CEOS OpenSearch

Conformance Test Plan

Version 1.0

CEOS Document

[CEOS-OPENSEARCH-CTP-V1.0]

Revision History

Date	Version	Sections affected	Changes
2018/03/30	1.0 D1	All	Y. Coene: Incomplete draft version proposing structure of future document.
2018/05/03	1.0 D3	All	Internally draft made available for internal review.
2018/05/09	1.0 D4	All	Comments from internal review addressed. Internally reviewed draft made available for ESA review.
2018/08/06	1.0 D5	All	Initial set of comments from WGISS SLT team addressed.
2018/08/28	1.0	All	Document finalized after WGISS SLT teleconference 2018/08/09 and email exchange with Calin Duma about §5.2.3.3.

Table of Contents

List of Figures

List of Tables

1 Introduction

1.1 Purpose of the document

Many CEOS member organizations are deploying OpenSearch compliant discovery interfaces for collections and granules (products). Most intend to adopt the related best practices defined by the WGISS (Working Group on Information Systems and Services) OpenSearch working group. Figure 1 depicts CEOS Agencies' data collections that are connected via the supported WGISS standards – OGC CSW 2.0.2 and CEOS OpenSearch Best Practices – which allow independent clients to search and access their unrestricted data.

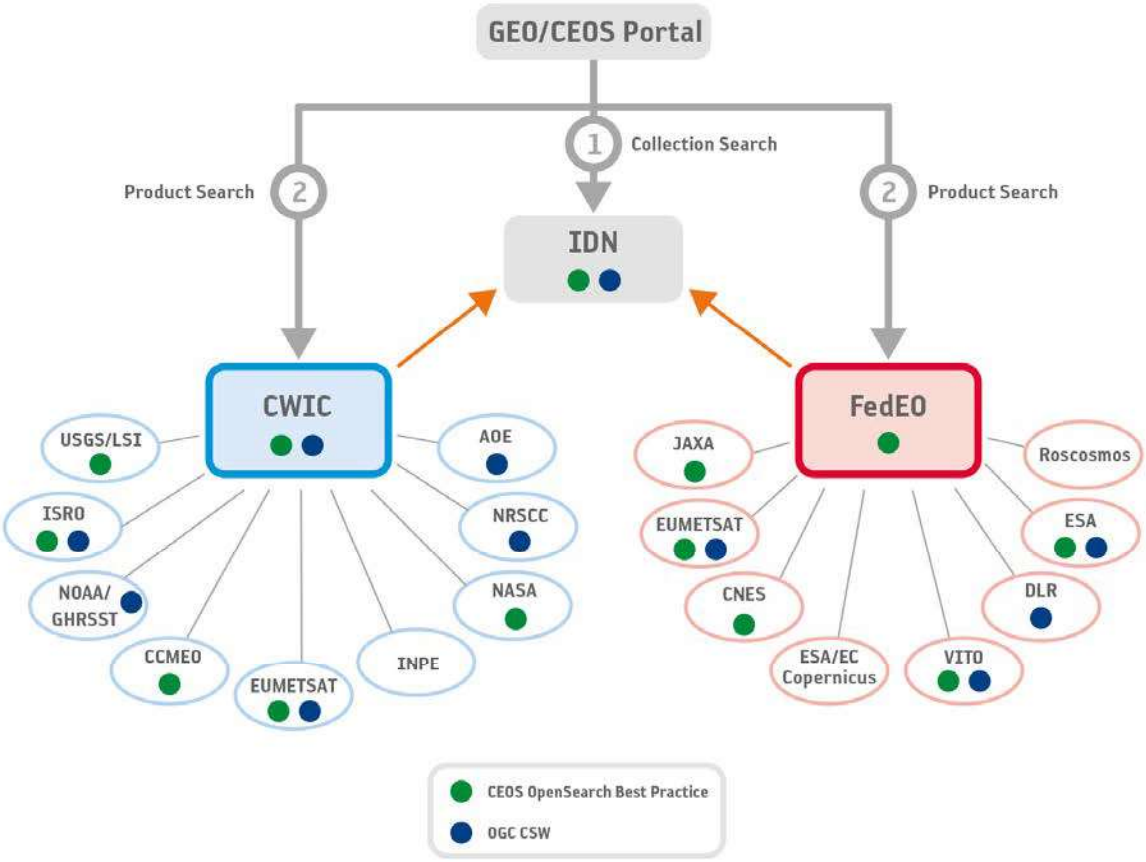

Figure 1: Use of CEOS OpenSearch Best Practice by CEOS member organisations (September 2017)

To support deployment and validation of these interfaces including their compliance with the applicable specifications, the need was identified by WGISS to prepare a **Conformance Test Plan**, possibly complemented by automated tools to support CEOS member organization to validate the interoperability of their OpenSearch endpoints.

This document presents a Conformance Test Plan defining the test designs and test cases that can be used to assess compliance of an OpenSearch endpoint with the CEOS OpenSearch Best Practice document [CEOS-OS-BP] and its underlying specifications.

The document has been prepared by the CEOS OpenSearch Project Team of the Committee on Earth Observation Satellites (CEOS) Working Group on Information Systems and Services (WGISS).

1.2 Organization of the document

This document is organized as an ECSS[1] Software Validation Specification document:

- Chapter 1 is the introduction of this document.
- Chapter 2 provides a brief description of the software to be tested.
- Chapter 3 identifies the features to be tested.
- Chapter 4 defines the conformance test design.
- Chapter 5 provides information about the individual test cases refining the test designs.
- Chapter 6 defines the verification methods for requirements that cannot be verified by test.
- Annex A provides traceability information.

1.3 Terms, definitions and abbreviated terms

1.3.1 Definitions

CEOS International Directory Network	CEOS IDN is an international effort developed to assist researchers in locating information on available collections and services. The directory is sponsored as a service to the Earth science community.
Collection	A collection is an aggregation of granules sharing the same product specification. A collection typically corresponds to the series of products derived from data acquired by a sensor on board a satellite and having the same mode of operation.
CEOS WGISS Integrated Catalog	The Working Group on Information Systems and Services is a subsidiary body supporting the Committee on Earth Observing Satellites (CEOS). WGISS promotes collaboration in the development of systems and services that manage and supply these observatory data.

[1] http://ecss.nl/standard/ecss-e-st-40c-software-general-requirements/

Federated Earth Observation Missions	FedEO provides interoperable access, following ISO/OGC interface guidelines, to Earth Observation metadata.
Granule	A granule is the finest granularity of data that can be independently managed. A granule usually matches the individual file of EO satellite data.
Open Geospatial Consortium	OGC is an international industry consortium of private companies, government agencies and universities participating in a consensus process to develop publicly available interface standards.

1.3.2 Abbreviated terms

ATS	Abstract Test Suite
CBP	CEOS Best Practice
CEOS	Committee on Earth Observation Satellites
CWIC	CEOS WGISS Integrated Catalog
DD	Description Document
DDC	Description Document for Collection search
DDG	Description Document for Granule search
ECSS	European Cooperation for Space Standardization
EO	Earth Observation
EOX	Earth Observation eXtension
FedEO	Federated Earth Observation Missions
GML	Geography Markup Language
GTX	Geo Time eXtension
HTTP	Hyper-Text Transfer Protocol
IDN	International Directory Network
OGC	Open Geospatial Consortium
OS	OpenSearch

OSDD	OpenSearch Description Document
RD	Response Document
RDC	Response Document for Collection search
RDG	Response Document for Granule search
URL	Universal Resource Locator
WGISS	Working Group on Information Systems and Services

1.3.3 Namespace prefix conventions

Namespace prefixes used in this document are not normative and are merely chosen for convenience. The namespaces to which the prefixes correspond are normative, however.

