).

The list of properties of which the presence is verified is:

- gml:description
- keywords
- Identification
    - urn:ogc:def:identifier:OGC:1.0:uniqueID
    - urn:ogc:def:identifier:OGC:1.0:longName
    - urn:ogc:def:identifier:OGC:1.0:shortName
    - parentSystemUniqueID
- Classification
    - intendedApplication [urn:ogc:def:classifier:OGC:1.0:application]
    - sensorType [urn:ogc:def:classifier:OGC:1.0:sensorType]
- validTime
- Capabilities
    - observedBBOX
- contact
- position
- Inputs
- Outputs
- Components

The most important elements are the uniqueID and the shortName, as they are used to make the link between the different entities involved (EO Series, sensors, EO Product).

7 Discovery strategy in EO Community

7.1 EO Community Metadata model

As seen before, there are various data models that are used in order to describe components of EO product acquisition systems. Figure 3 tries to illustrate in a simplified sketch the major EO data models (left-hand side) and what they describe (right-hand side).

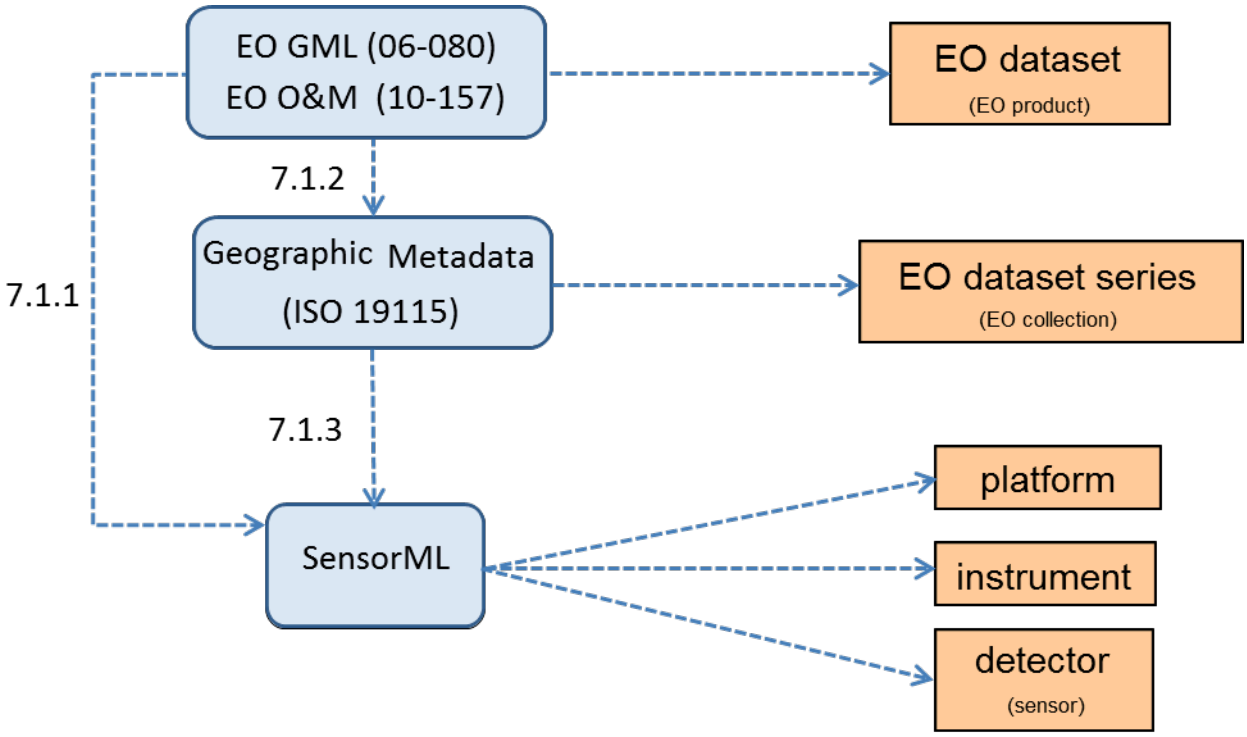

Figure 3 : EO Data Models and what they describe

7.1.1 Link between EO product metadata and the acquiring sensor

Each EO Product described using the Earth Observation Metadata profile of Observations & Measurements [RD20] contains an EarthObservationEquipment section grouping information about the platform, instrument and sensor used to produce this EO product. SensorML defines all the information about platform, instrument and sensor. So there clearly is a conceptual relationship between EO Product and Sensors. But with the current metadata model, there is currently no definition on how to express this linkage between an EO Product (EO GML) and a SensorML.

A snippet of the eop:EarthObservationEquipment of an EO Product taken by the SPOT-4 platform using the instrument HRVIR-Nb2 is given here:

```
<eop:EarthObservationEquipment>
    <eop:platform>
      <eop:Platform>
        <eop:shortName>SPOT</eop:shortName>
        <eop:serialIdentifier>4</eop:serialIdentifier>
        <eop:orbitType>LEO</eop:orbitType>
      </eop:Platform>
    </eop:platform>
    <eop:instrument>
      <eop:Instrument>
        <eop:shortName>HRVIR-Nb2</eop:shortName>
      </eop:Instrument>
    </eop:instrument>
    <eop:sensor>
      <eop:Sensor>
        <eop:sensorType>OPTICAL</eop:sensorType>
```

```
        </eop:Sensor>
      </eop:sensor>
          …
<eop:EarthObservationEquipment>
```

