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OGC® OpenSearch Geo and Time Extensions

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i. Preface

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ii. Document terms and definitions

This document uses the standard terms defined in Subclause 5.3 of [OGC 06-121], 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.

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Foreword

This document is the specification for the OpenSearch Geo and Time extensions.

This standard is intended to provide a very simple way to make spatial and temporal queries to a repository of geospatial content that contains geographic and temporal properties and to allow simple syndication of repositories.

The use cases at OpenSearch.org deal primarily with full-text search across textual data, but the protocol is equally applicable to simple searches across collections of structured data – particularly data with a geospatial component.

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Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

Introduction

The OpenSearch specification originated in a community effort built around Amazon's A9.com. It was intended to allow syndication of search results that could then be aggregated by one large index. The OpenSearch specification is made available under the Creative Commons Attribution-Sharealike 2.5 license. In addition, the OASIS Search Web Services group published an Abstract Protocol Definition of the interface or “binding”, which coincides with the community specification published at <http://opensearch.org>. In 2007, the geo and time extensions were proposed through OpenSearch.org.

This document codifies those extensions in a form compatible with the OGC standards baseline and incorporates feedback from developers in the open source geospatial community. This document includes several annexes showing result sets in several possible formats and giving details that reflect a sample implementation.

1 Scope

This OGC standard specifies the Geo and Time extensions to the OpenSearch query protocol. OpenSearch is a collection of simple formats for the sharing of search results.

The OpenSearch description document format can be used to describe a search engine so that it can be used by search client applications. The OpenSearch description format allows the use of extensions that allow search engines to request a specific and contextual query parameter from search clients.

The OpenSearch response elements can be used to extend existing syndication formats, such as RSS and Atom, with the extra metadata needed to return search results.

Services that support the OpenSearch Specification, the Geo and Time extensions defined in this document are called OpenSearch GeoTemporal Services.

2 Compliance

Conformance with this standard shall be checked using all the relevant tests specified in Annex A (normative) of this document. Annex B presents the different RELAX-NG schemas for the OpenSearch Description and the Atom Response Documents. The framework, concepts, and methodology for testing, and the criteria to be achieved to claim conformance are specified in the OGC Compliance Testing Policies and Procedures and the OGC Compliance Testing web site¹.

In order to conform to this OGC[®] interface standard, a software implementation shall conform to the Core Conformance Class specified in the Table 1.

All requirements-classes and conformance-classes described in this document are owned by the specification identified as <http://www.opengis.net/spec/opensearchgeo/1.0>.

The following table describes the conformance classes defined in this standard:

¹ www.opengeospatial.org/cite

² <http://spatialreference.org/ref/epsg/4326/>

³ The gml:id supports provision of a handle for the XML element representing a GML Object. Its use is mandatory for all GML objects. It is of XML type ID, so is constrained to be unique in the XML document within which it occurs.

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Table 1 – Conformance Classes

Conformance Class Name	Description	Test
Core (GeoSpatial Service)	The server generates a valid OpenSearch description document. http://www.opengis.net/spec/opensearchgeo/1.0/conf/osd	A.1
	The server defines an URL template for the Atom response type. http://www.opengis.net/spec/opensearchgeo/1.0/conf/atom	A.2
	The server implements a bounding box search. http://www.opengis.net/spec/opensearchgeo/1.0/conf/box	A.3
Arbitrary Geometry Search	The server implements a spatial search capability using an arbitrary geometry. http://www.opengis.net/spec/opensearchgeo/1.0/conf/searchbygeometry	A.4
Point and Radius Search	The server implements a spatial search using a point and a radius. http://www.opengis.net/spec/opensearchgeo/1.0/conf/searchbypointradius	A.5
Minimum spatial operator	The server implements the “intersects” spatial operator. http://www.opengis.net/spec/opensearchgeo/1.0/conf/intersects	A.6
Spatial relations	The server implements the spatial relations. http://www.opengis.net/spec/opensearchgeo/1.0/conf/spatialrelations	A.7
Get record by id.	The server can retrieve a record from its repository using the id of the record. http://www.opengis.net/spec/opensearchgeo/1.0/conf/searchbyid	A.8
Search by name	The server implements a spatial search using the name or address of a location. http://www.opengis.net/spec/opensearchgeo/1.0/conf/searchbyname	A.9
Temporal search core	The server implements a temporal search capability. http://www.opengis.net/spec/opensearchgeo/1.0/conf/searchbytime	A.10
Temporal search relation	The server implements a temporal search capability able to define temporal relations http://www.opengis.net/spec/opensearchgeo/1.0/conf/timerelations	A.11

3 Normative 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.

Atom - The Atom Syndication Format (IETF RFC4287), M. Nottingham, R. Sayre, <http://tools.ietf.org/html/rfc4287>

OASIS OpenSearch - *searchRetrieve: Part 4. APD Binding for OpenSearch Version 1.0*, OASIS Standard, 30 January 2013, <http://docs.oasis-open.org/search-ws/searchRetrieve/v1.0/os/part4-opensearch/searchRetrieve-v1.0-os-part4-opensearch.html>

OGC 06-050 - Open Geospatial Consortium: An Introduction to GeoRSS

OGC 06-121 - OWS Common Implementation Specification

OGC 06-103r4 - OpenGIS® Implementation Standard for Geographic information - Simple feature access - Part 1: Common architecture

RFC 3339 - *Date and Time on the Internet: Timestamps*. Internet profile of the ISO 8601 standard for representation of dates and times using the Gregorian calendar. <http://www.ietf.org/rfc/rfc3339.txt>

RFC 5646 - Tags for Identifying Languages - <http://tools.ietf.org/html/rfc5646>

RFC 5988 - *Web Linking* - <http://tools.ietf.org/html/rfc5988>
<http://www.iana.org/assignments/link-relations/link-relations.xhtml>

3.1 Other References

HMA - Heterogeneous Missions Accessibility – Design Methodology, Architecture and Use of Geospatial Standards for the Ground Segment Support of Earth Observation missions ESA TM-21 http://www.esa.int/About_Us/ESA_Publications/ESA_TM-21_Heterogeneous_Missions_Accessibility

OpenSearch Geo Extension - http://www.opensearch.org/Specifications/OpenSearch/Extensions/Geo/1.0/Draft_2

OpenSearch Parameter Extension - http://www.opensearch.org/Specifications/OpenSearch/Extensions/Parameter/1.0/Draft_2

OpenSearch Time Extension - http://www.opensearch.org/Specifications/OpenSearch/Extensions/Time/1.0/Draft_1

4 Terms and definitions

For the purposes of this standard, the definitions specified in Clause 4 of the OWS Common Implementation Specification [OGC 06-121] shall apply. In addition, the following terms and definitions apply.

4.1

OpenSearch

Draft specification for web search syndication, originating from Amazon's A9 project and given a corresponding interface binding by the OASIS Search Web Services working group.

4.2

OpenSearch Geospatial Service

Defines services that comply with the OpenSearch Specification and the Geo extension defined in this document

4.3

OpenSearch GeoTemporal Service

Defines services that comply with the OpenSearch Specification, the Geo and Time extensions defined in this document

4.4

OpenSearch Description Document

An XML document available at a consistent location describing metadata for the service and providing templates for queries.

4.5

Search feed

The response document of search service request containing zero or several entries.

4.6

Entry

An element of the search response representing a catalogued resource.

5 Conventions

5.1 Abbreviated terms

Some of the abbreviated terms listed in Subclause 5.1 of the OWS Common Implementation Specification [OGC 06-121] apply to this document, plus the following abbreviated terms.

EC	European Commission
ESA	European Space Agency
GeoRSS	Geospatial Extensions to Rich Site Syndication

HMA	Heterogeneous Missions Accessibility
OASIS	Advancing Open Standards for the Information Society
RSS	Rich Site Summary
SWS	Search Web Services
WKT	Well Known Text

5.2 Namespace prefix conventions

Table 2 lists the namespaces used in this document and the specifications in which they are defined. The prefixes are **not** normative and are merely chosen for convenience; they may appear in examples without being formally declared, and have no semantic significance. The namespaces to which the prefixes correspond are normative, however.

Table 2 — Namespace mappings

Prefix	Namespace URI	Specification
atom	http://www.w3.org/2005/Atom	The Atom Syndication Format Common 1.0 – RFC-4287
dc	http://purl.org/dc/elements/1.1/	Namespace Policy for the DCMI ^a
geo	http://a9.com/-/opensearch/extensions/geo/1.0/	OpenSearch Geo Extension
georss	http://www.georss.org/georss	GeoRSS Specification
gml	http://www.opengis.net/gml	OGC GML 3.1.1
os	http://a9.com/-/spec/opensearch/1.1/	OpenSearch 1.1 Specification
time	http://a9.com/-/opensearch/extensions/time/1.0/	OpenSearch Time Extension
^a See < http://dublincore.org/documents/dcmi-namespace/ >.		

6 OpenSearch Geo and Time Extensions overview

As the OpenSearch specification is defined in the OASIS SWS bindings [OASIS OpenSearch], we confine ourselves here to the OpenSearch Geo and Time extensions. A short overview of how they fit within the primary OpenSearch specification is provided.

The basic concept of OpenSearch is to specify how to query a web resource, and additional metadata to support syndicating the results. Search clients can use OpenSearch description documents to learn about the public interface of a search engine. These description documents contain parameterized URL templates that indicate how the search client should make search requests. Search engines can use the OpenSearch response elements to add search metadata to results in a variety of content formats. For example, if a web site allows search by the URL:

<http://www.example.com?q=question>

OpenSearch provides a way to define where that search term goes. Essentially it would look like: `http://www.example.com?q={searchTerms}`, where `{searchTerms}` would be replaced by any general string. Using OpenSearch, aggregators and applications have a way to simply define a search service and let a user just type in their terms, but then search N search engines. For example, the *Firefox* search bar is powered by OpenSearch and allows the user to add new OpenSearch compliant site.