Prefix	Namespace URI	Specification
atom	http://www.w3.org/2005/Atom	[Atom]
dc	http://purl.org/dc/elements/1.1/	Namespace Policy for the DCMI[2]
eo	http://a9.com/-/opensearch/extensions/eo/1.0/	[OGC 13-026r8]
geo	http://a9.com/-/opensearch/extensions/geo/1.0/	[OGC 10-032r8]
georss	http://www.georss.org/georss	GeoRSS Specification
gml	http://www.opengis.net/gml	GML specification
os	http://a9.com/-/spec/opensearch/1.1/	[OpenSearch]
param	http://a9.com/-/spec/opensearch/extensions/parameters/1.0/	[Param]
referrer	http://www.opensearch.org/Specifications/OpenSearch/Extensions/Referrer/1.0	[Referrer]
time	http://a9.com/-/opensearch/extensions/time/1.0/	[OGC 10-032r8]

Table 1 – List of namespace prefix mappings

[2] See <http://dublincore.org/documents/dcmi-namespace/>.

1.4 Applicable and Reference Documents

1.4.1 Applicable Documents

Acronym	Title	Reference	Issue
[CEOS-OS-BP]	CEOS OpenSearch Best Practice Document	http://ceos.org/document_management/Working_Groups/WGISS/Interest_Groups/OpenSearch/CEOS-OPENSEARCH-BP-V1.2.pdf	Version 1.2, 2017/06/13
[OpenSearch]	OpenSearch Specification	http://www.opensearch.org/Specifications/OpenSearch/1.1/Draft_5	1.1 Draft 5
[OGC 10-032r8]	OpenSearch Geo and Time extensions	https://portal.opengeospatial.org/files/?artifact_id=56866	r8, 2014/04/14
[OGC 13-026r8]	OpenSearch Extension for Earth Observation Products	http://docs.opengeospatial.org/is/13-026r8/13-026r8.html	r8, 2016/07/06
[Param]	OpenSearch Parameter Extension	http://www.opensearch.org/Specifications/OpenSearch/Extensions/Parameter/1.0/Draft_2	1.0 Draft 2
[Relevance]	OpenSearch Relevance Extension	http://www.opensearch.org/Specifications/OpenSearch/Extensions/Relevance/1.0/Draft_1	1.0 Draft 1
[Atom]	Atom syndication format	IETF RFC4287, http://tools.ietf.org/html/rfc4287	

Table 2 – List of applicable documents

1.4.2 Reference Documents

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

Acronym	Title	Reference	Issue
[OGC 10-157r4]	Earth Observation Profile of Observations and Measurements	http://docs.opengeospatial.org/is/10-157r4/10-157r4.html	r4.

[Referrer]	OpenSearch Referrer Extension	http://www.opensearch.org/Specifications/OpenSearch/Extensions/Referrer/1.0	Issue 1.0 Draft 1
[RFC6906]	RFC 6906, The "profile" Link Relation Type	https://tools.ietf.org/html/rfc6906	

Table 3 – List of reference documents

2 Software Overview

2.1 Items under Test

The items under test correspond to an Earth Observation **Collection Catalog server** and associated **Granule Catalog server(s)** which provide an external interface over HTTP or HTTPS intended to comply with the CEOS OpenSearch Best Practice and its underlying specifications.

2.1.1 Summary of Functionality

A collection catalog provides the functionality to discover available collections satisfying criteria provided in a search request. Catalogue response is embedded in a “Response Document” containing a “page”, referring to one or more matching collections, and metadata related to the matching collections. Matching collections can be organized in pages and the clients can traverse one by one. The metadata for a collection may include a reference to the corresponding granule catalog for that collection.

The interface through which the collection catalog is accessible over HTTP(S) is self-describing, therefore a client needs to access its Open Search Description Document (OSDD), which defines among others the available search parameters.

A granule catalog provides the functionality to discover available granules satisfying criteria provided in a search request. Catalogue response is embedded in a “Response Document” containing a “page”, referring to one or more matching granules, and metadata related to the matching granules. Matching granule can be organized in pages and the clients can traverse one by one. The metadata for a granule may include a reference to the corresponding granule file for download, related documentation, browse image, metadata in alternative formats etc. For more details, we refer to the specifications listed in section 1.4.1.

The interface through which the granules catalog is accessible over HTTP(S) is self-describing, therefore a client needs to access its OSDD, which defines among others the available search parameters. A client can find it in the response of the collection catalog. It should be noted that a priori, all collections offered by a single collection catalog may have different interfaces for granule search, which may need to be tested separately.

2.1.2 Operational Environment

The operational environment is mainly comprised of (virtual[3] or physical) Collection Catalog and/or Granule Catalogs offering access to metadata according to the OpenSearch family of specifications listed in section 1.4.1. The metadata provided by these catalogs may refer to online

[3] A gateway (e.g. CWIC or FedEO) offering access to different backend catalogs through a unique OpenSearch compliant endpoint is considered a virtual catalog and is a valid item under test.

product dissemination services or other related OGC services, but testing the actual interactions with these services is beyond the scope of the current conformance test plan.

2.1.3 External interfaces

The interfaces which are subject of the current test plan are the discovery interfaces. The interfaces offered by the various catalogs to load metadata in the catalog are not considered.

The discovery interface which is the subject of the current plan is to be accessible over HTTP(S) and comply with the OpenSearch Best Practices listed in section 1.4.1.

OpenSearch is a collection of simple formats for the sharing of search results. The OpenSearch specification defines an OSDD format that is used to describe the search interface of a catalog, so that it can be accessed by search client applications.

The client uses the OSDD to learn about the OpenSearch API implemented by the server. The OSDD contains parameterized URL templates that indicate how the search client should make search requests. The URL template can be repeated several times as long as the combination of relation and supported output format parameters is unique.

```
<OpenSearchDescription
 xmlns="http://a9.com/-/spec/opensearch/1.1/"
 xmlns:os="http://a9.com/-/spec/opensearch/1.1/"
 xmlns:atom="http://www.w3.org/2005/Atom"
 xmlns:time="http://a9.com/-/opensearch/extensions/time/1.0/"
 xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/"
 xmlns:eo="http://a9.com/-/opensearch/extensions/eo/1.0/"
 xmlns:param="http://a9.com/-/spec/opensearch/extensions/parameters/1.0/"
 xmlns:dc="http://purl.org/dc/elements/1.1/">
...
<description>This service is ...</description>
...
<Url                type="application/atom+xml"                rel=”results”
template="http://...search/atom?q={searchTerms}&ts={time:start}&te={time:end
}"/>
<Query role="example" searchTerms=”water"
  time:start="2012-04-01" time:end="2012-06-30”/>
...
```

```
</OpenSearchDescription>
```

Figure 2: OSDD containing parameterized URL templates

A client constructs the **search request** URL by replacing each {parameter} in the URL template with a value (See Figure 2). The values allowed may be constrained using the specification. It then sends that request to the server using HTTP GET. Optional template parameters are described with a "?" such as {parameter?} and can be left empty.

OpenSearch does not define or require any specific encoding format for the **search response** Instead, it defines a set of search-related metadata elements which can be inserted into existing encoding formats. The OGC and CEOS specifications in 1.4.1 impose support for Atom 1.0, which is the only response format considered in the current test plan.

OpenSearch response elements are used to extend the Atom syndication format with the extra metadata needed to return search results.

The response to a Collection Catalog search can point to a granule-level OSDD specific to the collection entry.. Client applications following this reference can then analyze its content, formulate a granule search request, receive a granule search response and process the provided metadata, optional thumbnail and/or quicklook, masks or product download links etc. according to the same process that applied for the Collection Catalog. In general, the search parameters available for granule search may differ by collection as optical, radar or other granule types may offer specific search criteria in addition to common search criteria such as time and location.

Figure 3 shows the client and server interactions of OpenSearch, including the two-step access to Collection Catalog and Granules Catalog(s). There may be multiple granule catalogs related to a single Collection Catalog, thus the number of interfaces to be validated may be significant.

