

# OGC API - Environmental Data Retrieval Standard

# Open Geospatial Consortium

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## OGC API - Environmental Data Retrieval Standard

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# Chapter 1. Introduction

## i. Abstract

The Environmental Data Retrieval (EDR) Application Programming Interface (API) provides a family of lightweight query interfaces to access Environmental Data resources by requesting data at a **Position**, within an **Area** or along a **Trajectory**. An Environmental Data resource is a collection of spatiotemporal data that can be sampled using the EDR query pattern geometries. These patterns are described in the [Requirement Class Core](#) section.

EDR API query patterns, such as [Position](#), [Area](#), [Cube](#), [Trajectory](#) or [Corridor](#), can be thought of as discrete sampling geometries, conceptually consistent with the feature of interest in the [Sensor Observation Service \(SOS\)](#). A typical EDR data resource is a multidimensional dataset that could be accessed via the [Web Coverage Service \(WCS\)](#). In contrast to SOS and WCS, EDR implements the technical baseline of the [OGC API](#) family of standards and aims to provide a single set of simple-to-use query patterns. Use cases for EDR range from real or virtual time-series observation retrievals, to sub-setting 4-dimensional data cubes along user-supplied sampling geometries. These query patterns do not attempt to satisfy the full scope of either SOS or WCS, but provide useful building blocks to allow the composition of APIs that satisfy a wide range of geospatial data use cases. By defining a set focused querying patterns (and no requirement to implement all of them), the EDR API should help to simplify the design of systems (as they can be performance tuned for the supported queries) making it easier to build robust and scalable infrastructure.

With the OGC API family of standards, the OGC community has extended its suite of standards to include Resource Oriented Architectures and Web Application Programming Interfaces (APIs). These standards are based on a shared foundation, the OGC API-Common standard, which defines the resources and access paths that are supported by all OGC APIs. These are listed in [Table 1](#). This document extends that foundation to define the Environmental Data Retrieval API.

*Table 1. Overview of Resources*

Resource	Path	HTTP Method	Document Reference
Landing page	/	GET	<a href="#">API Landing Page</a>
API definition	/api	GET	<a href="#">API Definition</a>
Conformance classes	/conformance	GET	<a href="#">Declaration of Conformance Classes</a>
Collections metadata	/collections	GET	<a href="#">Collections Metadata</a>
Collection instance metadata	/collections/{collection_id}	GET	<a href="#">Collection Metadata</a>

### CAUTION

During the development phase, these components use a base URL of <https://github.com/opengeospatial/Environmental-Data-Retrieval-API/master>, but eventually they are expected to be available under the base URL <http://schemas.opengis.net/ogcapi-edr-1/1.0>.



The resources identified in [Table 1](#) primarily support Discovery operations. Discovery operations allow clients to interrogate the API to determine its capabilities and obtain information (metadata) about a distribution of a resource. This includes the API definition of the server(s) as well as metadata about the resources provided by those servers.

This standard extends the [Table 1](#) common query operations by defining simple, coordinate-based, queries which are applicable to many geospatial resource types. Other OGC API standards may define additional query capabilities specific to their resource type. EDR Query operations allow resources or values to be retrieved from the underlying geospatial resource data store. The information returned is based upon the selection criteria (query string) provided by the client.

## **ii. Keywords**

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

ogcdoc, OGC document, property, geographic information, spatial data, spatial things, dataset, distribution, API, geojson, covJSON, html, OpenAPI, AsyncAPI, REST, Common, position, area, trajectory, corridor, time-series

## **iii. Preface**

### **OGC Declaration**

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## **iv. Submitting organizations**

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

- UK Met Office
- US Geological Service
- US National Weather Service
- Wuhan University
- Meteorological Service of Canada
- Finnish Meteorological Institute
- ESRI
- NASA
- Météo-France

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# Chapter 2. Scope

This specification identifies resources, captures compliance classes, and specifies requirements which are applicable to OGC Environmental Data Retrieval APIs.

This specification addresses two fundamental operations: discovery and query.

Discovery operations allow the API to be interrogated to determine its capabilities and retrieve information (metadata) about a distribution of a resource. This includes the API definition of the server as well as metadata about the Environmental Data resources provided by the server.

An Environmental Data resource is a **collection** of spatio-temporal data that can be sampled using OGC-API Environmental Data Retrieval query patterns.

Query operations allow other environmental data resources to be sampled from the underlying Environmental Data resource, or data store, based upon EDR query geometry and other selection criteria, defined by this standard and selected by the client.

# Chapter 3. Conformance

Conformance with this standard shall be checked using the tests specified in [Abstract Test Suite \(Normative\)](#) of this document. The framework, concepts, and methodology for testing, and the criteria to claim conformance are specified in the OGC Compliance Testing Policies and Procedures and the [OGC Compliance Testing](#) web site.

The one Standardization Target for this standard is [Web APIs](#).

OGC API - Common - Core defines an API module intended for re-use by other OGC Web API standards. This OGC API - EDR standard is an extension of OGC API - Common - Core. Conformance to this standard requires demonstrated conformance to the applicable Conformance Classes of OGC API - Common - Core.

This standard identifies nine (9) Conformance Classes. The [Conformance Classes](#) implemented by an API are advertised through the `/conformance` path on the landing page. Each Conformance Class is defined by one or more [Requirements Classes](#). The test classes in [Requirements Detail](#) are organized by Requirements Class. The Requirements Classes define the functional requirements which will be tested through the associated Conformance Class.

The conformance classes and their constituent requirements classes for OGC API-EDR are:

- [Core](#), one Requirement Class

The *Core Requirements Class* is the minimal useful service interface for an OGC API. The requirements specified in this Requirements Class are mandatory for all implementations of the EDR API.

The Core requirements class is specified in **Requirements Class Core** ([Chapter 8](#)).

- [Collections](#), one Requirement Class

The API-Common Part 2: Collections standard extends the API-Common Part 1: Core to enable discovery and query access to [collections](#) of [spatial resources](#).

The structure and organization of a [collection](#) of spatial data is very much dependent on the nature of that data and the expected access patterns. This is information which cannot be specified in a common manner. The OGC API-Common Part 2: Collections, specifies the requirements necessary to discover and understand a generic [collection](#) of spatial data.

The EDR API *Collection Requirements Class* extends the common requirements to those specific to the query and retrieval of collections of Environmental Data.

The EDR Collection requirements class is specified in **Requirements Class Collection** ([Chapter 9](#)).

- [Encodings](#), three Requirements Classes
  - [HTML](#)
  - [GeoJSON](#)
  - [CoverageJSON](#)

Neither the *Core* nor *Collection* requirements classes mandate specific encodings or formats for representing resources. The *HTML*, *GeoJSON* and *CoverageJSON* requirements classes specify representations for these resources in frequently used encodings for spatial data on the web.

None of these encodings are mandatory. An implementation of the EDR API may decide to implement another encoding instead of, or in addition to, those listed. However, a common format does simplify interoperability so support for *CoverageJSON* is highly recommended as an established, efficient and effective format.

The Encoding Requirements Classes are specified in **Encoding Requirements Classes** ([Chapter 10](#)).

- [OpenAPI 3.0](#), one Requirements Class

The OGC API-Common Part 1:Core standard does not mandate any encoding or format for the formal definition of the API. However, the preferred option is the OpenAPI 3.0 specification. Therefore the EDR APIs will be defined using *OpenAPI 3.0*.

The OpenAPI 3.0 Requirements Class is specified in **OpenAPI 3.0 Requirements Class** ([Chapter 10](#)).

- [Queries](#), eight Requirements classes
  - [Position](#)
  - [Radius](#)
  - [Area](#)
  - [Cube](#)
  - [Trajectory](#)
  - [Corridor](#)
  - [Items](#)
  - [Locations](#)
  - [Instances](#)

The EDR API Queries Conformance class does not mandate any specific query patterns for querying resources. The *Position*, *Area* and *Trajectory* requirements classes specify query patterns for which there are ubiquitous use cases.

An implementation of the EDR API may decide to implement another query pattern instead of, or in addition to, those listed. However, a minimal query pattern of retrieving data at a [position](#) (with elevation and time) does simplify interoperability so support for the [position](#) query is highly recommended.

The Queries Requirements Classes are specified in **Queries Requirements Classes** ([Chapter 9](#)).

# Chapter 4. References

The following normative documents contain provisions that, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

- Open API Initiative: **OpenAPI Specification 3.0.3**, <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.3.md>
- Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., Berners-Lee, T.: **IETF RFC 2616, HTTP/1.1**, <https://tools.ietf.org/rfc/rfc2616.txt>
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- Portele, C., Vretanos, P., Heazel, C.: **OGC API - Features - Part 1: Core**, <http://www.opengis.net/doc/IS/ogcapi-features-1/1.0>

# Chapter 5. Terms and Definitions

This document uses the terms defined in Sub-clause 5 of [OGC API-Common Part 1 \(OGC 19-072\)](#), which is based on the ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards. In particular, the word “shall” (not “must”) is the verb form used to indicate a requirement to be strictly followed to conform to this standard.

The [Glossary](#) includes terms from other standards and specifications that, while not normative, are critical to accurately understand this specification.

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

## 5.1. area

region specified with a geographic envelope that may have vertical dimension

## 5.2. corridor

path of a moving point described by a one-parameter window around a set of points

## 5.3. cube

rectangular area, with a vertical extent

## 5.4. location

identifiable geographic place

SOURCE: [ISO 19112](#)

### NOTE

A location is represented by one of a set of data types that describe a position, along with metadata about that data, including coordinates (from a coordinate reference system), a measure (from a linear referencing system), or an address (from an address system).

## 5.5. instance

version, release, or run of a given data collection

## 5.6. position

a place specified with a geographic point

## 5.7. radius

region specified with a geographic point and radial distance

## 5.8. trajectory

path of a moving point described by a one parameter set of points

SOURCE: [ISO 19141](#)



# Chapter 6. Conventions

## 6.1. Identifiers

The [Architecture of the World Wide Web](#) establishes the URI as the single global identification system for the Web. Therefore, URIs or [URI Templates](#) are used in OGC [Web API](#) standards to identify key entities in those standards.

The normative provisions in this standard are denoted by the URI:

<http://www.opengis.net/spec/ogcapi-edr-1/1.0>

All [Requirements](#) and [Conformance Tests](#) that appear in this document are denoted by partial URIs which are relative to this base.

A key requirement of [Web API](#) standards is the unambiguous identification of the [resources](#) they address. In an implementation of such a standard, URIs would be used to identify those resources. A standard, however, is not an implementation. A standard can identify potential resources, but not the resources themselves. Therefore, OGC [Web API](#) standards use [URI Templates](#) to identify [resource categories](#). These resource categories are instantiated in the implementation of the standard.

The scope of each URI Template is specified in the standard. In some cases, API implementations are required to implement the template as a path in their API. In most cases they are optional.

Implementation of the URI Templates is recommended in that they provide a common look and feel to implementations of OGC [Web API](#) standards.

## 6.2. Link relations

To express relationships between resources, [RFC 8288 \(Web Linking\)](#) and [registered link relation types](#) are used wherever possible and denoted below with [IANA]. Additional link relation types are registered with the [OGC Link Relation Registry](#). These are denoted below with [OGC].

The following link-relations are in common use by OGC [Web API](#) Standards.

- **alternate**: Refers to a substitute for this context. [IANA]
- **collection**: The target IRI points to a resource which represents the [collection](#) resource for the context IRI. [IANA]
- **conformance**: Refers to a resource that identifies the specifications that the link's context conforms to. [OGC]
- **data**: refers to the root resource of a dataset in an API. [OGC]
- **describedby**: Refers to a resource providing information about the link's context. [IANA]
- **item**: The target IRI points to a resource that is a member of the [collection](#) represented by the context IRI. [IANA]
- **items**: Refers to a resource that comprises members of the [collection](#) represented by the link's

context. [OGC]

- **license**: Refers to a license associated with this context. [IANA]
- **self**: Conveys an identifier for the link's context. [IANA]
- **service-desc**: Identifies service description for the context that is primarily intended for consumption by machines. [IANA]
  - API definitions are considered service descriptions.
- **service-doc**: Identifies service documentation for the context that is primarily intended for human consumption. [IANA]

Each resource representation includes an array of links. Implementations are free to add additional links for all resources provided by the API. For example, an **enclosure** link could reference a bulk download of a [collection](#). Or a **related** link on a feature could reference a related feature.

A **license** link could be used for constraints on the data retrieved. Multiple **license** links could be provided for different content types. Alternatively, if all data retrieved via the API is available under the same license, the link MAY instead be added to the top-level links property of the response.

#### NOTE

The query patterns of the EDR API use the link relation **data**. It is envisaged that, in the future, this link relation may be replaced by **position**, **area**, and **trajectory** which would all be specializations of the currently used **data**.

## 6.3. Media Types

JSON media types that would typically be used in an OGC API that supports JSON are:

- [application/prs.coverage+json](#) for resources that include coverage content, and
- [application/geo+json](#) for feature [collections](#) and features, and
- [application/json](#) for all other resources.

XML media types that would typically occur in an OGC API that supports XML are:

- [application/gml+xml;version=3.2](#) for any GML 3.2 feature [collections](#) and features,
- [application/gml+xml;version=3.2;profile=http://www.opengis.net/def/profile/ogc/2.0/gml-sf0](#) for GML 3.2 feature [collections](#) and features conforming to the GML Simple Feature Level 0 profile,
- [application/gml+xml;version=3.2;profile=http://www.opengis.net/def/profile/ogc/2.0/gml-sf2](#) for GML 3.2 feature [collections](#) and features conforming to the GML Simple Feature Level 2 profile, and
- [application/xml](#) for all other resources.

The typical HTML media type for all "web pages" in an OGC API would be [text/html](#).

The media types for an OpenAPI definition are [vnd.oai.openapi+json;version=3.0](#) (JSON) and [application/vnd.oai.openapi;version=3.0](#) (YAML).

<b>NOTE</b>	The OpenAPI media type has not been registered yet with IANA and may change.
<b>NOTE</b>	The CoverageJSON media type has not been registered yet with IANA and may change.

## 6.4. Examples

Most of the examples provided in this standard are encoded in JSON. JSON was chosen because it is widely understood by implementers and easy to include in a text document. This convention should NOT be interpreted as a requirement that JSON must be used. Implementors are free to use any format they desire as long as there is a Conformance Class for that format and the API advertises its support for that Conformance Class.

## 6.5. Schema

JSON Schema is used throughout this standard to define the structure of resources. These schema are typically represented using YAML encoding. This convention is for the ease of the user. It does not prohibit the use of another schema language or encoding. Nor does it indicate that JSON schema is required. Implementations should use a schema language and encoding appropriate for the format of the resource.

## 6.6. Use of HTTPS

For simplicity, this document generally refers to the HTTP protocol. This is not meant to exclude the use of HTTPS and simply is a shorthand notation for "HTTP or HTTPS". In fact, most servers are expected to use [HTTPS](#), not [HTTP](#).

## 6.7. API definition

### 6.7.1. General remarks

Good documentation is essential for every API so that developers can more easily learn how to use the API. In the best case, documentation would be available both in HTML for human consumption and in a machine readable format that can be best processed by software for run-time binding.

This standard specifies requirements and recommendations for APIs that share spatial resources and want to follow a standard way of doing so. In general, APIs will go beyond the requirements and recommendations stated in this standard. They will support additional operations, parameters, etc. that are specific to the API or the software tool used to implement the API.

### 6.7.2. Role of OpenAPI

This document uses OpenAPI 3.0 fragments as examples and to formally state requirements. Using OpenAPI 3.0 is not required for implementing an OGC API. Other API definition languages may be used along with, or instead of OpenAPI. However, any API definition language used should have an associated [conformance class](#) advertised through the [/conformance](#) path.

This approach is used to avoid lock-in to a specific approach to defining an API. This standard includes a [conformance class](#) for API definitions that follow the [OpenAPI specification 3.0](#). Conformance classes for additional API definition languages will be added as the API landscape continues to evolve.

In this document, fragments of OpenAPI definitions are shown in YAML since YAML is easier to format than JSON and is typically used in OpenAPI editors.

### 6.7.3. References to OpenAPI components in normative statements

Some normative statements (requirements, recommendations and permissions) use a phrase that a component in the API definition of the server must be "based upon" a schema or parameter component in the OGC schema repository.

In this case, the following changes to the pre-defined OpenAPI component are permitted:

- If the server supports an XML encoding, `xml` properties may be added to the relevant OpenAPI schema components.
- The range of values of a parameter or property may be extended (additional values) or constrained (if a subset of all possible values are applicable to the server). An example for a constrained range of values is to explicitly specify the supported values of a string parameter or property using an `enum`.
- Additional properties may be added to the schema definition of a Response Object.
- Informative text may be changed or added, like comments or description properties.

For API definitions that do not conform to the [OpenAPI Specification 3.0](#) the normative statement should be interpreted in the context of the API definition language used.

### 6.7.4. Paths in OpenAPI definitions

All paths in an OpenAPI definition are relative to the base URL of a server. Unlike Web Services, an API is decoupled from the server(s). Some ramifications of this are:

- An API may be hosted (replicated) on more than one server.
- Parts of an API may be distributed across multiple servers.

### *Example 1. URL of the OpenAPI definition*

If the OpenAPI Server Object looks like this:

```
servers:  
  - url: https://dev.example.org/  
    description: Development server  
  - url: https://data.example.org/  
    description: Production server
```

The path `/mypath`` in the OpenAPI definition of the API would be the URL `https://data.example.org/mypath`` for the production server.

## **6.7.5. Reusable OpenAPI components**

Reusable components for OpenAPI definitions for a OGC API are referenced from this document.

# Chapter 7. Overview

## 7.1. General

The [OGC API](#) standards enable access to resources using the HTTP protocol and its associated operations (GET, PUT, POST, etc.). OGC API-Common defines a set of facilities which are applicable to all OGC APIs. Other OGC standards extend API-Common with facilities specific to a resource type.

This OGC API-EDR standard defines an API with two goals:

1. To allow clients to retrieve a subset of data created by the API in response to a standardized, coordinate orientated, query pattern;
2. To provide 'building blocks' allowing the construction of more complex applications.

The EDR API can be considered a 'Sampling API'. The query creates a discrete sampling geometry against the Environmental Data resource of a relatively persistent data store. The query and its response are transient resources, which could be made persistent for re-use if required.

The functionality provided by EDR query patterns could be realized through specific implementation of the SOS (and to some extent WCS) from the [OGC Web Services family of \(XML-based\) standards](#). EDR introduces a streamlined JSON-based OGC API implementation of building blocks that could be used for many of the same use cases addressed by SOS and WCS in the past.

## 7.2. Resource Paths

[Table 2](#) summarizes the access paths and relation types defined in this standard.

*Table 2. Environmental Data API Paths*

Path Template	Relation	Resource
<b>Common</b>		
<a href="#">{root}/</a>	none	Landing page
<a href="#">{root}/api</a>	<a href="#">service-desc</a> or <a href="#">service-doc</a>	API Description (optional)
<a href="#">{root}/conformance</a>	<a href="#">conformance</a>	Conformance Classes
<b>Collections</b>		
<a href="#">{root}/collections</a>	<a href="#">data</a>	Metadata describing the <a href="#">collections</a> of data available from this API.
<a href="#">{root}/collections/{collectionId}</a>		Metadata describing the <a href="#">collection</a> of data which has the unique identifier <a href="#">{collectionId}</a>
<b>Features</b>		

Path Template	Relation	Resource
<a href="#">{root}/collections/{collectionId}/items</a>		Retrieve metadata about available items
<b>Queries</b>		
<a href="#">{root}/collections/{collectionId}/{queryType}</a>		Retrieve data according to the query pattern
<a href="#">{root}/collections/{collectionId}/instances</a>		Retrieve metadata about <a href="#">instances</a> of a <a href="#">collection</a>
<a href="#">{root}/collections/{collectionId}/instances/{instanceId}</a>		Retrieve metadata from a specific <a href="#">instance</a> of a <a href="#">collection</a> which has the unique identifier <a href="#">{instanceId}</a>

Where:

- [{root}](#) = Base URI for the API server
- [{collectionId}](#) = an identifier for a specific [collection](#) of data
- [{instanceId}](#) = an identifier for a specific version or [instance](#) of a [collection](#) of data
- [{queryType}](#) = an identifier for a specific query pattern to retrieve data from a specific [collection](#) of data

# Chapter 8. Dependencies on API-Common Core and Collections

The OGC API-EDR standard is an extension of the OGC API-Common Part 1: Core and Part 2: Collections standards. Therefore, an implementation of API-EDR shall first satisfy the appropriate Requirements Classes from API-Common.

**Requirement 1: /req/core/api-common** OGC API-Common

## 8.1. Overview

The **Core** Requirements Class defines the requirements for locating, understanding, and accessing environmental data resources.

**Requirements Class:** OGC API-Environmental Data Retrieval Core

The **Core** Requirements Class is presented in five sections:

1. **API Platform**: a set of common capabilities
2. **Collection Access**: operations for accessing **collections** of environmental data.
3. **Query Resources**: operations for accessing environmental data resources through queries
4. **Parameters**: parameters for use in the API-EDR operations.
5. **General**: general principles for use with this standard.

**Table 3** Identifies the API-Common Requirements Classes which are applicable to each section of this Standard. Instructions on when and how to apply these Requirements Classes are provided in each section.

*Table 3. Mapping API-EDR Sections to API-Common Requirements Classes*

API-EDR Section	API-Common Requirements Class
API Landing Page	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core</a>
API Definition	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core</a>
Declaration of Conformance Classes	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core</a>
Collections	<a href="http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections">http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections</a>
OpenAPI 3.0	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas30">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas30</a>
GeoJSON	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json</a>
CoverageJSON	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json</a>
HTML	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/html">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/html</a>



## 8.2. Platform

API-Common defines a set of common capabilities which are applicable to any OGC [Web API](#). Those capabilities provide the platform upon which resource-specific APIs can be built. This section describes those capabilities and any modifications needed to better support Environmental Data resources.

### 8.2.1. API landing page

The landing page provides links to start exploration of the resources offered by an API. Its most important component is a list of links. OGC API-Common already requires some common links. Those links are sufficient for this standard.

#### *Dependencies*

<http://www.opengis.net/spec/ogcapi-common-1/1.0/req/core>

#### **Operation**

The **Landing Page** operation is defined in the **Core** conformance class of API-Common. No modifications are needed to support **Environmental Data** resources. The **Core** conformance class specifies only one way of performing this operation:

1. Issue a **GET** request on the **{root}/** path

Support for **GET** on the **{root}/** path is required by API-Common.

#### **Response**

A successful response to the **Landing Page** operation is defined in API-Common. The schema for this resource is provided in [Landing Page Response Schema](#).

#### *Landing Page Response Schema*

```
type: object
required:
  - links
properties:
  title:
    type: string
    example: Meteorological data server
  description:
    type: string
    example: Access to Meteorological data via a Web API that conforms to the OGC
      API Environmental Data Retrieval specification.
  links:
    type: array
    items:
      $ref: link.yaml
    example:
      - href: http://www.example.org/edr/api
```

```

    hreflang: en
    rel: service
    type: application/openapi+json;version=3.0
    title: ""
  - href: http://www.example.org/edr/conformance
    hreflang: en
    rel: data
    type: application/json
    title: ""
  - href: http://www.example.org/edr/collections
    hreflang: en
    rel: data
    type: application/json
    title: ""
keywords:
  type: array
  items: string
  example:
    - Temperature
    - Wind
    - Point
    - Trajectory
provider:
  type: object
  properties:
    name:
      description: Name of organization providing the service
      type: string
    url:
      description: Link to service providers website
      type: string
contact:
  type: object
  properties:
    email:
      description: Email address of service provider
      type: string
    phone:
      description: Phone number of service provider
      type: string
    fax:
      description: Fax number of service provider
      type: string
    hours:
      type: string
    instructions:
      type: string
    address:
      type: string
    postalCode:
      type: string

```

```
city:
  type: string
stateorprovince:
  type: string
country:
  type: string
```

The following JSON fragment is an example of a response to an OGC API-EDR Landing Page operation.

#### *Landing Page Example*

```
{
  "title": "string",
  "description": "string",
  "links": [
    {
      "href": "http://data.example.org/",
      "rel": "self",
      "type": "application/json",
      "title": "this document"
    },
    {
      "href": "http://data.example.org/api",
      "rel": "service-desc",
      "type": "application/openapi+json;version=3.0",
      "title": "the API definition"
    },
    {
      "href": "http://data.example.org/conformance",
      "rel": "conformance",
      "type": "application/json",
      "title": "OGC conformance classes implemented by this API"
    },
    {
      "href": "http://data.example.org/collections",
      "title": "Metadata about the resource collections"
    }
  ]
}
```

### **Error situations**

The requirements for handling unsuccessful requests are provided in [\[http-response\]](#). General guidance on HTTP status codes and how they should be handled is provided in [HTTP Status Codes](#).

### **8.2.2. API definition**

Every API is required to provide a definition document that describes the capabilities of that API. This definition document can be used by developers to understand the API, by software clients to

connect to the server, or by development tools to support the implementation of servers and clients.

#### *Dependencies*

<http://www.opengis.net/spec/ogcapi-common-1/1.0/req/core>

### **Operation**

This operation is defined in the **Core** conformance class of API-Common. No modifications are needed to support **Environmental Data** resources. The **Core** conformance class describes two ways of performing this operation:

1. Issue a **GET** request on the **{root}/api** path
2. Follow the **service-desc** or **service-doc** link on the landing page

Only the link is required by API-Common.