The Description element provides some basic metadata about the contents of the service and the contact information pertaining to it, along with a set of URL Templates which illustrate the parameters accepted by the service and the variety of output formats in which results can be obtained. The OpenSearch request interface is simple, consisting of a description of a HTTP GET request with a series of optional key-value parameters that can be used to constrain the search.

The Geo and Time Extensions specify a series of parameters that can be used to geographically constrain search results. These are discussed in more detail in Section 9. In short, provision is made to filter results by:

- a) A bounding box
- b) An arbitrary geometry defined using Well Known Text
- c) Within a certain radius from a given latitude-longitude point
- d) Having a certain containment relation (intersects, contains, disjoint) with a geographic constraint
- e) Matching a geographic name
- f) Matching a given unique identifier in the context of the repository
- g) A start and end of a temporal extent
- h) Having a certain temporal relation (intersects, contains, during, disjoint, equals) with a temporal constraint

All geographic information is assumed to be expressed using the EPSG 4326 (WGS84 2d)² coordinate reference system (CRS), and any output listing the extents of the original query or containing further geographic information about the search results, will similarly be expressed in EPSG 4326. There is precedent for this in related OGC “Mass Market” standards, specifically GeoRSS [OGC 06-050] as well as many other standards that encode location.

A sample of a Description showing the use of Geo Extension with several output formats appropriate for geographic search results can be seen in Annex C.

² <http://spatialreference.org/ref/epsg/4326/>

7 Shared aspect

Not applicable

8 OpenSearch Description (Requirement)

8.1 Introduction

The OpenSearch Description Document allows clients to retrieve service metadata from a server. The response to a request for a Description shall be an XML document in the form specified by the SWS OpenSearch bindings published by OASIS. A brief summary of the Description's requirements is offered here.

The service metadata covered by the OpenSearch Description corresponds to the service metadata returned by e.g. a WMS GetCapabilities request. The request is not parameterised, but simply takes the form of an HTTP GET request to a URL (advertised on a web page or obtained from a repository of OpenSearch services which offer syndication of their result sets).

The OpenSearch Description Document contains information on the maintainer of the service and their contact information. It includes a brief title and short abstract describing the contents of the service, along with a list of keywords and optionally a list of languages in which the contents may be returned.

The key feature of the Description document is the URL template, which instructs a client application how to create queries to the service. The URL template represents a parameterized form of the URL by which a search engine is queried. Each response format supported by the service needs its own distinct URL template included in the Description differentiated by a type parameter that identifies the MIME type of response.

The search client must replace every instance of a template parameter with a value before the search request is performed. A parameter name consists of an optional parameter name prefix followed by the local parameter name. If the parameter name prefix is present then it will be separated from the local parameter name with the ":" character. All parameter names are associated with a parameter namespace. In the case of unqualified parameter names, the local parameter name is implicitly associated with the OpenSearch 1.1 namespace. In the case of fully qualified parameter names, the local parameter name is explicitly associated with an external namespace via the parameter name prefix. A service can extend the basic parameters included in the template.

EXAMPLE 1 The following XML document provides a sample response to a request for an OpenSearch Description from a repository supporting the Geo Extension. Note that the response type is given in the type attribute and not implicitly on the URL path and the parameter names are not necessarily equal in all access points.

```
<?xml version="1.0" encoding="UTF-8"?>
<OpenSearchDescription xmlns="http://a9.com/-/spec/opensearch/1.1/"
  xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/">
  <ShortName>Web Search</ShortName>
  <Description>Use Example.com to search the Web.</Description>
  <Tags>example web</Tags>
  <Contact>admin@example.com</Contact>
```

```

    <Url type="application/atom+xml" template="http://example.com/myatom/?q=
{searchTerms}&pw={startPage?}&box={geo:box?}" />
    <Url type="application/rdf+xml" template="http://example.com/myrdf/?q=
{searchTerms}&pp={startPage?}&bbx={geo:box?}" />
    <Url type="application/json" template="http://example.com/geojson/?
q={searchTerms}&page={startPage?}&b={geo:box?}" />
    <Url type="text/html" template="http://example.com/?q={searchTerms}
&bbox={geo:box?}&pw={startPage?}" />
    <LongName>Example.com Web Search</LongName>
    <Query role="example" searchTerms="cat" geo:box="121,12,1,-23"/>
    <Attribution>Copyright 2005, Example.com, Inc.</Attribution>
    <SyndicationRight>open</SyndicationRight>
</OpenSearchDescription>

```

EXAMPLE 2 The following XML document describes an OGC CSW service using the OpenSearch templates and geo extension.

```

<?xml version="1.0" encoding="UTF-8"?>
<OpenSearchDescription xmlns="http://a9.com/-/spec/opensearch/1.1/"
xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/">
<ShortName>CubeWerx</ShortName>
<Description>CubeWerx CSW </Description>
<Url type="application/atom+xml"
xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/"
template="http://www.cubewerx.com/wrs.cgi?service=CSW&version=2.0.2&req
uest=GetRecords&typeNames=csw:Record&outputFormat=RSS&
resultType=hits&startPosition={startIndex?}&maxRecords={count?}&bbo
x={geo:box?}&crs=urn:ogc:def:crs:EPSG::4326&anyText={searchTerms?}"/>
<!-- ... -->
</OpenSearchDescription>

```

For detail on the required and optional fields on the OpenSearch Description document please refer to the OpenSearch specification [OASIS OpenSearch].

9 OpenSearch Geo and Time Extensions

9.1 Introduction

OpenSearch Geo and Time Extensions are designed to provide a basic geographical and temporal search facility to the OpenSearch protocol. Two namespace are provided for use in URL templates that form part of the OpenSearch Description Document (see Annex C for an example), published by the server in XML at a stable URL.

Requirements Class	
http://www.opengis.net/spec/opensearchgeo/1.0/req/	
Requirement	http://www.opengis.net/spec/opensearchgeo/1.0/req/osd
	The server generates a valid OpenSearch description document
Requirement	http://www.opengis.net/spec/opensearchgeo/1.0/req/namespaces
	These namespaces and a corresponding namespace prefix shall be included when the extensions are used in an OpenSearch Description document or any other XML document:
	<ul style="list-style-type: none"> <input type="checkbox"/> http://a9.com/-/opensearch/extensions/geo/1.0/ <input type="checkbox"/> http://a9.com/-/opensearch/extensions/time/1.0/

Requirement	http://www.opengis.net/spec/opensearchgeo/1.0/req/atom The server shall provide an access point returning document complying with the rules specified in IETF [RFC-4287] (Atom 1.0)
Requirement	http://www.opengis.net/spec/opensearchgeo/1.0/req/geobox At a minimal, the server shall implement the capacity to query by geo:box

With the OpenSearch geo extension it is possible to formulate requests to all records found within a spatial area defined as a point-plus-radius, a bounding box, or as a geometry. Together with the Time extension, OpenSearch can specify time start and finish slices for searching data.

The flexibility of the OpenSearch protocol allows one to return lists of search results in any format that a client can be persuaded to understand. A server provides a description document that a client reads to determine how to formulate a search/retrieve request and interpret the response. The OpenSearch Description Document includes a mandatory URL element containing a mandatory request template. Where several request templates are provided, a client may choose the one offering the most useful format (specified by MIME-type defined in the *type* attribute of the element) as shown in Example 1.

9.2 Search operation request

9.2.1 Search request parameters

The following parameters may be submitted as part of a search request.

Table 3 — Parameters in a Search operation request

Names^a	Definition	Data type and values	Multiplicity and use
Geo Extension (http://a9.com/-/opensearch/extensions/geo/1.0/)			
Box	Geographic bounding box	The box is defined by "west, south, east, north" coordinates of longitude, latitude, in a EPSG:4326 ^e decimal degrees ^c	One (optional)
geometry	Geographic area (geometry)	The geometry is defined using the Well Known Text and supports the following 2D geographic shapes: POINT, LINESTRING, POLYGON, MULTIPOINT, MULTILINESTRING, MULTIPOLYGON The Geometry shall be expressed using the EPSG:4326 ^e	One (optional)
uid	Local identifier of the record in the repository context	Character String	One (optional)
lat	The latitude of a given point	Latitude in decimal degrees in EPSG:4326 ^e	One (optional)
lon	The longitude of a given point	Longitude in decimal degrees in EPSG:4326 ^e	One (optional)

Names ^a	Definition	Data type and values	Multiplicity and use
radius	A search radius from a lat-lon point	The distance in meters along the Earth's surface.	One (optional)
relation	Spatial relation to result set	Character String; One of “intersects”, “contains”, “disjoint”	One (optional) default is “intersects”
name	A string describing the location (place name) ^d to perform the search	Character String	One (optional)
Temporal Extension (http://a9.com/-/opensearch/extensions/time/1.0/)			
start	A string describing the start of the temporal interval to search (bigger or equal to).	Character String; must match the RFC-3339 ^b .	One (optional)
end	A string describing the end of the temporal interval to search (smaller or equal to).	Character String; must match the RFC-3339 ^b .	One (optional)
relation	A temporal relation to the result set	Character String: One the “intersects”, “contains”, “during”, “disjoint”, “equals”	One (optional) default is “intersects”
<p>^a The name capitalization rules being used here are specified in Sub clause 11.6.2 of [OGC 06-121].</p> <p>^b yyyy-MM-dd[Thh:mm:ss.S[Z +/-ZZ:zz]] where yyyy = Four digit year, MM = Two digit month (01 = January), dd = Two digit day of month (01 = first day), hh = Hour of day (00 – 23), mm = Minute of hour (00 – 59), ss = Second of minute (00 – 59), S = Milliseconds, ZZ = Hours of timezone offset, zz = Minutes of timezone offset</p> <p>^c For values crossing the 180 degrees meridian the west value should be bigger than the east value.</p> <p>^d The search engine can parse and geocode the value or pre-tag the records with a place name</p> <p>^e WGS84 Bounds: -180.00, -90.00, 180.00, 90.00, Projected Bounds: -180.00, -90.00, 180.00, 90.00</p>			

Geospatial Parameters

The *geo:box* parameter is replaced with the bounding box to search for geospatial results within. The box is defined by "west, south, east, north" coordinates of longitude, latitude, in a EPSG:4326 decimal degrees. This is also commonly referred to by minX, minY, maxX, maxY (where longitude is the X-axis, and latitude is the Y-axis), or also SouthWest corner and NorthEast corner. In the situation of a bounding box crossing the 180 degrees meridian it shall use the convention that the west value is bigger than the east value.