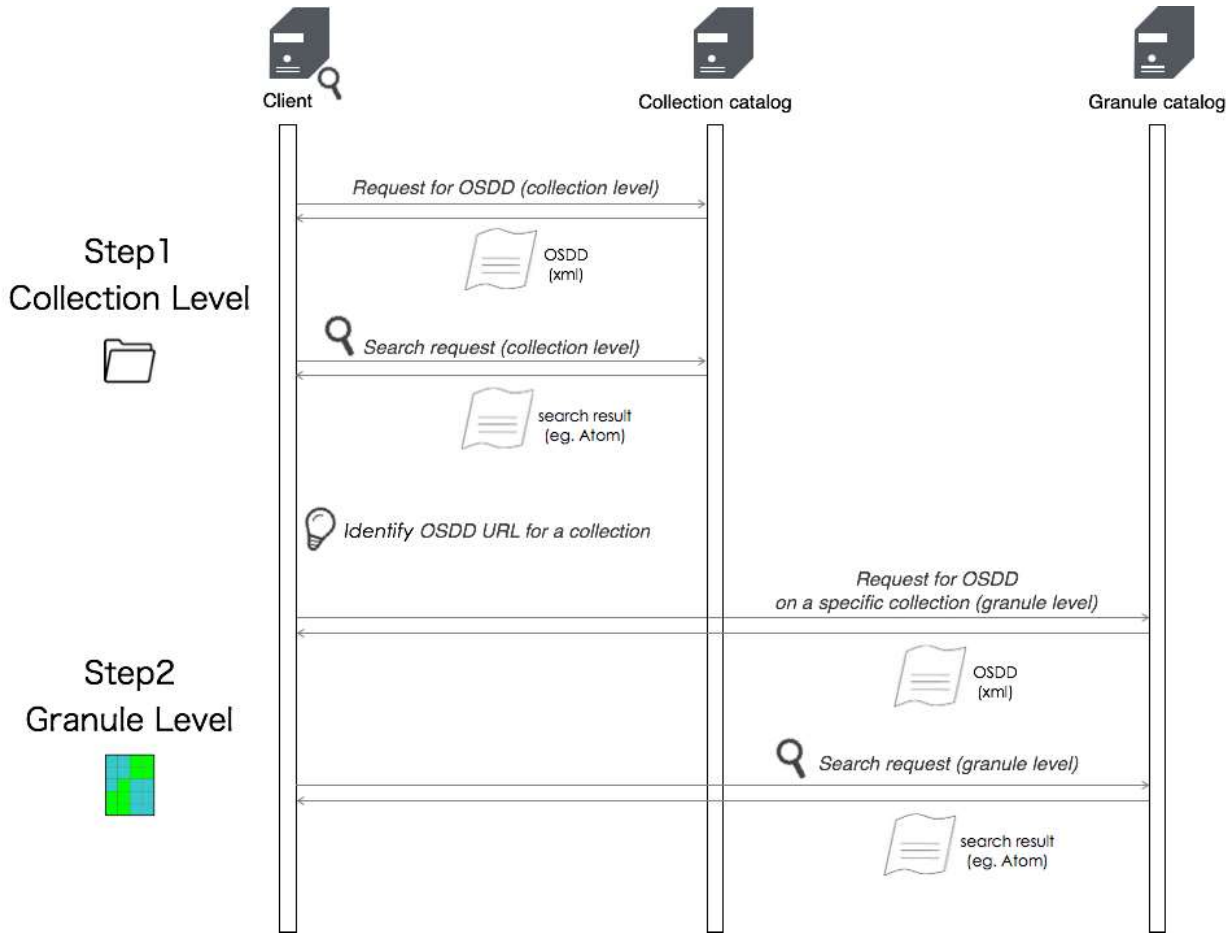

Figure 3: OpenSearch test-client to server interaction

3 Conformance Testing Specification Task Identification

3.1 Task and criteria

The conformance testing is performed by running a number of test cases according to a set of test procedures.

The items under test are:

- OpenSearch endpoint for collection discovery (a.k.a. OpenSearch Collection Catalog)
- OpenSearch endpoints for granule (product) discovery (a.k.a. OpenSearch Granule Catalogs)

3.2 Features to be tested

This document contains compliance tests for CEOS Best Practices corresponding to different requirement levels (Recommended, Requirement or Optional).

As the CEOS Best Practices rely on the underlying specifications [OGC 10-032r8] and [OGC 13-026r8]], mandatory requirements from these specifications are tested as well.

3.3 Features not to be tested

Optional requirements from the specifications [OGC 10-032r8] and [OGC 13-026r8] are not tested unless they are defined as mandatory requirements in the CEOS Best Practices.

In addition, CEOS Best Practice CEOS-BP-005E is a requirement on the client implementation, requiring it to preserve any non-variable search parameters given to it by the URL template in the OSDD for building a search request, then it is not testable being not a requirement related to the server.

3.4 Test pass/fail criteria

The item pass/fail criteria depend on the verification method for the item. The verification method for each requirement is listed in Annex A.1.

Possible verification methods are provided below.

- Test (T): verification/validation method by assessing the corresponding OpenSearch implementation functionality under representative simulated environments.

- Analysis (A): verification/validation method performing a theoretical or empirical evaluation using techniques agreed with the Customer. The selected techniques can typically include statistics, qualitative design analysis, modelling and computer simulation.
- Inspection (I): verification/validation method by visual determination of physical characteristics. Product characteristics include constructional features, hardware conformance to document drawing or workmanship requirements, physical conditions, software source code conformance with coding standards.
- Review of Design: verification/validation method using approved records or evidence that unambiguously shows that the requirement is met. Example: design documents, design reports, technical descriptions.

If the method is 'Inspection', the justification is analyzed.

For the 'Test' method, the expected result of each test is given in the test pass-fail criteria, for any verification step.

It should be noted that many tests are conditional and are only to be performed when the pre-condition is true. It is therefore expected that the result of a verification step may be:

- "pass",
- "failure"
- "not applicable".

E.g. CEOS-BP-008: a server is not required to support geo:radius, but if it does support it, and it is advertised as optional parameter in the Url template, then the default value has to be advertised in a certain way. The pre-condition of occurring "geo:radius" requires to test its default value since it is advertised as optional parameter in the Url template.

3.5 Items that cannot be validated by test

We assume that tests will be performed against an endpoint without prior knowledge of the actual content of the catalog. No test data is assumed to be loaded in the catalog before executing the tests, which the tests can then use to predict expected responses. The test cases will only rely on information returned by the Catalogs as part of the OpenSearch protocol.

The sample queries in the OSDD specified through the os:Query with role=example construct, support the creation of sample search requests and retrieval of associated responses, which in turn allow the creation of more comprehensive automated compliance tests.

The correct implementation of all individual search parameters, i.e. do they filter correctly the metadata records contained in the catalogs (are there not too many or not too few responses) cannot be checked.

There are a number of requirements that cannot be verified by test. Manual inspection can be used to verify requirements that cannot be verified via the 'Test' method.See chapter 6 for proposed verification methods.

4 Conformance Testing Specification Design

4.1 General

The current chapter provides the definition of the conformance testing specification design. The criteria used to group test designs is the artifact which is subjected to the test, i.e.

- Description Document (OSDD) content returned by the Catalog, with specializations for Collection search and Granule search.
- Response Document content returned by the Catalog, with specializations for Collection search and Granule search and exceptions.
- A search parameter and its associated result.

4.2 Test Design TD-DD – Description Document

4.2.1 Features to be tested

This test verifies that

- The OSDD provided by the endpoint complies with the applicable specifications common for OSDD for Collection Search and Granule Search.

4.2.2 Approach refinements

The following test cases are part of this test design:

- TC-OS-DD-100: OpenSearch 1.1 Description Document
- TC-GTX-DD-100: OGC 10-032r8 Description Document
- TC-EOX-DD-100: OGC 13-026r8 Description Document
- TC-CBP-DD-100: CEOS BP Description Document

4.3 Test Design TD-DDC – Description Document Collection Search

4.3.1 Features to be tested

This test verifies that

- The OSDD (for Collection Search) provided by the endpoint complies with the applicable specifications.

4.3.2 Approach refinements

The following test cases are part of this test design:

- All test cases refining TD-DD.
- TC-CBP-DDC-100 : CEOS BP Description Document for Collections

4.4 Test Design TD-DDG – Description Document Granule Search

4.4.1 Features to be tested

This test verifies that

- The OSDD (for Granule Search) provided by the endpoint complies with the applicable specifications.