A snippet of a SensorML describing the Spot 4 platform is given below. The unique Identifier « urn:ogc:id:CEOS:platform:SPOT4:v01», the shortName « SPOT4 » and the sensor type « Satellite » in the platform codespace « urn:ogc:def:dictionary:CEOS:eop:PlatformTypes:v01» are present.

```
<sml:SensorML version="1.0.1">
  <sml:member>
    <sml:System gml:id="SPOT4">
      <gml:description>…</gml:description>
      <!-- ================================================= -->
      <!--                System Identifiers               -->
      <!-- ================================================= -->
      <sml:identification>
        <sml:IdentifierList>
          <sml:identifier name="uniqueID">
            <sml:Term definition="urn:ogc:def:identifier:OGC:1.0:uniqueID">
              <sml:value>urn:ogc:id:CEOS:platform:SPOT4:v01</sml:value>
            </sml:Term>
          </sml:identifier>
          <sml:identifier name="shortName">
            <sml:Term definition="urn:ogc:def:identifier:OGC:1.0:shortName">
              <sml:value>SPOT4</sml:value>
            </sml:Term>
          </sml:identifier>
          …
        </sml:IdentifierList>
      </sml:identification>
      <!-- ================================================= -->
      <!--                System Classifiers               -->
      <!-- ================================================= -->
      <sml:classification>
        <sml:ClassifierList>
          <sml:classifier name="sensorType">
                <sml:Term definition="urn:ogc:def:classifier:OGC:1.0:sensorType">
                  <sml:codeSpace xlink:href="urn:ogc:def:dictionary:CEOS:eop:PlatformTypes:v01"/>
                  <sml:value>Satellite</sml:value>
                </sml:Term>
           </sml:classifier>
          …
        </sml:ClassifierList>
      </sml:classification>
          …
    </sml:System>
  </sml:member>
</sml:SensorML>
```


A snippet of a SensorML instance describing the SPOT-4 HRVIR1 instrument is given below. The unique Identifier « urn:ogc:id:CEOS:instrument:SPOT4:HRVIR1:v01», the shortName « SPOT-4 HRVIR1» and the sensor type « Imaging Multispectral Radiometer» in the instrument codespace « urn:ogc:def:dictionary:CEOS:eop:InstrumentTypes:v01» are present.

```
<sml:SensorML version="1.0.1">
  <sml:member
    <sml:System gml:id="SPOT4_HRVIR">
      <!-- ================================================== -->
      <!--                System Description              -->
      <!-- ================================================== -->
      <gml:description>…</gml:description>

      <!-- ================================================== -->
      <!--                System Identifiers              -->
      <!-- ================================================== -->
      <sml:identification>
        <sml:IdentifierList>
          <sml:identifier name="uniqueID">
            <sml:Term definition="urn:ogc:def:identifier:OGC:1.0:uniqueID">
              <sml:value>urn:ogc:id:CEOS:instrument:SPOT4:HRVIR1:v01</sml:value>
            </sml:Term>
          </sml:identifier>
                                                    <!--
          <sml:identifier name="Platform UID">
            <sml:Term definition="urn:ogc:def:property:CEOS:eop:PlatformID">
              <sml:value>urn:ogc:id:CEOS:platform:SPOT4:v01</sml:value>
            </sml:Term>
          </sml:identifier>
                                                    -->
          <sml:identifier name="shortName">
            <sml:Term definition="urn:ogc:def:identifier:OGC:1.0:shortName">
              <sml:value>SPOT-4 HRVIR1</sml:value>
            </sml:Term>
          </sml:identifier>
          …
          <sml:identifier name="parentSystemUniqueID">
            <sml:Term definition="urn:ogc:def:identifier:OGC:1.0:parentSystemUniqueID">
              <sml:value>urn:ogc:id:CEOS:platform:SPOT4:v01</sml:value>
            </sml:Term>
          </sml:identifier>
        </sml:IdentifierList>
      </sml:identification>
      <!-- ================================================== -->
      <!--                System Classifiers              -->
      <!-- ================================================== -->
      <sml:classification>
        <sml:ClassifierList>
          <sml:classifier name="sensorType">
            <sml:Term definition="urn:ogc:def:classifier:OGC:1.0:sensorType">
              <sml:codeSpace xlink:href="urn:ogc:def:dictionary:CEOS:eop:InstrumentTypes:v01"/>
              <sml:value>Imaging Multispectral Radiometer</sml:value>
            </sml:Term>
          </sml:classifier>

          <sml:classifier name="intendedApplication">
            <sml:Term definition="urn:ogc:def:classifier:OGC:1.0:application">
              <sml:value>Land - Multi-purpose Imagery</sml:value>
```

```
                    </sml:Term>
                </sml:classifier>

                <sml:classifier name="Acquisition Method">
                    <sml:Term definition="urn:ogc:def:property:OGC:sensorType">
                        <sml:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:AcquisitionMethods:v01"/>
                        <sml:value>Pushbroom</sml:value>
                    </sml:Term>
                </sml:classifier>
            </sml:ClassifierList>
        </sml:classification>
```

To express the linkage between EO Product metadata and the acquiring platform and sensor, we need to add the unique identifier of the platform, the instrument and perhaps the detector to the EOProduct metadata. Unfortunately, in the current version of OGC10-157 there are no elements to store these identifiers.

The long term solution is to add a new “identifier” element in the “eop:platform”, “eop:instrument” and “eop:sensor”. This solution would break backward compatibility.

Another solution that can be realized with the current version of OGC10-157, is to use the eop:platform:shortName and eop:instrument:shortName to make the linkage and fill them with the appropriate SensorML shortName. Note that this means that the platform shortname should include the platform serial identifier.