The *geo:geometry* parameter **shall** support Well Know Text [WKT] describing the following 2D geometric objects:

- POINT
- LINESTRING
- POLYGON
- MULTIPOINT
- MULTILINESTRING

□ MULTIPOLYGON

Note that the WKT coordinate pairs are in longitude, latitude order. Polygons are a collection of linear rings where the outer ring is expressed in counter-clockwise order. Internal rings have the opposite orientation, appearing as clockwise (OGC 06-103r4).

EXAMPLE 3 Example of geometries in WKT

```
POINT(6 10)
LINESTRING(3 4,10 50,20 25)
POLYGON((1 1,5 1,5 5,1 5,1 1),(2 2,2 3,3 3,3 2,2 2))
MULTIPOINT(3.5 5.6, 4.8 10.5)
MULTILINESTRING((3 4,10 50,20 25),(-5 -8,-10 -8,-15 -4))
MULTIPOLYGON(((1 1,5 1,5 5,1 5,1 1),(2 2,2 3,3 3,3 2,2 2)),((6 3,9
2,9 4,6 3)))
```

EXAMPLE 4 An example URL template supporting the geometry type

```
http://example.com/rss/?q={searchTerms}&g={geo:geometry?}&r={geo:relation}
```

EXAMPLE 5 Spaces must be URL encoded ('%20' or '+')

```
http://example.com/rss/?q=pizza&g=POLYGON((0.582%2040.496%2C%200.231
%2040.737%2C%200.736%2042.869%2C%203.351%2042.386%2C%203.263%2041.81
4%2C%202.164%2041.265%2C%200.978%20%20%2040.957%2C%200.802%2040.781%
2C%200.978%2040.649%2C%200.582%2040.496))&r=disjoint
```

The *geo:relation* parameter defines the spatial relationship of the query value to the result set. For example, a relation equal to “contains” expects results that are fully inside the requested value and not the inverse. The *geo:relation* supports the following values with the respective denotation:

- intersects (default)– true if the entry geometry share any portion of 2D space with the queried value
- disjoint – true if the entry geometry do not share any portion of 2D space with the queried value
- contains – true if no points of the entry geometry lie in the exterior of the queried value, and at least one point of the interior of entry geometry lies in the interior of queried value

The *geo:uid* parameter is used to query resources by their fragment identifier, unique within the search scope only. It can be used to query local identifiers that are not URI including the support of GML identifiers³.

Temporal Parameters

The RFC 3339 was selected for the temporal values because it defines a profile of ISO 8601 commonly used in Internet protocols and standards that excludes durations and partial dates. The more complex formats such as week numbers and ordinal days are also

³ The *gml:id* supports provision of a handle for the XML element representing a GML Object. Its use is mandatory for all GML objects. It is of XML type ID, so is constrained to be unique in the XML document within which it occurs.

not permitted. The start and end temporal parameters search for any item that intersects in any form the temporal range defined by them. The temporal characteristics of the searched items should focus on the actual data contents. When only one of the temporal queryables is present the OpenSearch GeoTemporal Server shall consider that client is requesting all items after or equal to a given start (when the end is missing) and conversely all items before or equal to a given end when the start queryable is not present. According to the RFC-3339 the `time:start` and `time:end` parameters can contain complete date and time (e.g. 2003-01-17T20:03:05) or just the date value (e.g. 2003-01-17). In the case of date value without the time part, the server shall consider the temporal part of the date equal to 00:00:00 for both the start and end parameters. Instantaneous searches (i.e. a search on an exact point in time) can be performed by setting `time:start` and `time:end` to the same exact value.

The `time:relation` supports the following values with the respective denotation:

- intersects (default): time intervals cross in any form
- contains (aka Time Full Coverage): select resources that fully contain the request time interval
- during (aka Time Group Coverage): select resources that are inside the requested time interval
- disjoint (aka Time Not Coverage): select resources that have no intersection with the requested time interval
- equals : select resources that have exactly the same time interval

This specification assigns no significance to the order of appearance of the results. However, when the request uses a temporal operator it recommends the following behaviour:

- default: order by oldest time start to newest
- `time:relation=contains` : order by newest time start to the oldest
- `time:relation=during`: order descending by duration time of the resource (time start - time end)
- `time:relation=disjoint`: order by ascending distance to the requested time

OpenSearch Parameters

The OpenSearch parameter sets are templates from which URLs can be constructed. The search client must replace every instance of a template parameter with a value before the search request is performed. Required template parameters are template parameters that do not contain a template parameter modifier. The search client may use the default value if one is known, but may not use the empty string as a value. Optional template parameters are template parameters that contain a template parameter modifier equal to "?". The search client may use the empty string as a value if no other value is available. Note that for the given key-value pairs, the key can be an arbitrary string, specified by one given instance of an OpenSearch repository. For example, one Description may provide a URL template asking for `box={geo:box}`, another specifying `bbox={geo:box}`.

It is the responsibility of the client application to parse the URL template and create the appropriate keys for each key-value pair.

Clients should take special consideration to the fact that according to the OpenSearch specification the OpenSearch parameters usage is not restricted to the URL query string and can be used as templates values in any of URL components (e.g. path, host).

EXAMPLE 6 An example URL template with OpenSearch parameters on the URL path

```
http://example.com/rss/{startPage}/?q={searchTerms}
```

All parameters of the OpenSearch query **should** be mapped to the appropriate catalogue fields. For example, the generic *searchTerms* parameter can be mapped to a given number of elements. Table 4 maps the Dublin Core and OGC queryable terms to the OpenSearch parameters.

Table 4 — Search operation queryable mappings

Opensearch Parameter	Dublin Core element name	OGC queryable term	Atom Response Element
searchTerms	title description subject	Title AnyText Abstract Subject	atom:title atom:summary atom:category
geo:box geo:geometry geo:lat, geo:lon and geo:radius geo:relation geo:name	coverage	BoundingBox	georss:*
geo:uid	identifier	Identifier	dc:identifier
time:start, time:end and time:relation ^a			dc:date
^a The temporal queryables should be mapped to the intersection of the data content values			

9.2.2 Search request KVP encoding (mandatory)

Requirements Class	
http://www.opengis.net/spec/opensearchgeo/1.0/req/request	
Target type	Token
Requirement	http://www.opengis.net/spec/opensearchgeo/1.0/req/kvpget Servers shall implement HTTP GET transfer of the Search operation request, using KVP encoding.
Requirement	http://www.opengis.net/spec/opensearchgeo/1.0/req/parameters The geo and time OpenSearch Parameters shall be used as specified in Table 3 and Table 5

Table 5 — Search operation request URL Template parameters

OpenSearch Parameter	Optionality and use	Definition and format
geo:box	Mandatory	Rectangular bounding box
geo:geometry	Optional	Geometry in WKT
geo:uid	Optional	The identifier of the resource within the search engine context (local reference).
geo:lat, geo:lon and geo:radius	Optional	Centroid (latitude and longitude) and a search radius
geo:relation	Optional	Spatial relation (possible values are “intersects”, “contains”, “disjoint”). The default is intersects.
geo:name	Optional	Character string with a geographical name to be geocoded
time:start	Optional	Character string with the start of the temporal interval according to RFC-3339.
time:end	Optional	Character string with the end of the temporal interval according to RFC-3339.
time:relation	Optional	Temporal relation (possible values are “intersects”, “contains”, “during”, “disjoint”, “equals”)

EXAMPLE 7 An example Search operation request KVP encoded for HTTP GET is:

```
http://foo.bar/foo?q=coverage&bbox=120,10,134,14
```

9.3 Search operation response

9.3.1 Normal response parameters

The normal response to a valid Search operation request **shall** be in one of several formats that are specified in the OpenSearch Description for a given instance. The mandatory response format is Atom but the server may support other formats.

9.3.2 Normal response XML encoding

The normative response format for an OpenSearch service using either the Geo Extension or Time Extension **shall** be in Atom 1.0. The properties shown in the Atom and OpenSearch namespaces are those mandated by the OpenSearch specification.

The Atom response is made of a *atom:feed* element that may contain several *atom:entry* elements. While latter describes the returned resources that respect the query performed the first describes the discovery service or search engine. In the *atom:feed* element the response should include the elements listed in Table 6 and the *atom:entry* elements should include the elements listed in

Table 7 (respecting the rules defined in [ATOM]). The metadata for each item in the result set **should** provide a link to a “full” view of the result, where more detailed metadata can be provided and, when available, a direct link to the resource using the *atom:link* element.