### **Response**

A successful response to the API Definition request is a resource which documents the design of the API. API-Common leaves the selection of format for the API Definition response to the API implementor. However, the options are limited to those which have been defined in the API-Common standard. At this time OpenAPI 3.0 is the only option provided.

### **Error situations**

The requirements for handling unsuccessful requests are provided in [\[http-response\]](#). General guidance on HTTP status codes and how they should be handled is provided in [HTTP Status Codes](#).

## **8.2.3. Declaration of conformance classes**

To support "generic" clients that want to access multiple OGC API standards and extensions - and not "just" a specific API server, the API has to declare the conformance classes it claims to have implemented.

#### *Dependencies*

<http://www.opengis.net/spec/ogcapi-common-1/1.0/req/core>

### **Operation**

This operation is defined in the **Core** conformance class of API-Common. No modifications are needed to support **Environmental Data** resources. The **Core** conformance class describes two ways of performing this operation:

1. Issue a **GET** request on the **{root}/conformance** path
2. Follow the **conformance** link on the landing page

Both techniques are required by API-Common.

## Response

A successful response to the Conformance operation is a list of URLs. Each URL identifies an OGC Conformance Class for which this API claims conformance. The schema for this resource is defined in API-Common and provided for reference in [Conformance Response Schema](#).

### Requirement 2: `/req/core/conformance` Core conformance classes

#### *Conformance Response Schema*

```
type: object
required:
  - conformsTo
properties:
  conformsTo:
    type: array
    items:
      type: string
```

The following JSON fragment is an example of a response to an OGC API-EDR conformance operation.

#### *Conformance Information Example*

```
{
  "conformsTo": [
    "http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/core",
    "http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core",
    "http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections",
    "http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas3",
    "http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/html",
    "http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json",
  ]
}
```

# Chapter 9. Query, Environmental and Information Resources

Query resources are spatial queries which support the operation of the API or the access and use of the Environmental Data resources. The API-EDR standard has identified an initial set of common **queryTypes** to implement, described in the [Query Resources](#) section. This list may change as the standard is used and experience gained.

An Environmental Data resource is a **collection** of spatiotemporal data that can be sampled using the API-EDR query patterns.

## 9.1. Requirements Class: Collections

<a href="http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections">http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections</a>	
Target type	Web API
Dependency	<a href="#">Requirements Class "OAPI Core"</a>
Dependency	<a href="#">ISO 19107</a>
Dependency	<a href="#">ISO 19108</a>
Dependency	<a href="#">ISO 19111</a>
Dependency	<a href="#">ISO 19108</a>
Dependency	<a href="#">ISO 8601</a>

Query resources related to Environmental Data resources (**collections** of spatiotemporal data) can be exposed using the path templates:

- **/collections/{collectionId}/{queryType}**
- **/collections/{collectionId}/instances/{instanceId}/{queryType}**

Where

**{collectionId}** = a unique identifier for a **collection** of geospatial data.

**{instanceId}** = a text string identifying the version or **instance** of the chosen **collection**.

**{queryType}** = a text string identifying the query pattern performed by the API.

The **instanceId** parameter allows support for multiple **instances** or versions of the same underlying datasource to be accessed by the API. This is applicable when the entire datasource has been regenerated rather than individual values in the datasource being changed. If only one **instance** of the datasource exists a value of **default** or **latest** could be used.

Information resources associated with a specific **collection** should be accessed through the **/collections** path. Information resources not associated with a specific **collection** should be accessed via the **/ {instanceId} / {queryType}** path template.

The resources returned from each node in these templates are described in [Table 4](#).

## 9.2. Information Resources

Table 4. Information Resource Paths

Path Template	Resource
/collections	The root resource describing the <a href="#">collections</a> of geospatial data available from this API.
/collections/{collectionId}	Identifies a <a href="#">collection</a> of geospatial data with the unique identifier <a href="#">{collectionId}</a>
/collections/{collectionId}/{queryType}	Identifies an Information Resource of type {queryType} associated with the <a href="#">{collectionId}</a> <a href="#">collection</a> .

The OGC API-Common standards do not define any information resource types. However [Table 5](#) provides a mapping of the initial query types proposed for the EDR API.

## 9.3. Query Resources

Table 5. Query Types

Path Template	Query Type	Description
/collections/{collectionId}/position	Position	Return data for the requested <a href="#">point location</a>
/collections/{collectionId}/radius	Radius	Return data within a given <a href="#">radius</a> of a position
/collections/{collectionId}/area	Area	Return data for the requested <a href="#">area</a>
/collections/{collectionId}/cube	Cube	Return data for a spatial <a href="#">cube</a>
/collections/{collectionId}/trajectory	Trajectory	Return data along a defined <a href="#">trajectory</a>
/collections/{collectionId}/corridor	Corridor	Return data within a spatial <a href="#">corridor</a>
/collections/{collectionId}/items	Item	Items associated with the <a href="#">{collectionId}</a> <a href="#">collection</a> .
/collections/{collectionId}/locations	Locations	Location identifiers associated with the <a href="#">{collectionId}</a> <a href="#">collection</a> .
/collections/{collectionId}/instances	Instances	List the available instances of the <a href="#">collection</a>

### 9.3.1. Shared query parameters

Query parameters are used in URLs to define the resources which are returned on a GET request. The following are defined as standard shared parameters for use.

#### Parameter coords

**Requirement 3: [/req/edr/coords-definition](#)** Parameter coords definition

**Requirement 4: [/req/edr/coords-response](#)** Parameter coords response

#### Parameter datetime

**Requirement 5: [/req/core/rc-datetime-parameter](#)** Datetime parameter

The **datetime** parameter is defined in API-Common. The following information is provided here as a convenience.

"Intersects" means that the time (instant or duration) specified in the parameter **datetime** includes a timestamp that is part of the temporal geometry of the resource (again, a time instant or duration). Time durations include the start and end times.

*Example 2. A datetime*

February 12, 2018, 23:20:52 GMT:

**datetime=2018-02-12T23%3A20%3A52Z**

For resources with a temporal property that is a timestamp (like **lastUpdate**), a **datetime** value would match all resources where the temporal property is identical.

For resources with a temporal property that is a date or a time interval, a **datetime** value would match all resources where the timestamp is on that day or within the time interval.

*Example 3. Intervals*

February 12, 2018, 00:00:00 GMT to March 18, 2018, 12:31:12 GMT:

**datetime=2018-02-12T00%3A00%3A00Z%2F2018-03-18T12%3A31%3A12Z**

February 12, 2018, 00:00:00 UTC or later:

**datetime=2018-02-12T00%3A00%3A00Z%2F..**

March 18, 2018, 12:31:12 UTC or earlier:

**datetime=..%2F2018-03-18T12%3A31%3A12Z**

A template for the definition of the parameter in YAML according to OpenAPI 3.0 is available at [datetime.yaml](#).



## Parameter `parametername`

**Requirement 6:** `/req/edr/parameters-definition` Parameter `parametername` definition

**Requirement 7:** `/req/edr/parameters-response` Parameter `parametername` response

*Example 4. A single parameter*

Only return values for the `Maximum_temperature`

```
parametername=Maximum_temperature
```

*Example 5. Return multiple parameters*

Values for the `Maximum_temperature`, `Minimum_temperature` and `Total_precipitation`

```
parametername=Maximum_temperature,Minimum_temperature,Total_precipitation
```

If a requested parameter doesn't exist in the `collection` the data for those parameters that do exist should be returned. If none of the requested parameters exist in the `collection` a `400` message SHOULD be returned.

## Parameter `crs`

**Requirement 8:** `/req/edr/outputCRS-definition` Parameter `crs` definition

**Requirement 9:** `/req/edr/outputCRS-response` Parameter `crs` response

The value of the `crs` query parameter will be one of the name values described in the `collection` metadata for supported coordinate reference system transformations.

## Parameter `f`

**Requirement 10:** `/req/edr/outputFormat-definition` Parameter `f` definition

**Requirement 11:** `/req/edr/outputFormat-response` Parameter `f` response

*Example 6. Return data as coverageJSON*

```
f=coverageJSON
```

If not specified, the query will return data in the native format of the `collection`. If the requested format system does not match an entry in the defined list of valid output formats for the `collection`, a `400` message SHOULD be returned.

### 9.3.2. Position query

The Position query returns data for the requested coordinate. Logic for identifying the best match for the coordinate will depend on the `collection`. The filter constraints are defined by the following query parameters:

## Parameter coords

**Requirement 3: /req/edr/coords-definition** Parameter coords definition

**Requirement 4: /req/edr/coords-response** Parameter coords response

location(s) to return data for. The coordinates are defined by a Well Known Text (wkt) string. To retrieve a single location:

```
POINT(x y)
```

And for a list of locations:

```
MULTIPOINT((x y),(x1 y1),(x2 y2),(x3 y3))
```

And for a list of locations at defined heights:

```
MULTIPOINT((x y),(x1 y1),(x2 y2),(x3 y3))
```

See [http://portal.opengeospatial.org/files/?artifact\\_id=25355](http://portal.opengeospatial.org/files/?artifact_id=25355) and [https://en.wikipedia.org/wiki/Well-known\\_text\\_representation\\_of\\_geometry](https://en.wikipedia.org/wiki/Well-known_text_representation_of_geometry).

The coordinate values will depend on the CRS parameter. If this is not defined, the values will be assumed to WGS84 values (i.e x=longitude and y=latitude).

### *Example 7. Single location*

Retrieve data for Greenwich, London:

```
coords=POINT(0 51.48)
```

### *Example 8. Multiple locations*

Retrieve data for a list of locations: 38.9N 77W, 48.85N 2.35E, 39.92N 116.38E, 35.29S 149.1E, 51.5N 0.1W:

```
coords=MULTIPOINT((38.9 -77),(48.85 2.35),(39.92 116.38),(-35.29 149.1),(51.5 -0.1))
```

## Parameter z

**Requirement 12: /req/edr/z-definition** Parameter z definition

**Requirement 13: /req/edr/z-response** Parameter z response

Define the vertical level to return data from i.e. z=level

If data at all available levels is required, z can be defined as ALL i.e. z=ALL

*Example 9. A single vertical level*

For example, if the 850hPa pressure level is being queried:

`z=850`

*Example 10. Return data at all a levels defined by a list of vertical levels*

Request data at levels 1000hPa, 900hPa, 850hPa, and 700hPa:

`z=1000,900,850,700`

*Example 11. Return data for all levels between and including 2 defined levels*

Request data for all levels between 2m and 100m:

`z=2/100`

*Example 12. Return data at all available vertical levels*

`z=ALL`

When not specified the API MUST return data from all available levels

**Parameter datetime**

**Parameter parametername**

**Parameter crs**

**Parameter f**

### 9.3.3. Radius query

The Radius query returns data within the defined radius of the requested coordinate. The filter constraints are defined by the following query parameters:

#### Parameter coords

**Requirement 3: /req/edr/coords-definition** Parameter coords definition

**Requirement 4: /req/edr/coords-response** Parameter coords response

location(s) to return data for, the coordinates are defined by a Well Known Text (wkt) string. To retrieve data for a single location :

POINT(x y)

A point at height *z* POINT(x y z)

And for a list of locations

MULTIPOINT((x y),(x1 y1),(x2 y2),(x3 y3))

And for a list of locations at defined heights

MULTIPOINT((x y z),(x1 y1 z1),(x2 y2 z2),(x3 y3 z3))

see [http://portal.opengeospatial.org/files/?artifact\\_id=25355](http://portal.opengeospatial.org/files/?artifact_id=25355) and [https://en.wikipedia.org/wiki/Well-known\\_text\\_representation\\_of\\_geometry](https://en.wikipedia.org/wiki/Well-known_text_representation_of_geometry)

The coordinate values will depend on the CRS parameter. If this is not defined the values will be assumed to be WGS84 values (i.e x=longitude and y=latitude)

*Example 13. Single location*

retrieve data for Greenwich, London

coords=POINT(0 51.48)

#### Parameter within

**Requirement 14: /req/edr/within-definition** Parameter within definition

**Requirement 15: /req/edr/within-response** Parameter within response

#### Parameter withinunits

The units supported by the collection will be listed in the collections end point

**Requirement 16: /req/edr/withinUnits-definition** Parameter withinUnits definition

**Requirement 17: /req/edr/within-response** Parameter withinUnits response

*Example 14. Define a 20Km radius*

i.e. Define the a Radius of 20 Km from the location defined by the coords query parameter  
within=20&withinunits=km

*Example 15. Define a 5 mile radius*

i.e. Define the a Radius of 5 miles from the location defined by the coords query parameter  
within=5&withinunits=miles

### **Parameter z**

Define the vertical level to return data from i.e. z=level

if data at all available levels is required z can be defined as ALL i.e. z=ALL

*Example 16. A single vertical level*

For example if the 80m level is being queried  
z=80

*Example 17. Return data at all available vertical levels*

z=ALL

When not specified the API MUST return data from all available levels

### **Parameter datetime**

### **Parameter parametername**

### **Parameter crs**

### **Parameter f**

### 9.3.4. Area query

The Area query returns data within the polygon defined by the **coords** parameter, the results are further filtered by the constraints defined by the following query parameters:

#### Parameter coords

**Requirement 3: /req/edr/coords-definition** Parameter coords definition

**Requirement 4: /req/edr/coords-response** Parameter coords response

Only data that has a geometry that intersects the **area** defined by the polygon are selected.

The polygon is defined using a Well Known Text string following

```
coords=POLYGON((x y,x1 y1,x2 y2,...,xn yn x y))
```

which are values in the coordinate system defined by the crs query parameter (if crs is not defined the values will be assumed to be WGS84 longitude/latitude coordinates).

For instance a polygon that roughly describes an **area** that contains South West England in WGS84 would look like:

```
coords=POLYGON((-6.1 50.3,-4.35 51.4,-2.6 51.6,-2.8 50.6,-5.3 49.9,-6.1,50.3))
```

see [http://portal.opengeospatial.org/files/?artifact\\_id=25355](http://portal.opengeospatial.org/files/?artifact_id=25355) and [https://en.wikipedia.org/wiki/Well-known\\_text\\_representation\\_of\\_geometry](https://en.wikipedia.org/wiki/Well-known_text_representation_of_geometry)

The **coords** parameter will only support 2D POLYGON

*Example 18. A polygon covering the UK*

An **area** covering the UK in WGS84 (from 15°W to 5°E and from 60.95°S to 48.8°S)

```
coords=POLYGON((-15 48.8,-15 60.95,5 60.85,5 48.8,-15 48.8))
```

*Example 19. Multiple areas*

Selecting data for two different regions

```
coords=MULTIPOLYGON((-15 48.8,-15 60.95,5 60.85,5 48.8,-15 48.8),(-6.1 50.3,-4.35 51.4,-2.6 51.6,-2.8 50.6,-5.3 49.9,-6.1,50.3))
```

#### Parameter z

**Requirement 12: /req/edr/z-definition** Parameter z definition

**Requirement 13: /req/edr/z-response** Parameter z response

Define the vertical level to return data from i.e. z=level

if data at all available levels is required z can be defined as ALL i.e. z=ALL

*Example 20. A single vertical level*

For example if the 850hPa pressure level is being queried

z=850

*Example 21. Return data at all a levels defined by a list of vertical levels*

Request data at levels 1000hPa, 900hPa, 850hPa, and 700hPa

z=1000,900,850,700

*Example 22. Return data for all levels between and including 2 defined levels*

Request data for all levels between 2m and 100m

z=2/100

*Example 23. Return data at all available vertical levels*

z=ALL

When not specified the API MUST return data from all available levels

**Parameter datetime**

**Parameter parametername**

**Parameter crs**

**Parameter f**

### 9.3.5. Cube query

The **Cube** query returns a data cube defined by the **coords**, **minz** and **maxz** parameters, \*Only WKT POLYGONS that define rectangles are valid inputs to the **coords** parameter. The results are further filtered by the constraints defined by the following query parameters:

#### Parameter coords

**Requirement 3: /req/edr/coords-definition** Parameter coords definition

**Requirement 4: /req/edr/coords-response** Parameter coords response

Only data that has a geometry that intersects the **area** defined by the **cube** are selected.

The cube's X Y coordinates are defined using Rectangular Polygon as Well Known Text

```
coords=POLYGON((x y,x1 y1,x2 y2, x3 y3, x y))
```

which are values in the coordinate system defined by the **crs** query parameter if **crs** is not defined the values will be assumed to be WGS84 longitude/latitude coordinates and heights will be assumed to be in metres above mean sea level

For instance a **cube** that roughly describes an **area** that contains South West England in WGS84 would look like

*Example 24. A cube covering the South West of the UK*

```
coords=POLYGON((-6.0 50.0,-4.35 50.0,-4.35 52.0,, -6.0 52.0,-6.0 50.0))
```

**If the WKT does not define a Rectangle the service will generate a 400 error message**

see [http://portal.opengeospatial.org/files/?artifact\\_id=25355](http://portal.opengeospatial.org/files/?artifact_id=25355) and [https://en.wikipedia.org/wiki/Well-known\\_text\\_representation\\_of\\_geometry](https://en.wikipedia.org/wiki/Well-known_text_representation_of_geometry)

#### Parameter minz

**Requirement 18: /req/edr/minz-definition** Parameter minx definition

**Requirement 19: /req/edr/minz-response** Parameter minz response

*Example 25. Define the bottom of the cube*

denotes the minimum level to return data for

```
minz=850
```

would retrieve data for the 850 level and for data above the 850 level, if a **maxz** is not specified a 400 error should be thrown



## Parameter maxz

**Requirement 20:** [/req/edr/maxz-definition](#) Parameter maxz definition

**Requirement 21:** [/req/edr/maxz-response](#) Parameter maxz response

*Example 26. Define the top of the cube*

denotes the maximum level to return data for

`maxz=300`

would retrieve data for the 300 level and for data below the 850 level, if a `minz` is not specified a `400` error should be thrown

## Parameter resolutionx

**Requirement 22:** [/req/edr/resolutionx-definition](#) Parameter resolutionx definition

**Requirement 23:** [/req/edr/resolutionx-response](#) Parameter resolutionx response

If not specified the query will not interpolate the data along the x-axis of the `cube` and only return values for the defined `coords` parameter values.

*Example 27. Define the resolution of data on the x-axis*

denotes the number of intervals to retrieve data for across the defined x-axis of the `cube`

`resolutionx=10`

would retrieve 10 values along the width from the minimum x coordinate to maximum x coordinate (i.e. a value at both the minimum x and maximum x coordinates and 8 values between).

## Parameter resolutiony

**Requirement 24:** [/req/edr/resolutiony-definition](#) Parameter resolutiony definition

**Requirement 25:** [/req/edr/resolutiony-response](#) Parameter resolutiony response

If not specified the query will not interpolate the data along the y-axis of the `cube` and only return values for the defined `coords` parameter values.

*Example 28. Define resolution of data on the y-axis*

denotes the number of intervals to retrieve data for across the defined y-axis of the [cube](#)

`resolutiony=10`

would retrieve 10 values along the width from the minimum y coordinate to maximum y coordinate (i.e. a value at both the minimum y and maximum y coordinates and 8 values between).

## Parameter resolutionz

**Requirement 26:** [/req/edr/resolutionz-definition](#) Parameter resolutionz definition

**Requirement 27:** [/req/edr/resolutionz-response](#) Parameter resolutionz response

If not specified the query will not interpolate the data along the z-axis of the [cube](#) and only return values for the defined `coords` parameter values.

*Example 29. Define resolution of data on the z-axis*

denotes the number of intervals to retrieve data for the defined z-axis of the [cube](#)

`resolutionz=10`

would retrieve 10 values along the z-axis from the minimum z coordinate to maximum z coordinate (i.e. a value at both the minimum z and maximum z coordinates and 8 values between).

## Parameter datetime

## Parameter parametername

## Parameter crs

## Parameter f

### 9.3.6. Trajectory query

The Trajectory query returns data along the path defined by the **coords** parameter. **The logic to match the data for the requested path will depend on and be defined by the collection.** The results are further filtered by the constraints defined by the following query parameters:

#### Parameter coords

**Requirement 3: /req/edr/coords-definition** Parameter coords definition

**Requirement 4: /req/edr/coords-response** Parameter coords response

"Intersects" means that the geospatial shape specified by the parameter **coords**, includes a coordinate that is part of the (spatial) geometry of the resource. This includes the boundaries of the geometries.

The trajectory query supports the Linestring Well Known Text (WKT) geometry type, the trajectory query SHOULD support 2D, 3D and 4D queries allowing the definition of a vertical level value (z) and a time value (as an epoch time) therefore coordinates for geometries may be 2D (x, y), 3D (x, y, z) or 4D (x, y, z, t).

A 2D trajectory, on the surface of earth with no time or height dimensions:  
coords=LINESTRING(51.14 -2.98, 51.36 -2.87, 51.03 -3.15, 50.74 -3.48, 50.9 -3.36)

A 2D trajectory, on the surface of earth all at the same time and no height dimension, time value defined in ISO8601 format by the **datetime** query parameter : coords=LINESTRING(51.14 -2.98, 51.36 -2.87, 51.03 -3.15, 50.74 -3.48, 50.9 -3.36)&datetime=2018-02-12T23:00:00Z

A 2D trajectory, on the surface of earth with no time value but at a fixed height level, height defined in the **collection** height units by the **z** query parameter : coords=LINESTRING(51.14 -2.98, 51.36 -2.87, 51.03 -3.15, 50.74 -3.48, 50.9 -3.36)&z=850

A 2D trajectory, on the surface of earth all at the same time and at a fixed height level, time value defined in ISO8601 format by the **datetime** query parameter and height defined in the **collection** height units by the **z** query parameter : coords=LINESTRING(51.14 -2.98, 51.36 -2.87, 51.03 -3.15, 50.74 -3.48, 50.9 -3.36)&datetime=2018-02-12T23:00:00Z&z=850

A 3D trajectory, on the surface of the earth but over a time range with no height values:  
coords=LINESTRINGM(51.14 -2.98 1560507000, 51.36 -2.87 1560507600, 51.03 -3.15 1560508200, 50.74 -3.48 1560508500, 50.9 -3.36 1560510240)

A 3D trajectory, on the surface of the earth but over a time range with a fixed height value, height defined in the **collection** height units by the **z** query parameter : coords=LINESTRINGM(51.14 -2.98 1560507000, 51.36 -2.87 1560507600, 51.03 -3.15 1560508200, 50.74 -3.48 1560508500, 50.9 -3.36 1560510240)&z=200

A 3D trajectory, through a 3D volume with height or depth, but no defined time:  
coords=LINESTRINGZ(51.14 -2.98 0.1, 51.36 -2.87 0.2, 51.03 -3.15 0.3, 50.74 -3.48 0.4, 50.9 -3.36 0.5)

A 3D trajectory, through a 3D volume with height or depth, but at a fixed time value defined in ISO8601 format by the **datetime** query parameter: coords=LINESTRINGZ(51.14 -2.98 0.1, 51.36 -2.87

0.2, 51.03 -3.15 0.3, 50.74 -3.48 0.4, 50.9 -3.36 0.5)&datetime=2018-02-12T23:00:00Z

A 4D trajectory, through a 3D volume and over a time range: coords=LINESTRINGZM(51.14 -2.98 0.1 1560507000,51.36 -2.87 0.2 1560507600, 51.03 -3.15 0.3 1560508200, 50.74 -3.48 0.4 1560508500, 50.9 -3.36 0.5 1560510240)

If the coords specify a 4D trajectory i.e. coords=LINESTRINGZM(...) an error MUST be thrown by the server if the client application defines either the **z** or **datetime** query parameters

where **Z** in **LINESTRINGZ** and **LINESTRINGZM** refers to the height value. If the specified CRS does not define the height units, the heights units will default to metres above mean sea level

and the **M** in **LINESTRINGM** and **LINESTRINGZM** refers to the number of seconds that have elapsed since the Unix epoch, that is the time 00:00:00 UTC on 1 January 1970. See [https://en.wikipedia.org/wiki/Unix\\_time](https://en.wikipedia.org/wiki/Unix_time)

*Example 30. A basic surface route*

From Bristol to Exeter

```
coords=LINESTRING(51.14 -2.98,51.36 -2.87,51.03 -3.15,50.74 -3.48,50.9 -3.36)
```

*Example 31. A basic surface route with defined datetime intervals*

From Bristol to Exeter

```
coords=LINESTRING(51.14 -2.98 0 1560507000,51.36 -2.87 0 1560507600,51.03 -3.15 0 1560508200,50.74 -3.48 0 1560508500,50.9 -3.36 0 1560510240)
```

## Parameter z

Used when the entire trajectory occurs at the same vertical height the **z** query parameter is used to define the height

*Example 32. A single vertical level*

for instance if the entire route is at the 850hPa pressure level

```
z=850
```

## Parameter datetime

## Parameter parametername

## Parameter crs

## Parameter f

### 9.3.7. Corridor query

The Corridor query returns data along and around the path defined by the `coords` parameter. **The logic to match the data for the requested path will depend on and be defined by the `collection`.** The results are further filtered by the constraints defined by the following query parameters:

#### Parameter `coords`

**Requirement 3: `/req/edr/coords-definition`** Parameter `coords` definition

**Requirement 4: `/req/edr/coords-response`** Parameter `coords` response

"Intersects" means that the geospatial shape specified by the parameter `coords`, includes a coordinate that is part of the (spatial) geometry of the resource. This includes the boundaries of the geometries.

The corridor query supports the Linestring Well Known Text (WKT) geometry type, the corridor query SHOULD support 2D, 3D and 4D queries allowing the definition of a vertical level value (z) and a time value (as an epoch time) therefore coordinates for geometries may be 2D (x, y), 3D (x, y, z) or 4D (x, y, z, t). The Linestring described by the `coords` parameter defines the center point of the corridor with the `corridorHeight` and `corridorWidth` query parameters defining the depth and breadth of the corridor.