Here is the previous EO Product snippet updated to use the same platform and instrument short name.

```
<eop:EarthObservationEquipment>
    <eop:platform>
      <eop:Platform>
        <eop:shortName>SPOT4</eop:shortName>
        <eop:serialIdentifier>4</eop:serialIdentifier>
        <eop:orbitType>LEO</eop:orbitType>
      </eop:Platform>
    </eop:platform>
    <eop:instrument>
      <eop:Instrument>
        <eop:shortName>SPOT-4 HRVIR1</eop:shortName>
      </eop:Instrument>
    </eop:instrument>
    <eop:sensor>
      <eop:Sensor>
        <eop:sensorType>OPTICAL</eop:sensorType>
      </eop:Sensor>
    </eop:sensor>
          …
<eop:EarthObservationEquipment>
```


7.1.2 Link between EO product metadata and the metadata of the corresponding EO Product Collection

The link between an EO Product and the corresponding dataset series is done using the “parentIdentifier” element. The “parentIdentifier” contains the identifier (element fileIdentifier) of the dataset series.

Here is a snippet of the “parentIdentifier” of the EO Product.

```
<opt:EarthObservation version="1.2.1">
  <gml:metaDataProperty>
    <eop:EarthObservationMetaData>
      <eop:identifier>urn:spot:sn:19336775:sat:Shift0:eop</eop:identifier>
      <eop:doi>urn:spot:sn:19336775:sat:Shift0:eop</eop:doi>
      <eop:parentIdentifier> urn:ogc:def:EOP:ESA:EECF.ENVISAT_ASA_APx_xS
      </eop:parentIdentifier>
      …
    </eop:EarthObservationMetaData>
  </gml:metaDataProperty>
</opt:EarthObservation>
```

Here is a snippet of a dataset series with the same fileIdentifier:

```
<gmd:MD_Metadata>
    <gmd:fileIdentifier>
        <gco:CharacterString> urn:ogc:def:EOP:ESA:EECF.ENVISAT_ASA_APx_xS
        </gco:CharacterString>
    </gmd:fileIdentifier>
    …
</gmd:MD_Metadata>
```

7.1.3 Link between the EO Product Collection metadata and the sensors information

The EO Product Collection metadata can contain a link to the sensors information. The ISO 19115/2 defines the extension to store acquisition information.

Here is a snippet of a dataset series with the “urn:ogc:id:CEOS:platform:SPOT1:v01” platform identifier and the “urn:ogc:id:CEOS:instrument:SPOT1:HRV:v01” instrument identifier.

```
<gmi:MI_Metadata>
…
  <gmi:acquisitionInformation>
      <gmi:MI_AcquisitionInformation>
          <gmi:platform>
              <gmi:MI_Platform>
                  <gmi:identifier>
                      <gmd:RS_Identifier>
                          <gmd:code>
                              <gco:CharacterString>urn:ogc:id:CEOS:platform:SPOT1:v01</gco:CharacterString>
                          </gmd:code>
```

```
                    <gmd:codeSpace>
                       <gco:CharacterString>http://spotimage.fr</gco:CharacterString>
                    </gmd:codeSpace>
                 </gmd:RS_Identifier>
              </gmi:identifier>
              <gmi:description>
                 <gco:CharacterString>Spot 1 platform</gco:CharacterString>
              </gmi:description>
              <gmi:instrument>
                 <gmi:MI_Instrument>
                    <gmi:citation>
                       <gmd:CI  Citation>
                          <gmd:title>
<gco:CharacterString>…</gco:CharacterString>
                          </gmd:title>
                          …
                          <gmd:identifier>
                             <gmd:RS_Identifier>
                                <gmd:code>

<gco:CharacterString>urn:ogc:id:CEOS:instrument:SPOT1:HRV:v01</gco:CharacterString>
                                </gmd:code>
                                <gmd:codeSpace>
                                   <gco:CharacterString>http://spotimage.fr</gco:CharacterString>
                                </gmd:codeSpace>
                             </gmd:RS  Identifier>
                          </gmd:identifier>
                       </gmd:CI_Citation>
                    </gmi:citation>
                    <gmi:type>
                       <gmi:MI_SensorTypeCode id="Imaging.Multispectral.Radiometer"/>
                    </gmi:type>
                 </gmi:MI_Instrument>
              </gmi:instrument>
           </gmi:MI_Platform>
        </gmi:platform>
     </gmi:MI_AcquisitionInformation>
  </gmi:acquisitionInformation>
</gmi:MI_Metadata>
```

7.1.4 Identifier definition

The key point to be able to define a formal link between metadata of EO Products, EO Product Collections and Sensors is to define stable, unique, coherent identifiers for each metadata entity. These identifiers will be used to make the link between the different metadata models. These identifier will also be used to identify and retrieve the metadata in catalogue/registry.

7.2 Metadata cataloguing

To catalogue metadata corresponding to the three different metadata models, we need to have a catalog solution capable of handling “any” metadata model.

The CSW ISO Application Profile (OGC 07-045) catalogue is only able to store ISO 19115/ISO19119 Metadata i.e EO Product Collections.

The CSW ebRIM Application Profile (OGC 07-110) catalogue is based on the generic ebXML model that can be profiled to store any model. These profiles are called extension packages. Currently there is one extension package defined for each of the three metadata models:

- OGC 06-131: EO Product Extension Package
- OGC 10-189: EO Product Extension Package v2
- OGC 07-038: ISO 19115/19119 Extension Package
- OGC 09-163: SensorML Extension Package

Currently, there is no official document that defines the interlinkage between these extension packages. The following section proposes some ideas to implement these links.

