



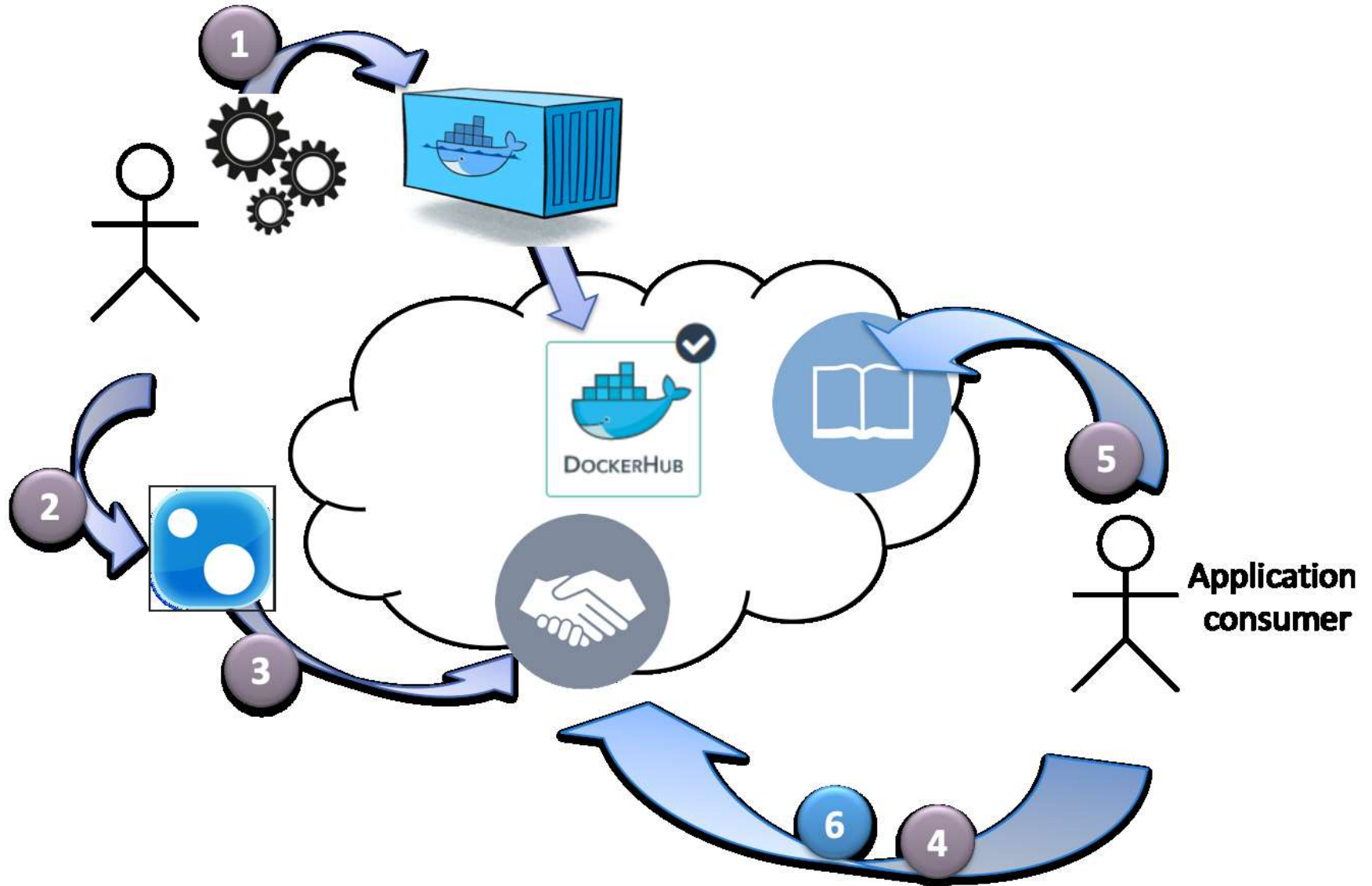
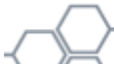
OpenSearch and JSON-LD for enhanced Earth observation data and service discovery