A 2D corridor, on the surface of earth with no time or height dimensions:  
`coords=LINESTRING(51.14 -2.98, 51.36 -2.87, 51.03 -3.15, 50.74 -3.48, 50.9 -3.36)`

A 2D corridor, on the surface of earth all at the same time and no height dimension, time value defined in ISO8601 format by the `datetime` query parameter : `coords=LINESTRING(51.14 -2.98, 51.36 -2.87, 51.03 -3.15, 50.74 -3.48, 50.9 -3.36)&datetime=2018-02-12T23:00:00Z`

A 2D corridor, on the surface of earth with no time value but at a fixed height level, height defined in the collection height units by the `z` query parameter : `coords=LINESTRING(51.14 -2.98, 51.36 -2.87, 51.03 -3.15, 50.74 -3.48, 50.9 -3.36)&z=850`

A 2D corridor, on the surface of earth all at the same time and at a fixed height level, time value defined in ISO8601 format by the `datetime` query parameter and height defined in the collection height units by the `z` query parameter : `coords=LINESTRING(51.14 -2.98, 51.36 -2.87, 51.03 -3.15, 50.74 -3.48, 50.9 -3.36)&datetime=2018-02-12T23:00:00Z&z=850`

A 3D corridor, on the surface of the earth but over a time range with no height values:  
`coords=LINESTRINGM(51.14 -2.98 1560507000, 51.36 -2.87 1560507600, 51.03 -3.15 1560508200, 50.74 -3.48 1560508500, 50.9 -3.36 1560510240)`

A 3D corridor, on the surface of the earth but over a time range with a fixed height value, height defined in the collection height units by the `z` query parameter : `coords=LINESTRINGM(51.14 -2.98 1560507000, 51.36 -2.87 1560507600, 51.03 -3.15 1560508200, 50.74 -3.48 1560508500, 50.9 -3.36 1560510240)&z=200`

A 3D corridor, through a 3D volume with height or depth, but no defined time:  
`coords=LINESTRINGZ(51.14 -2.98 0.1, 51.36 -2.87 0.2, 51.03 -3.15 0.3, 50.74 -3.48 0.4, 50.9 -3.36 0.5)`

A 3D corridor, through a 3D volume with height or depth, but at a fixed time, time value defined in ISO8601 format by the **datetime** query parameter: coords=LINESTRINGZ(51.14 -2.98 0.1, 51.36 -2.87 0.2, 51.03 -3.15 0.3, 50.74 -3.48 0.4, 50.9 -3.36 0.5)&datetime=2018-02-12T23:00:00Z

A 4D corridor, through a 3D volume but over a time range: coords=LINESTRINGZM(51.14 -2.98 0.1 1560507000,51.36 -2.87 0.2 1560507600, 51.03 -3.15 0.3 1560508200, 50.74 -3.48 0.4 1560508500, 50.9 -3.36 0.5 1560510240)

If the coords specify a 4D corridor i.e. coords=LINESTRINGZM(...) an error MUST be thrown by the server if the client application defines either the **z** or **datetime** query parameters

where **Z** in **LINESTRINGZ** and **LINESTRINGZM** refers to the height value. If the specified CRS does not define the height units, the heights units will default to metres above mean sea level

and the **M** in **LINESTRINGM** and **LINESTRINGZM** refers to the number of seconds that have elapsed since the Unix epoch, that is the time 00:00:00 UTC on 1 January 1970. See [https://en.wikipedia.org/wiki/Unix\\_time](https://en.wikipedia.org/wiki/Unix_time)

*Example 33. A basic surface route*

From Bristol to Exeter

```
coords=LINESTRING(51.14 -2.98,51.36 -2.87,51.03 -3.15,50.74 -3.48,50.9 -3.36)
```

*Example 34. A basic surface route with defined datetime intervals*

From Bristol to Exeter

```
coords=LINESTRING(51.14 -2.98 0 1560507000,51.36 -2.87 0 1560507600,51.03 -3.15 0 1560508200,50.74 -3.48 0 1560508500,50.9 -3.36 0 1560510240)
```

## Parameter z

Used when the entire corridor occurs at the same vertical height the **z** query parameter is used to define the height

*Example 35. A single vertical level*

for instance if the entire route is at the 850hPa pressure level

```
z=850
```

## Parameter datetime

### resolutionx

*Example 36. A interpolate corridor values along the width*

Return 10 values across the defined corridor width **resolutionx=10**

*Example 37. A get values across the width of the corridor at stored resolution*

Return values at the stored resolution `resolutionx=0`

**resolutionz**

*Example 38. A interpolate corridor values over the height*

Return 8 values over the defined corridor height `resolutionz=8`

*Example 39. A get values over the height of the corridor at stored resolution*

Return values at the stored resolution `resolutionz=0`

**corridorHeight**

**corridorWidth**

**Parameter parametername**

**Parameter crs**

**Parameter f**

### 9.3.8. Items query

The EDR Items query is an [OGC API - Features](#) endpoint that may be used to catalog pre-existing EDR sampling features. The pre-existence of an EDR sampling feature may be because of the existence of a monitoring location, because a particular query has been cached for later use, or for an array of application-specific use cases (e.g. a catalog of spatio-temporal domains of anomalies in a dataset). A [GeoJSON-compatible JSON-Schema](#) has been specified to document an EDR query endpoint and valid query parameters including time range, parameters, and spatial characteristics.

<b>Recommendation 1</b>	<b>/rec/core/edr-geojson</b>
A	If a collection using other EDR queries uses the <b>items</b> query, implementations SHOULD consider support for the EDR GeoJSON Schema as an encoding.

#### Parameter itemID

If an itemID is not specified, the query will return a list of the available itemID's. This behavior is specified in [OGC API - Features](#). all other parameters for use with the Items query are defined by [OGC API - Features](#).

*Example 40. List available items*

```
/collections/{collectionId}/items
```

e.g. return query parameters to retrieve tropical storms using [OGC API - Features](#) and the EDR FeatureCollection GeoJSON schema. Each item would include an [area](#) query end point, a time range, a list of available parameters, and a representative geojson geometry.

```
/collections/tropical_storms/items
```

e.g. return query parameters to retrieve monitoring data from a [collection](#) end point, a time range, a list of available parameters and a representative geojson geometry.

```
/collections/stream_gages/items
```



#### Example 41. itemID

```
/collections/{collectionId}/items/{itemID}
```

e.g. return information for the requested item with an id of KIAD\_2020-05-19T00Z from the Metar [collection](#). Returned data would include a location query end point, time range, a list of available parameters, and a representative geometry for the KIAD METAR station.

```
/collections/metar/items/KIAD_2020-05-19T00Z
```

e.g. return information for the requested item with an id of warning\_12345 from the forecast [collection](#). Returned data would include an [area](#) query end point, time range, a list of available parameters and a representative geometry for the warning\_12345 warning area.

```
/collections/forecast/items/warning_12345
```

### 9.3.9. Locations query

#### Parameter locationID

With the locations query a location is defined by a unique identifier, this is a string value. It can be anything as long as it is unique for the required location, for instance a GeoHash `gbsvn` or a WMO station id like `03772`, what3words like `bolt.lime.metro` or place name like `Devon`. The metadata returned by the API must supply a geospatial definition for the identifier.

*Example 42. get list of location id's*

```
/collections/{collectionID}/locations/
```

return a list of location identifiers and relevant metadata for the metar `collection`

```
/collections/metar/locations/
```

Valid locationIDs can also be discovered via another mechanism such as the `items` query.

*Example 43. locationID*

```
/collections/{collectionID}/locations/{locationID}
```

return all available data for the metar `collection` for the requested location identifier, where the location is defined by the Heathrow METAR id

```
/collections/metar/locations/EGLL
```

#### Parameter datetime

#### Parameter parametername

#### Parameter crs

#### Parameter f

### 9.3.10. Instances query

It is not unusual in the scientific world for there to be multiple versions or instances of the same [collection](#), where the same information is reprocessed or regenerated. Although they could be described as new [collections](#) the instance query type allows this data to be described as different views of the same [collection](#).

#### Parameter `instanceId`

A unique identifier for the instance of the [collection](#)

`/collections/{collectionId}/instance/{instanceId}`

1. Return the Raw data instance metadata (`instanceId = raw`) for the Metar ((`collectionId = metar`) [collection](#)

```
/collections/metar/instance/raw
```

1. Return the Level 1 Quality controlled data instance (`instanceId = qc_lvl_1`) metadata for the Metar (`collectionId = metar`) [collection](#)

```
/collections/metar/instance/qc_lvl_1
```

#### Parameter `queryType`

The `queryType` options are exactly the same as those available to [collections](#) that don't have multiple instances and support the same query parameters and functionality. See the `<query-resource-table>` for the mappings of the initial query types proposed for the EDR API.

`/collections/{collectionId}/instance/{instanceId}/{queryType}`

see the [Query Resources](#) section for details of the query parameters supported by the queryTypes.

1. A point query on an Raw data instance(`instanceId = raw`) for the Metar ((`collectionId = metar`) [collection](#)

```
/collections/metar/instance/raw/point
```

1. A trajectory query on an Raw data instance(`instanceId = raw`) for the Metar ((`collectionId = metar`) [collection](#)

```
/collections/metar/instance/raw/trajectory
```

# Chapter 10. General Requirements

The following general requirements and recommendations apply to all OGC APIs.

## 10.1. HTTP 1.1

The standards used for [Web APIs](#) are built on the HTTP protocol. Therefore, conformance with HTTP or a closely related protocol is required.

**Requirement 32:** [/req/core/http](#) HTTP

## 10.2. HTTP Status Codes

[Table 6](#) lists the main HTTP status codes that clients should be prepared to receive. This includes support for specific security schemes or URI redirection. In addition, other error situations may occur in the transport layer outside of the server.

*Table 6. Typical HTTP status codes*

Status code	Description
200	A successful request.
202	A successful request, but the response is still being generated. The response will include a <b>Retry-After</b> header field giving a recommendation in seconds for the client to retry.
304	An <a href="#">entity tag</a> was provided in the request and the resource has not been changed since the previous request.
308	The server cannot process the data through a synchronous request. The response includes a <b>Location</b> header field which contains the URI of the location the result will be available at once the query is complete <a href="#">Asynchronous queries</a> .
400	The server cannot or will not process the request due to an apparent client error. For example, a query parameter had an incorrect value.
401	The request requires user authentication. The response includes a <b>WWW-Authenticate</b> header field containing a challenge applicable to the requested resource.
403	The server understood the request, but is refusing to fulfill it. While status code <b>401</b> indicates missing or bad authentication, status code <b>403</b> indicates that authentication is not the issue, but the client is not authorised to perform the requested operation on the resource.
404	The requested resource does not exist on the server. For example, a path parameter had an incorrect value.
405	The request method is not supported. For example, a POST request was submitted, but the resource only supports GET requests.

Status code	Description
406	Content negotiation failed. For example, the <b>Accept</b> header submitted in the request did not support any of the media types supported by the server for the requested resource.
413	Request entity too large. For example the query would involve returning more data than the server is capable of processing, the implementation should return a message explaining the query limits imposed by the server implementation.
500	An internal error occurred in the server.

More specific guidance is provided for each resource, where applicable.

Permission 1	/per/core/additional-status-codes
A	Servers MAY support other capabilities of the HTTP protocol and, therefore, MAY return other status codes than those listed in <a href="#">Table 6</a> , too.

## 10.3. Web Caching

Entity tags are a mechanism for web cache validation and for supporting conditional requests to reduce network traffic. Entity tags are specified by [HTTP/1.1 \(RFC 2616\)](#).

Recommendation 2	/rec/core/etag
A	The service SHOULD support entity tags and the associated headers as specified by HTTP/1.1.

## 10.4. Support for Cross-Origin Requests

Access to data from a HTML page is by default prohibited for security reasons, if the data is located on another host than the webpage ("same-origin policy"). A typical example is a web-application accessing feature data from multiple distributed datasets.

Recommendation 3	/rec/core/cross-origin
A	If the server is intended to be accessed from the browser, cross-origin requests SHOULD be supported. Note that support can also be added in a proxy layer on top of the server.

Two common mechanisms to support cross-origin requests are:

- [Cross-origin resource sharing \(CORS\)](#)
- [JSONP \(JSON with padding\)](#)

## 10.5. Asynchronous queries

It will not always be possible to respond to queries synchronously. This standard does not specify how to handle any asynchrony. Different services may propose different best practices.

For example, if the query requires handling asynchronously, one option, but there are others, is that the system could respond with a HTTP code of **308** and include a **Location** response header field with the URI of the location of the data once the query has completed. If the user queries the URI of the product of the query before the data is available that response should respond with a HTTP code of **202** and include a **Retry-after** response header field with a suggested interval in seconds to retry the data retrieval.

## 10.6. Coordinate Reference Systems

As discussed in Chapter 9 of the W3C/OGC Spatial Data on the Web [Best Practices document](#), how to express and share the location of resources in a consistent way is one of the most fundamental aspects of publishing geospatial data and it is important to be clear about the coordinate reference system that the coordinates use.

For the reasons discussed in the Best Practices, EDR APIs MUST always support WGS84 longitude and latitude as a coordinate reference system.

### Requirement 33: [/req/core/crs84 CRS84](#)

The implementations compliant with the OGC API Common Part 1: Core are only required to support publishing geometries in coordinate reference system <http://www.opengis.net/def/crs/OGC/1.3/CRS84>.

## 10.7. Encodings

While the OGC API Common standard does not specify any mandatory encoding, the following encodings are recommended. See [Clause 7 \(Overview\)](#) for a discussion of this issue.

HTML encoding recommendation:

Recommendation 4	<a href="#">/rec/core/html</a>
A	To support browsing a API with a web browser and to enable search engines to crawl and index the dataset, implementations SHOULD consider to support an HTML encoding.

GeoJSON encoding recommendation:

Recommendation 5	<a href="#">/rec/core/geojson</a>
------------------	-----------------------------------

A	If the resource can be represented for the intended use in GeoJSON, implementations SHOULD consider to support GeoJSON as an encoding.
---	--

CoverageJSON encoding recommendation:

<b>Recommendation 6</b>	<b>/rec/core/covjson</b>
A	If the resource can be represented for the intended use in CoverageJSON, implementations SHOULD consider to support CoverageJSON as an encoding.

Requirement [/req/core/http](#) implies that the encoding of a response is determined using content negotiation as specified by the HTTP RFC.

The section [Media Types](#) includes guidance on media types for encodings that are specified in this document.

Note that any API that supports multiple encodings will have to support a mechanism to create encoding-specific URIs for resources in order to express links, for example, to alternative representations of the same resource. This document does not mandate any particular approach to how this is supported by the API.

As clients simply need to dereference the URI of the link, the implementation details and the mechanism how the encoding is included in the URI of the link are not important. Developers interested in the approach of a particular implementation, for example, to manipulate ("hack") in the browser address bar, can study the API definition.

NOTE	Two common approaches are:
	<ul style="list-style-type: none"> <li>• an additional path for each encoding of each resource (this can be expressed, for example, using format specific suffixes like <code>.html</code>);</li> <li>• an additional query parameter (for example, <code>accept</code> or <code>f</code>) that overrides the Accept header of the HTTP request.</li> </ul>

## 10.8. Link Headers

<b>Recommendation 7</b>	<b>/rec/core/link-header</b>
A	Links included in payload of responses SHOULD also be included as <a href="#">Link</a> headers in the HTTP response according to <a href="#">RFC 8288, Clause 3</a> .

B	This recommendation does not apply, if there are a large number of links included in a response or a link is not known when the HTTP headers of the response are created.
---	---

## 10.9. OpenAPI 3.0

### 10.9.1. Basic requirements

#### Requirements Class: [OpenAPI 3.0](#)

The OpenAPI 3.0 Requirements Class used in OGC API Common is applicable to the EDR API as well. So an implementation of EDR API which supports OpenAPI 3.0 as an API Description format must also comply with the OGC API-Common oas30 Conformance Class.

#### Requirement 34: [/req/oas30/oas-common](#) [OpenAPI 3.0 API Common](#)

Implementations must also advertise conformance with this Requirements Class.

#### Requirement 35 [|/req/oas30/conformance](#) [OpenAPI 3.0 Conformance](#)

Two example OpenAPI documents are included in [Annex B](#).

### 10.9.2. Complete definition

#### Requirement 36: [/req/oas30/completeness](#) [OpenAPI 3.0 Completeness](#)

Note, for example, that APIs which are access-controlled (see [Security](#)), support web cache validation, CORS or that use HTTP redirection will make use of additional HTTP status codes beyond regular codes such as [200](#) for successful GET requests and [400](#), [404](#) or [500](#) for error situations. See [HTTP Status Codes](#).

Clients have to be prepared to receive responses not documented in the OpenAPI definition. For example, additional errors may occur in the transport layer outside of the server.

### 10.9.3. Exceptions

#### Requirement 37: [/req/oas30/exceptions-codes](#) [OpenAPI 3.0 Exception codes](#)



```
description: An error occurred.
content:
  application/json:
    schema:
      $ref:
        https://raw.githubusercontent.com/engeospatial/OAPI/openapi/schemas/exception.yaml
  text/html:
    schema:
      type: string
```

## 10.10. Security

### Requirement 38: [/req/oas30/security](#) OpenAPI 3.0 Security

The OpenAPI specification currently supports the following [security schemes](#):

- HTTP authentication,
- an API key (either as a header or as a query parameter),
- OAuth2's common flows (implicit, password, application and access code) as defined in RFC6749, and
- OpenID Connect Discovery.

# Annex A: Requirements Detail

## A.1. Introduction

For clarity, the complete [requirements test class](#) descriptions are omitted in the body of this specification. This annex contains the complete requirements test classes.

## A.2. Requirements Test Class Core

### Requirements Class: OGC API-Environmental Data Retrieval Core

<a href="http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/core</a>	
Target type	Web API
Dependency	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core</a>
Dependency	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/collections">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/collections</a>

### Requirement 1: /req/core/api-common OGC API-Common

The API implementation SHALL demonstrate conformance with the following Requirements Classes of the OGC API-Common version 1.0 Standard.	
A	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core</a>
B	<a href="http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections">http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections</a>

### Requirement 2: /req/core/conformance Core conformance classes

The list of Conformance Classes advertised by the API SHALL include:	
A	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core</a>
B	<a href="http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections">http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections</a>
C	<a href="http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/core</a>

### Requirement 3: /req/edr/coords-definition Parameter coords definition

A	<p>Each geometry based resource (Position, Radius, Area, Cube , Trajectory, Corridor) collection operation SHALL support a parameter <b>coords</b> with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: coords in: query required: false schema:   type: string style: form explode: false </pre>
B	<p>The <b>coords</b> string value will be a Well Known Text of representation geometry as defined in <a href="#">Simple Feature Access - Part 1: Common Architecture</a>. The representation type will depend on the queryType of the API</p>

#### Requirement 4: /req/edr/coords-response Parameter coords response

A	<p>Only those resources that have a spatial geometry that intersects the area defined by the <b>coords</b> parameter SHALL be part of the result set.</p>
B	<p>The coordinates SHALL consist of a Well Known Text (WKT) geometry string</p>
C	<p>The coordinate reference system of the values SHALL be interpreted as WGS84 longitude/latitude</p> <pre> WKT: GEOGCS["WGS 84", DATUM["WGS_1984", SPHEROID["WGS 84", 6378137, 298.257223563, AUTHORITY["EPSG", "7030"]], AUTHORITY["EPSG", "6326"]], PRIMEM["Greenwich", 0 , AUTHORITY["EPSG", "8901"]], UNIT["degree", 0.01745329251994328, AUTHORITY["EPSG", "9122"]], AUTHORITY["EPSG", "4326"]] </pre> <pre> EPSG: http://www.opengis.net/def/crs/OGC/1.3/CRS84 </pre> <p>unless a different coordinate reference system is specified in a parameter <b>crs</b>.</p>

## Requirement 5: /req/core/rc-datetime-parameter Datetime parameter

A	<p>An EDR API SHALL support the Date-Time (datetime) parameter for <code>/collections</code> and <code>/collections/{collectionid}</code> requests.</p> <pre>name: datetime in: query required: false schema:   type: string style: form explode: false</pre>
B	<p>Requests which include the Date-Time parameter SHALL comply with API-Common requirement <code>/req/core/rc-time-definition</code>.</p>
C	<p>Responses to Date-Time requests SHALL comply with API-Common requirement <code>/req/core/rc-time-response</code>.</p>

## Requirement 6: /req/edr/parameters-definition Parameter parametername definition

A	<p>Each resource collection operation SHALL support a parameter <code>`parametername`</code> with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre>name: parametername in: query required: true explode: false schema:   minItems: 1   type: array   items:     type: string</pre>
---	---

## Requirement 7: /req/edr/parameters-response Parameter parametername response

A	<p>If the <code>parametername</code> parameter is provided, only those parameters named SHALL be returned. If the <code>parametername</code> parameter is not specified all parameters in the collection SHALL be returned.</p>
---	---

B	The <code>parametername</code> parameter SHALL consist of a comma delimited string value based on an enumerated list of options listed in the collections metadata
---	--

#### Requirement 8: `/req/edr/outputCRS-definition` Parameter `crs` definition

A	<p>Each resource collection operation SHALL support a parameter <code>crs</code> with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: crs in: query required: false schema:   type: string style: form explode: false </pre>
---	---

#### Requirement 9: `/req/edr/outputCRS-response` Parameter `crs` response

A	If the <code>crs</code> parameter is provided, the returned information should be reprojected (if required) to the defined coordinate system. If the <code>crs</code> parameter is not specified the data will be returned in its native projection.
B	The <code>crs</code> parameter SHALL consist of an identifier selected from the enumerated list of valid values supplied in the collections metadata.
C	if an unsupported <code>crs</code> value is requested a <code>400</code> error message SHOULD be returned .

#### Requirement 10: `/req/edr/outputFormat-definition` Parameter `f` definition

A	<p>Each resource collection operation SHALL support a parameter <b>f</b> with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: f in: query required: false schema:   type: string style: form explode: false </pre>
---	---

### Requirement 11: /req/edr/outputFormat-response Parameter **f** response

A	If the <b>f</b> parameter is provided, the returned information should be transformed to the defined data format.
B	The <b>f</b> parameter SHALL consist of an string value based on an enumerated list of available options provided in the collections metadata.
C	If an unsupported <b>f</b> value is requested a `400' error message should be returned. =====

### Requirement 12: /req/edr/z-definition Parameter **z** definition

A	<p>Each resource collection operation MAY support a parameter <b>z</b> with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: z in: query required: true schema:   type: string style: form explode: false </pre>
---	--

### Requirement 13: /req/edr/z-response Parameter **z** response

A	If the <b>z</b> parameter is provided, only resources that have a vertical geometry that intersects the vertical information in the <b>z</b> parameter SHALL be part of the result set.
---	---

B	The <b>z</b> can be defined as a height range by specifying a min-level and max-level seperated by a forward slash "/"
C	<p>A list of <b>z</b> can be defined be specifying a comma delimited list of values level1, level2, level3 etc</p> <pre> single-level  = level interval-closed = min-level "/" max-level level-list   = level1 "," level2 "," level3 </pre>

#### Requirement 14: /req/edr/within-definition Parameter within definition

A	Each resource collection operation MAY support a parameter `within` with the following characteristics (using an OpenAPI Specification 3.0 fragment):
B	<p>If the instance metadata does not provide <b>withinUnits</b> values the API SHALL NOT support <b>within</b> queries:</p> <pre> name: within in: query required: false schema:   type: string style: form explode: false </pre>

#### Requirement 15: /req/edr/within-response Parameter within response

A	If the <b>within</b> parameter is provided, all selected information within the specified radius SHALL be part of the result set.
B	If a <b>withinunits</b> parameter is not provided, a <b>400</b> error WILL be returned.