7.2.1 How to link different extension packages in a CSW ebRIM catalog

There are two ways to make a link between extension packages.

7.2.1.1 Link by association

The most obvious way to link objects (Registry Objects) in an ebRIM catalog is to create an Association between these objects. For instance, we can create an SubsetOf association between an EO product and its collection.

To create this association when an EO Product is harvested the identifier of the collection (the *parentIdentifier* element) needs to be extracted. Based on the collection identifier, we query the catalog to retrieve the Registry Object corresponding to this collection. If the Registry Object is found, the Association between the EO Product and the Collection Registry Object can be created.

This procedure can only work if the parentIdentifier within the EO Product metadata points to an existing collection. Hence the importance of a coherent identifier scheme.

7.2.1.2 Link by equivalent slot

Another solution is to define equivalent slots between the different extension packages. For instance, the EO Product Registry Object contains a slot called “parentIdentifier” which is equal to the slot “identifier” of the Collection registry Object. A GetRecords request can search for all EO Product in the collections matching one or several constraints (like a keyword equal to a particular value…).

An example CSW GetRecords Query searching for all EO Products within a collection where the topicCategory equals « imageryBaseMapsEarthCover » is given below:

```
<?xml version="1.0" encoding="UTF-8"?>
<csw:GetRecords
 xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"
 xmlns:ogc="http://www.opengis.net/ogc"
 version="2.0.2"
 resultType="RESULTS"
```



```
 maxRecords="10"
 outputSchema="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0">
 <csw:Query typeNames="RegistryPackage ExtrinsicObject__product ExtrinsicObject__collection">
  <csw:ElementName>/RegistryPackage</csw:ElementName>
  <csw:Constraint version="1.0.0">
   <ogc:Filter>
    <ogc:And>
          <ogc:PropertyIsEqualTo>
            <ogc:PropertyName>/RegistryPackage/RegistryObjectList/*/@id</ogc:PropertyName>
            <ogc:PropertyName>/product/@id</ogc:PropertyName>
          </ogc:PropertyIsEqualTo>
          <ogc:PropertyIsEqualTo>
            <ogc:PropertyName>/product/@objectType</ogc:PropertyName>
            <ogc:Literal>urn:ogc:def:objectType:OGC-CSW-ebRIM-EO::EOProduct</ogc:Literal>
          </ogc:PropertyIsEqualTo>
          <ogc:PropertyIsEqualTo>
            <ogc:PropertyName>/product/Slot[@name="urn:ogc:def:slot:OGC-CSW-ebRIM-
EO::parentIdentifier"]/ValueList/Value[1]</ogc:PropertyName>
            <ogc:PropertyName>/collection/Slot[@name="urn:ogc:def:slot:OGC-CSW-ebRIM-
CIM::identifier"]/ValueList/Value[1]</ogc:PropertyName>
          </ogc:PropertyIsEqualTo>
          <ogc:PropertyIsEqualTo>
       <ogc:PropertyName>/collection/@objectType</ogc:PropertyName>
       <ogc:Literal>urn:ogc:def:objectType:OGC-CSW-ebRIM-CIM::DataMetadata</ogc:Literal>
     </ogc:PropertyIsEqualTo>
          <ogc:PropertyIsEqualTo>
       <ogc:PropertyName>/collection/Slot[@name="urn:ogc:def:slot:OGC-CSW-ebRIM-
EO::topicCategory"]/ValueList/Value[1]</ogc:PropertyName>
       <ogc:Literal>imageryBaseMapsEarthCover</ogc:Literal>
     </ogc:PropertyIsEqualTo>
    </ogc:And>
   </ogc:Filter>
  </csw:Constraint>
 </csw:Query>
</csw:GetRecords>
```

To have a more coherent slot naming, OGC recommends using HTTP URIs (http://www.opengis.net/def/property/OGC/). For instance the identifier of a platform should be http://www.opengis.net/def/property/OGC-EO/0/Platform . This slot name should be used in EO Product, Collection and Sensor RegistryObjects.

At OGC, the slot names are URI and are registered into the OGC registry of Naming Authority. Another way of making a semantic relation between two slots is to create a relation like a skos:exactMatch or a rdf:sameAs between two URIs.

7.2.2 Link between EO Product and EO Product Collection metadata

The link can be done by using the “parentIdentifier” slot from the EOProduct ExtrinsicObject (EO extension Package) and the “identifier” slot of the MetadataInformation ExtrinsicObject (CIM Extension Package)

7.2.3 Link between EO Product and Sensor metata

For the platform, the link can be established using the “name” of the EOAcquisitionPlatform ExtrinsicObject and the “shortName” slot from the System

ExtrinsicObject describing the platform. The “name” must be identical in the 2 metadata records .

For the instrument, the link can be done between the “instrumentShortName » slot of the EOAcquisitionPlatform ExtrinsicObject and the “shortName” slot from the System ExtrinsicObject describing the Instrument. The “name” must be identical in the 2 metadata records .

What concerns the detector, there is no reference to the detector in the EO Product metadata model.

7.2.4 Link between Collection and Sensor

Currently, the ISO Extension package (CIM) does not support the ISO 19115/2 extensions. So we cannot establish the linkage with the current draft specification. To solve this issue, the proposal is to extend the current discovery model to take into account some part of ISO 19115/2.