Alternate representations of an entry

The *atom:link* element with the *atom:rel* attribute equal to “alternate” **should** be used to link the entry to additional representations of the metadata. The type of the metadata **should** be defined by the *atom:type* attribute. To designate the resource that is the source of the information provided in the containing element (e.g. original metadata) the value “via” **should** be used [RFC 5988] [ATOM] (section 6.2.2). This link represents the authoritative resource from where the information in the *atom:entry* was derived.

EXAMPLE 8 Defining an alternate representation in HTML for the metadata in a *atom:entry*

```
<atom:link rel="alternate" type="text/html" title="Product metadata
entry" href="http://eo-virtual-archive4.esa.int/search/ER02_SAR_IM__0P/
ER02_SAR_IM__0P_20110107T021611_20110107T021628_DPA_82164_0000/html" />
```

Please note that according to [ATOM] (section 4.1.2) the *atom:link* element with the *rel* attribute equal to “alternate” must follow some rules like:

- atom:entry* elements that contain no child *atom:content* element **MUST** contain at least one *atom:link* element with a *rel* attribute value of "alternate".
- atom:entry* elements **MUST NOT** contain more than one *atom:link* element with a *rel* attribute value of "alternate" that has the same combination of type and hreflang attribute values

Table 6 —Elements of Search operation response in the *atom:feed* element describing the search service

Term	OGC core returnable	Atom Element	Description	Mult.
Title	dc:title	atom:feed/ atom:title	A title for the search feed.	1 mandatory
Creator	dc:creator	atom:feed/ atom:author	An entity primarily responsible for making the content of the feed	1 mandatory
Subject	dc:subject	atom:feed/ atom:category	A topic of the search feed.	n optional
Abstract	dct:abstract	atom:feed/ atom:subtitle	An account of the content of the search feed	1 optional
Publisher	dc:publisher	atom:feed/ atom:generator	An entity or agent responsible for making the search feed.	1 optional
Contributor	dc:contributor	atom:feed/ atom:contributor	An entity responsible for making contributions to the feed's content	n optional
Modified	dc:date	atom:feed/ atom:updated	A date of a creation or update of the search feed (RFC 3339)	1 optional
Identifier	dc:identifier	atom:feed/ atom:id	An IRI as a unique identifier of the feed (no relative references). Not to be assumed dereferenceable.	1 mandatory
		atom:feed/ dc:identifier	The local identifier of the feed.	1 optional
Source	dc:source	atom:feed/atom:link[@rel='search'][@type='application/opensearchdescription+xml']	A reference to a resource from which the present feed is derived. This points to the OpenSearch document that describes the search engine	1 mandatory
Language	dc:language	atom:feed/ @xml:lang	A language of feed's content (RFC 5646)	1 optional
Envelope	dct:spatial	atom:feed/ georss:*	The maximal spatial extent of the search feed (GEORSS).	n optional
Rights	dc:rights	atom:feed/ atom:rights	Information about rights held in and over the resource	1 optional
Relation	dc:relation	atom:feed/atom:link[@rel='next']	Reference to the next page of the search feed	1 optional
		atom:feed/atom:link[@rel='previous' or @rel='prev']	Reference to the previous page of the search feed	1 optional
		atom:feed/atom:link[@rel='up']	Refers to a parent resource in a hierarchy of resources.	N optional
		atom:feed/atom:link[@rel='self']	Reference to the retrieval location of the search feed	1 optional
Query	-	atom:feed/os:Query	Defines the search request query.	1 optional
Extent (total results, start index and items per page)	dct:extent	atom:feed/ os:totalResults	OpenSearch element with the total number of feed's entries	1 mandatory
		atom:feed/ os:startIndex	OpenSearch element with the index of the first feed's entry.	1 mandatory
		atom:feed/ os:itemsPerPage	OpenSearch element with the number of entries returned per page.	1 mandatory

Table 7 —Elements of Search operation response in the *atom:entry* elements describing each search result

Term	OGC core returnable	Atom Element	Description	Mult.
Title	dc:title	atom:entry/ atom:title	A title given to the resource.	1 mandatory
Creator	dc:creator	atom:entry/ atom:author	An entity primarily responsible for making the content of the resource.	1 optional
Subject	dc:subject	atom:entry/ atom:category	A topic of the content of the resource (a topic category or other taxonomy can be applied).	n optional
Abstract	dct:abstract	atom:entry/ atom:summary	An account of the content of the resource.	1 optional
Contributor	dc:contributor	atom:entry/ atom:contributor	An entity responsible for making contributions to the content of the resource.	n optional
Modified	dc:date	atom:entry/ atom:updated	Creation or update date of the metadata resource (RFC-3339).	1 mandatory
Date	-	atom:entry/ dc:date	A date or range of dates relevant to the resource (RFC-3339) ^a .	1 optional
Identifier	dc:identifier	atom:entry/ atom:id	A unique identifier of the entry. Its content MUST be an IRI (it excludes relative references). It should not be assumed that it can be dereferenced.	1 mandatory
		atom:entry/ dc:identifier	The identifier of the resource within the search engine context (local reference).	1 optional
Source	dc:source	atom:entry/ atom:link[@rel= 'via']	A reference to a document that is the source of the information provided in the entry	n optional
Language	dc:language	atom:entry/ @xml:lang	Language of the content of the resource (RFC 5646)	1 optional
Rights	dc:rights	atom:entry/ atom:rights	Information about rights held in and over the resource.	1 optional
Envelope	dct:spatial	atom:entry/ georss:*	The spatial extent of the resource defined (GEORSS element).	n optional
Relation	dc:relation	atom:entry/atom:link[@rel= 'search']	OpenSearch description document (entry is a search service).	1 optional
		atom:entry/ atom:link[@rel= 'enclosure']	Location of the data resource described in the entry.	n optional
		atom:entry/atom:link[@rel= 'icon']	Reference to a quicklook image representing the entry.	n optional
		atom:entry/atom:link[@rel= 'up']	Refers to a parent resource in a hierarchy of resources	n optional
		atom:entry/ atom:link[@rel= 'alternate']	Refers to a resource that is an alternate representation of the entry.	n optional

Format	dc:format	atom:entry/atom:link[@rel='enclosure']/@type	The MIME types of the data resources available.	n optional
^a When specifying a temporal range the element should contain two dates separated by a slash, like: <dc:date>2004-02-19T03:03:23.736Z/2010-09-12T15:57:36.072Z</dc:date> Open date ranges can be represented by start date, followed by a “/”, or a “/” followed by an end date				

Requirements Class	
http://www.opengis.net/spec/opensearchgeo/1.0/req/response	
Requirement	http://www.opengis.net/spec/opensearchgeo/1.0/req/response/atom The server response in Atom encoding shall be in accordance with the rules defined in Table 6 and Table 7.

Linking an entry with external data

If possible, the access to the file or service that contains the data **should** be defined using a *atom:link* element with the *atom:rel* attribute equal to “enclosure”[RFC 5988]. To define the reference to a resource representing the quicklook or browse image that represents the entry, the *atom:rel* attribute should be equal to “icon”.

EXAMPLE 9 Defining the access to the product file of the atom:entry

```
<atom:link rel="enclosure" href="https://grid-eo-engine02.esrin.esa.int/ASA_WSM_1P/2009/01/ASA_WSM_1PNPDK20090122_205935_000002082075_00444_36069_6663.N1" type="application/binary"/>
```

EXAMPLE 10 Defining the access to quicklook or browse image of the atom:entry

```
<atom:link rel="icon" href="ftp://ladsftp.nascom.nasa.gov/allData/5/MOBRGB/2009/121/MOBRGB.A2009121.0020.005.2009126214738.jpg" hreflang="en-US" type="image/jpeg" title="" length="660988"/>
```

Search context propagation to external end points

If the resource described in the response entry is itself a search service an *atom:link* with the relation “search” **should** be used [RFC 5988]. This feature can be used to define recursive searches where the search context (geospatial and temporal queriables) is propagated to an internal or external service. It can also allow the aggregation of entries into collections or groups.

EXAMPLE 11 Defining access to the product file of the atom:entry

```
<atom:link rel="search" type="application/opensearchdescription+xml" href="http://search.acme.com/osd.xml" title="Search this resource" />
```

When an entry contains a link with the *rel* attribute equal to “search” and the *type* attribute equal to “application/opensearchdescription+xml” clients are recommended to

propagate the query parameters to the search engine described by the OpenSearch description document located on the *href* attribute value using the original query parameters.

Counting and paging the results

For easier client integration it is recommended to support result paging. To achieve this the *atom:feed* element **should** include *atom:link* elements with the attribute *atom:rel* equal to “self”, “prev” (or its synonym “previous”) and “next” [RFC 5988].

To support the execution of additional searches the *atom:feed* element **should** include *atom:link* elements with the attribute *atom:rel* equal to “search” [RFC 5988]. This element refers to the OpenSearch description document of the search engine that created the feed.