#### Requirement 16: /req/edr/withinUnits-definition Parameter withinUnits definition

A	Each resource collection operation MAY support a parameter `withinunits` with the following characteristics (using an OpenAPI Specification 3.0 fragment):
---	--

B	<p>A withinunits value MUST be one of the values defined in the instance metadata:</p> <pre> name: withinunits in: query required: false schema:   type: string style: form explode: false </pre>
---	---

### Requirement 17: /req/edr/within-response Parameter withinUnits response

A	<p>The <code>`withinunits`</code> parameter defines the distance units of the <code>`within`</code> query parameter value .</p>
---	---

### Requirement 18: /req/edr/minz-definition Parameter minx definition

A	<p>Each resource collection operation MUST support a parameter <code>`minz`</code> with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: minz in: query required: true schema:   type: string style: form explode: false </pre>
---	---

### Requirement 19: /req/edr/minz-response Parameter minz response

A	<p>Only resources with a vertical geometry coordinate that is greater than or includes the vertical information in the <code>minz</code> parameter SHALL be part of the result set.</p> <pre> minz = level </pre>
---	---



## Requirement 20: /req/edr/maxz-definition Parameter maxz definition

A	<p>Each resource collection operation MUST support a parameter `maxz` with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre>name: maxz in: query required: true schema:   type: string style: form explode: false</pre>
---	--

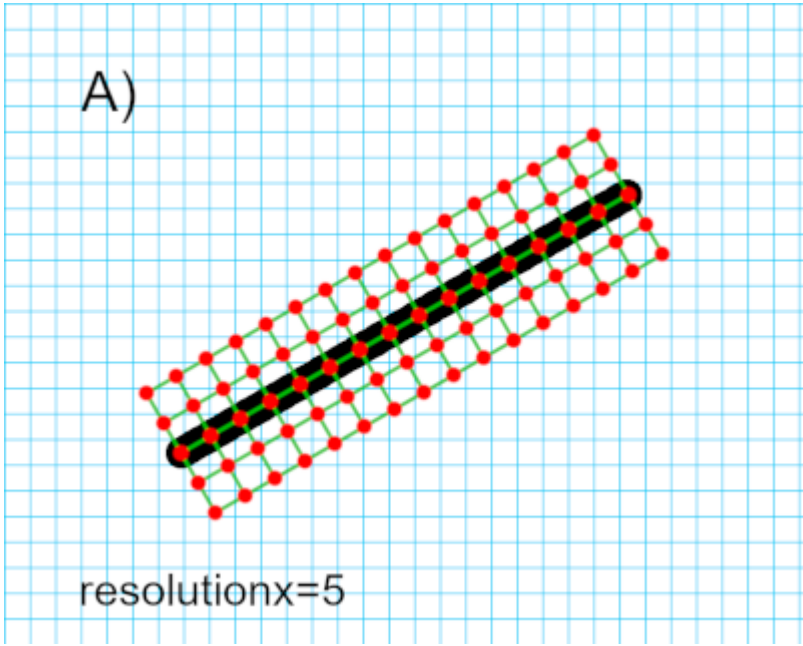
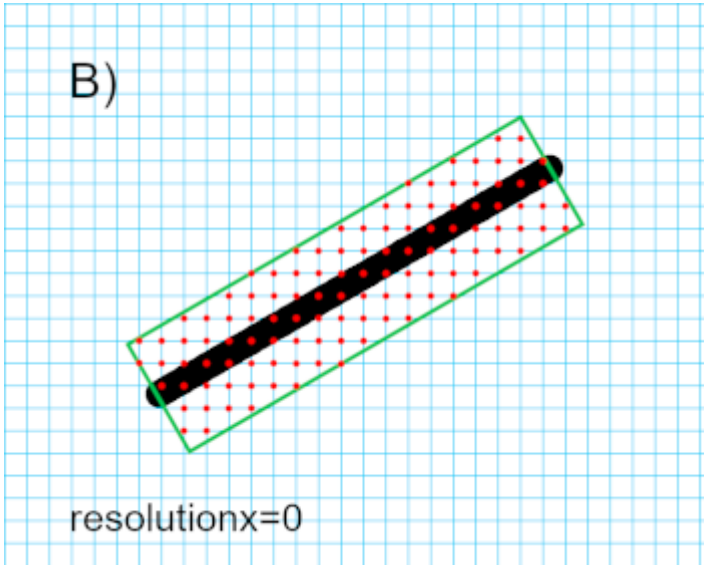
## Requirement 21: /req/edr/maxz-response Parameter maxz response

A	<p>Only resources with a vertical geometry coordinate that is less than or includes the vertical information in the <b>maxz</b> parameter SHALL be part of the result set.</p> <pre>maxz = level</pre>
---	--

## Requirement 22: /req/edr/resolutionx-definition Parameter resolutionx definition

A	<p>Each resource collection operation MAY support a parameter <b>resolutionx</b> with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre>name: resolutionx in: query required: false schema:   type: string style: form explode: false</pre>
---	---

## Requirement 23: /req/edr/resolutionx-response Parameter resolutionx response

A	<p>If the <code>resolutionx</code> parameter is provided, it denotes the number of positions to retrieve data for, across the width of the corridor path, including its minimum and maximum width coordinates.</p> 
B	<p>A <code>resolutionx</code> value of 0 SHALL return all available data at the stored resolution between (and including) the minimum and maximum coordinates of the defined corridor.</p> 
C	<p>If <code>resolutionx</code> is not specified, the API SHOULD return all available data at a resolution determined by the server, including the minimum and maximum coordinates of the defined corridor.</p>

`resolutionx` = number of intervals + 1

## Requirement 24: /req/edr/resolutiony-definition Parameter resolutiony definition

A	<p>Each resource collection operation MAY support a parameter <b>resolutiony</b> with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre>name: resolutiony in: query required: false schema:   type: string style: form explode: false</pre>
---	---

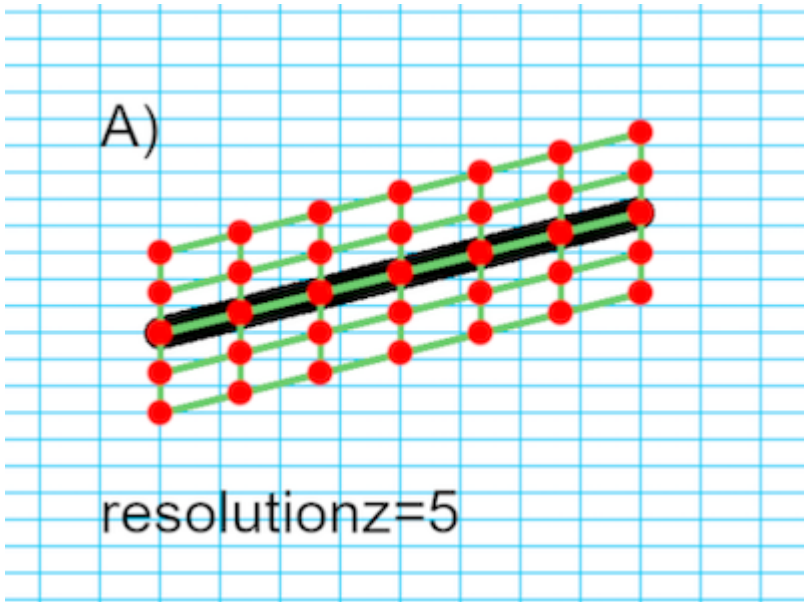
## Requirement 25: /req/edr/resolutiony-response Parameter resolutiony response

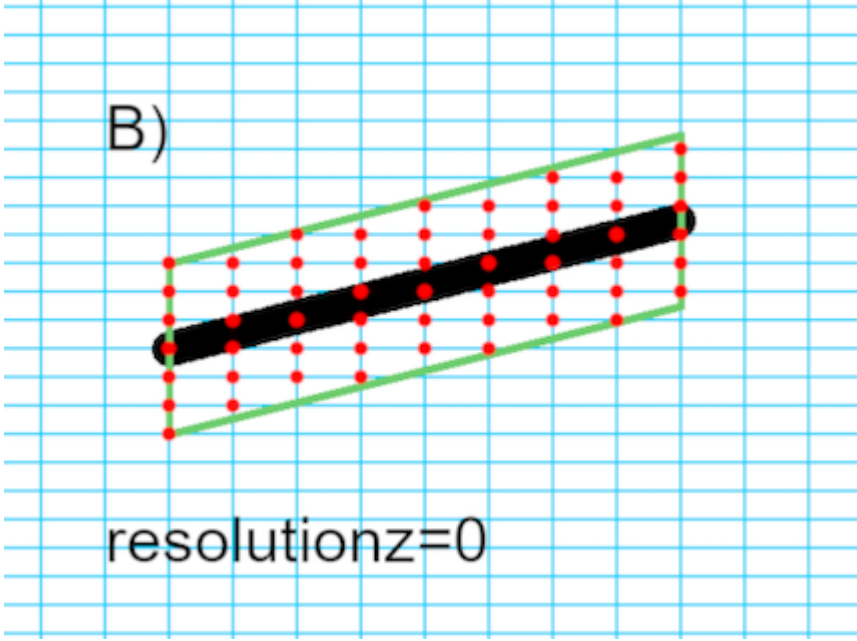
A	If the <b>resolutiony</b> parameter is provided, denotes the number of intervals to retrieve data for along the path between the minimum and maximum y coordinates
B	The total number of intervals includes the values for the minimum and maximum coordinates
C	A <b>resolutiony</b> value of 0 MUST return all available data at the native y resolution between the minimum and maximum coordinates
D	<p>IF <b>resolutiony</b> is not specified data should be returned for just the locations specified in the requested coordinates (<b>ONLY IF</b> interpolation is supported by the API)</p> <pre>resolutiony = number of intervals</pre>

## Requirement 26: /req/edr/resolutionz-definition Parameter resolutionz definition

A	<p>Each resource collection operation MAY support a parameter <b>resolutionz</b> with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: resolutionz in: query required: false schema:   type: string style: form explode: false </pre>
---	---

## Requirement 27: /req/edr/resolutionz-response Parameter resolutionz response

A	<p>If the <b>resolutionz</b> parameter is provided, it denotes the number of positions to retrieve data for, over the depth of the corridor path including its minimum and maximum width coordinates.</p>  <p>The diagram, labeled 'A)', shows a blue grid representing a spatial area. A black line, representing a corridor path, runs diagonally from the bottom-left towards the top-right. Along this path, there are red dots representing data points. The dots are spaced at regular intervals along the path. Below the path, the text 'resolutionz=5' is written, indicating the number of positions to retrieve data for. The path is bounded by two green lines, representing the minimum and maximum width coordinates.</p>
---	---

B	<p>A <b>resolutionz</b> value of 0 SHALL return all available data at the stored vertical resolution between (and including) the minimum and maximum coordinates of the defined corridor.</p> 
C	<p>If <b>resolutionz</b> is not specified the API SHOULD return all available data at a resolution determined by the server, including the minimum and maximum coordinates of the defined corridor.</p> <div data-bbox="435 1104 1321 1205" style="border: 1px solid #ccc; padding: 10px; background-color: #f9f9f9;"> <math display="block">\text{resolutionz} = \text{number of intervals} + 1</math> </div>

## Requirement 28: /req/edr/corridorHeight-definition Parameter corridorHeight definition

A	<p>Each resource collection operation SHALL support a parameter `corridorz` with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <div data-bbox="435 1576 1321 1908" style="border: 1px solid #ccc; padding: 10px; background-color: #f9f9f9;"> <pre> name: corridorz in: query required: true schema:   type: string style: form explode: false </pre> </div>
---	---

## Requirement 29: /req/edr/corridorHeight-response Parameter corridorHeight response

A	If the <b>corridorz</b> parameter is defined the result set SHALL contain values derieved based on the chosen interpolation algorithm at the number of specifed intervals.
B	<p>The <b>corridorz</b> information is a the corridor height and the corridor units.</p> <div><code>corridorz = height "/" units</code></div>
C	The height of corridor parameter is the total height of the required corridor.
D	The coordinates of the <b>coords</b> parameter define the centre point of the corridor.
E	If an unsupported units value is requested a <b>400</b> error should be returned.

## Requirement 30: /req/edr/corridorWidth-definition Parameter corridorWidth definition

A	<p>Each resource collection operation SHALL support a parameter `corridorwidth` with the following characteristics (using an OpenAPI Specification 3.0 fragment):</p> <div><code>name: corridorwidth in: query required: true schema:   type: string style: form explode: false</code></div>
---	--

## Requirement 31: /req/edr/corridorWidth-response Parameter corridorWidth response

A	The <b>corridorwidth</b> information is the total width of the required corridor.
---	---

B	<p>The supported <b>corridorwidth</b> width units will be supplied by the query metadata information.</p> <div> <code>corridorwidth = width "/" units</code> </div>
C	If the width value is the total width of the corridor.
D	The coordinates of the <b>coords</b> parameter define the centre point of the corridor.
E	If an unsupported units value is requested a <b>400</b> error should be returned.

### Requirement 32: /req/core/http HTTP

A	The API SHALL conform to <a href="#">HTTP 1.1</a> .
B	If the API supports HTTPS, then the API SHALL also conform to <a href="#">HTTP over TLS</a> .

### Requirement 33: /req/core/crs84 CRS84

A	Unless the client explicitly requests a different coordinate reference system, all spatial geometries SHALL be in the <a href="#">CRS84</a> (WGS 84 longitude/latitude) coordinate reference system for geometries without height information and <a href="#">CRS84h</a> (WGS 84 longitude/latitude plus ellipsoidal height) for geometries with height information.
---	--

## A.3. Requirements Test Class OpenAPI 3.0

### Requirements Class: OpenAPI 3.0

<a href="http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/oas30">http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/oas30</a>	
Target type	Web API
Dependency	<a href="#">Conformance Class "Core"</a>
Dependency	<a href="#">OGC API-Common Standard 1.0</a>
Dependency	<a href="#">OpenAPI Specification 3.0.3</a>

### Requirement 34: /req/oas30/oas-common OpenAPI 3.0 API Common

Extends	/req/core/api-common
A	The API SHALL demonstrate conformance with the following Requirements Class of the OGC API-Common version 1.0 Standard. <a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas30">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas30</a> .

### Requirement 35 | /req/oas30/conformance OpenAPI 3.0 Conformance

The list of Conformance Classes advertised by the API SHALL include:	
A	<a href="http://www.opengis.net/spec/ogcapi-coverages-1/1.0/conf/oas30">http://www.opengis.net/spec/ogcapi-coverages-1/1.0/conf/oas30</a>

### Requirement 36: /req/oas30/completeness OpenAPI 3.0 Completeness

A	The OpenAPI definition SHALL specify for each operation all <a href="#">HTTP Status Codes</a> and <a href="#">Response Objects</a> that the API uses in responses.
B	This includes the successful execution of an operation as well as all error situations that originate from the server.

### Requirement 37: /req/oas30/exceptions-codes OpenAPI 3.0 Exception codes

A	For error situations that originate from an API server, the API definition SHALL cover all applicable HTTP Status Codes.
---	--

### Requirement 38: /req/oas30/security OpenAPI 3.0 Security

A	For cases, where the operations of the API are access-controlled, the security scheme(s) and requirements SHALL be documented in the OpenAPI definition.
---	--



# Annex B: Abstract Test Suite (Normative)

## B.1. Introduction

The Abstract Test Suite (ATS) is a compendium of test assertions applicable to implementations of the EDR API. An ATS provides a basis for developing an Executable Test Suite to verify that the implementation under test conforms to all the relevant functional specifications.

The abstract test cases (assertions) are organized into test groups that correspond to distinct conformance test classes defined in the EDR API specification.

OGC Web APIs are not a Web Services in the traditional sense. Rather, they define the behavior and content of a set of Resources exposed through a Web Application Programming Interface (Web API). Therefore, an API may expose resources in addition to those defined by the standard. A test engine must be able to traverse the API, identify and validate test points, and ignore resource paths which are not to be tested.

## B.2. Conformance Class Core

Conformance Class	
<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core</a>	
Target type	Web API
Requirements Class	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core</a>

### B.2.1. General Tests

#### HTTP

Abstract Test 1	/conf/core/http
Test Purpose	Validate that the resource paths advertised through the API conform with HTTP 1.1 and, where appropriate, TLS.
Requirement	<a href="#">/req/core/http</a>
Test Method	<ol style="list-style-type: none"><li>1. All compliance tests shall be configured to use the HTTP 1.1 protocol exclusively.</li><li>2. For APIs which support HTTPS, all compliance tests shall be configured to use <a href="#">HTTP over TLS</a> (RFC 2818) with their HTTP 1.1 protocol.</li></ol>

### B.2.2. Landing Page {root}/

<b>Abstract Test 2</b>	<b>/conf/core/root-op</b>
Test Purpose	Validate that a landing page can be retrieved from the expected location.
Requirement	<a href="#">/req/core/root-op</a>
Test Method	<ol style="list-style-type: none"><li>1. Issue an HTTP GET request to the URL {root}/</li><li>2. Validate that a document was returned with a status code 200</li><li>3. Validate the contents of the returned document using test <a href="#">/conf/core/root-success</a>.</li></ol>

<b>Abstract Test 3</b>	<b>/conf/core/root-success</b>
Test Purpose	Validate that the landing page complies with the require structure and contents.
Requirement	<a href="#">/req/core/root-success</a>
Test Method	<p>Validate the landing page for all supported media types using the resources and tests identified in <a href="#">Table 7</a></p> <p>For formats that require manual inspection, perform the following:</p> <ol style="list-style-type: none"><li>a. Validate that the landing page includes a "service-desc" and/or "service-doc" link to an API Definition</li><li>b. Validate that the landing page includes a "conformance" link to the conformance class declaration</li><li>c. Validate that the landing page includes a "data" link to the Feature contents.</li></ol>

The landing page may be retrieved in a number of different formats. The following table identifies the applicable schema document for each format and the test to be used to validate the landing page against that schema. All supported formats should be exercised.

*Table 7. Schema and Tests for Landing Pages*

Format	Schema Document	Test ID
HTML	<a href="#">landingPage.json</a>	<a href="#">/conf/html/content</a>
JSON	<a href="#">landingPage.json</a>	<a href="#">/conf/geojson/content</a>

### B.2.3. API Definition Path {root}/api (link)

<b>Abstract Test 4</b>	<b>/conf/core/api-definition-op</b>
Test Purpose	Validate that the API Definition document can be retrieved from the expected location.
Requirement	<a href="#">/req/core/api-definition-op</a>
Test Purpose	Validate that the API Definition document can be retrieved from the expected location.
Test Method	<ol style="list-style-type: none"><li>1. Construct a path for each API Definition link on the landing page</li><li>2. Issue a HTTP GET request on each path</li><li>3. Validate that a document was returned with a status code 200</li><li>4. Validate the contents of the returned document using test <a href="#">/conf/core/api-definition-success</a>.</li></ol>

<b>Abstract Test 5</b>	<b>/conf/core/api-definition-success</b>
Test Purpose	Validate that the API Definition complies with the required structure and contents.
Requirement	<a href="#">/req/core/api-definition-success</a>
Test Method	Validate the API Definition document against an appropriate schema document.

### B.2.4. Conformance Path {root}/conformance

<b>Abstract Test 6</b>	<b>/conf/core/conformance-op</b>
Test Purpose	Validate that a Conformance Declaration can be retrieved from the expected location.
Requirement	<a href="#">/req/core/conformance-op</a>

Test Method	<ol style="list-style-type: none"> <li>1. Construct a path for each "conformance" link on the landing page as well as for the {root}/conformance path.</li> <li>2. Issue an HTTP GET request on each path</li> <li>3. Validate that a document was returned with a status code 200</li> <li>4. Validate the contents of the returned document using test <a href="#">/conf/core/conformance-success</a>.</li> </ol>
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<b>Abstract Test 7</b>	<b><a href="#">/conf/core/conformance-success</a></b>
Test Purpose	Validate that the Conformance Declaration response complies with the required structure and contents.
Requirement	<a href="#">/req/core/conformance-success</a>
Test Method	<ol style="list-style-type: none"> <li>1. Validate the response document against OpenAPI 3.0 schema <a href="#">confClasses.yaml</a></li> <li>2. Validate that the document includes the conformance class "http://www.opengis.net/spec/ogcapi-features-1/1.0/conf/core"</li> <li>3. Validate that the document list all OGC API conformance classes that the API implements.</li> </ol>

## B.3. Conformance Class Collections

<b>Conformance Class</b>	
<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/collections">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/collections</a>	
Target type	Web API
Requirements Class	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/collections">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/collections</a>
Dependency	<a href="#">Conformance Class "OAPI Core"</a>

### B.3.1. General Tests

#### CRS 84

<b>Abstract Test 8</b>	<b><a href="#">/conf/core/crs84</a></b>
Test Purpose	Validate that all spatial geometries provided through the API are in the CRS84 spatial reference system unless otherwise requested by the client.

Requirement	<a href="#">/req/core/crs84</a>
Test Method	<ol style="list-style-type: none"> <li>1. Do not specify a coordinate reference system in any request. All spatial data should be in the CRS84 reference system.</li> <li>2. Validate retrieved spatial data using the CRS84 reference system.</li> </ol>

### B.3.2. Environmental Data Collections {root}/collections

<b>Abstract Test 9</b>	<b><a href="#">/conf/collections/rc-md-op</a></b>
Test Purpose	Validate that information about the Collections can be retrieved from the expected location.
Requirement	<a href="#">/req/collections/rc-md-op</a>
Test Method	<ol style="list-style-type: none"> <li>1. Issue an HTTP GET request to the URL {root}/collections</li> <li>2. Validate that a document was returned with a status code 200</li> <li>3. Validate the contents of the returned document using test <a href="#">/conf/collections/rc-md-success</a>.</li> </ol>

<b>Abstract Test 10</b>	<b><a href="#">/conf/rc-md-success</a></b>
Test Purpose	Validate that the Collections content complies with the required structure and contents.
Requirement	<a href="#">/req/collections/rc-md-success</a> , <a href="#">/req/edr/rc-crs</a>
Test Method	<ol style="list-style-type: none"> <li>1. Validate that all response documents comply with <a href="#">/conf/collections/rc-collection-info-links</a></li> <li>2. In case the response includes a "crs" property, validate that it includes a valid Well Known Text definition</li> <li>3. Validate the collections content for all supported media types using the resources and tests identified in <a href="#">Table 8</a></li> </ol>

The Collections content may be retrieved in a number of different formats. The following table identifies the applicable schema document for each format and the test to be used to validate the against that schema. All supported formats should be exercised.

*Table 8. Schema and Tests for Collections content*

Format	Schema Document	Test ID
HTML	<a href="#">collections.json</a>	<a href="#">/conf/html/content</a>
JSON	<a href="#">collections.json</a>	<a href="#">/conf/geojson/content</a>

### B.3.3. Environmental Data Collection {root}/collections/{collectionId}

<b>Abstract Test 11</b>	<b>/conf/collections/src-md-op</b>
Test Purpose	Validate that the Collection content can be retrieved from the expected location.
Requirement	<a href="#">/req/collections/src-md-op</a>
Test Method	For every Feature Collection described in the Collections content, issue an HTTP GET request to the URL <a href="#">/collections/{collectionId}</a> where <a href="#">{collectionId}</a> is the <a href="#">id</a> property for the collection. . Validate that a Collection was returned with a status code 200 . Validate the contents of the returned document using test <a href="#">/conf/collections/src-md-success</a> .

<b>Abstract Test 12</b>	<b>/conf/collections/src-md-success</b>
Test Purpose	Validate that the Collection content complies with the required structure and contents.
Requirement	<a href="#">/req/collections/src-md-success</a>
Test Method	Verify that the content of the response is consistent with the content for this Resource Collection in the <a href="#">/collections</a> response. That is, the values for <a href="#">id</a> , <a href="#">title</a> , <a href="#">description</a> and <a href="#">extent</a> are identical.

### B.3.4. Second Tier Collections Tests

These tests are invoked by other tests.

#### Collection Extent

<b>Abstract Test 13</b>	<b>/conf/core/rc-extent</b>
Test Purpose	Validate that the <a href="#">extent</a> property if it is present
Requirement	<a href="#">/req/core/rc-extent</a>

Test Method	<ol style="list-style-type: none"> <li>1. Verify that the <b>extent</b> provides bounding boxes that include all spatial geometries</li> <li>2. Verify that if the <b>extent</b> provides time intervals that include all temporal geometries in this collection.</li> <li>3. A temporal extent of <b>null</b> indicates an open time interval.</li> <li>4. Verify that if the <b>extent</b> provides vertical intervals that include all vertical geometries in this collection.</li> <li>5. A vertical extent of <b>null</b> indicates an open vertical interval.</li> </ol>
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## Collection Queries

<b>Abstract Test 14</b>	<b>/conf/edr/rc-collection-info</b>
Test Purpose	Validate that each collection provided by the server is described in the Collections Metadata.
Requirement	<a href="#">/req/edr/rc-collection-info</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that all collections listed in the <b>collections</b> array of the Collections Metadata exist.</li> <li>2. Verify that each collection entry includes an identifier.</li> <li>3. Verify that each collection entry includes links in accordance with <a href="#">/core/rc-collection-info-links</a>.</li> <li>4. Verify that if the collection entry includes an extent property, the property complies with <a href="#">/core/rc-extent</a></li> <li>5. Verify that if the collection entry includes an crs property, the property complies with <a href="#">/edr/rc-crs</a></li> <li>6. Verify that if the collection entry includes an parameters property, the property complies with <a href="#">/edr/rc-parameters</a></li> <li>7. Validate each collection entry for all supported media types using the resources and tests identified in <a href="#">Table 9</a></li> </ol>

The collection entries may be encoded in a number of different formats. The following table identifies the applicable schema document for each format and the test to be used to validate the against that schema. All supported formats should be exercised.

*Table 9. Schema and Tests for Collection Entries*

Format	Schema Document	Test ID
HTML	<a href="#">collectionInfo.json</a>	<a href="#">/conf/html/content</a>
JSON	<a href="#">collectionInfo.json</a>	<a href="#">/conf/json/content</a>

<b>Abstract Test 15</b>	<b>/conf/edr/rc-md-query-links</b>
Test Purpose	Validate that each Collection metadata entry in the Collections Metadata document includes all required links.
Requirement	<a href="/req/edr/rc-md-query-links">/req/edr/rc-md-query-links</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that each Collection item in the Collections Metadata document includes a <b>link</b> property for each supported encoding.</li> <li>2. Verify that the <b>links</b> properties of the collection includes an item for each supported encoding with at least one link to either a query resource (relation: <b>data</b>) or instance resource (relation: <b>collection</b>).</li> <li>3. Verify that all links include the <b>rel</b> and <b>type</b> link parameters.</li> </ol>

### Collection Links

<b>Abstract Test 16</b>	<b>/conf/core/rc-collection-info-links</b>
Test Purpose	Validate that the required links are included in the Collections Metadata document.
Requirement	<a href="/req/core/rc-collection-info-links">/req/core/rc-collection-info-links</a>
Test Method	<p>Verify that the response document includes:</p> <ol style="list-style-type: none"> <li>1. a link to this response document (relation: <b>self</b>),</li> <li>2. a link to the response document in every other media type supported by the server (relation: <b>alternate</b>).</li> </ol> <p>Verify that all links include the <b>rel</b> and <b>type</b> link parameters.</p>

## B.4. Conformance Class JSON

<b>Conformance Class</b>	
<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json</a>	
Target type	Web API
Requirements Class	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json</a>
Dependency	<a href="#">Conformance Class "OAPI Core"</a>



### B.4.1. JSON Definition

Abstract Test 17	/conf/json/definition
Test Purpose	Verify support for JSON
Requirement	<a href="#">/req/json/definition</a>
Test Method	<ol style="list-style-type: none"><li>1. A resource is requested with response media type of <code>application/json</code></li><li>2. All 200-responses SHALL support the media type:- <code>application/json</code></li></ol>

## B.5. Conformance Class GeoJSON

Conformance Class	
<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json</a>	
Target type	Web API
Requirements Class	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/json</a>
Dependency	<a href="#">Conformance Class "OAPI Core"</a>

### B.5.1. JSON Definition

Abstract Test 18	/conf/json/definition
Test Purpose	Verify support for JSON
Requirement	<a href="#">/req/json/definition</a>
Test Method	<ol style="list-style-type: none"><li>1. A resource is requested with response media type of <code>application/json</code></li><li>2. All 200-responses SHALL support the media type:- <code>application/json</code></li></ol>

### B.5.2. GeoJSON Content

Abstract Test 19	/conf/geojson/content
Test Purpose	Verify the content of a GeoJSON document given an input document and schema.