For the platform, a suggestion is to extract the « *gmi:MI_AcquisitionInformation/gmi:platform/gmi:MI_Platform/gmi:identifier/gmd:RS_Identifier/gmd:code/gco:CharacterString »* property in the « platformIdentifier » slot of the MetadataInformation ExtrinsicObject. Then the link can be done with the “shortName” slot from the System ExtrinsicObject describing the platform.

For the instrument, a suggestion is to extract the « *gmi:MI_AcquisitionInformation/gmi:instrument/gmi:MI_Instrument/gmi:citation/gmd:CI_Citation/gmd:identifier/gmd:RS_Identifier/gmd:code/gco:CharacterString »* property in the « instrumentIdentifier » slot of the MetadataInformation ExtrinsicObject. Then the link can be done with the “shortName” slot from the System ExtrinsicObject describing the instrument.

Annex A
Informative
Example of EO Product Collection metadata

```
<?xml version="1.0" encoding="UTF-8"?>
<MI_Metadata xmlns="http://www.isotc211.org/2005/gmi"
xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gmd="http://www.isotc211.org/2005/gmd"
xsi:schemaLocation="http://www.isotc211.org/2005/gmd
http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/gmd/metadata
Application.xsd http://www.isotc211.org/2005/gmi
http://www.isotc211.org/2005/gmi/gmi.xsd" >
    <gmd:fileIdentifier>
        <gco:CharacterString>urn:HMA:GS:F81D4FAE-7DEC-11D0-A765-
00A0C91E6BF6</gco:CharacterString>
    </gmd:fileIdentifier>
    <gmd:language>
        <gmd:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/"
codeListValue="eng">eng</gmd:LanguageCode>
    </gmd:language>
    <gmd:characterSet>
        <gmd:MD_CharacterSetCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_Charact
erSetCode" codeListValue="utf8"/>
    </gmd:characterSet>
    <gmd:hierarchyLevel>
        <gmd:MD_ScopeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_ScopeC
ode" codeListValue="series"/>
    </gmd:hierarchyLevel>
    <gmd:hierarchyLevelName>
        <gco:CharacterString>EO Product Collection</gco:CharacterString>
    </gmd:hierarchyLevelName>
    <gmd:contact>
        <gmd:CI_ResponsibleParty>
            <gmd:individualName>
                <gco:CharacterString>eoHelp</gco:CharacterString>
            </gmd:individualName>
            <gmd:organisationName>
                <gco:CharacterString>ESA</gco:CharacterString>
            </gmd:organisationName>
            <gmd:positionName>
                <gco:CharacterString>Order Desk</gco:CharacterString>
            </gmd:positionName>
            <gmd:contactInfo>
                <gmd:CI_Contact>
                    <gmd:address>
                        <gmd:CI_Address>
                            <gmd:electronicMailAddress>

    <gco:CharacterString>eohelp@esa.int</gco:CharacterString>
                            </gmd:electronicMailAddress>
                        </gmd:CI_Address>
                    </gmd:address>
                </gmd:CI_Contact>
```

```
                </gmd:contactInfo>
                <gmd:role>
                    <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCod
e" codeListValue="pointOfContact"/>
                </gmd:role>
            </gmd:CI_ResponsibleParty>
        </gmd:contact>
        <gmd:dateStamp>
            <gco:Date>2006-05-04</gco:Date>
        </gmd:dateStamp>
        <gmd:metadataStandardName>
            <gco:CharacterString>OGC 11-035</gco:CharacterString>
        </gmd:metadataStandardName>
        <gmd:metadataStandardVersion>
            <gco:CharacterString>1.0</gco:CharacterString>
        </gmd:metadataStandardVersion>
        <gmd:identificationInfo>
            <gmd:MD_DataIdentification>
                <gmd:citation>
                    <gmd:CI_Citation>
                        <gmd:title>
                            <gco:CharacterString>ASAR Image Mode
Acquisitions</gco:CharacterString>
                        </gmd:title>
                        <gmd:date>
                            <gmd:CI_Date>
                                <gmd:date>
                                    <gco:Date>2006-05-04</gco:Date>
                                </gmd:date>
                                <gmd:dateType>
                                    <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_DateTyp
eCode" codeListValue="creation"/>
                                </gmd:dateType>
                            </gmd:CI_Date>
                        </gmd:date>
                        <gmd:identifier>
                            <gmd:MD_Identifier>
                                <gmd:code>
                                    <gco:CharacterString>urn:HMA:GS:F81D4FAE-7DEC-
11D0-A765-00A0C91E6BF6</gco:CharacterString>
                                </gmd:code>
                            </gmd:MD_Identifier>
                        </gmd:identifier>
                    </gmd:CI_Citation>
                </gmd:citation>
                <gmd:abstract>
                    <gco:CharacterString><![CDATA[The <a
href=http://envisat.esa.int/instruments/asar/>Advanced Synthetic Aperture Radar
(ASAR)</a> (more info <a
href=http://envisat.esa.int/dataproducts/asar/CNTR3.htm>here</a>) is one of the