Dr. Ingo Simonis

Workshop on making spatial data discoverable through
mainstream search engines

July 2019

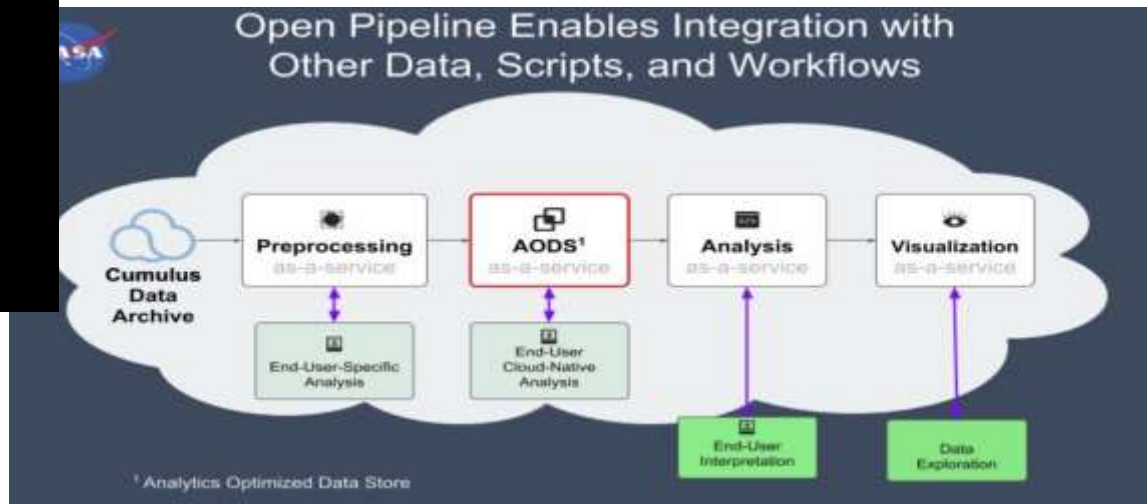
EO Applications in the Cloud



Testbed-15: Key Research Questions



- How can an application and application data catalog be established without inviting yet another catalog specification?
- How to link apps and data? Are apps by definition bound to a specific data server? If not, how to establish the links between apps and data?



EO Processes & Applications



- Metadata model
- Discovery service interface
- Management service interface

Some History: EO Products & Collections



- EO product characteristics
 - Platform / satellite
 - Sensor
 - Orbit number, track, frame, direction
 - Processing Center
 - Acquisition station
 - ...

Some History: EO Products & Collections



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EO Product
metadata model
10-157r4

EO Product
extension for ebRIM
10-189r2

EO Product
encoding
GeoJSON/JSON-LD
17-003

Some History: EO Products & Collections



EO Collection

metadata model & ebRIM extension
11-135r1

EO Collection

GeoJSON/JSON-LD
17-084

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metadata model
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Some History: EO Products & Collections



Uses:

Data Catalog Vocabulary (dcat),
Friends of a Friend (foaf),
Location Core Vocabulary (locn),
PROV Data Model (prov),
Resource Description Format (rdf),
Simple Knowledge Organization System (skos),
vCard Ontology (vcard)

...

