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

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Workshop on making spatial data discoverable through mainstream search engines
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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
  – ...

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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

EO Product metadata model
10-157r4

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10-189r2

EO Product encoding
GeoJSON/JSON-LD
17-003
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
  - extension for ebRIM
  - 10-189r2

**Encodings**

- **EO Collection**
  - GeoJSON/JSON-LD
  - 17-084

- **EO Product**
  - 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

OGC 17-047
OpenSearch GeoJSON(-LD) Response Encoding
- GeoJSON Response
- JSON-LD Response

OGC 17-003
EO Product Metadata GeoJSON(-LD) Encoding Standard
- GeoJSON Metadata
- JSON-LD Metadata
- EO Vocabulary

OGC 17-084
EO Collection Metadata GeoJSON(-LD) Encoding Best Practice
- GeoJSON Metadata
- JSON-LD Metadata

OGC 19-020
EO Process & application metadata
- GeoJSON Metadata
- JSON-LD Metadata

OGC 17-055r2
OWS Context GeoJSON Encoding

RFC 7946
The GeoJSON Format
Service – JSON-LD (DCAT)

- Service Resource
  - JSON-LD representation "dcat:DataService" via normative @context.
  - GeoJSON is a compaction of the JSON-LD representation.
Landing Page  http://databio.spacebel/eo-catalog/

Conformance  /conformance

Collections  /collections

(Collection)  /collections/{collection-id}

- resources - /collections/resources
- services - /collections/services
- series - /collections/series

APIDefinition  /description?httpAccept=application/opensearchdescription+xml (OpenSearch Description Document)

/apiDescription?httpAccept=application/openapi+json;version=3.0 (OpenAPI Definition)

[Open with Redoc | Open with Swagger.io]

(Services)  /resources

- DataBio (Filter by dc:type, dc:subject) - /resources?type=service&subject=databio
- DataBio (Filter by os:startIndex, os:count) - /resources?type=service&subject=databio&startIndex=2&maximumRecords=1
- Testbed-15 (Filter by dc:subject) - /resources?type=service&subject=testbed-15
- Testbed-15 (Filter by dc:subject, dc:organisationName) - /resources?type=service&organisationName="S2%20North"
- Testbed-15 (Filter by eoo:offering) - /resources?type=service&offering=docker

(Service)  /resources/{service-id}

- DataBio Component C07.01 - /resources/59c264f8e4b00685883826c7
- DataBio Component C05.01 - /resources/59c3b4fae4b00685883826d7
- DataBio Component C14.01 - /resources/59c3e48e4b006858838270d
- Testbed-15 NdivCalculation - /resources/org.n52.project.tb15.eopad.NdivCalculation
- 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

- Testbed-14 (Filter by dc:subject) - /resources?type=collection&subject=testbed-14
- DataBio (Filter by os:searchTerms) - /resources?type=collection&query=Copernicus

(Series)  /resources

- Sentinel-2 - /resources/EOP-ESA:Sentinel-2
OGC API Hackaton

• /collections response

```json
{
  "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/epad-geojson/1.0/epad-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

```xml
<param:Parameter name="organisationName"
    pattern="[a-z][A-Z][1-9]{1,}\|\_\+"
    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>
```

```json
{
    "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?
Thank You