4.4.2 Approach refinements

The following test cases are part of this test design:

- All test cases refining TD-DD.
- TC-CBP-DDG-100 : CEOS BP Description Document for Granules

4.5 Test Design TD-RD – Response Document

4.5.1 Features to be tested

This test verifies that

- The search response complies with the applicable specifications common to search responses for Collection Search and Granule Search

4.5.2 Approach refinements

The following test cases are part of this test design:

- TC-OS-RD-100: OpenSearch 1.1 Response Document
- TC-GTX-RD-100: OGC 10-032r8 Response Document
- TC-EOX-RD-100: OGC 13-026r8 Response Document
- TC-CBP-RD-100 : CEOS BP Response Document

4.6 Test Design TD-RDC – Response Document Collections

4.6.1 Features to be tested

This test verifies that

- The collection search response complies with the additional constraints from the applicable specifications specific for collection search results.

4.6.2 Approach refinements

The following test cases are part of this test design:

- All test cases refining TD-RD.
- TC-CBP-RDC-100: CEOS BP Response Document Collections

4.7 Test Design TD-RDG – Response Document Granules

4.7.1 Features to be tested

This test verifies that

- The granule search response complies with the additional constraints from the applicable specifications specific for granule search results.

4.7.2 Approach refinements

The following test cases are part of this test design:

- All test cases refining TD-RD.
- TC-CBP-RDG-100: CEOS BP Response Document Granules

4.8 Test Design TD-RE – Response Exceptions

4.8.1 Features to be tested

This test verifies that

- The non-nominal response complies with the applicable specifications.

4.8.2 Approach refinements

The following test cases are part of this test design:

- TC-CBP-RE-100 : CEOS BP Response Exceptions
- TC-GTX-RE-100 : OGC 10-032r8 Response Exceptions
- TC-EOX-RE-100 : OGC 13-026r8 Response Exceptions

4.9 Test Design TD-SPR – Search Parameter Results

4.9.1 Features to be tested

This test verifies that

- The interpretation of the search parameters advertised in the OSDD complies with the applicable specifications.

4.9.2 Approach refinements

The following test cases are part of this test design:

- TC-CBP-SP-100: CEOS BP Search Parameters
- TC-CBP-SPC-100: CEOS BP Search Parameters for Collections
- TC-GTX-SP-100: OGC 10-032r8 Search Parameters

5 Conformance Test Case Specification

5.1 General

This section provides the identification and specification of the conformance test cases defined in the conformance testing specification design (see previous section). They are grouped according to the specification document that defines the expected behavior and the artifact which is the subject of the test.

The 'Inputs specification' section contains the artifacts which serve as the test inputs. The testing approach will dictate whether all possible inputs or a subset of the inputs are chosen for the test implementation.

5.2 Test Group TC-CBP – CEOS Best Practices

5.2.1 Test Case TC-CBP-DD-100 – Description Document

5.2.1.1 Inputs specification

- Collection Catalog Description Document.
- Granule Catalog Description Documents.

5.2.1.2 Outputs specification

None.

5.2.1.3 Test pass-fail criteria

This test verifies that

- 1 – the OSDD is accessible via HTTP.
- 2 – the OSDD contains the namespace for the Parameter Extension (See [Param]) (CEOS-BP-002)
- 3 – the OSDD contains the Parameter Extension annotations as per CEOS-BP-002.
- 4 – the OSDD shall advertise supported geometry types using the Parameter extension and the mechanism (rel="profile") defined by CEOS-BP-002C if geo:geometry is a supported URL template parameter.
- 5 – the OSDD shall contain the requirements level encoded in the Tags element as per CEOS-BP-004.
- 6 – the OSDD shall define the indexOffset being 0 or 1 as per CEOS-BP-004B.

- 7 – the OSDD Url template with Atom response shall include the geo:name and optionally the geo:radius search parameters as per CEOS-BP-008.
- 8 – If the geo:radius parameter is declared as optional in the OSDD Url template then the OSDD shall advertise the default value for radius as per CEOS-BP-008.
- 9 – The OSDD contains at least one URL element with type attribute set to “application/atom+xml” (CEOS-BP-010).
- 10 – the OSDD Atom Url template shall encode the encoding format (Atom) as resource extension (CEOS-BP-009).

5.2.1.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-DD-100
- TC-GTX-DD-100
- TC-EOX-DD-100

5.2.2 Test Case TC-CBP-DDC-100 – Description Document Collections

5.2.2.1 Inputs specification

- Collection Catalog Description Document.

5.2.2.2 Outputs specification

None.

5.2.2.3 Test pass-fail criteria

This test verifies that

- 1 – the OSDD shall have a Url element with its rel attribute set to “collection” (CEOS-BP-003).
- 2 – the OSDD declare adherence to a specific standard for keyword search (i.e. {searchTerms}) using the Parameter extension and the mechanism (rel=”profile”) defined by CEOS-BP-002B if searchTerms is a supported URL template parameter.
- 3 – the OSDD shall include at least one Query element for collection search with Atom response as per CEOS-BP-003B. All Query elements in the OSDD shall relate to collection search.
- 4 – Execute the request using the information encoded in the above Query element and check that a valid response document (for collections) is returned (CEOS-BP-003B).

- 5 – the OSDD Url template with Atom response shall include at least the mandatory search parameters for collection search as per CEOS-BP-005.
- 6 – the OSDD Url template with Atom response shall include the eo:platform search parameter for collection search by satellite name as per CEOS-BP-005C.
- 7 – the OSDD shall define the referrer namespace as per CEOS-BP-005D.
- 8 – the OSDD Url template with Atom response shall include the referrer:source search parameter for client identification as per CEOS-BP-005D or use a non-variable search parameter in the URL template to identify the client.

5.2.2.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-DD-100
- TC-GTX-DD-100
- TC-EOX-DD-100

The following test cases are to be successfully executed in step 4 for each Query element obtained in step 3:

- TC-CBP-RDC-100

5.2.3 Test Case TC-CBP-DDG-100 – Description Document Granules

5.2.3.1 Inputs specification

- Granule Catalog Description Documents.

5.2.3.2 Outputs specification

None.

5.2.3.3 Test pass-fail criteria

This test verifies that

- 1 – the OSDD shall have a Url element with its rel attribute set to “results” (CEOS-BP-003).
- 2 – the OSDD shall include one or more Query elements for granules search with Atom response as per CEOS-BP-003B, unless the OSDD contains also a Url element with rel attribute set to “collection”, in which case all Query elements shall be related to collection search instead (See CEOS-BP-003B).

- 3 – If the OSDD does not contain a Url element with rel attribute set to “collection”, then execute the request using the information encoded in the above Query element and check that a valid response document (for granules) is returned (CEOS-BP-003B).
- 4 – the OSDD Url template (rel=”results”) with Atom response shall include at least the mandatory search parameters for granule search as per CEOS-BP-005.

5.2.3.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-DD-100
- TC-GTX-DD-100
- TC-EOX-DD-100

The following test cases are to be successfully executed in step 3 for each Query element obtained in step 2:

- TC-CBP-RDG-100

5.2.4 Test Case TC-CBP-RD-100 – Response Document

5.2.4.1 Inputs specification

- Atom response documents returned by the Collection Catalog, possibly with additional constraints as defined in the verification step.
- Atom response documents returned by the Granule Catalogs, possibly with additional constraints as defined in the verification step.

Automated test tools may assume that the os:Query information in an OSDD allows composing a valid request (and variations of it by changing, count, startIndex etc. parameters), alternatively, a set of valid requests/responses is to be provided as input to this test.

5.2.4.2 Outputs specification

None.

5.2.4.3 Test pass-fail criteria

This test verifies that

- 1 – A request with count=0 corresponds to an Atom feed with no entries, but preserving os:totalResults information (CEOS-BP-005B).
- 2 – Responses shall contain a dc:identifier element for each entry in the search result. Adding geo:uid with this identifier to the original search request should return the corresponding single item (CEOS-BP-011).