instruments aboard the Environmental Satellite <a href=http://envisat.esa.int/m-
s/>ENVISAT</a> ... br><br>From this collection you may order <a
href=http://envisat.esa.int/instruments/asar/data-app/dataprod.html>products</a> of the
following types:<br>- <a href=http://envisat.esa.int/instruments/asar/data-
app/prodspread.html#pgfId=ASA_IM__0P>Image Mode Level 0 (ASA_IM__0P)</a><br>-
<a href=http://envisat.esa.int/instruments/asar/data-
app/prodspread.html#pgfId=ASA_IMP_1P>Image Mode Precision Image
```

```
(ASA_IMP_1P)</a><br>- <a href=http://envisat.esa.int/instruments/asar/data-
app/prodspread.html#pgfId=ASA_IMS_1P>Image Mode Single Look Complex
(ASA_IMS_1P)</a><br>- <a href=http://envisat.esa.int/instruments/asar/data-
app/prodspread.html#pgfId=ASA_IMG_1P>Image Mode Ellipsoid Geocoded Image
(ASA_IMG_1P)</a><br>- <a href=http://envisat.esa.int/instruments/asar/data-
app/prodspread.html#pgfId=ASA_IMM_1P>Image Mode Medium Resolution
(ASA_IMM_1P)</a>]]></gco:CharacterString>
                </gmd:abstract>
                <gmd:pointOfContact>
                    <gmd:CI_ResponsibleParty>
                        <gmd:individualName>
                            <gco:CharacterString>eoHelp</gco:CharacterString>
                        </gmd:individualName>
                        <gmd:organisationName>
                            <gco:CharacterString>ESA</gco:CharacterString>
                        </gmd:organisationName>
                        <gmd:positionName>
                            <gco:CharacterString>Order Desk</gco:CharacterString>
                        </gmd:positionName>
                        <gmd:contactInfo>
                            <gmd:CI_Contact>
                                <gmd:address>
                                    <gmd:CI_Address>
                                        <gmd:electronicMailAddress>

    <gco:CharacterString>eohelp@esa.int</gco:CharacterString>
                                        </gmd:electronicMailAddress>
                                    </gmd:CI_Address>
                                </gmd:address>
                            </gmd:CI_Contact>
                        </gmd:contactInfo>
                        <gmd:role>
                            <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_RoleCod
e" codeListValue="originator"/>
                        </gmd:role>
                    </gmd:CI_ResponsibleParty>
                </gmd:pointOfContact>
                <gmd:descriptiveKeywords xmlns:gmd="http://www.isotc211.org/2005/gmd">
                    <gmd:MD_Keywords>
                        <gmd:keyword>
                            <gco:CharacterString>Orthoimagery</gco:CharacterString>
                        </gmd:keyword>
                        <gmd:type>
                            <gmd:MD_KeywordTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_Keywor
dTypeCode" codeListValue="theme"/>
                        </gmd:type>
                        <gmd:thesaurusName>
                            <gmd:CI_Citation>
                                <gmd:title>
                                    <gco:CharacterString>GEMET - INSPIRE themes,
version 1.0</gco:CharacterString>
                                </gmd:title>
                                <gmd:date>
                                    <gmd:CI_Date>
                                        <gmd:date>
                                            <gco:Date>2008-06-01</gco:Date>
                                        </gmd:date>
```

```
                                        <gmd:dateType>
                                            <gmd:CI_DateTypeCode
codeList="hhttp://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_DateTy
peCode" codeListValue="publication"/>
                                        </gmd:dateType>
                                    </gmd:CI_Date>
                                </gmd:date>
                            </gmd:CI_Citation>
                        </gmd:thesaurusName>
                    </gmd:MD_Keywords>
                </gmd:descriptiveKeywords>
                <gmd:resourceConstraints>
                    <gmd:MD_Constraints>
                        <gmd:useLimitation>
                            <gco:CharacterString>See </gco:CharacterString>
                        </gmd:useLimitation>
                    </gmd:MD_Constraints>
                </gmd:resourceConstraints>
                <gmd:resourceConstraints>
                    <gmd:MD_LegalConstraints>
                        <gmd:accessConstraints>
                            <gmd:MD_RestrictionCode codeListValue="copyright"
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_Restricti
onCode">copyright</gmd:MD_RestrictionCode>
                        </gmd:accessConstraints>
                    </gmd:MD_LegalConstraints>
                </gmd:resourceConstraints>
                <gmd:spatialRepresentationType>
                    <gmd:MD_SpatialRepresentationTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_Spatial
RepresentationTypeCode" codeListValue="grid"/>
                </gmd:spatialRepresentationType>
                <gmd:spatialResolution>
