Sentinel-1 Metadata Indexes

DHuS Open Source Framework

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Contents

List of Tables

Applicable Document

Id	Title	Reference	Issue
AD-1	OSF ICD	SPA-COPE-OSF-TN-005	1.1

Table 1 Applicable Documents

Reference Documents

Id	Title	Reference	Issue
RD-1	OData	http://www.odata.org/documentation/odata-version-2-0/	
RD-2	Apache Solr Reference Guide Covering Apache Solr 4.7	https://www.apache.org/dyn/closer.cgi/lucene/solr/ref-guide/	
RD-3	Sentinel-1 Product Specification	S1-RS-MDA-52-7441 – Version 2/9 European Space Agency (ESA)	

Table 2 Reference Documents

1 Open Data Indexes

1.1 Introducing the Sentinel-1 products formatting

SENTINEL-1 data products, as described in the Sentinel-1 Product Specification (see RD-3), are distributed using a SENTINEL-specific variation of the Standard Archive Format for Europe (SAFE) format specification. The SAFE format has been designed to act as a common format for archiving and conveying data within ESA Earth Observation archiving facilities.

The SENTINEL-SAFE format wraps a folder containing image data in a binary data format and product metadata in XML. This flexibility allows the format to be scalable enough to represent all levels of SENTINEL products.

A SENTINEL.SAFE product refers to a directory folder that contains a collection of information. It includes:

- a 'manifest.safe' file which holds the general product information in XML
- subfolders for measurement datasets containing image data in various binary formats
- a preview folder containing 'quicklooks' in PNG format, Google Earth overlays in KML format and HTML preview files
- an annotation folder containing the product metadata in XML as well as calibration data
- a support folder containing the XML schemes describing the product XML.

The data delivered is packaged as a file structure containing a manifest file in XML format listing general product metadata and subfolders for measurement data, annotations, previews and support files.

1.2 Inspection of Product Nodes

The DHuS recognises the Sentinel-1 products at ingestion time and makes products nodes accessible through the OData Protocol. The following odata query returns the list of nodes within the document root (first level). Note that both UUID and product name are needed.

```
/odata/v1/Products['UUID']/Nodes('PRODUCT_NAME.SAFE')/Nodes
```

An example of the xml returned by the previous query is shown below. The nodes are provided in the `<entry>` blocks.

```
▼<feed xmlns="http://www.w3.org/2005/Atom"
  xmlns:m="http://schemas.microsoft.com/ado/2007/08/dataservices/metadata"
  xmlns:d="http://schemas.microsoft.com/ado/2007/08/dataservices"
  xml:base="https://scihub.esa.int/dhus/odata/v1/Products('101749ae-2318-4607-bb72-
  10ff5091b544')/Nodes('S1A_IW_GRDH_1SDV_20150626T034656_20150626T034721_006539_008B1F_7364.SAFE')/">
  ▶<id>...</id>
    <title type="text">Nodes</title>
    <updated>2015-06-26T08:23:44.891Z</updated>
  ▼<author>
      <name/>
    </author>
    <link href="Nodes" rel="self" title="Nodes"/>
  ▼<entry>
    ▶<id>...</id>
      <title type="text">annotation</title>
      <updated>2015-06-26T08:23:44.891Z</updated>
      <category term="DHuS.Node" scheme="http://schemas.microsoft.com/ado/2007/08/dataservices/scheme"/>
      <link href="Nodes('annotation')" rel="edit" title="Node"/>
      <link href="Nodes('annotation')/$value" rel="edit-media" type="application/octet-stream"/>
      <link href="Nodes('annotation')/Nodes"
      rel="http://schemas.microsoft.com/ado/2007/08/dataservices/related/Nodes" title="Nodes"
      type="application/atom+xml;type=feed"/>
      <link href="Nodes('annotation')/Attributes"
      rel="http://schemas.microsoft.com/ado/2007/08/dataservices/related/Attributes" title="Attributes"
      type="application/atom+xml;type=feed"/>
      <content type="application/octet-stream" src="Nodes('annotation')/$value"/>
    ▼<m:properties>
        <d:Id>annotation</d:Id>
        <d:Name>annotation</d:Name>
        <d:ContentType>Item</d:ContentType>
        <d:ContentLength>0</d:ContentLength>
        <d:ChildrenNumber>3</d:ChildrenNumber>
        <d:Value m:null="true"/>
      </m:properties>
    </entry>
  ▶<entry>...</entry>
  ▶<entry>...</entry>
  ▶<entry>...</entry>
  ▶<entry>...</entry>
  ▶<entry>...</entry>
</feed>
```