Requirement	<a href="#">/req/geojson/content</a>
Test Method	<ol style="list-style-type: none"> <li>1. Validate that the document is a GeoJSON document.</li> <li>2. Validate the document against the schema using an JSON Schema validator.</li> <li>3. Validate the document against the schema using an GeoJSON Schema validator.</li> </ol>

## B.6. Conformance Class EDR GeoJSON

<b>Conformance Class</b>	
<a href="http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/core/edr-geojson">http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/core/edr-geojson</a>	
Target type	Web API
Requirements Class	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/edr-geojson">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/edr-geojson</a>
Dependency	<a href="#">Conformance Class "OAPI Core"</a>

### B.6.1. EDR GeoJSON Definition

<b>Abstract Test 20</b>	<b><a href="#">/conf/edr-geojson/definition</a></b>
Test Purpose	Verify support for the EDR GeoJSON Schema
Requirement	<a href="#">/req/edr-geojson/definition</a>
Test Method	<ol style="list-style-type: none"> <li>1. A resource is requested with response media type of <b>application/json</b> and adheres to the EDR Feature Collection GeoJSON Schema.</li> <li>2. All <b>200</b>-responses SHALL support the following media types: <ul style="list-style-type: none"> <li>◦ <b>application/json</b> for resources</li> </ul> </li> </ol>

### B.6.2. EDR GeoJSON Content

<b>Abstract Test 21</b>	<b><a href="#">/conf/edr-geojson/content</a></b>
Test Purpose	Verify the content of a EDR GeoJSON document given an input document and schema.
Requirement	<a href="#">/req/edr-geojson/content</a>

Test Method	<ol style="list-style-type: none"> <li>1. Validate that the document is an EDR GeoJSON document.</li> <li>2. Validate the document against the schema using an JSON Schema validator.</li> <li>3. Validate the document against the schema using an EDR GeoJSON Schema validator.</li> </ol>
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## B.7. Conformance Class CoverageJSON

<b>Conformance Class</b>	
<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/covjson">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/covjson</a>	
Target type	Web API
Requirements Class	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/covjson">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/covjson</a>
Dependency	<a href="#">Conformance Class "OAPI Core"</a>

### B.7.1. CoverageJSON Definition

<b>Abstract Test 22</b>	<b>/conf/covjson/definition</b>
Test Purpose	Verify support for CoverageJSON
Requirement	<a href="/req/covjson/definition">/req/covjson/definition</a>
Test Method	<ol style="list-style-type: none"> <li>1. A resource is requested with response media type of <code>application/prs.coverage+json</code></li> <li>2. All 200-responses SHALL support the following media types: <ul style="list-style-type: none"> <li>◦ <code>application/prs.coverage+json</code> for resources</li> </ul> </li> </ol>

### B.7.2. CoverageJSON Content

<b>Abstract Test 23</b>	<b>/conf/covjson/content</b>
Test Purpose	Verify the content of a CoverageJSON document given an input document and schema.
Requirement	<a href="/req/covjson/content">/req/covjson/content</a>

Test Method	<ol style="list-style-type: none"> <li>1. Validate that the document is a CoverageJSON document.</li> <li>2. Validate the document against the schema using an JSON Schema validator.</li> <li>3. Validate the document against the schema using an CoverageJSON Schema validator.</li> </ol>
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## B.8. Conformance Class HTML

<b>Conformance Class</b>	
<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/html">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/html</a>	
Target type	Web API
Requirements Class	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/html">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/html</a>
Dependency	<a href="#">Conformance Class "OAPI Core"</a>

### B.8.1. HTML Definition

<b>Abstract Test 24</b>	<b>/conf/html/definition</b>
Test Purpose	Verify support for HTML
Requirement	<a href="#">/req/html/definition</a>
Test Method	Verify that every <b>200</b> -response of every operation of the API where HTML was requested is of media type <b>text/html</b>

### B.8.2. HTML Content

<b>Abstract Test 25</b>	<b>/conf/html/content</b>
Test Purpose	Verify the content of an HTML document given an input document and schema.
Requirement	<a href="#">/req/html/content</a>
Test Method	<ol style="list-style-type: none"> <li>1. Validate that the document is an <a href="#">HTML 5 document</a></li> <li>2. Manually inspect the document against the schema.</li> </ol>

## B.9. Conformance Class OpenAPI 3.0

Conformance Class	
<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas3">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas3</a>	
Target type	Web API
Requirements Class	<a href="http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas3">http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas3</a>
Dependency	<a href="#">Conformance Class "OAPI Core"</a>

<b>Abstract Test 26</b>	<b>/conf/oas30/completeness</b>
Test Purpose	Verify the completeness of an OpenAPI document.
Requirement	<a href="#">/req/oas30/completeness</a>
Test Method	Verify that for each operation, the OpenAPI document describes all <a href="#">HTTP Status Codes</a> and <a href="#">Response Objects</a> that the API uses in responses.

<b>Abstract Test 27</b>	<b>/conf/oas30/exceptions-codes</b>
Test Purpose	Verify that the OpenAPI document fully describes potential exception codes.
Requirement	<a href="#">/req/oas30/exceptions-codes</a>
Test Method	Verify that for each operation, the OpenAPI document describes all <a href="#">HTTP Status Codes</a> that may be generated.

<b>Abstract Test 28</b>	<b>/conf/oas30/oas-definition-1</b>
Test Purpose	Verify that JSON and HTML versions of the OpenAPI document are available.
Requirement	<a href="#">/req/oas30/oas-definition-1</a>
Test Method	<ol style="list-style-type: none"><li>1. Verify that an OpenAPI definition in JSON is available using the media type <code>application/vnd.oai.openapi+json;version=3.0</code> and link relation <code>service-desc</code></li><li>2. Verify that an HTML version of the API definition is available using the media type <code>text/html</code> and link relation <code>service-doc</code>.</li></ol>

<b>Abstract Test 29</b>	<b>/conf/oas30/oas-definition-2</b>
Test Purpose	Verify that the OpenAPI document is valid JSON.
Requirement	<a href="#">/req/oas30/oas-definition-2</a>
Test Method	Verify that the JSON representation conforms to the <a href="#">OpenAPI Specification, version 3.0</a> .

<b>Abstract Test 30</b>	<b>/conf/oas30/oas-impl</b>
Test Purpose	Verify that all capabilities specified in the OpenAPI definition are implemented by the API.
Requirement	<a href="#">/req/oas30/oas-impl</a>
Test Method	<ol style="list-style-type: none"> <li>1. Construct a path from each URL template including all server URL options and all enumerated path parameters.</li> <li>2. For each path defined in the OpenAPI document, validate that the path performs in accordance with the API definition and the API-Features standard.</li> </ol>

<b>Abstract Test 31</b>	<b>/conf/oas30/security</b>
Test Purpose	Verify that any authentication protocols implemented by the API are documented in the OpenAPI document.
Requirement	<a href="#">/req/oas30/security</a>
Test Method	<ol style="list-style-type: none"> <li>1. Identify all authentication protocols supported by the API.</li> <li>2. Validate that each authentication protocol is described in the OpenAPI document by a Security Schema Object and its use specified by a Security Requirement Object.</li> </ol>

## B.10. Conformance Class Queries

<b>Conformance Class</b>	
<a href="http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/queries">http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/queries</a>	
Target type	Web API
Requirements Class	<a href="http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/queries">http://www.opengis.net/spec/ogcapi-edr-1/1.0/conf/queries</a>

Dependency	<a href="#">Conformance Class "OGC API Common Core"</a>
Dependency	<a href="#">Conformance Class "OGC API Common Collections"</a>

## B.10.1. Query Pattern Tests

### Position

<b>Abstract Test 32</b>	<b>/conf/position</b>
Test Purpose	Validate that an error is returned by a <b>Position</b> query if no query parameters are specified.
Requirement	<a href="#">/req/queries/position</a>
Test Method	<ol style="list-style-type: none"> <li>1. No query parameters are specified</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 33</b>	<b>/conf/position</b>
Test Purpose	Validate that an error is returned by a <b>Position</b> query when the coords query parameter is not specified.
Requirement	<a href="#">/req/queries/position</a>
Test Method	<ol style="list-style-type: none"> <li>1. coords query parameter is not specified</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 34</b>	<b>/conf/position</b>
Test Purpose	Validate that an error is returned by a <b>Position</b> query when the coords query parameter does not contain a valid POINT Well Known Text value.
Requirement	<a href="#">/req/queries/position</a>
Test Method	<ol style="list-style-type: none"> <li>1. Check coords query parameter is a valid Well Known Text Point value</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 35</b>	<b>/conf/position</b>
Test Purpose	Validate that resources can be identified and extracted from a Collection with a <b>Position</b> query using query parameters.

Requirement	<a href="#">/req/queries/position</a>
Test Method	<ol style="list-style-type: none"> <li>1. Test with valid query parameters</li> <li>2. Validate that a document was returned with a status code 200.</li> </ol> <p>Repeat these tests using the following parameter tests:</p> <p><b>Coordinates</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="#">/conf/collections/rc-coords-definition</a></li> <li>• Response <a href="#">/conf/collections/rc-coords-response</a></li> </ul> <p><b>VerticalLevel</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="#">/conf/collections/rc-z-definition</a></li> <li>• Response <a href="#">/conf/collections/rc-z-response</a></li> </ul> <p><b>Parameters</b> * Parameter <a href="#">/conf/collections/rc-parametername-definition</a> * Response <a href="#">/conf/collections/rc-parametername-response</a></p> <p><b>DateTime</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="#">/conf/collections/rc-time-definition</a></li> <li>• Response <a href="#">/conf/collections/rc-time-response</a></li> </ul> <p>Execute requests with combinations of the "coords","time","parametername","z","crs" and "f" query parameters and verify that only information that matches the selection criteria is returned.</p>

<b>Abstract Test 36</b>	<b><a href="#">/conf/edr/rc-coords-definition</a></b>
Test Purpose	Validate that the coords query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-coords-definition</a>



Test Method	<p>Verify that the <b>coords</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: coords in: query required: true schema:   type: string   style: form   explode: false </pre> <p>Use a coords value in all requests:</p> <ul style="list-style-type: none"> <li>• A valid Well-known text representation of geometry string</li> </ul>
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<b>Abstract Test 37</b>	<b>/conf/edr/rc-coords-response</b>
Test Purpose	Validate that the <b>coords</b> query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-coords-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources that have a spatial geometry that intersects the coordinates are returned as part of the result set.</li> </ol>
Test Method	<ol style="list-style-type: none"> <li>1. Verify <b>coords</b> values are valid for the specified coordinate reference system</li> <li>2. Verify that the coordinate reference system of the geometries are valid for the parameter defined by <b>crs</b>. If the <b>crs</b> parameter is not defined the geometries must be valid for WGS 84 longitude/latitude (<a href="http://www.opengis.net/def/crs/OGC/1.3/CRS84">http://www.opengis.net/def/crs/OGC/1.3/CRS84</a> or <a href="http://www.opengis.net/def/crs/OGC/0/CRS84h">http://www.opengis.net/def/crs/OGC/0/CRS84h</a>).</li> </ol>

<b>Abstract Test 38</b>	<b>/conf/edr/rc-z-definition</b>
Test Purpose	Validate that the vertical level query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-z-definition</a>

Test Method	<p>Verify that the <b>z</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: z in: query required: false schema:   type: string style: form explode: false </pre>
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<b>Abstract Test 39</b>	<b>/conf/edr/rc-z-response</b>
Test Purpose	Validate that the vertical level query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-z-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources that have a vertical geometry that intersects the vertical information in the <b>z</b> parameter were included in the result set</li> <li>2. Validate that the vertical level parameter complies with the syntax described in <a href="#">/req/edr/REQ_rc-z-response</a>.</li> </ol>

<b>Abstract Test 40</b>	<b>/conf/core/rc-time-definition</b>
Test Purpose	Validate that the dateTime query parameters are constructed correctly.
Requirement	<a href="#">/req/core/rc-time-definition</a>
Test Method	<p>Verify that the <b>time</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: time in: query required: false schema:   type: string style: form explode: false </pre>

<b>Abstract Test 41</b>	<b>/conf/core/rc-time-response</b>
Test Purpose	Validate that the dateTime query parameters are processed correctly.
Requirement	<a href="#">/req/core/rc-time-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources that have a temporal geometry that intersects the temporal information in the <b>datetime</b> parameter were included in the result set</li> <li>2. Verify that all resources in the collection that are not associated with a temporal geometry are included in the result set</li> <li>3. Validate that the datetime parameter complies with the syntax described in <a href="#">/req/core/rc-time-response</a>.</li> </ol>

<b>Abstract Test 42</b>	<b>/conf/collections/rc-parametername-definition</b>
Test Purpose	Validate that the parametername query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-parametername-definition</a>
Test Method	<p>Verify that the <b>parametername</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: parametername in: query required: false schema:   type: string style: form explode: false </pre>

<b>Abstract Test 43</b>	<b>/conf/edr/rc-parametername-response</b>
Test Purpose	Validate that the parametername query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-parametername-response</a>

Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources for the requested parameters were included in the result set</li> <li>2. Validate that the <code>parametername</code> parameter complies with the syntax described in <a href="#">/req/edr/rc-parameters-response</a>.</li> </ol>
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<b>Abstract Test 44</b>	<b>/conf/edr/rc-outputCRS-definition</b>
Test Purpose	Validate that the crs query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-outputCRS-definition</a>
Test Method	<p>Verify that the <code>crs</code> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: crs in: query required: false schema:   type: string style: form explode: false </pre>

<b>Abstract Test 45</b>	<b>/conf/edr/rc-outputCRS-response</b>
Test Purpose	Validate that the crs query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-outputCRS-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that the geometry of the resources returned are valid for the requested coordinate reference system</li> </ol>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that all crs values defined in the collections metadata are supported by the collection</li> <li>2. Validate that the crs parameter complies with the syntax described in <a href="#">/req/collections/edr/rc-crs-response</a>.</li> </ol>

<b>Abstract Test 46</b>	<b>/conf/edr/rc-outputformat-definition</b>
Test Purpose	Validate that the <code>f</code> query parameter is constructed correctly.
Requirement	<a href="#">/req/edr/rc-outputformat-definition</a>

Test Method	<p>Verify that the <b>f</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: f in: query required: false schema:   type: string style: form explode: false </pre>
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<b>Abstract Test 47</b>	<b>/conf/collections/rc-outputformat-response</b>
Test Purpose	Validate that the <b>f</b> query parameters are processed correctly.
Requirement	<a href="#">/req/collections/rc-outputformat-response</a>
Test Method	1. Verify that the response is returned in the requested data format
Test Method	1. Verify that all output format values defined in the collections metadata are supported by the collection 2. Validate that the <b>f</b> parameter complies with the syntax described in <a href="#">/req/collections/edr/rc-output-response</a> .

## Area

<b>Abstract Test 48</b>	<b>/conf/area</b>
Test Purpose	Validate that an error is returned by a <b>Area</b> query if no query parameters are specified.
Requirement	<a href="#">/req/queries/area</a>
Test Method	1. No query parameters are specified 2. Validate that a document was returned with a status code 400.
<b>Abstract Test 49</b>	<b>/conf/area</b>
Test Purpose	Validate that an error is returned by a <b>Area</b> query when the coords query parameter is not specified.

Requirement	<a href="#">/req/queries/area</a>
Test Method	<ol style="list-style-type: none"> <li>1. coords query parameter is not specified</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 50</b>	<b>/conf/area</b>
Test Purpose	Validate that an error is returned by a <b>Area</b> query when the coords query parameter does not contain a valid POLYGON Well Known Text value.
Requirement	<a href="#">/req/queries/position</a>
Test Method	<ol style="list-style-type: none"> <li>1. Check coords query parameter is a valid Well Known Text Polygon value</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 51</b>	<b>/conf/area</b>
Test Purpose	Validate that resources can be identified and extracted from a Collection with a <b>Area</b> query using query parameters.
Requirement	<a href="#">/req/queries/area</a>

Test Method	<ol style="list-style-type: none"> <li>1. Test with valid query parameters</li> <li>2. Validate that a document was returned with a status code 200.</li> </ol> <p>Repeat these tests using the following parameter tests:</p> <p><b>Coordinates</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="#">/conf/collections/rc-coords-definition</a></li> <li>• Response <a href="#">/conf/collections/rc-coords-response</a></li> </ul> <p><b>VerticalLevel</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="#">/conf/collections/rc-z-definition</a></li> <li>• Response <a href="#">/conf/collections/rc-z-response</a></li> </ul> <p><b>Parameters</b> * Parameter <a href="#">/conf/collections/rc-parametername-definition</a> * Response <a href="#">/conf/collections/rc-parametername-response</a></p> <p><b>DateTime</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="#">/conf/collections/rc-time-definition</a></li> <li>• Response <a href="#">/conf/collections/rc-time-response</a></li> </ul> <p>Execute requests with combinations of the "coords","time","parametername","z","crs" and "f" query parameters and verify that only information that matches the selection criteria is returned.</p>
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<b>Abstract Test 52</b>	<b><a href="#">/conf/edr/rc-coords-definition</a></b>
Test Purpose	Validate that the coords query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-coords-definition</a>

Test Method	<p>Verify that the <b>coords</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: coords in: query required: true schema:   type: string   style: form   explode: false </pre> <p>Use a coords value in all requests:</p> <ul style="list-style-type: none"> <li>• A valid Well-known text representation of geometry string</li> </ul>
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<b>Abstract Test 53</b>	<b>/conf/edr/rc-coords-response</b>
Test Purpose	Validate that the <b>coords</b> query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-coords-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources that have a spatial geometry that intersects the coordinates are returned as part of the result set.</li> </ol>
Test Method	<ol style="list-style-type: none"> <li>1. Verify <b>coords</b> values are valid for the specified coordinate reference system</li> <li>2. Verify that the coordinate reference system of the geometries are valid for the parameter defined by <b>crs</b>. If the <b>crs</b> parameter is not defined the geometries must be valid for WGS 84 longitude/latitude (<a href="http://www.opengis.net/def/crs/OGC/1.3/CRS84">http://www.opengis.net/def/crs/OGC/1.3/CRS84</a> or <a href="http://www.opengis.net/def/crs/OGC/0/CRS84h">http://www.opengis.net/def/crs/OGC/0/CRS84h</a>).</li> </ol>

<b>Abstract Test 54</b>	<b>/conf/edr/rc-z-definition</b>
Test Purpose	Validate that the vertical level query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-z-definition</a>



Test Method	<p>Verify that the <b>z</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: z in: query required: false schema:   type: string style: form explode: false </pre>
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<b>Abstract Test 55</b>	<b>/conf/edr/rc-z-response</b>
Test Purpose	Validate that the vertical level query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-z-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources that have a vertical geometry that intersects the vertical information in the <b>z</b> parameter were included in the result set</li> <li>2. Validate that the vertical level parameter complies with the syntax described in <a href="#">/req/edr/REQ_rc-z-response</a>.</li> </ol>

<b>Abstract Test 56</b>	<b>/conf/core/rc-time-definition</b>
Test Purpose	Validate that the dateTime query parameters are constructed correctly.
Requirement	<a href="#">/req/core/rc-time-definition</a>
Test Method	<p>Verify that the <b>time</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: time in: query required: false schema:   type: string style: form explode: false </pre>

<b>Abstract Test 57</b>	<b>/conf/core/rc-time-response</b>
Test Purpose	Validate that the dateTime query parameters are processed correctly.
Requirement	<a href="#">/req/core/rc-time-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources that have a temporal geometry that intersects the temporal information in the <b>datetime</b> parameter were included in the result set</li> <li>2. Verify that all resources in the collection that are not associated with a temporal geometry are included in the result set</li> <li>3. Validate that the datetime parameter complies with the syntax described in <a href="#">/req/core/rc-time-response</a>.</li> </ol>

<b>Abstract Test 58</b>	<b>/conf/collections/rc-parametername-definition</b>
Test Purpose	Validate that the parametername query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-parametername-definition</a>
Test Method	<p>Verify that the <b>parametername</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: parametername in: query required: false schema:   type: string style: form explode: false </pre>

<b>Abstract Test 59</b>	<b>/conf/edr/rc-parametername-response</b>
Test Purpose	Validate that the parametername query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-parametername-response</a>

Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources for the requested parameters were included in the result set</li> <li>2. Validate that the <code>parametername</code> parameter complies with the syntax described in <a href="#">/req/edr/rc-parameters-response</a>.</li> </ol>
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<b>Abstract Test 60</b>	<b>/conf/edr/rc-outputCRS-definition</b>
Test Purpose	Validate that the crs query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-outputCRS-definition</a>
Test Method	<p>Verify that the <code>crs</code> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: crs in: query required: false schema:   type: string style: form explode: false </pre>

<b>Abstract Test 61</b>	<b>/conf/edr/rc-outputCRS-response</b>
Test Purpose	Validate that the crs query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-outputCRS-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that the geometry of the resources returned are valid for the requested coordinate reference system</li> </ol>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that all crs values defined in the collections metadata are supported by the collection</li> <li>2. Validate that the crs parameter complies with the syntax described in <a href="#">/req/collections/edr/rc-crs-response</a>.</li> </ol>

<b>Abstract Test 62</b>	<b>/conf/edr/rc-outputformat-definition</b>
Test Purpose	Validate that the <code>f</code> query parameter is constructed correctly.
Requirement	<a href="#">/req/edr/rc-outputformat-definition</a>

Test Method	<p>Verify that the <b>f</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: f in: query required: false schema:   type: string style: form explode: false </pre>
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<b>Abstract Test 63</b>	<b>/conf/collections/rc-outputformat-response</b>
Test Purpose	Validate that the <b>f</b> query parameters are processed correctly.
Requirement	<a href="#">/req/collections/rc-outputformat-response</a>
Test Method	1. Verify that the response is returned in the requested data format
Test Method	1. Verify that all output format values defined in the collections metadata are supported by the collection 2. Validate that the <b>f</b> parameter complies with the syntax described in <a href="#">/req/collections/edr/rc-output-response</a> .

## Trajectory

<b>Abstract Test 64</b>	<b>/conf/trajectory</b>
Test Purpose	Validate that an error is returned by a <b>Trajectory</b> query if no query parameters are specified.
Requirement	<a href="#">/req/queries/trajectory</a>
Test Method	1. No query parameters are specified 2. Validate that a document was returned with a status code 400.
<b>Abstract Test 65</b>	<b>/conf/trajectory</b>
Test Purpose	Validate that an error is returned by a <b>Trajectory</b> query when the coords query parameter is not specified.