                    <gmd:MD_Resolution>
                        <gmd:distance>
                            <gco:Distance uom="m">30</gco:Distance>
                        </gmd:distance>
                    </gmd:MD_Resolution>
                </gmd:spatialResolution>
                <gmd:language>
                    <gco:CharacterString>eng</gco:CharacterString>
                </gmd:language>
                <gmd:characterSet>
                    <gmd:MD_CharacterSetCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_Charact
erSetCode" codeListValue="utf8"/>
                </gmd:characterSet>
                <gmd:topicCategory>

    <gmd:MD_TopicCategoryCode>imageryBaseMapsEarthCover</gmd:MD_TopicCateg
oryCode>
                </gmd:topicCategory>
                <gmd:extent>
                    <gmd:EX_Extent>
                        <gmd:geographicElement>
                            <gmd:EX_GeographicBoundingBox>
                                <gmd:westBoundLongitude>
                                    <gco:Decimal>-11.0</gco:Decimal>
                                </gmd:westBoundLongitude>
```

```
                                <gmd:eastBoundLongitude>
                                    <gco:Decimal>120.0</gco:Decimal>
                                </gmd:eastBoundLongitude>
                                <gmd:southBoundLatitude>
                                    <gco:Decimal>17.5</gco:Decimal>
                                </gmd:southBoundLatitude>
                                <gmd:northBoundLatitude>
                                    <gco:Decimal>68.0</gco:Decimal>
                                </gmd:northBoundLatitude>
                            </gmd:EX_GeographicBoundingBox>
                        </gmd:geographicElement>
                    </gmd:EX_Extent>
                </gmd:extent>
            </gmd:MD_DataIdentification>
        </gmd:identificationInfo>
        <gmd:dataQualityInfo>
            <gmd:DQ_DataQuality>
                <gmd:scope>
                    <gmd:DQ_Scope>
                        <gmd:level>
                            <gmd:MD_ScopeCode codeListValue="series"
codeList="">series</gmd:MD_ScopeCode>
                        </gmd:level>
                    </gmd:DQ_Scope>
                </gmd:scope>
                <gmd:report>
                    <gmd:DQ_DomainConsistency>
                        <gmd:result>
                            <gmd:DQ_ConformanceResult>
                                <gmd:specification>
                                    <gmd:CI_Citation>
                                        <gmd:title>
                                            <gco:CharacterString>INSPIRE data
specification concerning orthoimagery - exact reference TBC</gco:CharacterString>
                                        </gmd:title>
                                        <gmd:date>
                                            <gmd:CI_Date>
                                                <gmd:date>
                                                    <gco:Date>2001-01-01</gco:Date>
                                                </gmd:date>
                                                <gmd:dateType/>
                                            </gmd:CI_Date>
                                        </gmd:date>
                                    </gmd:CI_Citation>
                                </gmd:specification>
                                <gmd:explanation>
                                    <gco:CharacterString>INSPIRE Data specification for
orthoimagery is not yet officially published so conformity has not yet been
evaluated.</gco:CharacterString>
                                </gmd:explanation>
                                <gmd:pass/>
                            </gmd:DQ_ConformanceResult>
                        </gmd:result>
                    </gmd:DQ_DomainConsistency>
                </gmd:report>
            </gmd:DQ_DataQuality>
        </gmd:dataQualityInfo>
        <acquisitionInformation>
        <MI_AcquisitionInformation><platform><MI_Platform>
```

```
            <identifier><gmd:RS_Identifier>

      <gmd:code><gco:CharacterString>urn:ogc:id:CEOS:platform:ENVISAT:v01</gco:Char
acterString></gmd:code>
<gmd:codeSpace><gco:CharacterString>http://www.esa.int</gco:CharacterString></gmd:c
odeSpace>
            </gmd:RS_Identifier></identifier>
            <description><gco:CharacterString>Envisat</gco:CharacterString></description>
            <instrument><MI_Instrument>
                  <identifier><gmd:RS_Identifier>

      <gmd:code><gco:CharacterString>urn:ogc:id:CEOS:instrument:ENVISAT:ASAR:v01</
gco:CharacterString></gmd:code>
<gmd:codeSpace><gco:CharacterString>http://www.esa.int</gco:CharacterString></gmd:c
odeSpace>
                  </gmd:RS_Identifier></identifier>
                  <type><MI_SensorTypeCode codeListValue=""
codeList="">Imaging.microwave.radars</MI_SensorTypeCode></type>
            </MI_Instrument></instrument>
      </MI_Platform></platform>
      </MI_AcquisitionInformation>
      </acquisitionInformation>
</MI_Metadata>
```