EO Collection
GeoJSON/JSON-LD
17-084

Some History: EO Products & Collections



Models

EO Collection

metadata model & ebRIM extension
11-135r1

EO Product
metadata model
10-157r4

EO Product
extension for ebRIM
10-189r2

Encodings

EO Collection

GeoJSON/JSON-LD
17-084

EO Product
encoding

GeoJSON/JSON-LD
17-003

Open Search Interface



OpenSearch extension for
EO Products & Collections
13-026r8

OpenSearch Geo & Time
extension
10-032r8

Open Search Interface



OpenSearch extension for
EO Products & Collections
13-026r8

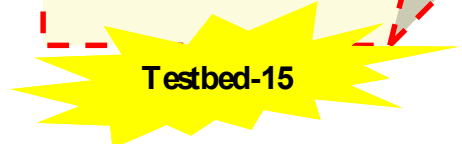
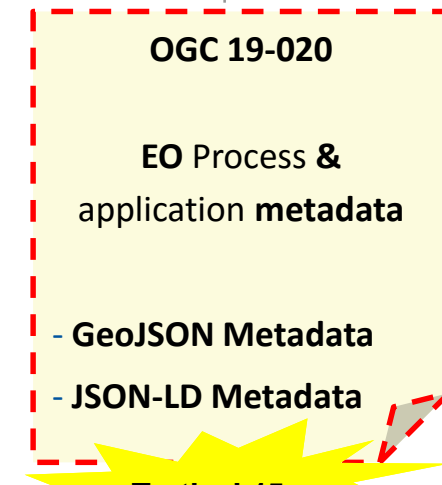
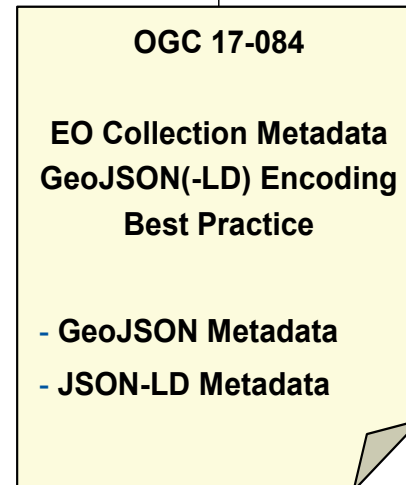
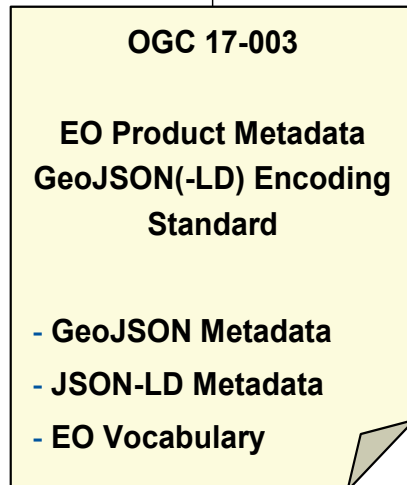
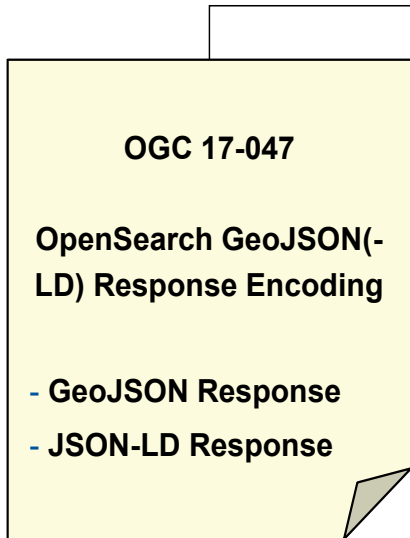
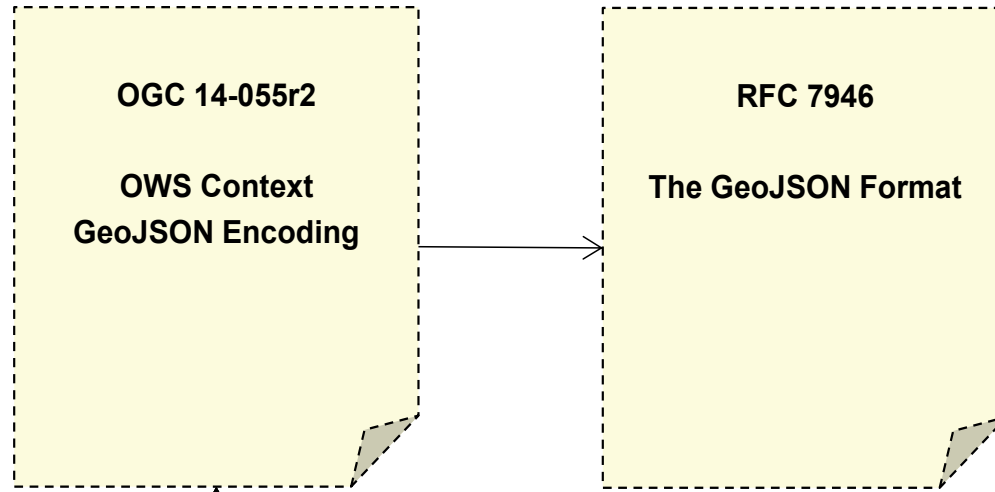
OpenSearch Geo & Time
extension
10-032r8

OpenSearch Description Document
(OSDD)

- Extendable
- Query params & resp. formats
- Mandatory resp. format:
Atom1.0/XML