Requirement	<a href="/req/queries/trajectory">/req/queries/trajectory</a>
Test Method	<ol style="list-style-type: none"> <li>1. coords query parameter is not specified</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 66</b>	<b><a href="/conf/trajectory">/conf/trajectory</a></b>
Test Purpose	Validate that an error is returned by a <b>Trajectory</b> query when the coords query parameter does not contain a valid LINESTRING Well Known Text value.
Requirement	<a href="/req/queries/trajectory">/req/queries/trajectory</a>
Test Method	<ol style="list-style-type: none"> <li>1. Check coords query parameter is a valid Well Known Text Linestring value</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 67</b>	<b><a href="/conf/trajectory">/conf/trajectory</a></b>
Test Purpose	Validate that an error is returned by a <b>Trajectory</b> query when the coords query parameter does not contain a valid LINESTRINGM Well Known Text value.
Requirement	<a href="/req/queries/trajectory">/req/queries/trajectory</a>
Test Method	<ol style="list-style-type: none"> <li>1. Check coords query parameter with time parameter is a valid Well Known Text LINESTRINGM value, the <b>M</b> coordinate must be a valid Epoch value (as known as UNIX time)</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 68</b>	<b><a href="/conf/trajectory">/conf/trajectory</a></b>
Test Purpose	Validate that an error is returned by a <b>Trajectory</b> query when the <b>coords</b> query parameter is a LINESTRINGZ coordinate and the <b>`z`</b> query parameter is specified
Requirement	<a href="/req/queries/trajectory">/req/queries/trajectory</a>
Test Method	<ol style="list-style-type: none"> <li>1. Check coords query parameter that the system throws an error when a vertical level is specified in both the <b>coords</b> and <b>z</b> parameters</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>

<b>Abstract Test 69</b>	<b>/conf/trajectory</b>
Test Purpose	Validate that an error is returned by a <b>Trajectory</b> query when the <b>coords</b> query parameter is a LINESTRINGZM coordinate and the <b>`z`</b> query parameter is specified
Requirement	<a href="/req/queries/trajectory">/req/queries/trajectory</a>
Test Method	<ol style="list-style-type: none"> <li>1. Check coords query parameter that the system throws an error when a vertical level is specified in both the <b>coords</b> and <b>z</b> parameters</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 70</b>	<b>/conf/trajectory</b>
Test Purpose	Validate that an error is returned by a <b>Trajectory</b> query when the coords query parameter does not contain a valid LINESTRINGMZ Well Known Text value.
Requirement	<a href="/req/queries/trajectory">/req/queries/trajectory</a>
Test Method	<ol style="list-style-type: none"> <li>1. Check coords query parameter with time parameter is a valid Well Known Text LINESTRINGMZ value, the <b>Z</b> coordinate must be a within the range of vertical levels advertised in the Collection metadata</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 71</b>	<b>/conf/trajectory</b>
Test Purpose	Validate that an error is returned by a <b>Trajectory</b> query when the coords query parameter does not contain a valid LINESTRINGZ Well Known Text value.
Requirement	<a href="/req/queries/trajectory">/req/queries/trajectory</a>
Test Method	<ol style="list-style-type: none"> <li>1. Check coords query parameter with time parameter is a valid Well Known Text LINESTRINGZ value, the <b>Z</b> coordinate must be a within the range of vertical levels advertised in the Collection metadata</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 72</b>	<b>/conf/trajectory</b>

Test Purpose	Validate that an error is returned by a <b>Trajectory</b> query when the <b>coords</b> query parameter contains invalid time coordinates
Requirement	<a href="/req/queries/trajectory">/req/queries/trajectory</a>
Test Method	<ol style="list-style-type: none"> <li>1. If a time values are specified in the <b>coords</b> query parameter check that they are within the range of time values defined in the Collection metadata</li> <li>2. Validate that a document was returned with a status code 400.</li> </ol>
<b>Abstract Test 73</b>	<b><a href="/conf/trajectory">/conf/trajectory</a></b>
Test Purpose	Validate that resources can be identified and extracted from a Collection with a <b>Trajectory</b> query using query parameters.
Requirement	<a href="/req/queries/trajectory">/req/queries/trajectory</a>
Test Method	<ol style="list-style-type: none"> <li>1. Test with valid query parameters</li> <li>2. Validate that a document was returned with a status code 200.</li> </ol> <p>Repeat these tests using the following parameter tests:</p> <p><b>Coordinates</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="/conf/collections/rc-coords-definition">/conf/collections/rc-coords-definition</a></li> <li>• Response <a href="/conf/collections/rc-coords-response">/conf/collections/rc-coords-response</a></li> </ul> <p><b>VerticalLevel</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="/conf/collections/rc-z-definition">/conf/collections/rc-z-definition</a></li> <li>• Response <a href="/conf/collections/rc-z-response">/conf/collections/rc-z-response</a></li> </ul> <p><b>Parameters</b> * Parameter <a href="/conf/collections/rc-parametername-definition">/conf/collections/rc-parametername-definition</a> * Response <a href="/conf/collections/rc-parametername-response">/conf/collections/rc-parametername-response</a></p> <p>Execute requests with combinations of the "coords", "parametername", "z", "crs" and "f" query parameters and verify that only information that matches the selection criteria is returned.</p>
<b>Abstract Test 74</b>	<b><a href="/conf/edr/rc-coords-definition">/conf/edr/rc-coords-definition</a></b>
Test Purpose	Validate that the coords query parameters are constructed correctly.

Requirement	<a href="#">/req/edr/rc-coords-definition</a>
Test Method	<p>Verify that the <b>coords</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: coords in: query required: true schema:   type: string   style: form   explode: false </pre> <p>Use a coords value in all requests:</p> <ul style="list-style-type: none"> <li>• A valid Well-known text representation of geometry string</li> </ul>

<b>Abstract Test 75</b>	<b><a href="#">/conf/edr/rc-coords-response</a></b>
Test Purpose	Validate that the <b>coords</b> query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-coords-response</a>
Test Method	1. Verify that only resources that have a spatial geometry that intersects the coordinates are returned as part of the result set.
Test Method	1. Verify <b>coords</b> values are valid for the specified coordinate reference system 2. Verify that the coordinate reference system of the geometries are valid for the parameter defined by <b>crs</b> . If the <b>crs</b> parameter is not defined the geometries must be valid for WGS 84 longitude/latitude ( <a href="http://www.opengis.net/def/crs/OGC/1.3/CRS84">http://www.opengis.net/def/crs/OGC/1.3/CRS84</a> or <a href="http://www.opengis.net/def/crs/OGC/0/CRS84h">http://www.opengis.net/def/crs/OGC/0/CRS84h</a> ).

<b>Abstract Test 76</b>	<b><a href="#">/conf/collections/rc-parametername-definition</a></b>
Test Purpose	Validate that the parametername query parameters are constructed correctly.



Requirement	<a href="#">/req/edr/rc-parametername-definition</a>
Test Method	<p>Verify that the <b>parametername</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: parametername in: query required: false schema:   type: string   style: form   explode: false </pre>

<b>Abstract Test 77</b>	<b><a href="#">/conf/edr/rc-parametername-response</a></b>
Test Purpose	Validate that the parametername query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-parametername-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources for the requested parameters were included in the result set</li> <li>2. Validate that the parametername parameter complies with the syntax described in <a href="#">/req/edr/rc-parameters-response</a>.</li> </ol>

<b>Abstract Test 78</b>	<b><a href="#">/conf/edr/rc-outputCRS-definition</a></b>
Test Purpose	Validate that the crs query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-outputCRS-definition</a>
Test Method	<p>Verify that the <b>crs</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: crs in: query required: false schema:   type: string   style: form   explode: false </pre>

<b>Abstract Test 79</b>	<b>/conf/edr/rc-outputCRS-response</b>
Test Purpose	Validate that the crs query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-outputCRS-response</a>
Test Method	1. Verify that the geometry of the resources returned are valid for the requested coordinate reference system
Test Method	1. Verify that all crs values defined in the collections metadata are supported by the collection 2. Validate that the crs parameter complies with the syntax described in <a href="#">/req/collections/edr/rc-crs-response</a> .

<b>Abstract Test 80</b>	<b>/conf/edr/rc-outputformat-definition</b>
Test Purpose	Validate that the <b>f</b> query parameter is constructed correctly.
Requirement	<a href="#">/req/edr/rc-outputformat-definition</a>
Test Method	Verify that the <b>f</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment): <div style="border: 1px solid #ccc; padding: 10px; margin-top: 10px;"> <pre> name: f in: query required: false schema:   type: string   style: form   explode: false </pre> </div>

<b>Abstract Test 81</b>	<b>/conf/collections/rc-outputformat-response</b>
Test Purpose	Validate that the <b>f</b> query parameters are processed correctly.
Requirement	<a href="#">/req/collections/rc-outputformat-response</a>
Test Method	1. Verify that the response is returned in the requested data format

Test Method	<ol style="list-style-type: none"> <li>1. Verify that all output format values defined in the collections metadata are supported by the collection</li> <li>2. Validate that the <b>f</b> parameter complies with the syntax described in <a href="#">/req/collections/edr/rc-output-response</a>.</li> </ol>
-------------	---

## B.10.2. Collections and Instances

### Feature Collections {root}/collections

<b>Abstract Test 82</b>	<b>/conf/collections/rc-md-op</b>
Test Purpose	Validate that information about the Collections can be retrieved from the expected location.
Requirement	<a href="#">/req/collections/rc-md-op</a>
Test Method	<ol style="list-style-type: none"> <li>1. Issue an HTTP GET request to the URL {root}/collections</li> <li>2. Validate that a document was returned with a status code 200</li> <li>3. Validate the contents of the returned document using test <a href="#">/conf/collections/rc-md-success</a>.</li> </ol>

<b>Abstract Test 83</b>	<b>/conf/rc-md-success</b>
Test Purpose	Validate that the Collections content complies with the required structure and contents.
Requirement	<a href="#">/req/collections/rc-md-success</a> , <a href="#">/req/edr/rc-crs</a>
Test Method	<ol style="list-style-type: none"> <li>1. Validate that all response documents comply with <a href="#">/conf/collections/rc-collection-info-links</a></li> <li>2. In case the response includes a "crs" property, validate that it includes a valid Well Known Text definition</li> <li>3. Validate the collections content for all supported media types using the resources and tests identified in <a href="#">Table 8</a></li> </ol>

The Collections content may be retrieved in a number of different formats. The following table identifies the applicable schema document for each format and the test to be used to validate the against that schema. All supported formats should be exercised.

*Table 10. Schema and Tests for Collections content*

Format	Schema Document	Test ID
HTML	<a href="#">collections.json</a>	<a href="#">/conf/html/content</a>
JSON	<a href="#">collections.json</a>	<a href="#">/conf/geojson/content</a>

#### Feature Collection {root}/collections/{collectionId}

<b>Abstract Test 84</b>	<b>/conf/collections/src-md-op</b>
Test Purpose	Validate that the Collection content can be retrieved from the expected location.
Requirement	<a href="#">/req/collections/src-md-op</a>
Test Method	For every Feature Collection described in the Collections content, issue an HTTP GET request to the URL <a href="#">/collections/{collectionId}</a> where <a href="#">{collectionId}</a> is the <a href="#">id</a> property for the collection. . Validate that a Collection was returned with a status code 200 . Validate the contents of the returned document using test <a href="#">/conf/collections/src-md-success</a> .

<b>Abstract Test 85</b>	<b>/conf/collections/src-md-success</b>
Test Purpose	Validate that the Collection content complies with the required structure and contents.
Requirement	<a href="#">/req/collections/src-md-success</a>
Test Method	Verify that the content of the response is consistent with the content for this Resource Collection in the <a href="#">/collections</a> response. That is, the values for <a href="#">id</a> , <a href="#">title</a> , <a href="#">description</a> and <a href="#">extent</a> are identical.

#### Features {root}/collections/{collectionId}/items

**NOTE** | This test is too Feature centric. Will need to be greatly reduced in scope.

<b>Abstract Test 86</b>	<b>/conf/core/rc-op</b>
Test Purpose	Validate that resources can be identified and extracted from a Collection using query parameters.
Requirement	<a href="#">/req/collections/rc-op</a>

Test Method	<ol style="list-style-type: none"> <li>1. For every resource collection identified in Collections, issue an HTTP GET request to the URL <code>/collections/{collectionId}/items</code> where <code>{collectionId}</code> is the <code>id</code> property for a Collection described in the Collections content.</li> <li>2. Validate that a document was returned with a status code 200.</li> </ol> <p>Repeat these tests using the following parameter tests:</p> <p><b>Bounding Box:</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="#">/conf/core/rc-bbox-definition</a></li> <li>• Response <a href="#">/conf/core/rc-bbox-response</a></li> </ul> <p><b>DateTime:</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="#">/conf/core/rc-time-definition</a></li> <li>• Response <a href="#">/conf/core/rc-time-response</a></li> </ul> <p>Execute requests with combinations of the "bbox" and "datetime" query parameters and verify that only features are returned that match both selection criteria.</p>
-------------	--

<b>Abstract Test 87</b>	<b><a href="#">/conf/core/bbox-definition</a></b>
Test Purpose	Validate that the bounding box query parameters are constructed correctly.
Requirement	<a href="#">/req/core/bbox-definition</a>

Test Method	<p>Verify that the <b>bbox</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: bbox in: query required: false schema:   type: array   minItems: 4   maxItems: 6   items:     type: number style: form explode: false </pre> <p>Use a bounding box with four numbers in all requests:</p> <ul style="list-style-type: none"> <li>• Lower left corner, WGS 84 longitude</li> <li>• Lower left corner, WGS 84 latitude</li> <li>• Upper right corner, WGS 84 longitude</li> <li>• Upper right corner, WGS 84 latitude</li> </ul>
-------------	---

<b>Abstract Test 88</b>	<b>/conf/core/rc-bbox-response</b>
Test Purpose	Validate that the bounding box query parameters are processed correctly.
Requirement	<a href="#">/req/core/rc-bbox-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources that have a spatial geometry that intersects the bounding box are returned as part of the result set.</li> <li>2. Verify that the <b>bbox</b> parameter matched all resources in the collection that were not associated with a spatial geometry (this is only applicable for datasets that include resources without a spatial geometry).</li> <li>3. Verify that the coordinate reference system of the geometries is WGS 84 longitude/latitude (<a href="http://www.opengis.net/def/crs/OGC/1.3/CRS84">http://www.opengis.net/def/crs/OGC/1.3/CRS84</a> or <a href="http://www.opengis.net/def/crs/OGC/0/CRS84h">http://www.opengis.net/def/crs/OGC/0/CRS84h</a>) since no parameter <b>bbox-crs</b> was specified in the request.</li> </ol>

<b>Abstract Test 89</b>	<b>/conf/core/rc-time-definition</b>
Test Purpose	Validate that the dateTime query parameters are constructed correctly.
Requirement	<a href="#">/req/core/rc-time-definition</a>
Test Method	<p>Verify that the <b>time</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: time in: query required: false schema:   type: string style: form explode: false </pre>

<b>Abstract Test 90</b>	<b>/conf/core/rc-time-response</b>
Test Purpose	Validate that the dataTime query parameters are processed correctly.
Requirement	<a href="#">/req/core/rc-time-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources that have a temporal geometry that intersects the temporal information in the <b>datetime</b> parameter were included in the result set</li> <li>2. Verify that all resources in the collection that are not associated with a temporal geometry are included in the result set</li> <li>3. Validate that the datetime parameter complies with the syntax described in <a href="#">/req/core/rc-time-response</a>.</li> </ol>

<b>Abstract Test 91</b>	<b>/conf/collections/rc-response</b>
Test Purpose	Validate that the Resource Collection complies with the require structure and contents.
Requirement	<a href="#">/req/collections/rc-response</a>
Test Method	The test method is specific to the resource type returned.

**Instances {root}/collections/{collectionId}/instances**

<b>Abstract Test 92</b>	<b>/conf/instances/rc-md-op</b>
Test Purpose	Validate that information about the instances of a Collection can be retrieved from the expected location.
Requirement	<a href="#">/req/instances/rc-md-op</a>
Test Method	<ol style="list-style-type: none"> <li>1. Issue an HTTP GET request to the URL {root}/collections/{collectionId}/instances</li> <li>2. Validate that a document was returned with a status code 200</li> <li>3. Validate the contents of the returned document using test <a href="#">/conf/collections/rc-md-success</a>.</li> </ol>

<b>Abstract Test 93</b>	<b>/conf/instances_rc-md-success</b>
Test Purpose	Validate that the instances of the Collection content complies with the required structure and contents.
Requirement	<a href="#">/req/instances/rc-md-success</a> , <a href="#">/req/core/crs84</a>
Test Method	<ol style="list-style-type: none"> <li>1. Validate that all response documents comply with <a href="#">/conf/collections/rc-md-links</a></li> <li>2. In case the response includes a "crs" property, validate that the first value is either "http://www.opengis.net/def/crs/OGC/1.3/CRS84" or "http://www.opengis.net/def/crs/OGC/0/CRS84h"</li> <li>3. Validate the collections content for all supported media types using the resources and tests identified in <a href="#">Table 8</a></li> </ol>

The Instances content, unlike the Collections content, may only be retrieved in the same formats as specified for the single parent collection.

*Table 11. Schema and Tests for Collections content*

Format	Schema Document	Test ID
HTML	<a href="#">collections.json</a>	<a href="#">/conf/html/content</a>
JSON	<a href="#">collections.json</a>	<a href="#">/conf/geojson/content</a>

**Instance {root}/collections/{collectionId}/instances/instanceId**

<b>Abstract Test 94</b>	<b>/conf/instances/src-md-op</b>
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Test Purpose	Validate that the Instances of the Collection content can be retrieved from the expected location.
Requirement	<a href="#">/req/collections/src-md-op</a>
Test Method	For every Instance of a Collection described in the Collections content, issue an HTTP GET request to the URL <code>/collections/{collectionId}/instances/{instanceId}</code> where <code>{collectionId}</code> is the <code>id</code> property for the collection and <code>{instanceId}</code> is the <code>id</code> property for the instance. . Validate that an Instance of a Collection was returned with a status code 200 . Validate the contents of the returned document using test <a href="#">/conf/collections/src-md-success</a> .

<b>Abstract Test 95</b>	<b><a href="#">/conf/instances/src-md-success</a></b>
Test Purpose	Validate that the Instance of a Collection content complies with the required structure and contents.
Requirement	<a href="#">/req/collections/src-md-success</a>
Test Method	Verify that the content of the response is consistent with the content for this Resource Collection in the <code>/collections</code> response. That is, the values for <code>id</code> , <code>title</code> , <code>description</code> and <code>extent</code> are identical.

### B.10.3. Second Tier Tests

These tests are invoked by other tests.

#### Items

<b>Abstract Test 96</b>	<b><a href="#">/conf/edr/rc-collection-info</a></b>
Test Purpose	Validate that each collection provided by the server is described in the Collections Metadata.
Requirement	<a href="#">/req/edr/rc-collection-info</a>

Test Method	<ol style="list-style-type: none"> <li>1. Verify that all collections listed in the <b>collections</b> array of the Collections Metadata exist.</li> <li>2. Verify that each collection entry includes an identifier.</li> <li>3. Verify that each collection entry includes links in accordance with <a href="#">/core/rc-collection-info-links</a>.</li> <li>4. Verify that if the collection entry includes an extent property, the property complies with <a href="#">/core/rc-extent</a></li> <li>5. Verify that if the collection entry includes an crs property, the property complies with <a href="#">/edr/rc-crs</a></li> <li>6. Verify that if the collection entry includes an parameters property, the property complies with <a href="#">/edr/rc-parameters</a></li> <li>7. Validate each collection entry for all supported media types using the resources and tests identified in <a href="#">Table 9</a></li> </ol>
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The collection entries may be encoded in a number of different formats. The following table identifies the applicable schema document for each format and the test to be used to validate the against that schema. All supported formats should be exercised.

<b>Abstract Test 97</b>	<b>/conf/core/rc-collection-info-links</b>
Test Purpose	Validate that each Collection metadata entry in the Collections Metadata document includes all required links.
Requirement	<a href="#">/req/core/rc-collection-info-links</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that each Collection item in the Collections Metadata document includes a <b>link</b> property for each supported encoding.</li> <li>2. Verify that the <b>links</b> properties of the collection includes an item for each supported encoding with a link to the features resource (relation: <b>items</b>).</li> <li>3. Verify that all links include the <b>rel</b> and <b>type</b> link parameters.</li> </ol>

## Locations

<b>Abstract Test 98</b>	<b>/conf/locations</b>
Test Purpose	Validate that a list of valid locations are returned by a <b>Locations</b> query if no query parameters are specified.
Requirement	<a href="#">/req/queries/locations</a>

Test Method	<ol style="list-style-type: none"> <li>1. No query parameters are specified</li> <li>2. Validate that a GeoJSON document was returned with a status code 200 containing at least a list of features one for each location supported by the collection.</li> </ol>
<b>Abstract Test 99</b>	<b>/conf/locations</b>
Test Purpose	Validate that an error is returned by a <b>Locations</b> query when the the locationId is invalid.
Requirement	<a href="#">/req/queries/locations</a>
Test Method	<ol style="list-style-type: none"> <li>1. Check that invalid <b>locationId</b> values return an error message</li> <li>2. Validate that a document was returned with a status code 404.</li> </ol>
<b>Abstract Test 100</b>	<b>/conf/locations</b>
Test Purpose	Validate that resources can be identified and extracted from a Collection with a <b>Locations</b> query using query parameters.
Requirement	<a href="#">/req/queries/locations</a>
Test Method	<ol style="list-style-type: none"> <li>1. Test with valid query parameters</li> <li>2. Validate that a document was returned with a status code 200.</li> </ol> <p>Repeat these tests using the following parameter tests:</p> <p><b>Parameters</b> * Parameter <a href="#">/conf/collections/rc-parametername-definition</a> * Response <a href="#">/conf/collections/rc-parametername-response</a></p> <p><b>DateTime</b></p> <ul style="list-style-type: none"> <li>• Parameter <a href="#">/conf/collections/rc-time-definition</a></li> <li>• Response <a href="#">/conf/collections/rc-time-response</a></li> </ul> <p>Execute requests with combinations of the "time","parametername","crs" and "f" query parameters and verify that only information that matches the selection criteria is returned.</p>
<b>Abstract Test 101</b>	<b>/conf/core/rc-time-definition</b>

Test Purpose	Validate that the dateTime query parameters are constructed correctly.
Requirement	<a href="#">/req/core/rc-time-definition</a>
Test Method	<p>Verify that the <b>time</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: time in: query required: false schema:   type: string style: form explode: false </pre>

<b>Abstract Test 102</b>	<b><a href="#">/conf/core/rc-time-response</a></b>
Test Purpose	Validate that the dataTime query parameters are processed correctly.
Requirement	<a href="#">/req/core/rc-time-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources that have a temporal geometry that intersects the temporal information in the <b>datetime</b> parameter were included in the result set</li> <li>2. Verify that all resources in the collection that are not associated with a temporal geometry are included in the result set</li> <li>3. Validate that the dateime parameter complies with the syntax described in <a href="#">/req/core/rc-time-response</a>.</li> </ol>

<b>Abstract Test 103</b>	<b><a href="#">/conf/collections/rc-parametername-definition</a></b>
Test Purpose	Validate that the parametername query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-parametername-definition</a>

Test Method	<p>Verify that the <b>parametername</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: parametername in: query required: false schema:   type: string style: form explode: false </pre>
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<b>Abstract Test 104</b>	<b>/conf/edr/rc-parametername-response</b>
Test Purpose	Validate that the parametername query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-parametername-response</a>
Test Method	<ol style="list-style-type: none"> <li>1. Verify that only resources for the requested parameters were included in the result set</li> <li>2. Validate that the parametername parameter complies with the syntax described in <a href="#">/req/edr/rc-parameters-response</a>.</li> </ol>

<b>Abstract Test 105</b>	<b>/conf/edr/rc-outputCRS-definition</b>
Test Purpose	Validate that the crs query parameters are constructed correctly.
Requirement	<a href="#">/req/edr/rc-outputCRS-definition</a>
Test Method	<p>Verify that the <b>crs</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment):</p> <pre> name: crs in: query required: false schema:   type: string style: form explode: false </pre>

<b>Abstract Test 106</b>	<b>/conf/edr/rc-outputCRS-response</b>
Test Purpose	Validate that the crs query parameters are processed correctly.
Requirement	<a href="#">/req/edr/rc-outputCRS-response</a>
Test Method	1. Verify that the geometry of the resources returned are valid for the requested coordinate reference system
Test Method	1. Verify that all crs values defined in the collections metadata are supported by the collection 2. Validate that the crs parameter complies with the syntax described in <a href="#">/req/collections/edr/rc-crs-response</a> .

<b>Abstract Test 107</b>	<b>/conf/edr/rc-outputformat-definition</b>
Test Purpose	Validate that the <b>f</b> query parameter is constructed correctly.
Requirement	<a href="#">/req/edr/rc-outputformat-definition</a>
Test Method	Verify that the <b>f</b> query parameter complies with the following definition (using an OpenAPI Specification 3.0 fragment): <div style="border: 1px solid #ccc; padding: 10px; margin-top: 10px;"> <pre> name: f in: query required: false schema:   type: string   style: form   explode: false </pre> </div>

<b>Abstract Test 108</b>	<b>/conf/collections/rc-outputformat-response</b>
Test Purpose	Validate that the <b>f</b> query parameters are processed correctly.
Requirement	<a href="#">/req/collections/rc-outputformat-response</a>
Test Method	1. Verify that the response is returned in the requested data format

Test Method	<ol style="list-style-type: none"><li>1. Verify that all output format values defined in the collections metadata are supported by the collection</li><li>2. Validate that the <b>f</b> parameter complies with the syntax described in <a href="#">/req/collections/edr/rc-output-response</a>.</li></ol>
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# Annex C: Examples (Informative)

## C.1. Example Landing Pages

*Example 45. JSON Landing Page*

```
{
  "links": [
    { "href": "http://data.example.org/",
      "rel": "self", "type": "application/json", "title": "this document" },
    { "href": "http://data.example.org/api",
      "rel": "service", "type": "application/openapi+json;version=3.0", "title":
"the API definition" },
    { "href": "http://data.example.org/conformance",
      "rel": "conformance", "type": "application/json", "title": "OGC conformance
classes implemented by this API" },
    { "href": "http://data.example.org/collections",
      "rel": "data", "type": "application/json", "title": "Metadata about the
resource collections" }
  ]
}
```

## C.2. API Description Examples

The API is described using the OpenAPI 3.02 specification, example responses for a server which supports all possible EDR query patterns can be found at:

[JSON OpenAPI document](#)

[YAML OpenAPI document](#)

## C.3. Conformance Examples



#### Example 46. Conformance Response

This example response in JSON is for an OGC API Features that supports OpenAPI 3.0 for the API definition and HTML and GeoJSON as encodings for resources.

```
{
  "conformsTo": [
    "http://www.opengis.net/spec/ogcapi-features-1/1.0/conf/core",
    "http://www.opengis.net/spec/ogcapi-features-1/1.0/conf/oas30",
    "http://www.opengis.net/spec/ogcapi-features-1/1.0/conf/html",
    "http://www.opengis.net/spec/ogcapi-features-1/1.0/conf/geojson"
  ]
}
```

## C.4. Collections Metadata Examples

#### Example 47. Collections metadata response document

The example below shows a service with two [collections](#), one for observations and another for forecast data. The forecast data is regenerated every hour so the [collection](#) provides access to multiple instances of the [collection](#) via an instances endpoint.