Annex B:
(Informative)
Example of EO Service Metadata

```
<?xml version="1.0" encoding="UTF-8"?>
<MD_Metadata xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:gts="http://www.isotc211.org/2005/gts"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:srv="http://www.isotc211.org/2005/srv" xmlns:gml="http://www.opengis.net/gml"
xmlns:wms="http://www.opengis.net/wms" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns="http://www.isotc211.org/2005/gmd"
xsi:schemaLocation="http://www.isotc211.org/2005/gmd
http://schemas.opengis.net/iso/19139/20060504/gmd/gmd.xsd
http://www.isotc211.org/2005/srv
http://schemas.opengis.net/iso/19139/20060504/srv/srv.xsd">
    <fileIdentifier>
        <gco:CharacterString>F81D4FAE-7DEC-11D0-A765-
00A0C91E6BF6</gco:CharacterString>
    </fileIdentifier>
    <language>
        <LanguageCode codeList="http://www.loc.gov/standards/iso639-2/"
codeListValue="eng">eng</LanguageCode>
    </language>
    <hierarchyLevel>
        <MD_ScopeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_ScopeC
ode" codeListValue="service">service</MD_ScopeCode>
    </hierarchyLevel>
    <hierarchyLevelName>
        <gco:CharacterString>EO Service</gco:CharacterString>
    </hierarchyLevelName>
    <contact>
        <CI_ResponsibleParty>
            <individualName>
                <gco:CharacterString>B. B.</gco:CharacterString>
            </individualName>
            <organisationName>
                <gco:CharacterString>DLR/DFD</gco:CharacterString>
            </organisationName>
            <positionName>
                <gco:CharacterString>DLR HMA System
Engineer</gco:CharacterString>
            </positionName>
            <contactInfo>
                <CI_Contact>
                    <phone>
                        <CI_Telephone>
                            <voice>
                                <gco:CharacterString>+49 ...</gco:CharacterString>
                            </voice>
                            <facsimile>
                                <gco:CharacterString>+49 ...</gco:CharacterString>
                            </facsimile>
                        </CI_Telephone>
                    </phone>
                    <address>
```

```
                        <CI_Address>
                            <deliveryPoint>
                                <gco:CharacterString>Muenchner Str.
20</gco:CharacterString>
                            </deliveryPoint>
                            <city>

    <gco:CharacterString>Oberpfaffenhofen</gco:CharacterString>
                            </city>
                            <postalCode>
                                <gco:CharacterString>82234</gco:CharacterString>
                            </postalCode>
                            <country>
                                <gco:CharacterString>DE</gco:CharacterString>
                            </country>
                            <electronicMailAddress>
                                <gco:CharacterString>b.b@...</gco:CharacterString>
                            </electronicMailAddress>
                        </CI_Address>
                    </address>
                </CI_Contact>
            </contactInfo>
            <role>
                <CI_RoleCode codeList=""
codeListValue="pointOfContact">pointOfContact</CI_RoleCode>
            </role>
        </CI_ResponsibleParty>
    </contact>
    <dateStamp>
        <gco:Date>2006-06-06</gco:Date>
    </dateStamp>
    <metadataStandardName>
        <gco:CharacterString>OGC 11-035</gco:CharacterString>
    </metadataStandardName>
    <metadataStandardVersion>
        <gco:CharacterString>1.0.0</gco:CharacterString>
    </metadataStandardVersion>
    <identificationInfo>
        <srv:SV_ServiceIdentification>
            <citation>
                <CI_Citation>
                    <title>
                        <gco:CharacterString>My Example
Service</gco:CharacterString>
                    </title>
                    <date>
                        <CI_Date>
                            <date>
                                <gco:Date>2006-06-06</gco:Date>
                            </date>
                            <dateType>
                                <CI_DateTypeCode codeList=""
codeListValue="creation">creation</CI_DateTypeCode>
                            </dateType>
                        </CI_Date>
                    </date>
                    <edition>
                        <gco:CharacterString>1.0.0</gco:CharacterString>
                    </edition>
```

```
                        <identifier>
                            <MD_Identifier>
                                <code>

    <gco:CharacterString>DLR:DFD:MyExampleService</gco:CharacterString>
                                </code>
                            </MD_Identifier>
                        </identifier>
                    </CI_Citation>
                </citation>
                <abstract>
                    <gco:CharacterString> This service provides an example for a service
metadata record</gco:CharacterString>
                </abstract>
                <pointOfContact>
                    <CI_ResponsibleParty>
                        <individualName>
                            <gco:CharacterString>B.B.</gco:CharacterString>
                        </individualName>
                        <organisationName>
                            <gco:CharacterString>DLR/DFD</gco:CharacterString>
                        </organisationName>
                        <positionName>
                            <gco:CharacterString>DLR HMA System
Engineer</gco:CharacterString>
                        </positionName>
                        <contactInfo>
                            <CI_Contact>
                                <phone>
                                    <CI_Telephone>
                                        <voice>
                                            <gco:CharacterString>+49
...</gco:CharacterString>
                                        </voice>
                                        <facsimile>
                                            <gco:CharacterString>+49
...</gco:CharacterString>
                                        </facsimile>
                                    </CI_Telephone>
                                </phone>
                                <address>
                                    <CI_Address>
                                        <deliveryPoint>
                                            <gco:CharacterString>Muenchner Str.
20</gco:CharacterString>
                                        </deliveryPoint>
                                        <city>

    <gco:CharacterString>Oberpfaffenhofen</gco:CharacterString>
                                        </city>
                                        <postalCode>

    <gco:CharacterString>82234</gco:CharacterString>
                                        </postalCode>
                                        <country>

    <gco:CharacterString>DE</gco:CharacterString>
                                        </country>
                                        <electronicMailAddress>
```

```
        <gco:CharacterString>b.b@...</gco:CharacterString>
                                        </electronicMailAddress>
                                    </CI_Address>
                                </address>
                            </CI_Contact>
                        </contactInfo>
                        <role>
                            <CI_RoleCode codeList=""
codeListValue="pointOfContact">pointOfContact</CI_RoleCode>
                        </role>
                    </CI_ResponsibleParty>
                </pointOfContact>
                <descriptiveKeywords>
                    <MD_Keywords>
                        <keyword>

        <gco:CharacterString>infoMapAccessService</gco:CharacterString>
                        </keyword>
                        <thesaurusName>
                            <CI_Citation>
                                <title>
                                    <gco:CharacterString> D.4 of the Commission
Regulation (EG) NR. 1205/2008</gco:CharacterString>
                                </title>
                                <date>
                                    <CI_Date>
                                        <date>
                                            <gco:Date>2008-12-03</gco:Date>
                                        </date>
                                        <dateType>
                                            <CI_DateTypeCode
codeListValue="publication"
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/res
ources/Codelist/ML_gmxCodelists.xml#CI_DateTypeCode">publication</CI_DateTypeCod
e>
                                        </dateType>
                                    </CI_Date>
                                </date>
                            </CI_Citation>
                        </thesaurusName>
                    </MD_Keywords>
                </descriptiveKeywords>
                <resourceConstraints>
                    <MD_Constraints>
                        <useLimitation>
                            <gco:CharacterString>No limitation</gco:CharacterString>
                        </useLimitation>
                    </MD_Constraints>
                </resourceConstraints>
                <srv:serviceType>
                    <gco:ScopedName codeSpace="anyURI">view</gco:ScopedName>
                </srv:serviceType>
                <srv:serviceTypeVersion>
                    <gco:CharacterString>1.0.0</gco:CharacterString>
                </srv:serviceTypeVersion>
                <srv:extent>
                    <EX_Extent>
                        <geographicElement>
```

```
                        <EX_GeographicBoundingBox>
                            <westBoundLongitude>
                                <gco:Decimal>-11.0</gco:Decimal>
                            </westBoundLongitude>
                            <eastBoundLongitude>
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