OpenSearch response encoding
GeoJSON / JSON-LD
17-047

Testbed-15



GeoJSON
Feature
[OGC 14-055r2]

dcat:
DataService
[DCAT
Version 2]

```
{
  "id": "http://fedeo.esa.int/services/NdviCalculation",
  "type": "Feature",
  "geometry": null,
  "properties": {
    "identifier": "NdviCalculation",
    "kind": "http://inspire.ec.europa.eu/metadata-codelist/
    "title": "Calculation of NDVI using the SNAP toolbox for Sentinel-2",
    "abstract": "Calculation of NDVI using the SNAP toolbox for Sentinel-2",
    "updated": "2019-05-20T00:00:00Z",
    "versionInfo": "0.1",
    "versionNotes": "Initial version of application for use in OGC Testbed-15.",
    "lang": "en",
    "keyword": [
      "Vegetation"
    ],
    "links": { ... },
    "offerings": [
      {
        "type": "Offering",
        "code": "http://www.opengis.net/spec/owc-geojson/1.0/req/docker/image",
        "contents": [
          {
            "type": "text/plain",
            "content": "docker.52north.org/eopad/snap-sentinel-2-ndvi.latest"
          }
        ]
      },
      {
        "type": "Offering",
        "code": "http://www.opengis.net/spec/owc-geojson/1.0/req/wps",
        "operations": [
          {
            "code": "DescribeProcess",
            "method": "GET",
            "type": "application/json",
            "href": "http://52north.org/eopad/wps/processes/NdviCalculation",
            "result": { ... }
          }
        ]
      }
    ],
    "contactPoint": [
      {
        "type": "Organization",
        "hasName": "52 North"
      }
    ]
  }
}
```

```
1
2
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@dcat:DataService [DCAT Version 2]
"@context": { ... },
"@id": "http://fedeo.esa.int/services/NdviCalculation",
"@type": "dcat:DataService",
"dct:description": "Calculation of NDVI using the SNAP toolbox for Sentinel-2",
"dct:identifier": "NdviCalculation",
"dct:language": {
  "@id": "http://id.loc.gov/vocabulary/iso639-1/en"
},
"dct:modified": "2019-05-20T00:00:00Z",
"dct:title": "Calculation of NDVI using the SNAP toolbox for Sentinel-2",
"dct:type": "http://inspire.ec.europa.eu/metadata-codelist/Resource",
"owc:links": {
  "iana:alternate": { ... },
  "iana:describedby": { ... },
  "iana:profile": { ... }
},
"owc:offerings": [
  {
    "@type": "owc:Offering",
    "owc:code": "http://www.opengis.net/spec/owc-geojson/1.0/req/docker/image",
    "owc:contents": {
      "owc:content": "docker.52north.org/eopad/snap-sentinel-2-ndvi.latest",
      "owc:type": "text/plain"
    }
  },
  {
    "@type": "owc:Offering",
    "owc:code": "http://www.opengis.net/spec/owc-geojson/1.0/req/wps",
    "owc:operations": {
      "owc:code": "DescribeProcess",
      "owc:href": "http://52north.org/eopad/wps/processes/NdviCalculation",
      "owc:method": "GET",
      "owc:result": {
        "owc:content": {
          "wps:processDescription": {
            "wps:process": {
              "@id": "NdviCalculation"
            }
          }
        },
        "owc:type": "application/json"
      },
      "owc:type": "application/json"
    }
  }
],
"owl:versionInfo": "0.1",
"adms:versionNotes": "Initial version of application for use in OGC Testbed-15.",
"dcat:contactPoint": {
  "@type": "vcard:Organization",
  "vcard:hasName": "52 North"
},
"dcat:keyword": "Vegetation"
```

Service – JSON-LD (DCAT)