To inspect the nodes of lower levels,

```
/odata/v1/Products['UUID']/Nodes('PRODUCT_NAME.SAFE')/Nodes('nodename')/Nodes
```

For example, in order to get all children of the Node 'annotation' of a Product

```
/odata/v1/Products('2573986b-f66e-46a4-90e8-
00598c3b6475')/Nodes('S1A_S5_GRDH_1SSV_20141003T182910_20141003T182928_002669
_002F8D_E968.SAFE')/Nodes('annotation')/Nodes
```

The Content Type property reveals the type of the Node content. `<d:ContentType>`

If the content type of a node is '**Item**' and the number of its children is 0, the node is actually a leaf and it has a value. The user might get this value by appending the string `/Value/$value` to the leaf path.

The following example will return the value of the Absolute Calibration constant in an xml file:

Getting the metadata included in the leaf 'annotation/calibration/…' of the Product (XML response)

```
/odata/v1/Products('244565d4-8ee1-4524-a05c-
2244bd9a4bb3')/Nodes('S1A_EW_GRDM_1SDH_20150217T054734_20150217T054838_004659
_005C03_7B0D.SAFE')/Nodes('annotation')/Nodes('calibration')/Nodes('calibrati
on-s1a-ew-grd-hh-20150217t054734-20150217t054838-004659-005c03-
001.xml')/Nodes('calibration')/Nodes('calibrationInformation')/Nodes('absolut
eCalibrationConstant')/Value/$value
```

If the node has content type different from 'item' (e.g `XML Document (eXtensible Markup Language)`, `SAFE Manifest`, etc..), the content download is allowed by appending the string `/$value` to the node path.

The following example will download the manifest.safe of a product:

Getting the manifest of a product

```
/odata/v1/Products('244565d4-8ee1-4524-a05c-
2244bd9a4bb3')/Nodes('S1A_EW_GRDM_1SDH_20150217T054734_20150217T054838_004659
_005C03_7B0D.SAFE')/Nodes('manifest.safe')/$value
```

2 Open Search Indexes

The following table contains the list of the principle Sentinel-1 metadata indexed for Open Search.

N.B.: every open search is triggered by adding to the dhus path the string "/search?q=" followed by the example provided in the last column below.

Metadata Name	Index Name	Description	Example
Collection	collection	Name of the collection the products is linked	`collection:name_collection`
Date	-	Start time of the acquisition period of the sensor in UTC format (yyyy-mm-ddThh:mm:ss.ssssssZ)	
Filename	filename	Name of the file	`filename:S1A_EW*`
Footprint	footprint	Footprint polygon coordinates	`footprint:"Intersects(POLYGON((-13.115927734375 27.752507427949,37.509072265625 27.752507427949,37.509072265625 61.475999093721,-13.115927734375 61.475999093721,-13.115927734375 27.752507427949)))"`
Ingestion Date	IngestionDate	Product Ingestion date in UTC format (yyyy-mm-ddThh:mm:ss.ssssssZ)	`ingestionDate:[2014-11-11T00:00:00.000Z TO NOW ]`