EXAMPLE 12 Including paging support on the Atom response (XML fragment)

```
<feed xmlns=http://www.w3.org/2005/Atom
      xmlns:os="http://a9.com/-/spec/opensearch/1.1/"
      xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/"
      xmlns:georss="http://www.georss.org/georss">
  <title>ACME Catalogue ENVISAT ASAR Wide Swath Mode</title>
  <subtitle>Query Parameters used bbox=10,10,20,20</subtitle>
  <link rel="self" type="application/atom+xml" href="http://acme.com/ASA_WSM_1P/atom/?startIndex=0&bbox=10,10,20,20" title="self"/>
  <link rel="next" type="application/atom+xml" href="http://acme.com/ASA_WSM_1P/atom/?startIndex=20&bbox=10,10,20,20" title="next">
  <link rel="search" type="application/opensearchdescription+xml" href="http://acme.com/ASA_WSM_1P/description" title="search"/>
  <os:Query role="request" count="2" geo:box="10,10,20,20"/>
  <os:totalResults>782</os:totalResults>
  <os:startIndex>0</os:startIndex>
  <os:itemsPerPage>20</os:itemsPerPage>

<!-- ... -->
```

Also shown in the previous example is the usage of the OpenSearch elements (*os:totalResults*, *os:startIndex*, *os:itemsPerPage* and *os:Query*) that **shall** be included in the response. In the situation of a zero result query, the service **shall** return a valid response (e.g. Atom feed with no entries) and with the *os:totalResults* element equal to 0.

Error handling

The Atom and the OpenSearch specifications do not directly specify how to deal with server and request errors. It is recommended that an OpenSearch Geospatial Service use the HTTP error codes for client (4xx) and server (5xx) errors. In particular, it is recommended to use the following error codes in the particular situations of client error:

- *400 Bad Request*: The request has an invalid syntax (i.e. badly formatted geometry)
- *413 Request Entity Too Large*: The request originates too many returnable hits

For server side errors the following error codes are recommended:

- *500 Internal Server Error*: Default code for the server side for an execution error.
- *501 Not Implemented*: When requesting an unimplemented feature (e.g. relation operator not supported).
- *503 Service Unavailable*: When the search service is temporarily not available (due to overload or other reasons)
- *504 Gateway Timeout*: When the search engine is a broker or aggregator to other services that fail to produce a answer within a giving time frame.

EXAMPLE 13 Response example for a bad request (incorrect geo:box format)

```
HTTP/1.1 400 Bad Request
Content-Type: text/plain
Date: Mon, 6 Feb 2012 14:27:37 GMT
Content-Length: 56
```

Bad Request - Wrong geo:box format (minx,miny,maxx,maxy)

Extending the response model and foreign elements

According to the Atom documentation [ATOM] (section 4.1.3.3), special conditions have to be considered when using the *atom:content* and *atom:summary* with the *atom:type* equal to "html". For example:

*If the value of "type" is "html", the content of atom:content MUST NOT contain child elements and SHOULD be suitable for handling as HTML [HTML]. The HTML markup MUST be escaped; for example, "
" as "
". The HTML markup SHOULD be such that it could validly appear directly within an HTML <DIV> element. Atom Processors that display the content MAY use the markup to aid in displaying it.*

EXAMPLE 14 HTML elements inside the atom:summary must be escaped [ATOM]

```
<summary type="html">
  &lt;b&gt; Start :&lt;/b&gt; 2010-04-13T20:38:16.000Z
  &lt;b&gt; End :&lt;/b&gt; 2010-04-13T20:40:00.000Z
  &lt;br&gt;&lt;b&gt;Acquisition Station :&lt;/b&gt; PDAS-M
  &lt;b&gt;Processing Center :&lt;/b&gt; I-PAC
  &lt;br&gt;&lt;b&gt; Orbit :&lt;/b&gt; 42453
</summary>
```

The *atom:summary* element usually takes precedence to *atom:content* element when client application display the entries listing. It's however recommended that a OpenSearch GeoTemporal Service does not use the *atom:content* element to expand or define new metadata elements. If such a feature is required one should instead add directly the required element under the *atom:feed* or *atom:entry* elements with the respective namespace.

EXAMPLE 15 Extending the response entry with elements from a different namespace

```
<?xml version="1.0" encoding="UTF-8"?>
<feed xmlns="http://www.w3.org/2005/Atom"
  xmlns:georss="http://www.georss.org/georss"
  xmlns:gml="http://www.opengis.net/gml"
```

```

>
<!-- ... -->

<entry>
<!-- ... -->
  <owc:offering xmlns:owc="http://www.opengis.net/owc/1.0"
    code="http://www.opengis.net/spec/owc-atom/1.0/req/wms">
    <owc:operation code="GetCapabilities">
href="http://www.someserver.com/wrs.cgi?REQUEST=GetCapabilities&SERVICE=WMS&VERSION=1.1.1"/>
    </owc:offering>
<!-- ... -->

</entry>
</feed>

```

9.3.3 Atom 1.0 response example

```

<?xml version="1.0" encoding="UTF-8"?>
  <feed xmlns="http://www.w3.org/2005/Atom"
    xmlns:opensearch="http://a9.com/-/spec/opensearch/1.1/"
    xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/"
    xmlns:georss="http://www.georss.org/georss">
    <title>Example.com Search: New York history</title>
    <link href="http://example.com/New+York+history"/>
    <updated>2003-12-13T18:30:02Z</updated>
    <author>
      <name>Example.com, Inc.</name>
    </author>
    <id>urn:uuid:60a76c80-d399-11d9-b93C-0003939e0af6</id>
    <opensearch:totalResults>4230000</opensearch:totalResults>
    <opensearch:startIndex>21</opensearch:startIndex>
    <opensearch:itemsPerPage>10</opensearch:itemsPerPage>
    <opensearch:Query role="request" searchTerms="New York History"
startPage="3" geo:box="-74.0667,40.69418,-73.9116,40.7722"/>
    <link rel="alternate" href="http://example.com/New+York+History?
pw=3&bbox=-74.0667,40.69418,-73.9116,40.7722" type="text/html"/>
    <link rel="search" type="application/opensearchdescription+xml"
href="http://example.com/opensearchdescription.xml"/>
    <georss:box>40.69418 -74.0667 40.7722 -73.9116</georss:box>
    <entry>
      <title>New York History</title>
      <link
href="http://www.columbia.edu/cu/lweb/eguids/amerihist/nyc.html"/>
      <id>urn:uuid:1225c695-cfb8-4ebb-aaaa-80da344efa6a</id>
      <dc:identifier>1225c695-cfb8-4ebb-aaaa-
80da344efa6a</dc:identifier>
      <updated>2003-12-13T18:30:02Z</updated>
      <georss:line>40.73763 -73.9972 40.73519 -73.99167 40.737015 -
73.99035 40.73643 -73.98914 40.734640 -73.990431 40.731617 -
73.991504</georss:line>
      <content type="text">
        ... Union Square.NYC - A virtual tour and information on
        businesses ...with historic photos of Columbia's own New York
        neighborhood ... Internet Resources for the City's History...
      </content>
    </entry>

```

```
</feed>
```

9.3.4 Atom 1.0 response example for Earth Observation Imagery

```
<?xml version="1.0" encoding="utf-8"?>
<feed xml:lang="en" xmlns="http://www.w3.org/2005/Atom"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:georss="http://www.georss.org/georss"
  xmlns:os="http://a9.com/-/spec/opensearch/1.1/"
  xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/"
  xmlns:time="http://a9.com/-/opensearch/extensions/time/1.0/" >
  <title>Catalogue Search Feed for ERS-2 SAR Image Mode Level 0</title>
  <subtitle type="html">
    Found 66 results. Showing the first 20 results
  </subtitle>
  <generator uri="http://www.terradue.com" version="1.4.0">Terradue
CAS</generator>
  <author><name>GEOSS Supersites</name></author>
  <updated>2013-05-30T18:05:09Z</updated>
  <id>http://eo-virtual-
archive4.esa.int/search/ER02_SAR_IM__0P/atom/</id>
  <dc:identifier>ER02_SAR_IM__0P</dc:identifier>
  <link rel="self" type="application/atom+xml" href="http://eo-virtual-
archive4.esa.int/search/ER02_SAR_IM__0P/atom/?startIndex=0&start=19
92-01-01&stop=2013-05-30&bbox=126.6,40.8,132,43.5"/>
  <link rel="first" type="application/atom+xml" href="http://eo-
virtual-archive4.esa.int/search/ER02_SAR_IM__0P/atom/?startIndex=0&
start=1992-01-01&stop=2013-05-30&bbox=126.6,40.8,132,43.5"/>
  <link rel="next" type="application/atom+xml" href="http://eo-virtual-
archive4.esa.int/search/ER02_SAR_IM__0P/atom/?startIndex=1&start=19
92-01-01&stop=2013-05-30&bbox=126.6,40.8,132,43.5"/>
  <link rel="last" type="application/atom+xml" href="http://eo-virtual-
archive4.esa.int/search/ER02_SAR_IM__0P/atom/?startIndex=60&start=1
992-01-01&stop=2013-05-30&bbox=126.6,40.8,132,43.5"/>
  <link rel="search" type="application/opensearchdescription+xml"
href="http://eo-virtual-
archive4.esa.int/search/ER02_SAR_IM__0P/description"/>
  <os:totalResults>66</os:totalResults>
  <os:startIndex>0</os:startIndex>
  <os:itemsPerPage>1</os:itemsPerPage>
  <os:Query role="request" startIndex="0" time:start="1992-01-01"
time:end="2013-05-30" geo:box="126.6,40.8,132,43.5"/>
  <georss:polygon>40.8 126.6 43.5 126.6 43.5 132 40.8 132 40.8
132</georss:polygon>
  <entry>
    <id>http://eo-virtual-archive4.esa.int/search/ER02_SAR_IM__0P/ER02_
SAR_IM__0P_20110107T021611_20110107T021628_DPA_82164_0000/atom</id>

  <title>ER02_
SAR_IM__0P_20110107T021611_20110107T021628_DPA_82164_0000</title>
  <dc:identifier>ER02_SAR_IM__0P_20110107T021611_20110107T021628_DPA_8216
4_0000</dc:identifier>
  <published>2012-03-02T23:50:07.000Z</published>
  <updated>2013-05-16T22:25:57.124Z</updated>
  <dc:date>2011-01-07T02:16:11.481Z/2011-01-07T02:16:28.864Z</dc:date>
```

```

    <georss:polygon>42.3599 128.7932 42.5625 127.5283 41.4319 127.2083
    41.2386 128.4171 42.3599 128.7932</georss:polygon>
    <link rel="alternate" type="text/html" title="HTML page"
    href="http://eo-virtual-archive4.esa.int/search/ER02_SAR_IM__OP/
    ER02_SAR_IM__OP_20110107T021611_20110107T021628_DPA_82164_0000/html"/>
    <link rel="via" type="application/rdf+xml" title="RDF metadata
    entry" href="http://eo-virtual-archive4.esa.int/search/ER02_SAR_IM__OP/
    ER02_SAR_IM__OP_20110107T021611_20110107T021628_DPA_82164_0000/rdf"/>
    <link rel="enclosure" length="141898780" type="application/binary"
    title="ER02_SAR_IM__OP_20110107T021611_20110107T021628_DPA_82164_0000.C
    EOS.tar.gz" href="https://eo-virtual-archive4.esa.int/supersites/ER02_S
    AR_IM__OP_20110107T021611_20110107T021628_DPA_82164_0000.CEOS.tar.gz"/>
    <content type="html">
      <ul><li> <b>Date</b>: 2011-01-07 <br/>
      (2011-01-07T02:16:11.481Z / 2011-01-07T02:16:28.864Z) </li>
      <li> <b>Orbit Number</b>: 82164 </li>
      <li> <b>Processing Center</b>: D-PAF
    </li></ul>
    </content>
  </entry>

  [...]
</feed>