- 3 – Response documents representing a first, middle or last page of a single-page, multi-page or empty response shall contain the navigation links defined in CEOS-BP-011B.
- 4 – Responses shall contain Atom links with rel=”via” or rel=”alternate” to refer to metadata representations (CEOS-BP-012).
- 5 – Above links to metadata representations shall use the media types defined in table 7 of [CEOS-OS-BP] (CEOS-BP-012).
- 6 – Response by implementations using syndication of results provided by third-party catalogs shall include provenance information as per CEOS-BP-012B if applicable.
- 7 – Responses shall contain Atom links with rel=”describedby” to refer to human readable documentation (CEOS-BP-012C).
- 8 – Responses shall contain Atom links with relations as defined in table 8 of [CEOS-OS-BP] to refer to artifacts associated with a resource (CEOS-BP-012D).
- 9 – Atom links in Responses shall provide the media type of the artifact they refer to as “type” attribute of the Atom link (CEOS-BP-012E).
- 10 – Atom summary elements in Responses shall define the type of the summary. Default media type shall be “text” (CEOS-BP-013).
- 11 – Responses shall contain dc:date elements for each entry as per [OGC 10-032r8] (CEOS-BP-013B).
- 12 – Responses shall contain the GeoRSS Simple representation for each entry corresponding to a point, line or polygon (CEOS-BP-014).
- 13 – Responses shall contain the GeoRSS GML representation for each entry corresponding to a multi-polygon as per CEOS-BP-014B (CEOS-BP-014).
- 14 – Responses shall contain the GeoRSS GML representation for each entry corresponding to a multi-point as per CEOS-BP-014C (CEOS-BP-014).
- 15 – Responses shall contain the GeoRSS GML representation for each entry corresponding to a multi-line as per CEOS-BP-014D (CEOS-BP-014).

5.2.4.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-RD-100
- TC-GTX-RD-100
- TC-EOX-RD-100

5.2.5 Test Case TC-CBP-RDC-100 – Response Document Collections

5.2.5.1 Inputs specification

- Atom response documents returned by the Collection Catalog.

5.2.5.2 Outputs specification

None.

5.2.5.3 Test pass-fail criteria

This test verifies that

- 1 – the response document contains rel=search links to a valid OSDD document for each search result to be used for granule search as per CEOS-BP-001.
- 2 – the above document can be loaded (CEOS-BP-001) and complies with the applicable criteria for Description Documents.

5.2.5.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-RD-100
- TC-GTX-RD-100
- TC-EOX-RD-100

The following test cases are to be successfully executed for each Description Document obtained in step 2:

- TC-CBP-DD-100
- TC-CBP-DDG-100

5.2.6 Test Case TC-CBP-RDG-100 – Response Document Granules

5.2.6.1 Inputs specification

- Atom response documents returned by the Granule Catalogs, possibly with additional constraints as defined in the verification step.

5.2.6.2 Outputs specification

None.

5.2.6.3 Test pass-fail criteria

This test verifies that

- 1 – Responses shall contain a georss:box representing the minimum bounding rectangle of the (granule) footprint for each entry (CEOS-BP-014E).
- 2 – Responses shall contain an atom:link element with rel=”icon” or a Media RSS element to refer to the granule’s browse/quicklook image when available (CEOS-BP-015).
- 3 – In case granules have multiple browse/quicklook images, they shall be encoded in the Response as multiple atom:link elements with rel=”icon” or Media RSS media:group elements as per CEOS-BP-015B.
- 4 – Responses shall contain an atom:link element with rel=”enclosure” to refer to the actual data access URL for download when available (CEOS-BP-016).
- 5 – In case granules have multiple files available for data access, they shall be encoded in the Response as multiple atom:link elements with rel=”section” (CEOS-BP-016B), or represented as a single Metalink file or .ZIP file (CEOS-BP-016).

5.2.6.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-RD-100
- TC-GTX-RD-100
- TC-EOX-RD-100

5.2.7 Test Case TC-CBP-RE-100 – Response Exceptions

5.2.7.1 Inputs specification

- Catalog search requests expected to generate specific exception responses.

5.2.7.2 Outputs specification

None.

5.2.7.3 Test pass-fail criteria

This test verifies that

- 1 – The server generates the HTTP status codes corresponding to the type of exceptions as defined by CEOS-BP-017.

5.2.7.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-GTX-RE-100
- TC-EOX-RE-100

5.2.8 Test Case TC-CBP-SP-100 – Search Parameters

The purpose of these tests is to assess whether using a specific search parameter has the expected effect on the results returned.

5.2.8.1 Inputs specification

- Catalog search requests required to generate specific nominal responses as defined in each verification step.

5.2.8.2 Outputs specification

None.

5.2.8.3 Test pass-fail criteria

This test verifies that

- 1 – The API processes parameters declared as optional in the OSDD URL template as per CEOS-BP-005. Values of optional parameters can be left empty or the corresponding key/value pair can be removed completely resulting in the same result.
- 2 – If the OSDD advertises both startIndex and startPage, verify that startPage is ignored when both parameters are used simultaneously as startIndex takes precedence (CEOS-BP-007).
- 3 – If the OSDD Atom Url template advertises geo:name without geo:radius then the search should behave as a point search as per CEOS-BP-008. E.g. by comparing results with similar results using a very small geo:box.
- 4 – Append an additional http request parameter which does not appear in the corresponding OSDD template to a valid collection or granule search request which returns at least one result. Verify that the result remains unchanged and that the HTTP status code remains 200 (OK) as imposed by CEOS-BP-009B (“Handling unsupported request parameter”).[4]

[4] We assume that “unsupported request parameter” is to be understood as parameter not appearing in the applicable OSDD. Note that a request parameter which does not appear in the OSDD can (by definition) not be included in the os:Query response element as it contains only OpenSearch parameters define din the OSDD by definition. This part of the CEOS-BP-009B requirement is thus redundant.

5.2.8.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-GTX-SP-100.

5.2.9 Test Case TC-CBP-SPC-100 – Search Parameters for Collections

5.2.9.1 Inputs specification

- Collection Catalog search requests required to generate specific nominal responses as defined in each verification step.

5.2.9.2 Outputs specification

None.

5.2.9.3 Test pass-fail criteria

This test verifies that

- 1 – If the Parameter extension is not used to define a custom search “profile” for searchTerms, then a multi-word value will be interpreted as per CEOS-BP-006, i.e. a space denotes a logical “and” unless the search string is surrounded by double quotes.

5.2.9.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- None.

5.3 Test Group TC-OS – OpenSearch

5.3.1 Test Case TC-OS-DD-100 – Description Document

5.3.1.1 Inputs specification

- Collection Catalog Description Document.
- Granule Catalog Description Documents.

5.3.1.2 Outputs specification

None.

5.3.1.3 Test pass-fail criteria

This test verifies that

- 1 – the OSDD is accessible via HTTP.
- 2 – the XML representation of the OSDD is well formed.
- 3 – the XML representation of the OSDD is valid according to osdd.rnc in Annex B.3 of [OGC 10-032r8].
- 4 – OpenSearch 1.1 namespace is correctly included in the OSDD.
- 5 – The OSDD contains at least one URL element with type attribute set to “application/atom+xml”.
- 6 – If parameters in the request template attribute of a URL element appear with the OpenSearch 1.1 namespace (which can also be the default namespace), then they are listed in [OpenSearch]. No other parameters shall use the OpenSearch 1.1 (possibly default) namespace in the URL element template.
- 7 – Verify that the URL template elements follow the correct syntax[5] and that all search parameters with a namespace prefix refer to a namespace defined in the OSDD.

5.3.1.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- None.

5.3.2 Test Case TC-OS-RD-100 – Response Document

5.3.2.1 Inputs specification

- Atom response documents returned by the Collection Catalog, possibly with additional constraints as defined in the verification step.
- Atom response documents returned by the Granule Catalog Server, possibly with additional constraints as defined in the verification step.

5.3.2.2 Outputs specification

None.