There are links to the responses of the [collections](#) ([link relation type](#): "self").

Representations of these resource in other formats are referenced using [link relation type](#) "alternate".

The data queries that are supported by each [collection](#) are referenced using [link relation type](#) "data".

There are also links to the license information for the observation and forecast data (using:<https://www.iana.org/assignments/link-relations/link-relations.xhtml>[[link relation type](#) "license"]) and also the terms and conditions of service (using:<https://www.iana.org/assignments/link-relations/link-relations.xhtml>[[link relation type](#) "restrictions"]).

```
{
  "links": [
    {
      "href": "http://www.example.org/edr/collections/",
      "hreflang": "en",
      "rel": "self",
      "type": "application/json"
    },
    {
      "href": "http://www.example.org/edr/collections/",
      "hreflang": "en",
      "rel": "alternate",
      "type": "text/html"
    },
    {
      "href": "http://www.example.org/edr/collections/",
      "hreflang": "en",
      "rel": "alternate",
      "type": "application/xml"
    }
  ],
  "collections": [
    {
      "id": "hourly observations",
      "title": "Hourly Site Specific observations",
      "description": "Observation data for UK observing sites",
      "keywords": [
        "Wind Direction",
        "Wind Speed",
        "Wind Gust",
```

```

        "Air Temperature",
        "Weather",
        "Relative Humidity",
        "Dew point",
        "Pressure",
        "Pressure Tendancy",
        "Visibility"
    ],
    "links": [
        {
            "href": "http://www.example.org/uk-hourly-site-specific-
observations",
            "hreflang": "en",
            "rel": "service-doc",
            "type": "text/html",
            "title": ""
        },
        {
            "href": "http://www.example.org/terms-and-conditions---
datapoint#datalicence",
            "hreflang": "en",
            "rel": "license",
            "type": "text/html",
            "title": ""
        },
        {
            "href":
"http://www.metoffice.gov.uk/services/data/datapoint/terms-and-conditions---
datapoint#termsofservice",
            "hreflang": "en",
            "rel": "restrictions",
            "type": "text/html",
            "title": ""
        },
        {
            "href":
"http://www.example.org/edr/collections/hrly_obs/position",
            "hreflang": "en",
            "rel": "data",
            "type": "position",
            "title": ""
        },
        {
            "href":
"http://www.example.org/edr/collections/hrly_obs/radius",
            "hreflang": "en",
            "rel": "data",
            "type": "radius",
            "title": ""
        }
    ]
}

```

```

        "href":
"http://www.example.org/edr/collections/hrly_obs/area",
        "hreflang": "en",
        "rel": "data",
        "type": "area",
        "title": ""
    },
    {
        "href":
"http://www.example.org/edr/collections/hrly_obs/locations",
        "hreflang": "en",
        "rel": "data",
        "type": "location",
        "title": ""
    }
],
"extent": {
    "spatial": {
        "bbox": [
            -15.0,
            48.0,
            5.0,
            62.0
        ],
        "crs": "GEOGCS[\"WGS 84\",DATUM[\"WGS_1984\",SPHEROID[\"WGS
84\",6378137,298.257223563,AUTHORITY[\"EPSG\", \"7030\"]],AUTHORITY[\"EPSG\", \"6326
\"]],PRIMEM[\"Greenwich\",0,AUTHORITY[\"EPSG\", \"8901\"]],UNIT[\"degree\",0.017453
29251994328,AUTHORITY[\"EPSG\", \"9122\"]],AUTHORITY[\"EPSG\", \"4326\"]]"
    },
    "temporal": {
        "interval": [
            "2020-04-19T11:00:00Z/2020-06-30T09:00:00Z"
        ],
        "trs": "TIMECRS[\"DateTime\",TDATUM[\"Gregorian
Calendar\"],CS[TemporalDateTime,1],AXIS[\"Time (T)\",future]"
    }
},
"crs": [
    {
        "name": "CRS84",
        "wkt": "GEOGCS[\"WGS 84\",DATUM[\"WGS_1984\",SPHEROID[\"WGS
84\",6378137,298.257223563,AUTHORITY[\"EPSG\", \"7030\"]],AUTHORITY[\"EPSG\", \"6326
\"]],PRIMEM[\"Greenwich\",0,AUTHORITY[\"EPSG\", \"8901\"]],UNIT[\"degree\",0.017453
29251994328,AUTHORITY[\"EPSG\", \"9122\"]],AUTHORITY[\"EPSG\", \"4326\"]]"
    }
],
"distanceunits": [
    "km",
    "miles"
],
"outputformat": [

```

```

    {
      "name": "GeoJSON",
      "data_schema":
"http://www.example.org/edr/static/json/dp_schema.json"
    },
    {
      "name": "CoverageJSON"
    }
  ],
  "parameters": {
    "Wind Direction": {
      "type": "Parameter",
      "description": {
        "en": ""
      },
      "unit": {
        "label": {
          "en": "degree true"
        },
        "symbol": {
          "value": "°",
          "type":
"http://www.example.org/edr/metadata/units/degree"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-
kind/_windDirection",
        "label": {
          "en": "Wind Direction"
        }
      },
      "measurementType": {
        "method": "mean",
        "period": "-PT10M/PT0M"
      }
    },
    "Wind Speed": {
      "type": "Parameter",
      "description": {
        "en": ""
      },
      "unit": {
        "label": {
          "en": "mph"
        },
        "symbol": {
          "value": "mph",
          "type":
"http://www.example.org/edr/metadata/units/mph"
        }
      }
    }
  }
}

```

```

    },
    "observedProperty": {
      "id": "http://codes.wmo.int/common/quantity-
kind/_windSpeed",
      "label": {
        "en": "Wind Speed"
      }
    },
    "measurementType": {
      "method": "mean",
      "period": "-PT10M/PT0M"
    }
  },
  "Wind Gust": {
    "type": "Parameter",
    "description": {
      "en": ""
    },
    "unit": {
      "label": {
        "en": "mph"
      },
      "symbol": {
        "value": "mph",
        "type":
"http://www.example.org/edr/metadata/units/mph"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/common/quantity-
kind/_maximumWindGustSpeed",
      "label": {
        "en": "Wind Gust"
      }
    },
    "measurementType": {
      "method": "maximum",
      "period": "-PT10M/PT0M"
    }
  },
  "Air Temperature": {
    "type": "Parameter",
    "description": {
      "en": ""
    },
    "unit": {
      "label": {
        "en": "degC"
      },
      "symbol": {
        "value": "°C",

```

```

        "type":
"http://www.example.org/edr/metadata/units/degC"
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
        "label": {
            "en": "Air Temperature"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Weather": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "weather"
        },
        "symbol": {
            "value": "",
            "type":
"http://www.example.org/edr/metadata/lookup/mo_dp_weather"
        }
    },
    "observedProperty": {
        "id":
"http://codes.wmo.int/wmdr/ObservedVariableAtmosphere/_266",
        "label": {
            "en": "Weather"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Relative Humidity": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "percent"
        }
    }
}

```

```

        },
        "symbol": {
            "value": "%",
            "type":
"http://www.example.org/edr/metadata/units/percent"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/bufr4/b/13/_009",
        "label": {
            "en": "Relative Humidity"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Dew point": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "degC"
        },
        "symbol": {
            "value": "°C",
            "type":
"http://www.example.org/edr/metadata/units/degC"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-kind/_dewPointTemperature",
        "label": {
            "en": "Dew point"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Pressure": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {

```



```

        "label": {
            "en": "hPa"
        },
        "symbol": {
            "value": "hPa",
            "type":
"http://www.example.org/edr/metadata/units/hPa"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/bufr4/b/10/_051",
        "label": {
            "en": "Pressure"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Pressure Tendancy": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "tendency"
        },
        "symbol": {
            "value": "",
            "type":
"http://www.example.org/edr/metadata/units/hPa"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-
kind/_pressureTendency",
        "label": {
            "en": "Pressure Tendancy"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Visibility": {
    "type": "Parameter",
    "description": {
        "en": ""
    }
}

```

```

    },
    "unit": {
      "label": {
        "en": "m"
      },
      "symbol": {
        "value": "m",
        "type": "http://www.example.org/edr/metadata/units/m"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/common/quantity-kind/_horizontalVisibility",
      "label": {
        "en": "Visibility"
      }
    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    }
  }
},
{
  "id": "UK 3 hourly forecast",
  "title": "UK 3 Hourly Site Specific Forecast",
  "description": "Five day site specific forecast for 6000 UK
locations",
  "keywords": [
    "Wind Direction",
    "Wind Speed",
    "Wind Gust",
    "Air Temperature",
    "Weather",
    "Relative Humidity",
    "Feels like temperature",
    "UV index",
    "Probabilty of precipitation",
    "Visibility"
  ],
  "links": [
    {
      "href": "https://http://www.example.org/uk-3-hourly-site-specific-forecast",
      "hreflang": "en",
      "rel": "service-doc",
      "type": "text/html",
      "title": ""
    }
  ],
  {

```

```

        "href": "https://http://www.example.org/terms-and-conditions---datapoint#datalicence",
        "hreflang": "en",
        "rel": "licence",
        "type": "text/html",
        "title": ""
    },
    {
        "href": "https://http://www.example.org/terms-and-conditions---datapoint#termsofservice",
        "hreflang": "en",
        "rel": "restrictions",
        "type": "text/html",
        "title": ""
    },
    {
        "href":
"http://www.example.org/edr/collections/3_hrly_fcst/instances",
        "hreflang": "en",
        "rel": "collection",
        "type": "instances",
        "title": ""
    }
],
"extent": {
    "spatial": {
        "bbox": [
            -15.0,
            48.0,
            5.0,
            62.0
        ],
        "crs": "GEOGCS[\"WGS 84\", DATUM[\"WGS_1984\", SPHEROID[\"WGS 84\", 6378137, 298.257223563, AUTHORITY[\"EPSG\", \"7030\"]], AUTHORITY[\"EPSG\", \"6326 \"]], PRIMEM[\"Greenwich\", 0, AUTHORITY[\"EPSG\", \"8901\"]], UNIT[\"degree\", 0.017453 29251994328, AUTHORITY[\"EPSG\", \"9122\"]], AUTHORITY[\"EPSG\", \"4326\"]]"
    },
    "temporal": {
        "interval": [
            "2020-06-23T18:00:00Z/2020-07-04T21:00:00Z"
        ],
        "trs": "TIMECRS[\"DateTime\", TDATUM[\"Gregorian Calendar\"], CS[TemporalDateTime, 1], AXIS[\"Time (T)\", future]"
    }
},
"crs": [
    {
        "name": "CRS84",
        "wkt": "GEOGCS[\"WGS 84\", DATUM[\"WGS_1984\", SPHEROID[\"WGS 84\", 6378137, 298.257223563, AUTHORITY[\"EPSG\", \"7030\"]], AUTHORITY[\"EPSG\", \"6326 \"]], PRIMEM[\"Greenwich\", 0, AUTHORITY[\"EPSG\", \"8901\"]], UNIT[\"degree\", 0.017453

```

```

29251994328,AUTHORITY[\"EPSG\", \"9122\"]],AUTHORITY[\"EPSG\", \"4326\"]]"
    }
  ],
  "distanceunits": [
    "km",
    "miles"
  ],
  "outputformat": [
    {
      "name": "GeoJSON",
      "data_schema":
"http://www.example.org/edr/static/json/dp_schema.json"
    },
    {
      "name": "CoverageJSON"
    }
  ],
  "parameters": {
    "Wind Direction": {
      "type": "Parameter",
      "description": {
        "en": "Direction wind is from"
      },
      "unit": {
        "label": {
          "en": "degree true"
        },
        "symbol": {
          "value": "°",
          "type":
"http://www.example.org/edr/metadata/units/degree"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-0",
        "label": {
          "en": "Wind Direction"
        }
      },
      "measurementType": {
        "method": "mean",
        "period": "-PT10M/PT0M"
      }
    },
    "Wind Speed": {
      "type": "Parameter",
      "description": {
        "en": "Average wind speed"
      },
      "unit": {
        "label": {

```

```

        "en": "mph"
      },
      "symbol": {
        "value": "mph",
        "type":
"http://www.example.org/edr/metadata/units/mph"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-1",
      "label": {
        "en": "Wind Speed"
      }
    },
    "measurementType": {
      "method": "mean",
      "period": "-PT10M/PT0M"
    }
  },
  "Wind Gust": {
    "type": "Parameter",
    "description": {
      "en": "Wind gusts are a rapid increase in strength of the
wind relative to the wind speed."
    },
    "unit": {
      "label": {
        "en": "mph"
      },
      "symbol": {
        "value": "mph",
        "type":
"http://www.example.org/edr/metadata/units/mph"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-1",
      "label": {
        "en": "Wind Gust"
      }
    },
    "measurementType": {
      "method": "maximum",
      "period": "-PT10M/PT0M"
    }
  },
  "Air Temperature": {
    "type": "Parameter",
    "description": {
      "en": "2m air temperature in the shade and out of the
wind"

```

```

    },
    "unit": {
      "label": {
        "en": "degC"
      },
      "symbol": {
        "value": "°C",
        "type":
"http://www.example.org/edr/metadata/units/degC"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
      "label": {
        "en": "Air Temperature"
      }
    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    }
  },
  "Weather": {
    "type": "Parameter",
    "description": {
      "en": ""
    },
    "unit": {
      "label": {
        "en": "weather"
      },
      "symbol": {
        "value": "",
        "type":
"http://www.example.org/edr/metadata/lookup/mo_dp_weather"
      }
    },
    "observedProperty": {
      "id":
"http://codes.wmo.int/wmdr/ObservedVariableAtmosphere/_266",
      "label": {
        "en": "Weather"
      }
    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    }
  },
  "Relative Humidity": {

```

```

        "type": "Parameter",
        "description": {
            "en": ""
        },
        "unit": {
            "label": {
                "en": "percent"
            },
            "symbol": {
                "value": "%",
                "type":
"http://www.example.org/edr/metadata/units/percent"
            }
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
            "label": {
                "en": "Relative Humidity"
            }
        },
        "measurementType": {
            "method": "instantaneous",
            "period": "PT0M"
        }
    },
    "Feels like temperature": {
        "type": "Parameter",
        "description": {
            "en": ""
        },
        "unit": {
            "label": {
                "en": "degC"
            },
            "symbol": {
                "value": "°C",
                "type":
"http://www.example.org/edr/metadata/units/degC"
            }
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
            "label": {
                "en": "Feels like temperature"
            }
        },
        "measurementType": {
            "method": "instantaneous",
            "period": "PT0M"
        }
    }

```

```

    },
    "UV index": {
      "type": "Parameter",
      "description": {
        "en": ""
      },
    },
    "unit": {
      "label": {
        "en": "UV_index"
      },
    },
    "symbol": {
      "value": "",
      "type":
"http://www.example.org/edr/metadata/lookup/mo_dp_uv"
    }
  },
  "observedProperty": {
    "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-4-51",
    "label": {
      "en": "UV index"
    }
  },
  "measurementType": {
    "method": "instantaneous",
    "period": "PT0M"
  }
},
"Probabilty of precipitation": {
  "type": "Parameter",
  "description": {
    "en": ""
  },
  "unit": {
    "label": {
      "en": "percent"
    },
  },
  "symbol": {
    "value": "%",
    "type":
"http://www.example.org/edr/metadata/units/percent"
  }
},
  "observedProperty": {
    "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
    "label": {
      "en": "Probabilty of precipitation"
    }
  },
  "measurementType": {
    "method": "instantaneous",
    "period": "PT0M"
  }
}

```



```

    },
    "Visibility": {
      "type": "Parameter",
      "description": {
        "en": ""
      },
      "unit": {
        "label": {
          "en": "quality"
        },
        "symbol": {
          "value": "",
          "type":
"http://www.example.org/edr/metadata/lookup/mo_dp_visibility"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-
kind/_horizontalVisibility",
        "label": {
          "en": "Visibility"
        }
      },
      "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
      }
    }
  }
}
]
}

```

## C.5. Instance Metadata Examples

This is an example of the metadata returned by the instances query

([link relation type](#): "items").

There is a link to the instance response itself ([link relation type](#): "self").

Representations of this resource in other formats are referenced using [link relation type](#) "alternate".

The data queries that are supported by each instance are referenced using [link relation type](#) "data".

There are also links to the license information for the observation and forecast data (using:<https://www.iana.org/assignments/link-relations/link-relations.xhtml>[[link relation type](#) "license"]) and also the terms and conditions of service (using:<https://www.iana.org/assignments/link-relations/link-relations.xhtml>[[link relation type](#) "restrictions"]) .

```
{
  "links": [
    {
      "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/",
      "hreflang": "en",
      "rel": "self",
      "type": "application/json"
    },
    {
      "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/",
      "hreflang": "en",
      "rel": "alternate",
      "type": "text/html"
    },
    {
      "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/",
      "hreflang": "en",
      "rel": "alternate",
      "type": "application/xml"
    },
    {
      "href": "https://http://www.example.org/terms-and-conditions---
datapoint#termsofservice",
      "hreflang": "en",
      "rel": "restrictions",
      "type": "text/html",
      "title": ""
    }
  ]
}
```

```

    },
    {
      "href": "https://http://www.example.org/terms-and-conditions---
datapoint#datalicence",
      "hreflang": "en",
      "rel": "license",
      "type": "text/html",
      "title": ""
    },
    {
      "href": "https://http://www.example.org/uk-3-hourly-site-specific-
forecast",
      "hreflang": "en",
      "rel": "service-doc",
      "type": "text/html",
      "title": ""
    }
  ],
  "instances": [
    {
      "id": "2020-06-30T10:00:00Z",
      "title": "3 hrly fcst",
      "description": "Five day site specific forecast for 6000 UK locations
3 hrly fcst",
      "keywords": [
        "Wind Direction",
        "Wind Speed",
        "Wind Gust",
        "Air Temperature",
        "Weather",
        "Relative Humidity",
        "Feels like temperature",
        "UV index",
        "Probabilty of precipitation",
        "Visibility"
      ],
      "links": [
        {
          "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-
30T10:00:00Z/position",
          "hreflang": "en",
          "rel": "data",
          "type": "position",
          "title": ""
        },
        {
          "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-
30T10:00:00Z/radius",
          "hreflang": "en",

```

```

        "rel": "data",
        "type": "radius",
        "title": ""
    },
    {
        "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T10:00:00Z/area",
        "hreflang": "en",
        "rel": "data",
        "type": "area",
        "title": ""
    },
    {
        "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T10:00:00Z/locations",
        "hreflang": "en",
        "rel": "data",
        "type": "location",
        "title": ""
    }
],
"extent": {
    "spatial": {
        "bbox": [
            -15.0,
            48.0,
            5.0,
            62.0
        ],
        "crs": "GEOGCS[\"WGS 84\", DATUM[\"WGS_1984\", SPHEROID[\"WGS 84\", 6378137, 298.257223563, AUTHORITY[\"EPSG\", \"7030\"]], AUTHORITY[\"EPSG\", \"6326 \"]], PRIMEM[\"Greenwich\", 0, AUTHORITY[\"EPSG\", \"8901\"]], UNIT[\"degree\", 0.017453 29251994328, AUTHORITY[\"EPSG\", \"9122\"]], AUTHORITY[\"EPSG\", \"4326\"]]"
    },
    "temporal": {
        "interval": [
            "2020-06-30T06:00:00Z/2020-07-04T21:00:00Z"
        ],
        "trs": "TIMECRS[\"DateTime\", TDATUM[\"Gregorian Calendar\"], CS[TemporalDateTime, 1], AXIS[\"Time (T)\", future]"
    }
},
"crs": [
    {
        "name": "CRS84",
        "wkt": "GEOGCS[\"WGS 84\", DATUM[\"WGS_1984\", SPHEROID[\"WGS 84\", 6378137, 298.257223563, AUTHORITY[\"EPSG\", \"7030\"]], AUTHORITY[\"EPSG\", \"6326 \"]], PRIMEM[\"Greenwich\", 0, AUTHORITY[\"EPSG\", \"8901\"]], UNIT[\"degree\", 0.017453 29251994328, AUTHORITY[\"EPSG\", \"9122\"]], AUTHORITY[\"EPSG\", \"4326\"]]"
    }
]

```

```

    }
  ],
  "distanceunits": [
    "km",
    "miles"
  ],
  "outputformat": [
    {
      "name": "GeoJSON",
      "data_schema":
"http://http://www.example.org/edr/static/json/dp_schema.json"
    },
    {
      "name": "CoverageJSON"
    }
  ],
  "parameters": {
    "Wind Direction": {
      "type": "Parameter",
      "description": {
        "en": "Direction wind is from"
      },
      "unit": {
        "label": {
          "en": "degree true"
        },
        "symbol": {
          "value": "°",
          "type":
"http://http://www.example.org/edr/metadata/units/degree"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-0",
        "label": {
          "en": "Wind Direction"
        }
      },
      "measurementType": {
        "method": "mean",
        "period": "-PT10M/PT0M"
      }
    },
    "Wind Speed": {
      "type": "Parameter",
      "description": {
        "en": "Average wind speed"
      },
      "unit": {
        "label": {
          "en": "mph"
        }
      }
    }
  }
}

```



```

        "unit": {
            "label": {
                "en": "degC"
            },
            "symbol": {
                "value": "°C",
                "type":
"http://http://www.example.org/edr/metadata/units/degC"
            }
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
            "label": {
                "en": "Air Temperature"
            }
        },
        "measurementType": {
            "method": "instantaneous",
            "period": "PT0M"
        }
    },
    "Weather": {
        "type": "Parameter",
        "description": {
            "en": ""
        },
        "unit": {
            "label": {
                "en": "weather"
            },
            "symbol": {
                "value": "",
                "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_weather"
            }
        },
        "observedProperty": {
            "id":
"http://codes.wmo.int/wmdr/ObservedVariableAtmosphere/_266",
            "label": {
                "en": "Weather"
            }
        },
        "measurementType": {
            "method": "instantaneous",
            "period": "PT0M"
        }
    },
    "Relative Humidity": {
        "type": "Parameter",

```

```

      "description": {
        "en": ""
      },
      "unit": {
        "label": {
          "en": "percent"
        },
        "symbol": {
          "value": "%",
          "type":
"http://http://www.example.org/edr/metadata/units/percent"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
        "label": {
          "en": "Relative Humidity"
        }
      },
      "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
      }
    },
    "Feels like temperature": {
      "type": "Parameter",
      "description": {
        "en": ""
      },
      "unit": {
        "label": {
          "en": "degC"
        },
        "symbol": {
          "value": "°C",
          "type":
"http://http://www.example.org/edr/metadata/units/degC"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
        "label": {
          "en": "Feels like temperature"
        }
      },
      "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
      }
    },
  },

```



```

    "UV index": {
      "type": "Parameter",
      "description": {
        "en": ""
      },
      "unit": {
        "label": {
          "en": "UV_index"
        },
        "symbol": {
          "value": "",
          "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_uv"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-4-51",
        "label": {
          "en": "UV index"
        }
      },
      "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
      }
    },
    "Probabilty of precipitation": {
      "type": "Parameter",
      "description": {
        "en": ""
      },
      "unit": {
        "label": {
          "en": "percent"
        },
        "symbol": {
          "value": "%",
          "type":
"http://http://www.example.org/edr/metadata/units/percent"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
        "label": {
          "en": "Probabilty of precipitation"
        }
      },
      "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
      }
    }
  }

```

```

    },
    "Visibility": {
      "type": "Parameter",
      "description": {
        "en": ""
      },
    },
    "unit": {
      "label": {
        "en": "quality"
      },
    },
    "symbol": {
      "value": "",
      "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_visibility"
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/common/quantity-
kind/_horizontalVisibility",
      "label": {
        "en": "Visibility"
      },
    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    },
  },
},
{
  "id": "2020-06-30T09:00:00Z",
  "title": "3 hrly fcst",
  "description": "Five day site specific forecast for 6000 UK locations
3 hrly fcst",
  "keywords": [
    "Wind Direction",
    "Wind Speed",
    "Wind Gust",
    "Air Temperature",
    "Weather",
    "Relative Humidity",
    "Feels like temperature",
    "UV index",
    "Probabilty of precipitation",
    "Visibility"
  ],
  "links": [
    {
      "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-

```

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30T09:00:00Z/position",
    "hreflang": "en",
    "rel": "data",
    "type": "position",
    "title": ""
  },
  {
    "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-
30T09:00:00Z/radius",
    "hreflang": "en",
    "rel": "data",
    "type": "radius",
    "title": ""
  },
  {
    "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-
30T09:00:00Z/area",
    "hreflang": "en",
    "rel": "data",
    "type": "area",
    "title": ""
  },
  {
    "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-
30T09:00:00Z/locations",
    "hreflang": "en",
    "rel": "data",
    "type": "location",
    "title": ""
  }
],
"extent": {
  "spatial": {
    "bbox": [
      -15.0,
      48.0,
      5.0,
      62.0
    ],
    "crs": "GEOGCS[\"WGS 84\",DATUM[\"WGS_1984\",SPHEROID[\"WGS
84\",6378137,298.257223563,AUTHORITY[\"EPSG\", \"7030\"]],AUTHORITY[\"EPSG\", \"6326
\"]],PRIMEM[\"Greenwich\",0,AUTHORITY[\"EPSG\", \"8901\"]],UNIT[\"degree\",0.017453
29251994328,AUTHORITY[\"EPSG\", \"9122\"]],AUTHORITY[\"EPSG\", \"4326\"]]"
  },
  "temporal": {
    "interval": [
      "2020-06-30T06:00:00Z/2020-07-04T21:00:00Z"
    ]
  }
}