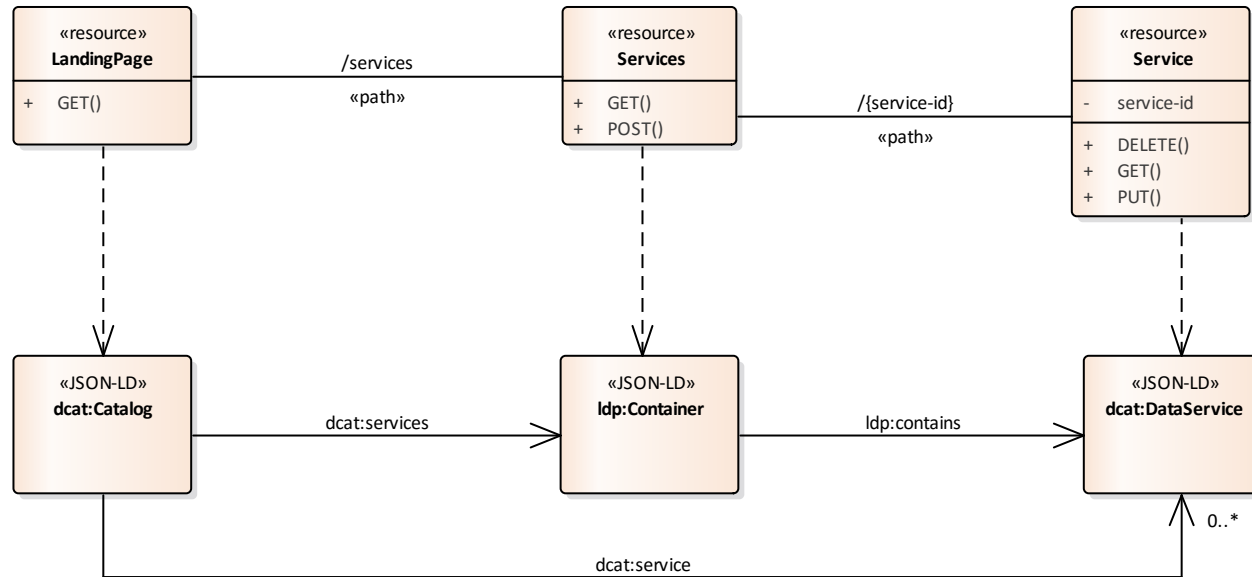


- Service Resource

- JSON-LD representation
"dcat:DataService" via normative @context.
- GeoJSON is a compaction of the JSON-LD representation.

JSON-LD (Compacted)

```
{
  "@context": "http://schemas.opengis.net/eopad-geojson/1.0/eopad-geojson.jsonld",
  "type": "Feature",
  ... same content as example in previous section ...
}
```



Landing Page	http://databio.spacebel/eo-catalog/
Conformance	/conformance
Collections	/collections
(Collection) /collections/{collection-id}	<ul style="list-style-type: none"> • resources - /collections/resources • services - /collections/services • series - /collections/series
API Definition	<p>/description?httpAccept=application/opensearchdescription+xml (OpenSearch Description Document)</p> <p>/description?httpAccept=application/openapi+json;version=3.0 (OpenAPI Definition)</p> <p>[Open with Redoc Open with Swagger.io]</p>
(Services) /resources	<ul style="list-style-type: none"> • DataBio (Filter by dc:type, dc:subject) - /resources?type=service&subject=databio • DataBio (Filter by os:startIndex, os:count) - /resources?type=service&subject=databio&startRecord=2&maximumRecords=1 • Testbed-15 (Filter by dc:subject) - /resources?type=service&subject=testbed-15 • Testbed-15 (Filter by dc:type, eo:organisationName) - /resources?type=service&organisationName=%20North • Testbed-15 (Filter by eo:offering) - /resources?type=service&offering=docker
(Service) /resources/{service-id}	<ul style="list-style-type: none"> • DataBio Component C07.01 - /resources/59c264f8e4b00685883826c7 • DataBio Component C05.01 - /resources/59c3b4fae4b00685883826d7 • DataBio Component C14.01 - /resources/59ce3e48e4b006858838270d • Testbed-15 NdviCalculation - /resources/org_n52.project.tb15.eopad.NdviCalculation • Testbed-15 SentinelQualityAreaOfInterest - /resources/org_n52.project.tb15.eopad.SentinelQualityAreaOfInterest • Testbed-15 MultiSensorNDVI - /resources/MultiSensorNDVI • Testbed-15 WPS - /resources/testbed.dev.52north.org.javaps-eopad.rest
(Series) /resources	<ul style="list-style-type: none"> • Testbed-14 (Filter by dc:subject) - /resources?type=collection&subject=testbed-14 • DataBio (Filter by os:searchTerms) - /resources?type=collection&query=Copernicus
(Series)	<ul style="list-style-type: none"> • Sentinel-2 - /resources/EOP-ESA:Sentinel-2

Earth Observation Catalog 1.0.0 OAS3

<http://databio.spacebel.be/eo-catalog/description?httpAccept>

EO Catalog provides interoperable access, following ISO/OGC interface guidelines, to Earth Observation metadata. You can try all HTTP operations described in this OpenAPI 3.0 specification.

Spacebel s.a. - Website
Send email to Spacebel s.a.
Apache 2.0

Servers
<https://databio.spacebel.be/eo-catalog>

LandingPage Provide Landing page of the catalog

GET / provide landing page (rel="self") in OAPI Common format

Conformance Provide conformance class information

GET /conformance provide conformance class information (rel="conformance") in OAPI D

APIDefinition Describe the catalogue interface

GET /resources/{seriesId}/description

GET /description Describe the catalogue interface (rel="service")

Resources Operations for resources

POST /resources

GET /resources

Resource Operations for a resource

GET /resources/{resourceId}

DELETE /resources/{resourceId}

Datasets Operations for datasets

POST /resources/{seriesId}/datasets

ReDoc <http://databio.spacebel.be/eo-catalog/description?httpAccept> TRY IT @ cors Star 5,827

Search...