5.3.2.3 Test pass-fail criteria

This test verifies that

[5] This verification is not part of the Relax NG schema used in step (3), and therefore included separately.

- 1 – the response is a valid Atom feed document according to rfc4287.rnc in Annex B.1 of [OGC 10-032r8].
- 2 – the response is a valid Atom document according to osatom.rnc in Annex B.2 of [OGC 10-032r8].

5.3.2.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- None.

5.4 Test Group TC-GTX – OGC Geo and Time Extension

5.4.1 Test Case TC-GTX-DD-100 – Description Document

5.4.1.1 Inputs specification

- Collection Catalog Description Document.
- Granule Catalog Description Documents.

5.4.1.2 Outputs specification

None.

5.4.1.3 Test pass-fail criteria

This test verifies that

- 1 – the OSDD is accessible via HTTP.
- 2 – the XML representation of the OSDD is valid according to osddtime.rnc in Annex B.9 (and B.3) of [OGC 10-032r8].
- 3 – the XML representation of the OSDD is valid according to osddgeo.rnc in Annex B.6 (and B.3) of [OGC 10-032r8].
- 4 – geo and time namespaces are correctly included in the OSDD when used in an URL template.
- 5 – The OSDD contains at least one URL element with type attribute set to “application/atom+xml”.
- 6 – If parameters in the request template attribute of a URL element appear with the Geo or Time extension namespace, then they are listed in Table 3 of [OGC 10-032r8]. No other parameters shall use these namespaces in the URL element template.

- 7 – the XML representation of the OSDD is valid according to osdd.rnc in Annex B.3 of [OGC 10-032r8].

5.4.1.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-DD-100

5.4.2 Test Case TC-GTX-RD-100 – Response Document

5.4.2.1 Inputs specification

- Atom response documents returned by the Collection Catalog, possibly with additional constraints as defined in the verification step.
- Atom response documents returned by the Granule Catalogs, possibly with additional constraints as defined in the verification step.

5.4.2.2 Outputs specification

None.

5.4.2.3 Test pass-fail criteria

This test verifies that

- 1 – the response is a valid Atom feed document according to rfc4287.rnc in Annex B.1 of [OGC 10-032r8].
- 2 – the response is a valid Atom document according to osatom.rnc in Annex B.2 of [OGC 10-032r8].
- 3 – the response is a valid Atom document according to atomgeo.rnc in Annex B.8 of [OGC 10-032r8].
- 4 – the response is a valid Atom document according to atomtime.rnc in Annex B.11 of [OGC 10-032r8].
- 5 – the optional element os:Query[6] (role=”request”) and optional atom:link (rel=”self”) if present, refer to the original search request and thus a valid Response Document.
- 6 – the optional elements os:Query (with role not equal to ”request”) refer to a valid Response Document.

[6] Is optional in Table 6, but mandatory on page 19 of [OGC 10-032r8].

- 7 – the response contains the mandatory elements at feed level as defined in table 6 of [OGC 10-032r8] including totalResults, startIndex and itemsPerPage[7].

5.4.2.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-RD-100

5.4.3 Test Case TC-GTX-RE-100 – Response Exceptions

5.4.3.1 Inputs specification

- Catalog search requests expected to generate specific exceptions responses as defined in each verification step.

5.4.3.2 Outputs specification

None.

5.4.3.3 Test pass-fail criteria

This test verifies that

- 1 – Verify that search requests corresponding to client-side errors return an exception code as defined in the “Error Handling” section page 19 of [OGC 10-032r8].
- 2 – Verify that search requests corresponding to server-side errors return an exception code as defined in the “Error Handling” section page 20 of [OGC 10-032r8].
- 3 – Verify that invalid bounding box requests to the server return a response as described in OGC 10-032r8 (See Annex A3 of [OGC 10-032r8].).

5.4.3.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- None.

[7] Unfortunately; the Relax NG schemas from [OGC 10-032r8] used in steps 1 and 2 of this test case do not enforce the presence of some of these mandatory fields but allow them to be optional.

5.4.4 Test Case TC-GTX-SP-100 – Search Parameters

5.4.4.1 Inputs specification

- Catalog search requests required to generate specific nominal responses as defined in each verification step.

5.4.4.2 Outputs specification

None.

5.4.4.3 Test pass-fail criteria

This test verifies that

- 1 – Verify that the OSDD advertises the geo:box parameter (See Annex A3[8] of [OGC 10-032r8]).
- 2 – Submit a series of valid bounding box requests to the server and verify that the server responds as described in OGC 10-032r8 (See Annex A3 of [OGC 10-032r8].).
- 3 – Verify that the results obtained satisfy the “intersects” spatial operator (default) (See Annex A6 of [OGC 10-032r8]).
- 4 – Submit a series of collection search requests that retrieve records using the records identifier (geo:uid). Verify that the id of the record in the response corresponds to the requested id (See Annex A8 of [OGC 10-032r8]).
- 5 – Submit a series of granule search requests that retrieve records using the records identifier (geo:uid). Verify that the id of the record in the response corresponds to the requested id (See Annex A8 of [OGC 10-032r8]).
- 6 – Submit a series of collection search requests that retrieve records using the time:start and time:end parameters. Verify that the temporal property of the records in the response intersects with the specified start and end time (See Annex A10 of [OGC 10-032r8]).
- 7 – Submit a series of granule search requests that retrieve records using the time:start and time:end parameters. Verify that the temporal property of the records in the response intersects with the specified start and end time (See Annex A10 of [OGC 10-032r8]).

5.4.4.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- None.

[8] Annex A of [OGC 10-032r8] contains the Abstract Test Suite (ATS) for this specification.

5.5 Test Group TD-EOX – OGC Earth Observation Extension

5.5.1 Test Case TC-EOX-DD-100 – Description Document

5.5.1.1 Inputs specification

- Collection Catalog Description Document.
- Granule Catalog Description Documents.

5.5.1.2 Outputs specification

None.

5.5.1.3 Test pass-fail criteria

This test verifies that

- 1 – the OSDD is accessible via HTTP (See Annex A.1.1[9] of [OGC 13-026r8]).
- 2 – the XML representation of the OSDD is valid according to B.6 (including B.3, B.4 and B.7) of [OGC 13-026r8] (See Annex A.1.1 of [OGC 13-026r8]).
- 3 – eo namespaceis correctly included in the OSDD when used in an URL template (See Annex A.1.3 of [OGC 13-026r8]).
- 4 – The OSDD contains at least one URL element with type attribute set to “application/atom+xml” (See Annex A.1.2 of [OGC 13-026r8]).
- 5 – If parameters in the request template attribute of a URL element appear with the EO extension namespace, then they are listed in Annex B7 of [OGC 10-032r8]. No other parameters shall use these namespaces in the URL element template (See Annex A.1.6 of [OGC 13-026r8]).
- 6 – Verify that the URL elements contain at least one parameter from the EO extension (See Annex A.1.6 of [OGC 13-026r8]).
- 7 – Verify that the OSDD contains at least one URL element with the type attribute set to “application/atom+xml” corresponding to an HTTP GET request (See Annex A.1.5 of [OGC 13-026r8]).

5.5.1.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-DD-100
- TC-GTX-DD-100

[9] Annex A of [OGC 13-026r8] contains the Abstract Test Suite (ATS) for this specification.

5.5.2 Test Case TC-EOX-RD-100 – Response Document

5.5.2.1 Inputs specification

- Atom response documents returned by the Collection Catalog, possibly with additional constraints as defined in the verification step.
- Atom response documents returned by the Granule Catalogs, possibly with additional constraints as defined in the verification step.

5.5.2.2 Outputs specification

None.

5.5.2.3 Test pass-fail criteria

This test verifies that

- 1 – the response is a valid Atom feed document according to rfc4287.rnc in Annex B.1 of [OGC 13-026r8] (A.1.4).
- 2 – the response is a valid Atom document according to osatom.rnc in Annex B.2 of [OGC 13-026r8] (A.1.4).
- 3 – the response is a valid Atom document according to atomeo.rnc in Annex B.8 of [OGC 13-026r8] (A.1.4).