Instrument	-	Instrument short name	
Instrument abbreviation	instrumentShortName	Instrument short name SAR-C	`instrumentshortname:'SAR'`
Instrument description	-	The description of the instrument is linked to https://sentinel.esa.int/web/sentinel/missions/sentinel-1	
Instrument mode	sensorOperationalMode	Instrument mode	`sensoroperationalmode:S1`
Instrument name	instrumentName	Instrument name: Synthetic Aperture Radar (C-band)	`instrumentName:SAR`
Instrument swath	swathIdentifier	Instrument swath	`swathidentifier:IW`
Instrument type	instrumentType	Instrument type	
Mission datatake id	missionDatatakeId	Mission datatake identifier	`missiondatatakeid:12283` `missiondatatakeid:[12300 TO 12800]` `(notice that in the search qery there should be entered the decimal value of the mission datat take id dhus will return the products having dt ids in hexadecimal: 12283=002FFB)`
Mission type	-	Mission type: Earth Observation	
Mode	sensoroperationalmode	Sensor mode	`sensoroperationalmode:S1`
NSSDC identifier	platformidentifier	Platform NSSDC identifier	
Orbit number	orbitNumber	Absolute orbit number of the stopping of acquisitions	`orbitnumber:[2000 TO 2700]`

(start)			
Orbit number (stop)	lastOrbitNumber	Absolute orbit number of the stopping of acquisitions	`lastorbitnumber:[2000 TO 2700]`
Pass direction	orbitDirection	Track direction	`orbitdirection:ASCENDING`
Phase identifier	-	Orbit phase identifier to which the oldest data unit of the data object refers	
Polarisation	polarisationMode	Enumeration of valid polarisations for the Sentinel-1 SAR instrument.	`polarisationmode:'HH HV'`
Product class	productclass	Class of the products	`productclass:S`
Product class description	-	Description of the class of the product	
Product composition	-	Enumeration of product composition indicators. The valid values are: "Individual", to indicate a full nonsliced product; "Slice", to indicate that this is a single slice of a larger product; and "Assembled", to indicate that this is a product that has been created by combining multiple slices.	
Product level	-	Processing level of the products	
Product type	productType	Output product type.	`producttype:SLC`
Relative orbit (start)	relativeOrbitNumber	Indicates if the orbit number refers to the oldest or the most recent data unit.	`relativeorbitnumber:[10 TO 30]`
Relative orbit	lastRelativeOrbitNumber	Indicates if the orbit number refers to the oldest or the	`lastrelativeorbitnumber:[10 TO 30]`

(stop)		most recent data unit. Shall be ""start"" if the occurrence is 1.	
Resolution	-	Resolution class	
Satellite	platformname	Satellite of the acquisition (Sentinel-1)	`platformname:Sentinel-1`
Satellite description	-	The description of the satellite is linked to https://sentinel.esa.int/web/sentinel/missions/sentinel-1	
Satellite name	platformShortName	Satellite of the acquisition name (Sentinel-1)	`satelliteNaem:Sentinel-1`
Satellite number	platformSerialIdentifier	Number of the satellite of the acquisition	`platformSerialIdentifier:A`
Sensing start	beginPosition	Sensing Start time of the data segment in UTC format (yyyy-mm-ddThh:mm:ss.ssssssZ)	`beginposition:[2014-01-01T00:00:00.000Z TO NOW]` `beginposition:[NOW-1HOUR TO NOW]`
Sensing stop	endPosition	Sensing Stop time of the data segment in UTC format (yyyy-mm-ddThh:mm:ss.ssssssZ)	`endposition:[2014-01-01T00:00:00.000Z TO NOW]`
Sensor Type	sensorType	Sensor Type (RADAR)	
Size	size	Products size	
Slice number	slicenumber	Number of slices of the acquisition	`slicenumber:[5 TO 7]`
Start relative orbit number	relativeOrbitNumber	Indicates if the orbit number refers to the oldest or the most recent data unit.	`relativeorbitnumber:[10 TO 30]`
Status	status	Status of products	
Stop relative orbit number	lastRelativeOrbitNumber	Indicates if the orbit number refers to the oldest or the most recent data unit. Shall be ""start"" if the occurrence is 1.	`lastrelativeorbitnumber:[10 TO 30]`

Swath Identifier	swathidentifier	Swath Identifier	`swathidentifier:IW`
Timeliness Category	-	Timeliness category under which the product was produced, i.e. time frame from the data acquisition (for the near real time categories) or from the satellite tasking to the product delivery to the end user.	

Table 3 Sentinel-1 Indexed metadata for Open search and description

In case that no indexName is identified these metadata are used for within freetext searches