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```

      "trs": "TIMECRS[\"DateTime\",TDATUM[\"Gregorian
Calendar\"],CS[TemporalDateTime,1],AXIS[\"Time (T)\",future]"
    },
    "crs": [
      {
        "name": "CRS84",
        "wkt": "GEOGCS[\"WGS 84\",DATUM[\"WGS_1984\",SPHEROID[\"WGS
84\",6378137,298.257223563,AUTHORITY[\"EPSG\", \"7030\"]],AUTHORITY[\"EPSG\", \"6326
\"]],PRIMEM[\"Greenwich\",0,AUTHORITY[\"EPSG\", \"8901\"]],UNIT[\"degree\",0.017453
29251994328,AUTHORITY[\"EPSG\", \"9122\"]],AUTHORITY[\"EPSG\", \"4326\"]]"
      }
    ],
    "distanceunits": [
      "km",
      "miles"
    ],
    "outputformat": [
      {
        "name": "GeoJSON",
        "data_schema":
"http://http://www.example.org/edr/static/json/dp_schema.json"
      },
      {
        "name": "CoverageJSON"
      }
    ],
    "parameters": {
      "Wind Direction": {
        "type": "Parameter",
        "description": {
          "en": "Direction wind is from"
        },
        "unit": {
          "label": {
            "en": "degree true"
          },
          "symbol": {
            "value": "°",
            "type":
"http://http://www.example.org/edr/metadata/units/degree"
          }
        },
        "observedProperty": {
          "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-0",
          "label": {
            "en": "Wind Direction"
          }
        }
      },
      "measurementType": {
        "method": "mean",

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        "period": "-PT10M/PT0M"
    },
    "Wind Speed": {
        "type": "Parameter",
        "description": {
            "en": "Average wind speed"
        },
        "unit": {
            "label": {
                "en": "mph"
            },
            "symbol": {
                "value": "mph",
                "type":
"http://http://www.example.org/edr/metadata/units/mph"
            }
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-1",
            "label": {
                "en": "Wind Speed"
            }
        },
        "measurementType": {
            "method": "mean",
            "period": "-PT10M/PT0M"
        }
    },
    "Wind Gust": {
        "type": "Parameter",
        "description": {
            "en": "Wind gusts are a rapid increase in strength of the
wind relative to the wind speed."
        },
        "unit": {
            "label": {
                "en": "mph"
            },
            "symbol": {
                "value": "mph",
                "type":
"http://http://www.example.org/edr/metadata/units/mph"
            }
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-1",
            "label": {
                "en": "Wind Gust"
            }
        }
    },

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```

        "measurementType": {
            "method": "maximum",
            "period": "-PT10M/PT0M"
        }
    },
    "Air Temperature": {
        "type": "Parameter",
        "description": {
            "en": "2m air temperature in the shade and out of the
wind"
        },
        "unit": {
            "label": {
                "en": "degC"
            },
            "symbol": {
                "value": "°C",
                "type":
"http://http://www.example.org/edr/metadata/units/degC"
            }
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
            "label": {
                "en": "Air Temperature"
            }
        },
        "measurementType": {
            "method": "instantaneous",
            "period": "PT0M"
        }
    },
    "Weather": {
        "type": "Parameter",
        "description": {
            "en": ""
        },
        "unit": {
            "label": {
                "en": "weather"
            },
            "symbol": {
                "value": "",
                "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_weather"
            }
        },
        "observedProperty": {
            "id":
"http://codes.wmo.int/wmdr/ObservedVariableAtmosphere/_266",

```

```

        "label": {
            "en": "Weather"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Relative Humidity": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "percent"
        },
        "symbol": {
            "value": "%",
            "type":
"http://http://www.example.org/edr/metadata/units/percent"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
        "label": {
            "en": "Relative Humidity"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Feels like temperature": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "degC"
        },
        "symbol": {
            "value": "°C",
            "type":
"http://http://www.example.org/edr/metadata/units/degC"
        }
    },
    "observedProperty": {

```

```

        "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
        "label": {
            "en": "Feels like temperature"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"UV index": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "UV_index"
        },
        "symbol": {
            "value": "",
            "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_uv"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-4-51",
        "label": {
            "en": "UV index"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Probabilty of precipitation": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "percent"
        },
        "symbol": {
            "value": "%",
            "type":
"http://http://www.example.org/edr/metadata/units/percent"
        }
    }
}

```



```

    },
    "observedProperty": {
      "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
      "label": {
        "en": "Probabilty of precipitation"
      }
    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    }
  },
  "Visibility": {
    "type": "Parameter",
    "description": {
      "en": ""
    },
    "unit": {
      "label": {
        "en": "quality"
      },
      "symbol": {
        "value": "",
        "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_visibility"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/common/quantity-kind/_horizontalVisibility",
      "label": {
        "en": "Visibility"
      }
    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    }
  }
},
{
  "id": "2020-06-30T08:00:00Z",
  "title": "3 hrly fcst",
  "description": "Five day site specific forecast for 6000 UK locations  
3 hrly fcst",
  "keywords": [
    "Wind Direction",
    "Wind Speed",
    "Wind Gust",
    "Air Temperature",

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```

        "Weather",
        "Relative Humidity",
        "Feels like temperature",
        "UV index",
        "Probabilty of precipitation",
        "Visibility"
    ],
    "links": [
        {
            "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T08:00:00Z/position",
            "hreflang": "en",
            "rel": "data",
            "type": "position",
            "title": ""
        },
        {
            "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T08:00:00Z/radius",
            "hreflang": "en",
            "rel": "data",
            "type": "radius",
            "title": ""
        },
        {
            "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T08:00:00Z/area",
            "hreflang": "en",
            "rel": "data",
            "type": "area",
            "title": ""
        },
        {
            "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T08:00:00Z/locations",
            "hreflang": "en",
            "rel": "data",
            "type": "location",
            "title": ""
        }
    ],
    "extent": {
        "spatial": {
            "bbox": [
                -15.0,
                48.0,
                5.0,

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        62.0
    ],
    "crs": "GEOGCS[\"WGS 84\", DATUM[\"WGS_1984\", SPHEROID[\"WGS
84\", 6378137, 298.257223563, AUTHORITY[\"EPSG\", \"7030\"]], AUTHORITY[\"EPSG\", \"6326
\"]], PRIMEM[\"Greenwich\", 0, AUTHORITY[\"EPSG\", \"8901\"]], UNIT[\"degree\", 0.017453
29251994328, AUTHORITY[\"EPSG\", \"9122\"]], AUTHORITY[\"EPSG\", \"4326\"]]"
  },
  "temporal": {
    "interval": [
      "2020-06-30T03:00:00Z/2020-07-04T21:00:00Z"
    ],
    "trs": "TIMECRS[\"DateTime\", TDATUM[\"Gregorian
Calendar\"], CS[TemporalDateTime, 1], AXIS[\"Time (T)\", future]"
  }
},
"crs": [
  {
    "name": "CRS84",
    "wkt": "GEOGCS[\"WGS 84\", DATUM[\"WGS_1984\", SPHEROID[\"WGS
84\", 6378137, 298.257223563, AUTHORITY[\"EPSG\", \"7030\"]], AUTHORITY[\"EPSG\", \"6326
\"]], PRIMEM[\"Greenwich\", 0, AUTHORITY[\"EPSG\", \"8901\"]], UNIT[\"degree\", 0.017453
29251994328, AUTHORITY[\"EPSG\", \"9122\"]], AUTHORITY[\"EPSG\", \"4326\"]]"
  }
],
"distanceunits": [
  "km",
  "miles"
],
"outputformat": [
  {
    "name": "GeoJSON",
    "data_schema":
"http://http://www.example.org/edr/static/json/dp_schema.json"
  },
  {
    "name": "CoverageJSON"
  }
],
"parameters": {
  "Wind Direction": {
    "type": "Parameter",
    "description": {
      "en": "Direction wind is from"
    },
    "unit": {
      "label": {
        "en": "degree true"
      },
      "symbol": {
        "value": "°",
        "type":

```

```

"http://http://www.example.org/edr/metadata/units/degree"
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-0",
      "label": {
        "en": "Wind Direction"
      }
    },
    "measurementType": {
      "method": "mean",
      "period": "-PT10M/PT0M"
    }
  },
  "Wind Speed": {
    "type": "Parameter",
    "description": {
      "en": "Average wind speed"
    },
    "unit": {
      "label": {
        "en": "mph"
      },
      "symbol": {
        "value": "mph",
        "type":
"http://http://www.example.org/edr/metadata/units/mph"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-1",
      "label": {
        "en": "Wind Speed"
      }
    },
    "measurementType": {
      "method": "mean",
      "period": "-PT10M/PT0M"
    }
  },
  "Wind Gust": {
    "type": "Parameter",
    "description": {
      "en": "Wind gusts are a rapid increase in strength of the
wind relative to the wind speed."
    },
    "unit": {
      "label": {
        "en": "mph"
      },
      "symbol": {

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```

        "value": "mph",
        "type":
"http://http://www.example.org/edr/metadata/units/mph"
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-1",
        "label": {
            "en": "Wind Gust"
        }
    },
    "measurementType": {
        "method": "maximum",
        "period": "-PT10M/PT0M"
    }
},
"Air Temperature": {
    "type": "Parameter",
    "description": {
        "en": "2m air temperature in the shade and out of the
wind"
    },
    "unit": {
        "label": {
            "en": "degC"
        },
        "symbol": {
            "value": "°C",
            "type":
"http://http://www.example.org/edr/metadata/units/degC"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
        "label": {
            "en": "Air Temperature"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Weather": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {

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```

        "en": "weather"
      },
      "symbol": {
        "value": "",
        "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_weather"
      }
    },
    "observedProperty": {
      "id":
"http://codes.wmo.int/wmdr/ObservedVariableAtmosphere/_266",
      "label": {
        "en": "Weather"
      }
    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    }
  },
  "Relative Humidity": {
    "type": "Parameter",
    "description": {
      "en": ""
    },
    "unit": {
      "label": {
        "en": "percent"
      },
      "symbol": {
        "value": "%",
        "type":
"http://http://www.example.org/edr/metadata/units/percent"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
      "label": {
        "en": "Relative Humidity"
      }
    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    }
  },
  "Feels like temperature": {
    "type": "Parameter",
    "description": {
      "en": ""
    },

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```

        "unit": {
            "label": {
                "en": "degC"
            },
            "symbol": {
                "value": "°C",
                "type":
"http://http://www.example.org/edr/metadata/units/degC"
            }
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
            "label": {
                "en": "Feels like temperature"
            }
        },
        "measurementType": {
            "method": "instantaneous",
            "period": "PT0M"
        }
    },
    "UV index": {
        "type": "Parameter",
        "description": {
            "en": ""
        },
        "unit": {
            "label": {
                "en": "UV_index"
            },
            "symbol": {
                "value": "",
                "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_uv"
            }
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-4-51",
            "label": {
                "en": "UV index"
            }
        },
        "measurementType": {
            "method": "instantaneous",
            "period": "PT0M"
        }
    },
    "Probabilty of precipitation": {
        "type": "Parameter",
        "description": {

```

```

        "en": ""
    },
    "unit": {
        "label": {
            "en": "percent"
        },
        "symbol": {
            "value": "%",
            "type":
"http://http://www.example.org/edr/metadata/units/percent"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
        "label": {
            "en": "Probabilty of precipitation"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Visibility": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "quality"
        },
        "symbol": {
            "value": "",
            "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_visibility"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-kind/_horizontalVisibility",
        "label": {
            "en": "Visibility"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
}
}

```



```

    },
    {
      "id": "2020-06-30T07:00:00Z",
      "title": "3 hrly fcst",
      "description": "Five day site specific forecast for 6000 UK locations  
3 hrly fcst",
      "keywords": [
        "Wind Direction",
        "Wind Speed",
        "Wind Gust",
        "Air Temperature",
        "Weather",
        "Relative Humidity",
        "Feels like temperature",
        "UV index",
        "Probabilty of precipitation",
        "Visibility"
      ],
      "links": [
        {
          "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T07:00:00Z/position",
          "hreflang": "en",
          "rel": "data",
          "type": "position",
          "title": ""
        },
        {
          "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T07:00:00Z/radius",
          "hreflang": "en",
          "rel": "data",
          "type": "radius",
          "title": ""
        },
        {
          "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T07:00:00Z/area",
          "hreflang": "en",
          "rel": "data",
          "type": "area",
          "title": ""
        },
        {
          "href":
"http://http://www.example.org/edr/collections/3_hrly_fcst/instances/2020-06-30T07:00:00Z/locations",
          "hreflang": "en",

```

```

        "rel": "data",
        "type": "location",
        "title": ""
    }
],
"extent": {
    "spatial": {
        "bbox": [
            -15.0,
            48.0,
            5.0,
            62.0
        ],
        "crs": "GEOGCS[\"WGS 84\", DATUM[\"WGS_1984\", SPHEROID[\"WGS 84\", 6378137, 298.257223563, AUTHORITY[\"EPSG\", \"7030\"]], AUTHORITY[\"EPSG\", \"6326\"]], PRIMEM[\"Greenwich\", 0, AUTHORITY[\"EPSG\", \"8901\"]], UNIT[\"degree\", 0.017453 29251994328, AUTHORITY[\"EPSG\", \"9122\"]], AUTHORITY[\"EPSG\", \"4326\"]]"
    },
    "temporal": {
        "interval": [
            "2020-06-30T03:00:00Z/2020-07-04T21:00:00Z"
        ],
        "trs": "TIMECRS[\"DateTime\", TDATUM[\"Gregorian Calendar\"], CS[TemporalDateTime, 1], AXIS[\"Time (T)\", future]"
    }
},
"crs": [
    {
        "name": "CRS84",
        "wkt": "GEOGCS[\"WGS 84\", DATUM[\"WGS_1984\", SPHEROID[\"WGS 84\", 6378137, 298.257223563, AUTHORITY[\"EPSG\", \"7030\"]], AUTHORITY[\"EPSG\", \"6326\"]], PRIMEM[\"Greenwich\", 0, AUTHORITY[\"EPSG\", \"8901\"]], UNIT[\"degree\", 0.017453 29251994328, AUTHORITY[\"EPSG\", \"9122\"]], AUTHORITY[\"EPSG\", \"4326\"]]"
    }
],
"distanceunits": [
    "km",
    "miles"
],
"outputformat": [
    {
        "name": "GeoJSON",
        "data_schema":
"http://http://www.example.org/edr/static/json/dp_schema.json"
    },
    {
        "name": "CoverageJSON"
    }
],
"parameters": {
    "Wind Direction": {

```

```

        "type": "Parameter",
        "description": {
            "en": "Direction wind is from"
        },
        "unit": {
            "label": {
                "en": "degree true"
            },
            "symbol": {
                "value": "°",
                "type":
"http://http://www.example.org/edr/metadata/units/degree"
            },
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-0",
            "label": {
                "en": "Wind Direction"
            },
        },
        "measurementType": {
            "method": "mean",
            "period": "-PT10M/PT0M"
        },
    },
    "Wind Speed": {
        "type": "Parameter",
        "description": {
            "en": "Average wind speed"
        },
        "unit": {
            "label": {
                "en": "mph"
            },
            "symbol": {
                "value": "mph",
                "type":
"http://http://www.example.org/edr/metadata/units/mph"
            },
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-1",
            "label": {
                "en": "Wind Speed"
            },
        },
        "measurementType": {
            "method": "mean",
            "period": "-PT10M/PT0M"
        },
    },
},

```

```

    "Wind Gust": {
      "type": "Parameter",
      "description": {
        "en": "Wind gusts are a rapid increase in strength of the
wind relative to the wind speed."
      },
      "unit": {
        "label": {
          "en": "mph"
        },
        "symbol": {
          "value": "mph",
          "type":
"http://http://www.example.org/edr/metadata/units/mph"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-2-1",
        "label": {
          "en": "Wind Gust"
        }
      },
      "measurementType": {
        "method": "maximum",
        "period": "-PT10M/PT0M"
      }
    },
    "Air Temperature": {
      "type": "Parameter",
      "description": {
        "en": "2m air temperature in the shade and out of the
wind"
      },
      "unit": {
        "label": {
          "en": "degC"
        },
        "symbol": {
          "value": "°C",
          "type":
"http://http://www.example.org/edr/metadata/units/degC"
        }
      },
      "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
        "label": {
          "en": "Air Temperature"
        }
      },
      "measurementType": {

```

```

        "method": "instantaneous",
        "period": "PT0M"
    },
    },
    "Weather": {
        "type": "Parameter",
        "description": {
            "en": ""
        },
        "unit": {
            "label": {
                "en": "weather"
            },
            "symbol": {
                "value": "",
                "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_weather"
            }
        },
        "observedProperty": {
            "id":
"http://codes.wmo.int/wmdr/ObservedVariableAtmosphere/_266",
            "label": {
                "en": "Weather"
            }
        },
        "measurementType": {
            "method": "instantaneous",
            "period": "PT0M"
        }
    },
    "Relative Humidity": {
        "type": "Parameter",
        "description": {
            "en": ""
        },
        "unit": {
            "label": {
                "en": "percent"
            },
            "symbol": {
                "value": "%",
                "type":
"http://http://www.example.org/edr/metadata/units/percent"
            }
        },
        "observedProperty": {
            "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
            "label": {
                "en": "Relative Humidity"
            }
        }
    }
}

```

```

    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    }
  },
  "Feels like temperature": {
    "type": "Parameter",
    "description": {
      "en": ""
    },
    "unit": {
      "label": {
        "en": "degC"
      },
      "symbol": {
        "value": "°C",
        "type":
"http://http://www.example.org/edr/metadata/units/degC"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/common/quantity-
kind/_airTemperature",
      "label": {
        "en": "Feels like temperature"
      }
    },
    "measurementType": {
      "method": "instantaneous",
      "period": "PT0M"
    }
  },
  "UV index": {
    "type": "Parameter",
    "description": {
      "en": ""
    },
    "unit": {
      "label": {
        "en": "UV_index"
      },
      "symbol": {
        "value": "",
        "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_uv"
      }
    },
    "observedProperty": {
      "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-4-51",
      "label": {

```

```

        "en": "UV index"
    },
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Probabilty of precipitation": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "percent"
        },
        "symbol": {
            "value": "%",
            "type":
"http://http://www.example.org/edr/metadata/units/percent"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/grib2/codeflag/4.2/_0-1-1",
        "label": {
            "en": "Probabilty of precipitation"
        }
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
},
"Visibility": {
    "type": "Parameter",
    "description": {
        "en": ""
    },
    "unit": {
        "label": {
            "en": "quality"
        },
        "symbol": {
            "value": "",
            "type":
"http://http://www.example.org/edr/metadata/lookup/mo_dp_visibility"
        }
    },
    "observedProperty": {
        "id": "http://codes.wmo.int/common/quantity-

```

```

kind/_horizontalVisibility",
    "label": {
        "en": "Visibility"
    },
    "measurementType": {
        "method": "instantaneous",
        "period": "PT0M"
    }
}
]
}

```

## C.6. Location Query Metadata Examples



#### Example 49. Collection instance metadata response document

A example of the Locations metadata from a collection that supports the **Location** query pattern.

```
(link:https://www.iana.org/assignments/link-relations/link-relations.xhtml[link relation type: "items").
```

There is a link to the collections response itself (**link relation type**: "self").

Representations of this resource in other formats are referenced using **link relation type** "alternate".

Finally there are also links to the license information for the data (using:https://www.iana.org/assignments/link-relations/link-relations.xhtml[link relation type] "license").

```
{
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "id": 3002,
      "geometry": {
        "type": "Point",
        "coordinates": [
          -0.854,
          60.749
        ]
      },
      "properties": {
        "name": "BALTASOUND",
        "datetime": "2020-03-30T19:00:00Z/2020-04-20T07:00:00Z",
        "detail":
"https://oscar.wmo.int/surface/rest/api/stations/station/1745/stationReport",
        "WIGOS Station Identifier": "0-20000-0-03002"
      }
    },
    {
      "type": "Feature",
      "id": 3005,
      "geometry": {
        "type": "Point",
        "coordinates": [
          -1.183,
          60.139
        ]
      },
      "properties": {
```

```

      "name": "LERWICK (S. SCREEN)",
      "datetime": "2020-03-30T19:00:00Z/2020-04-20T07:00:00Z",
      "detail":
"https://oscar.wmo.int/surface/rest/api/stations/station/1746/stationReport",
      "WIGOS Station Identifier": "0-20000-0-03005"
    }
  },
  {
    "type": "Feature",
    "id": 3008,
    "geometry": {
      "type": "Point",
      "coordinates": [
        -1.628,
        59.527
      ]
    },
    "properties": {
      "name": "FAIR ISLE",
      "datetime": "2020-03-30T19:00:00Z/2020-04-20T07:00:00Z",
      "detail":
"https://oscar.wmo.int/surface/rest/api/stations/station/1747/stationReport",
      "WIGOS Station Identifier": "0-20000-0-03008"
    }
  },
  {
    "type": "Feature",
    "id": 3017,
    "geometry": {
      "type": "Point",
      "coordinates": [
        -2.9,
        58.954
      ]
    },
    "properties": {
      "name": "KIRKWALL",
      "datetime": "2020-03-30T19:00:00Z/2020-04-20T07:00:00Z",
      "detail":
"https://oscar.wmo.int/surface/rest/api/stations/station/1750/stationReport",
      "WIGOS Station Identifier": "0-20000-0-03017"
    }
  },
  {
    "type": "Feature",
    "id": 3023,
    "geometry": {
      "type": "Point",
      "coordinates": [
        -7.397,
        57.358

```

```
]
},
"properties": {
  "name": "SOUTH UIST RANGE",
  "datetime": "2020-03-30T19:00:00Z/2020-04-20T07:00:00Z",
  "detail":
    "https://oscar.wmo.int/surface/rest/api/stations/station/1751/stationReport",
    "WIGOS Station Identifier": "0-20000-0-03023"
  }
}
```

# Annex D: Glossary

## Abstract Test Suite (ATS)

A compendium of test assertions applicable to implementations of a standard. An ATS provides a basis for developing an Executable Test Suite to verify that the implementation under test conforms to all the relevant functional specifications.

## Collection

body of resources that belong or are used together. An aggregate, set, or group of related resources. ([OGC 20-024](#))

## Conformance Module; Conformance Test Module

set of related tests, all within a single conformance test class ([OGC 08-131](#))

### NOTE

When no ambiguity is possible, the word **test** may be omitted. i.e. conformance test module is the same as conformance module. Conformance modules may be nested in a hierarchical way.

## Conformance Class; Conformance Test Class

set of conformance test modules that must be applied to receive a single certificate of conformance ([OGC 08-131](#))

### NOTE

When no ambiguity is possible, the word *test* may be left out, so conformance test class maybe called a conformance class.

## dataset

collection of data, published or curated by a single agent, and available for access or download in one or more formats ([DCAT](#))

## distribution

represents an accessible form of a **dataset** ([DCAT](#))

### NOTE

EXAMPLE: a downloadable file, an RSS feed or a web service that provides the data.

## Executable Test Suite (ETS)

A set of code (e.g. Java and CTL) that provides runtime tests for the assertions defined by the ATS. Test data required to do the tests are part of the ETS ([OGC 08-134](#))

## Recommendation

expression in the content of a document conveying that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required, or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited ([OGC 08-131](#))

## Requirement

expression in the content of a document conveying criteria to be fulfilled if compliance with the

document is to be claimed and from which no deviation is permitted ([OGC 08-131](#))

### Requirements Class

aggregate of all requirement modules that must all be satisfied to satisfy a conformance test class ([OGC 08-131](#))

### Requirements Module

aggregate of requirements and recommendations of a specification against a single standardization target type ([OGC 08-131](#))

### Spatial Resource

[resources](#) usually considered as Geospatial Data. ([OGC 19-072](#))

### Standardization Target

entity to which some requirements of a standard apply ([OGC 08-131](#))

#### NOTE

The standardization target is the entity which may receive a certificate of conformance for a requirements class.

### Web API

API using an architectural style that is founded on the technologies of the Web. ([W3C Data on the Web Best Practices](#))

# Annex E: Revision History

Date	Release	Editor	Primary clauses modified	Description
2019-10-31	October 2019 snapshot	C. Heazel	all	Baseline update
2020-06-04	June 2020 master	Mark Burgoyne	all	Resolved Trajectory pattern
2020-06-05	June 2020 branch	Chris Little	all	Increase alignment with Common
2020-07-15	July 2020 branch	Chris Little	all	Editorial consistency
2020-07-22	Restructure branch	Chris Little	all	Restructure 7,8,9,10
2020-07-22	Issues 106, 107	Dave Blodgett	all	Fix broken links
2020-10-20	Oct 2020 Master	Chris Little	Definitions	Added missing Cube definition

# Annex F: Bibliography

- Open Geospatial Consortium: The Specification Model — A Standard for Modular specifications, [OGC 08-131](#)
- W3C/OGC: Spatial Data on the Web Best Practices, W3C Working Group Note 28 September 2017, <https://www.w3.org/TR/sdw-bp/>
- W3C: Data on the Web Best Practices, W3C Recommendation 31 January 2017, <https://www.w3.org/TR/dwbp/>
- W3C: Data Catalog Vocabulary, W3C Recommendation 16 January 2014, <https://www.w3.org/TR/vocab-dcat/>
- IANA: Link Relation Types, <https://www.iana.org/assignments/link-relations/link-relations.xml>