5.5.2.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- TC-OS-RD-100
- TC-GTX-RD-100

5.5.3 Test Case TC-EOX-RE-100 – Response Exceptions

5.5.3.1 Inputs specification

- Catalog search requests expected to generate specific exceptions responses as defined in each verification step.

5.5.3.2 Outputs specification

None.

5.5.3.3 Test pass-fail criteria

This test verifies that

- 1 – Verify that search requests corresponding to client-side errors return an exception code as defined in the “Error Handling” section 8.2.6 of [OGC 13-026r8].
- 2 – Verify that search requests corresponding to server-side errors return an exception code as defined in the “Error Handling” section 8.2.6 of [OGC 13-026r8].

5.5.3.4 Interfaces dependencies

The following test cases have to be successfully executed before this test case:

- None.

6 Conformance Test Analysis, Inspection, Review of design

6.1 Verification methods

This chapter reports the steps to be performed to verify the requirements which verification method is not Test.

There are e.g. requirements which cannot be completely tested as the intention of the implementers cannot be known:

- CEOS-BP-005C, CEOS-BP-005D. Servers not advertising these search parameters may not have the need to search by satellite name or identify client applications performing requests in which case they are compliant. On the other hand, servers may use a different name for the search parameter (e.g. {xyz:satellite} instead of {eo:platform}), in which case they are non-compliant. The absence of the search parameter in the URL template in the OSDD is thus not sufficient to decide.
- CEOS-BP-015, CEOS-BP-016: Some catalog implementations or catalog entries may not have download URL for granule downloads or have no quicklooks for the granules. It may therefore be normal that a response document does not contain the corresponding information. On the other hand, responses may contain download or quicklook links encoded differently, which would violate the requirement.
- CEOS-BP-016C: it cannot be verified by “test” if an “href” attribute refers to a download or ordering interface and thus matches the ”type” attribute. In both cases, the rel=”enclosure”. The “href” may also require prior authentication. The requirement also does not state explicitly that the link is mandatory and is to be always present in case of Response Documents for granules.

The following table reports the “Non testable” requirements with the descriptions of verification activities to be performed. For each requirement the verification method is defined using the classification from section 3.4.

Requirement	Requirement Title	Requirement Level	Verification Method
CEOS-BP-005C	Search with satellite name	Optional	T,I
CEOS-BP-005D	Client identification	Recommended	T,I
CEOS-BP-009B	Handling unsupported request parameter	Optional	T
CEOS-BP-015	Browse Image	Recommended	T,I
CEOS-BP-016	Data access	Recommended	T,I
CEOS-BP-016C	Data access for data download and order	Optional	I

Table 4 – Non testable requirements

Annex A: TRACEABILITY TABLES

A.1. CEOS Best Practice to Test Cases

Requirement	Requirement Title	Requirement Level	Verification Method	Test Cases (step)
CEOS-BP-001	Support of two step search	Recommended	T	TC-CBP-RDC-100 (1)
CEOS-BP-002	Support of OpenSearch Parameter Extension (Draft 2)	Recommended	T	TC-CBP-DD-100 (2, 3)
CEOS-BP-002B	Free text parameters	Recommended	T	TC-CBP-DDC-100 (2)
CEOS-BP-002C	Advertising supported geometry types	Requirement	T	TC-CBP-DD-100 (4)
CEOS-BP-003	rel attribute of the URL in OSDD	Recommended	T	TC-CBP-DDC-100 (1) TC-CBP-DDG-100 (1)
CEOS-BP-003B	Query element in OSDD	Recommended	T	TC-CBP-DDC-100 (3, 4) TC-CBP-DDG-100 (2, 3)
CEOS-BP-004	CEOS OpenSearch Best Practice identifier	Recommended	T	TC-CBP-DD-100 (5)
CEOS-BP-004B	indexOffset/pageOffset attribute of the URL in OSDD [Recommended]	Recommended	T	TC-CBP-DD-100 (6)
CEOS-BP-005	Supported search parameters	Requirement	T	TC-CBP-DDC-100 (5) TC-CBP-DDG-100 (4) TC-CBP-SP-100 (1)
CEOS-BP-005B	Search with count=0	Optional	T	TC-CBP-RD-100 (1)
CEOS-BP-005C	Search with satellite name	Optional	T, I	TC-CBP-DDC-100 (6)
CEOS-BP-005D	Client identification	Recommended	T, I	TC-CBP-DDC-100 (7, 8)
CEOS-BP-005E	Preserving URL template parameters	Requirement		N/A (Client requirement)
CEOS-BP-005F	Optional template parameters	Requirement	T	TC-CBP-SP-100 (1)
CEOS-BP-006	Multi-words for searchTerms	Recommended	T	TC-CBP-SPC-100 (1)
CEOS-BP-007	Use of startIndex over startPage	Recommended	T	TC-CBP-SP-100 (2)
CEOS-BP-008	Search with geo:name	Recommended	T	TC-CBP-DD-100 (7, 8) TC-CBP-SP-100 (3)
CEOS-BP-009	Output encoding format in search URL	Optional	T	TC-CBP-DD-100 (10)
CEOS-BP-009B	Handling unsupported request parameter	Optional	T	TC-CBP-SP-100 (4)
CEOS-BP-010	Output encoding format support (atom)	Requirement	T	TC-CBP-DD-100 (9)

CEOS-BP-011	Support of dc:identifier in search response to allow for search-by-ID	Requirement	T	TC-CBP-RD-100 (2)
CEOS-BP-011B	Result set navigation	Recommended	T	TC-CBP-RD-100 (3)
CEOS-BP-012	Metadata representation in search response	Recommended	T	TC-CBP-RD-100 (4, 5)
CEOS-BP-012B	Provenance information	Optional	T	TC-CBP-RD-100 (6)
CEOS-BP-012C	Reference to documentation	Recommended	T	TC-CBP-RD-100 (7)
CEOS-BP-012D	Relation attribute values	Recommended	T	TC-CBP-RD-100 (8)
CEOS-BP-012E	Link type attribute	Recommended	T	TC-CBP-RD-100 (9)
CEOS-BP-013	atom:summary	Recommended	T	TC-CBP-RD-100 (10)
CEOS-BP-013B	Dublin Core date	Recommended	T	TC-CBP-RD-100 (11)
CEOS-BP-014	GeoRSS	Recommended	T	TC-CBP-RD-100 (12,13,14,15)
CEOS-BP-014B	GeoRSS multi-polygon footprint	Recommended	T	TC-CBP-RD-100 (13)
CEOS-BP-014C	GeoRSS multi-point footprint	Recommended	T	TC-CBP-RD-100 (14)
CEOS-BP-014D	GeoRSS multi-line footprint	Recommended	T	TC-CBP-RD-100 (15)
CEOS-BP-014E	Minimum-bounding rectangle	Optional	T	TC-CBP-RDG-100 (1)
CEOS-BP-015	Browse Image	Recommended	T, I	TC-CBP-RDG-100 (2)
CEOS-BP-015B	Multiple browse images	Optional	T	TC-CBP-RDG-100 (3)
CEOS-BP-016	Data access	Recommended	T, I	TC-CBP-RDG-100 (4, 5)
CEOS-BP-016B	Data access to multiple files	Optional	T	TC-CBP-RDG-100 (5)
CEOS-BP-016C	Data access for data download and order	Optional	I	
CEOS-BP-017	Exception codes	Recommended	T	TC-CBP-RE-100

Table 5 – Traceability versus CEOS Best Practice [CEOS-OS-BP]

A.2. OGC 10-032r8 Abstract Test Suite to Test Cases

This section shows the mapping between the ATS test cases defined in Annex A of [OGC 10-032r8] and the test cases defined in the current document. Optional requirements are not considered unless they are made mandatory in [CEOS-OS-BP].