```

The complete listing of the examples can be seen in Annex C.

Annex A (normative)

Abstract test suite

A.1 OpenSearch description document

<http://www.opengis.net/spec/ogcsearchgeo/1.0/conf/result-osd>

Test Purpose: Verify that the server generates a valid OpenSearch description document.

Test Method: Execute an HTTP GET request to retrieve a server's description document. Verify that the response is correct XML and is valid according to the description in this standard.

References: Clause 8, OpenSearch

Test type: Capability

A.2 Atom response type

<http://www.opengis.net/spec/ogcsearchgeo/1.0/conf/result-atom>

Test Purpose: Verify that the server defines an URL template for the Atom response type.

Test Method: Execute an HTTP GET request to retrieve a server's description document. Verify that an URL element with the type equal to “application/atom+xml” exists.

References: 9.1

Test type: Capability

A.3 Bounding box search

<http://www.opengis.net/spec/ogcsearchgeo/1.0/req/result-box>

Test Purpose: Verify that the server conforms to the Bounding Box Search conformance class.

Test Method: Submit a series of bounding box requests to the server and verify that the server responds as described in the standard. The set of requests should

include both valid and invalid requests to test for exceptions.

References: 9.2.1, Sub-clause 9.3

Test type: Capability

A.4 Arbitrary geometry search

<http://www.opengis.net/spec/ogpsearchgeo/1.0/conf/result-searchbygeometry>

Test Purpose: Verify that the server conforms to the Arbitrary Geometry Search conformance class.

Test Method: Submit a series of queries to the server using the geometry parameter. The geometry values should be encoded using WKT. Verify that the server responds as described in the standard. The set of requests should include both valid and invalid requests to test for exceptions.

References: 9.2.1, Sub-clause 9.3

Test type: Capability

A.5 Point and radius search

<http://www.opengis.net/spec/ogpsearchgeo/1.0/conf/result-searchbypointradius>

Test Purpose: Verify that the server conforms to the Point and Radius Search conformance class.

Test Method: Submit a series of queries to the server using the lat, lon and radius parameters. Verify that the server responds as described in the standard. The set of requests should include both valid and invalid requests to test for exceptions.

References: 9.2.1, Sub-clause 9.3

Test type: Capability

A.6 Min spatial operator

<http://www.opengis.net/spec/ogpsearchgeo/1.0/conf/result-intersect>

Test Purpose: Verify that the server conforms to the Min Spatial Operator conformance class.

Test Method: Submit a series of requests to the server and verify that all records in the

response satisfy the “intersects” operator.

References: 9.2.1,

Test type: Capability

A.7 Spatial operators

<http://www.opengis.net/spec/ogcsearchgeo/1.0/conf/result-spatialrelations>

Test Purpose: Verify that the server conforms to the Spatial Operators conformance class.

Test Method: Submit a series of requests to the server and verify that the spatial information of the records in the response is coded in GeoRSS and satisfy the spatial operator specified in the request.

References: 9.1, 9.2.1

Test type: Capability

A.8 Get record by id

<http://www.opengis.net/spec/ogcsearchgeo/1.0/conf/result-searchbyid>

Test Purpose: Verify that the server conforms to the Get record by id conformance class.

Test Method: Submit a series of request to the server that retrieve records using the records identifier. Verify that the id of the record in the response corresponds to the requested id.

References: 9.2.1

Test type: Capability

A.9 Search by name

<http://www.opengis.net/spec/ogcsearchgeo/1.0/conf/result-searchbyname>

Test Purpose: Verify that the server conforms to the Search by name conformance class.

Test Method: Submit a series of requests to the server that search using the name or address of a location. Verify that the records in the response correspond to the specified name or address.

References: 9.2.1,

Test type: Capability

A.10 Temporal search

<http://www.opengis.net/spec/ogcsearchgeo/1.0/conf/result-searchbytime>

Test Purpose: Verify that the server conforms to the Temporal Search conformance class.

Test Method: Submit a series of request to the server using the start and end parameters. Verify that the temporal property of the records in the response falls between the specified start and end times.

References: 9.2.1,

Test type: Capability

A.11 Temporal search relation

<http://www.opengis.net/spec/ogcsearchgeo/1.0/conf/result-timerelations>

Test Purpose: Verify that the server conforms to the Temporal Search conformance class with temporal relations.

Test Method: Submit a series of request to the server using the start, end and relation parameters. Verify that the temporal property of the records in the response falls between the specified start and end times in accordance with the relation chosen.

References: 9.2.1,

Test type: Capability

Annex B (informative)

XML Schema Documents

B.1. Atom Schema (atom.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar for the
# Atom Format Specification
# Taken from http://tools.ietf.org/html/rfc4287#page-35
# Defined a new constructor for Atom Feed and Entry
namespace atom = "http://www.w3.org/2005/Atom"
namespace xhtml = "http://www.w3.org/1999/xhtml"
namespace s = "http://purl.oclc.org/dsdl/schematron"
namespace local = ""
start = atomFeed | atomEntry

# Common attributes
atomCommonAttributes = attribute xml:base { atomUri }?,
                        attribute xml:lang { atomLanguageTag }?, undefinedAttribute*

# Text Constructs
atomPlainTextConstruct = atomCommonAttributes, attribute type { "text" | "html" }?, text
atomXHTMLTextConstruct = atomCommonAttributes, attribute type { "xhtml" }, xhtmlDiv
atomTextConstruct = atomPlainTextConstruct | atomXHTMLTextConstruct

# Person Construct
atomPersonConstruct = atomCommonAttributes,
                      (element atom:name { text } & element atom:uri { atomUri }?
                       & element atom:email { atomEmailAddress }? & extensionElement*)

# Date Construct
atomDateConstruct = atomCommonAttributes, xsd:dateTime

# atom:feed
atomFeed = [
  s:pattern [ name="check authors"
  s:rule [ context = "atom:feed"
    s:assert [test = "atom:author or not(atom:entry[not(atom:author)])"
      "An atom:feed must have an atom:author unless all "
      ~ "of its atom:entry children have an atom:author."]]]]
  element atom:feed { atomFeedConstruct }

atomFeedConstruct =
  atomCommonAttributes, (atomAuthor* & atomCategory* & atomContributor*
  & atomGenerator? & atomIcon? & atomId & atomLink* & atomLogo? & atomRights? &
  atomSubtitle? & atomTitle & atomUpdated & extensionElement*), atomEntry*

# atom:entry
atomEntry = [
  s:pattern [ name="check entry's alternate link"
  s:rule [ context = "atom:entry" s:assert [
    test = "atom:link[@rel='alternate'] "
    ~ "or atom:link[not(@rel)] or atom:content"
    "An atom:entry must have at least one atom:link element "

```

```

        ~ "with a rel attribute of 'alternate' or an atom:content."
    ]]]
s:pattern [ name="check entry's author"
s:rule [ context = "atom:entry" s:assert [
    test = "atom:author or ../atom:author or atom:source/atom:author"
    "An atom:entry must have an atom:author if its feed does not."
    ]]]]
    element atom:entry { atomEntryConstruct }

atomEntryConstruct =
    atomCommonAttributes,
    (atomAuthor* & atomCategory* & atomContent? & atomContributor*
    & atomId & atomLink* & atomPublished? & atomRights? & atomSource?
    & atomSummary? & atomTitle & atomUpdated & extensionElement*)