- LandingPage >
- Conformance >
- APIDefinition >
- Resources >
- Resource >
- Search a resource (service or series) from the cat
- Delete a resource (service or series)**
- Datasets >
- Dataset >

Documentation Powered by ReDoc

Delete a resource (service or series).

Delete a resource (service or series).

PATH PARAMETERS

resourceId	string
required	resource identifier

Responses

- 204 resource (service or series) has been deleted.
- 401 Unauthorized
- 500 Unexpected error

DELETE /resources/{resourceId}

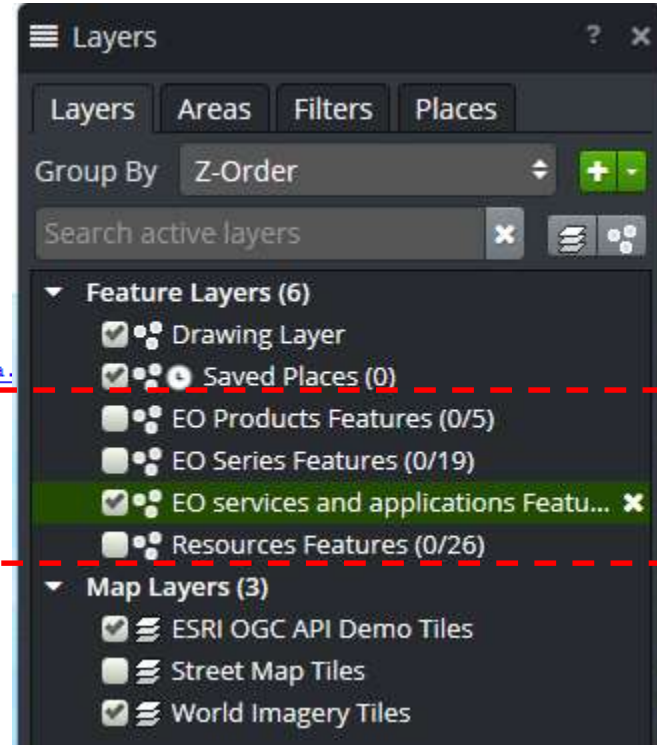


OGC API Hackaton



- /collections response

```
{
  "collections": [
    {
      "description": "Metadata records representing EO services and applications.",
      "links": [
        {
          "rel": "items",
          "href": "http://databio.spacebel.be/eo-catalog/resources?type=service",
          "type": "application/geo+json",
          "title": "Services and applications"
        },
        {
          "rel": "describedBy",
          "href": "http://schemas.opengis.net/eopad-geojson/1.0/eopad-geojson-schema",
          "type": "application/schema+json",
          "title": "JSON schema for items belonging to this collection"
        }
      ],
      "id": "services",
      "title": "EO services and applications"
    },
    {
      "links": [
        {
          "rel": "self",
          "href": "http://databio.spacebel.be/eo-catalog/collections",
          "type": "application/json",
          "title": "this document"
        }
      ]
    }
  ]
}
```



API Definition - OpenAPI



- OpenSearch still requires OSDD in XML format
 - OpenAPI definition contains most of information already...
 - Preserve investments in current OpenSearch extensions (OpenSearch does not define the HTTP parameter names visible in OpenAPI)
- OSDD + Param Extension =? OpenAPI + OpenSearch Extension

```
<param:Parameter name="organisationName"
  pattern="[a-zA-Z|1-9|\-|_]+"
  title="Name of data provider."
  value="{eo:organisationName}">
  <param:Option label="ESA" value="ESA"/>
  <param:Option label="VITO" value="VITO"/>
  <param:Option label="JAXA" value="JAXA"/>
  <param:Option label="DLR" value="DLR"/>
</param:Parameter>
```

```
{
  "name": "organisationName",
  "in": "query",
  "x-value": "{eo:organisationName}",
  "description": "Name of data provider {eo:organisationName}.",
  "required": false,
  "schema": {
    "type": "string",
    "enum": [
      "ESA",
      "VITO",
      "JAXA",
      "DLR"
    ]
  }
}
```

Summary



- Use available namespaces and elements as widely as possible
- Many EO elements still require eop namespace elements
- Available at Web APIs
- Search engine index?
- How far does this get us?