ATS	**Comments / Obligation**	**Verification Method**	**Test Cases (step)**
A1 – OSDD	Mandatory	T	TC-GTX-DD-100 (1, 2, 3, 4, 6, 7)
A2 – Atom response type	Mandatory	T	TC-GTX-DD-100 (5) TC-GTX-RD-100 (1, 2, 3, 4)

A3 – Bounding Box search	Mandatory	T	TC-GTX-SP-100 (1, 2) TC-GTX-RE-100 (3)
A4 – Arbitrary geometry search	Optional		
A5 – Point and radius search	Optional		
A6 – Min spatial operator	Mandatory	T	TC-GTX-SP-100 (3)
A7 – Spatial operators	Optional		
A8 – Get record by id	Optional[10]	T	TC-GTX-SP-100 (4, 5)
A9 – Search by name	Optional		
A10 – Temporal search	Optional[10]	T	TC-GTX-SP-100 (6, 7)
A11 – Temporal search relation	Optional		

Table 6 – Traceability versus [OGC 10-032r8]

A.3. OGC 13-026r8 Abstract Test Suite to Test Cases

This section shows the mapping between the ATS test cases defined in Annex A of [OGC 13-026r8]] and the test cases defined in the current document. Optional requirements are not considered unless they are made mandatory in [CEOS-OS-BP].

ATS	Comments/ Obligation	Verification Method	Test case
A.1.1 – OSDD	Mandatory	T	TC-EOX-DD-100 (1, 2)
A.1.2 – Atom response type	Mandatory	T	TC-EOX-DD-100 (4)
A.1.3 – Namespaces	Mandatory	T	TC-EOX-DD-100 (3)
A.1.4 – Atom response	Mandatory	T	TC-EOX-RD-100 (1, 2, 3)
A.1.5 – KVP Get	Mandatory	T	TC-EOX-DD-100 (7)
A.1.6 – Parameters	Mandatory	T	TC-EOX-DD-100 (5, 6)
A.2.1 – EarthObservation Foreign Element	Optional		
A.3.1 – Suggestions	Optional		
A.3.2 – Suggestions Range	Optional		
A.4.1 – INSPIRE	Optional		

Table 7 – Traceability versus [OGC 13-026r8]

[10] Mandatory according to CEOS-BP-005.

A.4. CWICSmart Validation Test Cases to Test Cases

The current section shows the mapping between the tests implemented by NASA in the OpenSearch-UI (former CwicSmart) On-line Validation tool[11] versus the test cases in the current document. This section may be removed in the final version of the document.

CWICSmart Test Case		Test Case
HTTP Validity		
	#1 OSDD accessible	TC-OS-DD-100 (1) TC-GTX-DD-100 (1) TC-EOX-DD-100 (1)
OpenSearch Version 1.1 Draft 5		
	#1 Description	TC-OS-DD-100 (3)
	#2 Short name	TC-OS-DD-100 (3)
	#3 URL of type Atom	TC-GTX-DD-100 (5)
	#4 Wellformed XML	TC-OS-DD-100 (2)
	#5 Result metrics[12]	TC-GTX-RD-100 (7)
	#7 OpenSearch Description[13]	TC-OS-DD-100 (3, 4)
	#8 Response has search Query[14]	TC-GTX-RD-100 (5) considered as mandatory although specifications state it to be optional.
	#9 URL template syntax	TC-OS-DD-100 (7)
	#10 Query example	TC-CBP-DDC-100 (3) TC-CBP-DDG-100 (2)
	#11 Response schema compliance	TC-OS-RD-100 (1, 2)
OpenSearch Geo Version 1.0 Draft 2		
	#1 Geo bounding box parameter is allowed	TC-GTX-SP-100 (1)
	#2 Geo uid parameter is allowed	TC-GTX-SP-100 (4, 5)
	#3 Geo namespace is present	TC-GTX-DD-100 (4)

[11] https://opensearch-ui.earthdata.nasa.gov/validations/index (Last accessed 2018/04/10).
[12] This test refers to the presence of 'totalResults', 'startIndex' and 'itemsPer Page'
[13] The test refers to whether or not the OSDD contains a prefix:OpenSearchDescription element where the prefix is mapped to http://a9.com/-/spec/opensearch/1.1/
[14] Test refers to 'Does the OpenSearch response to the OSDD sample search query contain the query? It checks the presence of os:Query element with role="request" Inconsistent in OGC 10-032r8 (mentioned as optional in table and mandatory in text).

	#4 Georss bounding box extent[15]	Georss elements are optional in tables 6 and 7 of [OGC 10-032r8]. TC-GTX-RD-100 (3) TC-CBP-RDG-100 (1)
OpenSearch Time Version 1.0 Draft 1		
	#1 Time end parameter	TC-GTX-SP-100 (6, 7)
	#2 Time namespace is present	TC-GTX-DD-100 (4)
	#3 Time start parameter	TC-GTX-SP-100 (6, 7)
OpenSearch Parameter Extension Version 1.0 Draft 1		
	#1 Parameter attributes	
	#2 Url method	
	#3 Url enctype	
	#4 Param namespace	
ESIP OpenSearch Best Practices		
	#1	
	#2	
	#3	
	#4	
	#5	
	#6	
	#7	
	#8	
	#9	
OGC OpenSearch Geo and Time Extensions		
	#1 OSDD OGC OpenSearch time compliance	TC-GTX-DD-100 (2)
	#2 Response OGC atom feed compliance	TC-GTX-RD-100 (1)
	#3 Response OGC atom OpenSearch compliance	TC-GTX-RD-100 (2)

[15] Make sure that if an entry has a spatial extent than it is a valid (in terms of coordinates and geometry) georss entry of some kind. If it doesn't, report this but do not fail the validation.

	#4 Response OGC atom geo compliance	TC-GTX-RD-100 (3)
	#5 Response OGC atom time compliance	TC-GTX-RD-100 (4)
	#6 OSDD OGC OpenSearch geo compliance	TC-GTX-DD-100 (3)
	#7 OSDD OGC OpenSearch base compliance	TC-GTX-DD-100 (7) TC-OS-DD-100 (2) TC-OS-DD-100 (3)
CEOS OpenSearch Best Practices Version 1.2		
	#1 – CEOS-BP-003	See section A.1.
	#2 – CEOS-BP-016	See section A.1.
	#3 – CEOS-BP-014E	See section A.1.
	#4 – CEOS-BP-005F	See section A.1.
	#5 – CEOS-BP-012B - relationship attribute values in result	See section A.1.
	#6 – CEOS-BP-004	See section A.1.
	#7 – CEOS-BP-013	See section A.1.
	#8 – CEOS-BP-015	See section A.1.
	#9 – provenance info in result	See section A.1.
	#10 – CEOS-BP-014	See section A.1.
	#11 – CEOS-BP-012E - Link media type in result	See section A.1.
	#12 – CEOS-BP-003B	See section A.1.
	#13 – CEOS-BP-007	See section A.1.
	#14 - CEOS-BP-004B	See section A.1.
	#15 – CEOS-BP-002	See section A.1.
	#16 – CEOS-BP-013B	See section A.1.
	#17 – CEOS-BP-005	See section A.1.
	#18 – CEOS-BP-001	See section A.1.
	#19 – CEOS-BP-009B	See section A.1.
	#20 – CEOS-BP-012	See section A.1.
	#21 – CEOS-BP-011	See section A.1.

	#22 – CEOS-BP-008	See section A.1.
	#23 – CEOS-BP-002B	See section A.1.
	#24 – CEOS-BP-002C	See section A.1.
	#25 – CEOS-BP-010	See section A.1.
	#26 – CEOS-BP-012C	See section A.1.
	#27 - CEOS-BP-005C	See section A.1.
	#28 - CEOS-BP-005D	See section A.1.
	#29 - CEOS-BP-011B	See section A.1.
	#30 - CEOS-BP-009	See section A.1.
OGC OpenSearch Extension for Earth Observation Version 13-026r6		
	#1 OSDD OGC EOX extension compliance	TC-EOX-DD-100 (2)
	#2 OSDD EOX base compliance	TC-EOX-DD-100 (2)
	#3 Response OGC EOX extension compliance	TC-EOX-RD-100 (3)

Table 8 – Traceability versus CWICSmart Validation Test Cases