# atom:content
atomInlineTextContent = element atom:content { atomCommonAttributes,
    attribute type { "text" | "html" }?, (text)* }

atomInlineXHTMLContent = element atom:content { atomCommonAttributes,
    attribute type { "xhtml" }, xhtmlDiv }

atomInlineOtherContent = element atom:content { atomCommonAttributes,
    attribute type { atomMediaType }?, (text|anyElement)*}

atomOutOfLineContent = element atom:content { atomCommonAttributes,
    attribute type { atomMediaType }?, attribute src { atomUri }, empty }

atomContent = atomInlineTextContent | atomInlineXHTMLContent
    | atomInlineOtherContent | atomOutOfLineContent

atomAuthor = element atom:author { atomPersonConstruct }

atomCategory =
    element atom:category { atomCommonAttributes, attribute term { text },
    attribute scheme { atomUri }?, attribute label { text }?,
    undefinedContent }

atomContributor = element atom:contributor { atomPersonConstruct }

atomGenerator = element atom:generator { atomCommonAttributes,
    attribute uri { atomUri }?, attribute version { text }?, text }

atomIcon = element atom:icon { atomCommonAttributes, (atomUri) }

atomId = element atom:id { atomCommonAttributes, (atomUri) }

atomLogo = element atom:logo { atomCommonAttributes, (atomUri)}

atomLink =
    element atom:link { atomCommonAttributes, attribute href { atomUri },
    attribute rel { atomNCName | atomUri }?, attribute type { atomMediaType }?,
    attribute hreflang { atomLanguageTag }?, attribute title { text }?,
    attribute length { text }?, undefinedContent }

atomPublished = element atom:published { atomDateConstruct }

atomRights = element atom:rights { atomTextConstruct }

atomSource = element atom:source {
    atomCommonAttributes, (atomAuthor* & atomCategory* & atomContributor* &

```

```

atomGenerator? & atomIcon? & atomId? & atomLink* & atomLogo? & atomRights?
  & atomSubtitle? & atomTitle? & atomUpdated? & extensionElement*})

atomSubtitle = element atom:subtitle { atomTextConstruct }

atomSummary = element atom:summary { atomTextConstruct }

atomTitle = element atom:title { atomTextConstruct }

atomUpdated = element atom:updated { atomDateConstruct }

# Low-level simple types
atomNCName = xsd:string { minLength = "1" pattern = "[^:]*" }

# Whatever a media type is, it contains at least one slash
atomMediaType = xsd:string { pattern = ".+/.+" }

# As defined in RFC 3066
atomLanguageTag = xsd:string { pattern = "[A-Za-z]{1,8}(-[A-Za-z0-9]{1,8})*" }

# Unconstrained; it's not entirely clear how IRI fit into
# xsd:anyURI so let's not try to constrain it here
atomUri = text

# Whatever an email address is, it contains at least one @
atomEmailAddress = xsd:string { pattern = ".+@.+" }

# Simple Extension
simpleExtensionElement = element * - atom:* { text }

# Structured Extension
structuredExtensionElement = element * - atom:* {
  (attribute * { text }+, (text|anyElement)*)
  | (attribute * { text }*, (text?, anyElement+, (text|anyElement)*))}

# Other Extensibility
extensionElement = simpleExtensionElement | structuredExtensionElement

undefinedAttribute = attribute * - (xml:base | xml:lang | local:*) { text }

undefinedContent = (text|anyForeignElement)*

anyElement = element * { (attribute * { text } | text | anyElement)* }

anyForeignElement = element * - atom:* { (attribute * { text } | text | anyElement)* }

# XHTML
anyXHTML = element xhtml:* { (attribute * { text } | text | anyXHTML)* }

xhtmlDiv = element xhtml:div { (attribute * { text } | text | anyXHTML)* }

# EOF

```

B.2. OpenSearch Atom Schema (osatom.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar for
# Atom encoding and foreign elements for OpenSearch
namespace s = "http://purl.oclc.org/dsdl/schematron"
namespace atom = "http://www.w3.org/2005/Atom"
namespace os = "http://a9.com/-/spec/opensearch/1.1/"

# Redefine atom:feed to include new OpenSearch elements
atomFeedConstruct &= osQuery ? & osTotalResults? & osStartIndex? & osItemsPerPage?
osQuery = element os:Query { undefinedAttribute*, ( osQueryAttr ) }
osTotalResults = element os:totalResults { xsd:int }
osStartIndex = element os:startIndex { xsd:int }
osItemsPerPage = element os:itemsPerPage { xsd:int }

include "osquery.rnc"

# Replacing definitions on RFC4287
include "atom.rnc"{
  # Redefine the Simple Extension to exclude os:* elements
  simpleExtensionElement = element * - (atom:* | os:*) { text }
  # Redefine the Structured Extension to exclude os:* elements
  structuredExtensionElement = element * -
    (atom:* | os:* ) { (attribute * { text }+, (text|anyElement)*)
      | (attribute * { text }*, (text?, anyElement+, (text|anyElement)*))}

  # Redefine Atom rules
  atomFeed = [
  ]
  element atom:feed { atomFeedConstruct }

  atomEntry = [
  s:pattern [ name="check entry content"
  s:rule [ context = "atom:entry"
  s:assert [ test = "atom:content"
  "An atom:entry must have one atom:content "
  ~ "element in a format understandable by generic Atom readers"
  ~ " ( @type equal to 'html' is recommended)"]]]
  ]
  element atom:entry { atomEntryConstruct }
}
# EOF

```

B.3. OpenSearch Description Document Schema (osdd.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar for
# OpenSearch Description Document

namespace os = "http://a9.com/-/spec/opensearch/1.1/"
namespace s = "http://purl.oclc.org/dsdl/schematron"
namespace local = ""
start = osDocument

osDocument = element os:OpenSearchDescription { osDocumentConstruct }

osDocumentConstruct =
  element os:ShortName { xsd:string { maxLength = "16" } }
  & element os:Description { xsd:string { maxLength = "1024" } }
  & element os:Url { osUrlAttr } *
  & element os:Contact { xsd:string { pattern=".+@.+" } }?
  & element os:Tags { text }? & element os:LongName { xsd:string { maxLength="48" } }?
  & element os:Image { osImage } *
  & element os:Query { undefinedAttribute*, ( osQueryAttr ) } *
  & element os:Developer { xsd:string { maxLength = "64" } }?
  & element os:Attribution { xsd:string { maxLength = "256" } }?
  & element os:SyndicationRight { osSyndicationRightValues } ?
  & element os:AdultContent { "false" | "true" } ?
  & element os:Language { xsd:string { pattern="[A-Za-z]{1,8}(-[A-Za-z0-9]{1,8})*" } }?
  & element os:InputEncoding { text } ? & element os:OutputEncoding { text } ?
  & undefinedAttribute*
  & extensionElement*

osUrlAttr = attribute template { text }, attribute type { text },
  attribute rel { osRelationValues }?, attribute indexOffset { xsd:int }?,
  attribute pageOffset { xsd:int }?, undefinedAttribute*, extensionElement*

osImage = attribute height {xsd:int}, attribute width {xsd:int},
  attribute type {xsd:string}, text

include "osquery.rnc"

osRelationValues = "results" | "suggestions" | "self" | "collection"
osSyndicationRightValues = "open" | "limited" | "private" | "closed"

# Simple Extension
simpleExtensionElement = element * - os:* { text }

# Structured Extension
structuredExtensionElement = element * - os:* {
  (attribute * { text }+, (text|anyElement)*)
  | (attribute * { text }*, (text?, anyElement+, (text|anyElement)*))}

# Other Extensibility
extensionElement = simpleExtensionElement | structuredExtensionElement
undefinedAttribute = attribute * - (local:* ) { text }
undefinedContent = (text|anyForeignElement)*
anyElement = element * { (attribute * { text } | text | anyElement)* }
anyForeignElement = element * - os:* { (attribute * { text } | text | anyElement)* }

# EOF

```

B.4. OpenSearch Query Element Schema (osquery.rnc)

```
# *- rnc *-  
# RELAX NG Compact Syntax Grammar for  
# OpenSearch Query element  
  
namespace os = "http://a9.com/-/spec/opensearch/1.1/"  
namespace s = "http://purl.oclc.org/dsdl/schematron"  
namespace local = ""  
  
osQueryAttr = attribute role { osQueryRoleValues },  
  attribute title { xsd:string { maxLength="256"}? }, attribute searchTerms { text }?,  
  attribute totalResults { xsd:int }?, attribute count { text }?,  
  attribute startIndex { text }?, attribute startPage { text }?,  
  attribute inputEncoding { text }?, attribute outputEncoding { text }?,  
  attribute language { text }?  
  
osQueryRoleValues = "request" | "example" | "related" | "correction" | "subset" |  
"superset"  
  
# EOF
```

B.5. GeoRSS Schema (georss.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar for the GEORSS
# This defines the conformance to the rules of GEORSS

namespace georss="http://www.georss.org/georss"
namespace gml="http://www.opengis.net/gml"
namespace local = ""

georssElement = ( georssSimple | georssWhere)

georssWhere = element georss:where { gmlAttribute*, gmlElement }

georssSimple = georssPoint | georssLine | georssPolygon | georssBox | georssCircle
               | georssFeatureTypeTag | georssFeatureName | georssElev | georssFloor

georssPoint = element georss:point { list { xsd:decimal, xsd:decimal } }
georssLine = element georss:line { list { (xsd:decimal, xsd:decimal)+ } }
georssPolygon = element georss:polygon { list { (xsd:decimal, xsd:decimal)+ } }
georssBox = element georss:box {
  list { (xsd:decimal, xsd:decimal, xsd:decimal, xsd:decimal) } }
georssCircle = element georss:circle {
  list { (xsd:decimal, xsd:decimal, xsd:decimal) } }
georssFeatureTypeTag = element georss:featureTypeTag { text }
georssRelationshipTag = element georss:relationshipTag { text }
georssFeatureName = element georss:featureName { text }
georssElev = element georss:elev {xsd:decimal}
georssFloor = element georss:floor {xsd:decimal}
georssRadius = element georss:radius {xsd:decimal}

gmlAttribute = attribute (xml:base | xml:lang | local:* | gml:* ) { text }

gmlElement = (gmlPointElement | gmlLineStringElement |
              gmlPolygonElement | gmlEnvelopeElement )

gmlPointElement =
  element gml:Point { gmlAttribute*,
                    element gml:pos { gmlAttribute*, list { xsd:decimal, xsd:decimal }}}}

gmlLineStringElement = element gml:LineString { gmlAttribute*,
                                                element gml:posList {gmlAttribute*, list { (xsd:decimal, xsd:decimal)+ }}}}

gmlPolygonElement = element gml:Polygon { gmlAttribute*,
    element gml:exterior { gmlAttribute*,
    element gml:LinearRing { gmlAttribute*,
    element gml:posList { gmlAttribute*,
    list { (xsd:decimal, xsd:decimal)+ }}}}}

gmlEnvelopeElement = element gml:Envelope { gmlAttribute*,
    ( element gml:lowerCorner { gmlAttribute*,
    list { xsd:decimal, xsd:decimal } }
    & element gml:upperCorner { gmlAttribute*,
    list { xsd:decimal, xsd:decimal } } ) }

# EOF

```


B.6. Geo Extension Description Document Schema (osddgeo.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar for
# OpenSearch Description Document with the Geo Extension

namespace os = "http://a9.com/-/spec/opensearch/1.1/"
namespace s = "http://purl.oclc.org/dsdl/schematron"
namespace local = ""
namespace geo = "http://a9.com/-/opensearch/extensions/geo/1.0/"

include "geo.rnc"

include "osdd.rnc"{

    undefinedAttribute = attribute * - (local:* | geo:* ) { text }

    osDocument = [
        s:pattern [ name="Check for Atom Url template"
            s:rule [ context = "os:OpenSearchDescription"
                s:assert [ test = "os:Url[@type='application/atom+xml']"
                    "An OpenSearch Description Document must have a Url template with "
                    ~ " type of Atom document." ]]]

        s:pattern [ name="Check for box parameter"
            s:rule [ context = "os:OpenSearchDescription"
                s:assert [ test = "os:Url[@type='application/atom+xml'] [substring-
before(@template, '{geo:box'})!='"
                    "An OpenSearch Description Document must have at least a geo:box parameter"
                    ~ " in the Atom response." ]]]

        ]
    element os:OpenSearchDescription { osDocumentConstruct }
}
# EOF

```

B.7. Geo Extension Query Element Schema (geo.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar
# OpenSearch Query Element as defined in OGC 10-032 for geo extension

namespace geo = "http://a9.com/-/opensearch/extensions/geo/1.0/"

osQueryAttr &= attribute geo:box { geobox }?
             & attribute geo:geometry { text }?
             & attribute geo:uid { text }?
             & attribute geo:lat {xsd:double}?
             & attribute geo:lon {xsd:double}?
             & attribute geo:radius {xsd:double}?
             & attribute geo:relation { relation }?
             & attribute geo:name {text}?

geobox = xsd:string { pattern = "[\+\-]?\[\d\]*([\d]+)?(\, [\+\-]?\[\d\]*([\d]+)?){3}" }

relation = "intersects" | "contains" | "disjoint"

# EOF

```

B.8. Geo Extension Atom Response Schema (atomgeo.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar for
# Atom encoding and foreign elements as defined in OGC 10-032 for the geo extension
namespace atom = "http://www.w3.org/2005/Atom"
namespace os = "http://a9.com/-/spec/opensearch/1.1/"
namespace dc="http://purl.org/dc/elements/1.1/"
namespace geo = "http://a9.com/-/opensearch/extensions/geo/1.0/"
namespace georss="http://www.georss.org/georss"
namespace s = "http://purl.oclc.org/dsdl/schematron"
namespace local = ""

# Redefine atom:feed to include new OGC10-032 elements
atomFeedConstruct &= georssElement ? & element dc:identifier { xsd:token } ?
# Redefine atom:entry to include new OGC10-032 elements
atomEntryConstruct &= georssElement ? & element dc:identifier { xsd:token } ?

include "geo.rnc"
include "georss.rnc"
include "osatom.rnc"{
  undefinedAttribute = attribute * - (xml:base | xml:lang | local:* | geo:* ) {text}

  # Redefine the Simple Extension to exclude atom geo elements
  simpleExtensionElement = element * -
    (atom:* | georss:* | os:* | dc:identifier ) { text }

  # Redefine the Structured Extension to exclude atom geo elements
  structuredExtensionElement = element * -
    (atom:* | georss:* | os:* | dc:identifier ) {
      (attribute * { text }+, (text|anyElement)*)
      | (attribute * { text }*, (text?, anyElement+, (text|anyElement)*))}

  atomFeed = [
    s:pattern [ name="Check for georss element "
      s:rule [ context = "atom:feed"
        s:assert [ test = "georss:* or not(atom:entry[not(georss:*)])"
          "An atom:feed must have an georss element unless all "
          ~ "of its atom:entry children have one."]]]
    ]
  element atom:feed { atomFeedConstruct }

  atomEntry =[
    s:pattern [ name="Check for HTML Content"
      s:rule [ context = "atom:entry"
        s:assert [ test = "atom:content"
          "An atom:entry must have one atom:content MUST have content "
          ~ "element in a format understandable by generic Atom readers"
          ~ " ( @type equal to 'html' is recommended)"]]]

    s:pattern [ name="Check for georss element "
      s:rule [ context = "atom:entry"
        s:assert [ test = "georss:* or "
          ~ "../georss:* "
          "An atom:entry must have an georss element "
          ~ "if its feed does not."]]]
    ]
  element atom:entry { atomEntryConstruct }
}
# EOF

```

B.9. Time Extension Description Document Schema (osddtime.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar for
# OpenSearch Description Documents defined in OGC 10-032
# for the time extension

namespace os = "http://a9.com/-/spec/opensearch/1.1/"
namespace s = "http://purl.oclc.org/dsdl/schematron"
namespace local = ""

namespace time = "http://a9.com/-/opensearch/extensions/time/1.0/"

include "time.rnc"

include "osdd.rnc"{

    undefinedAttribute = attribute * - (local:* | time:* ) { text }

    # Redefine the Simple Extension to exclude geo:* and time:* elements
    simpleExtensionElement = element * -
        ( os:* ) { text }

    # Redefine the Structured Extension to exclude geo:* and time:* elements
    structuredExtensionElement = element * -
        ( os:* ) {
            (attribute * { text }+, (text|anyElement)*)
            | (attribute * { text }*, (text?, anyElement+, (text|anyElement)*))}

    osDocument = [ s:rule [ context = "os:OpenSearchDescription"
        s:assert [ test = "os:Url[@type='application/atom+xml']"
            "An OpenSearch Description Document must have a Url template with "
            ~ " type of Atom document." ]]]
        element os:OpenSearchDescription { osDocumentConstruct }
}

# EOF

```

B.10. Time Extension Query Element Schema (time.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar
# OpenSearch Query Elements as defined in OGC 10-032 for the time extension

namespace time = "http://a9.com/-/opensearch/extensions/time/1.0/"

osQueryAttr &= attribute time:start { dateTimeString }?
              & attribute time:end { dateTimeString }?
              & attribute time:relation { timerelation } ?

timerelation = "intersects" | "contains" | "during" | "disjoint" | "equals"

dateTimeString = xsd:string { pattern = "[0-9]{4}-[0-9]{2}-[0-9]{2}([T[0-9]{2}:[0-9]{2}:[0-9]{2}(\.[0-9]+)?(Z|[\+\-][0-9]{2}:[0-9]{2}))?" }

# EOF

```

B.11. Time Extension Atom Response Schema (atomtime.rnc)

```

# -*- rnc -*-
# RELAX NG Compact Syntax Grammar for
# Atom encoding and foreign elements as defined in OGC 10-032
# for the time extension
namespace atom = "http://www.w3.org/2005/Atom"
namespace os = "http://a9.com/-/spec/opensearch/1.1/"
namespace dc="http://purl.org/dc/elements/1.1/"
namespace time = "http://a9.com/-/opensearch/extensions/time/1.0/"
namespace s = "http://purl.oclc.org/dsdl/schematron"
namespace local = ""
# Define date time interval
datetimeInterval= xsd:string { pattern="\s*[0-9]{4}-[0-9]{2}-[0-9]{2}T[0-9]{2}:[0-9]{2}:[0-9]{2}(\.[0-9]+)?(Z|[\+\-][0-9]{2}:[0-9]{2})?(/[0-9]{4}-[0-9]{2}-[0-9]{2}T[0-9]{2}:[0-9]{2}:[0-9]{2}(\.[0-9]+)?(Z|[\+\-][0-9]{2}:[0-9]{2})|)\s*" }

# Redefine atom:entry to include new OGC10-032 elements
atomEntryConstruct &= element dc:date { datetimeInterval }?

include "time.rnc"
# Replacing definitions on RFC4287 plus OpenSearch
include "osatom.rnc"{
  undefinedAttribute = attribute * - (xml:base | xml:lang | local:* | time:*) {text}
  # Redefine the Simple Extension to exclude os and time extension elements
  simpleExtensionElement = element * - (atom:* | dc:date | os:*) { text }
  # Redefine the Structured Extension to exclude os and time extension elements
  structuredExtensionElement = element * -
    (atom:* | dc:date | os:*) { (attribute * { text }+, (text|anyElement)*)
    | (attribute * { text }*, (text?, anyElement+, (text|anyElement)*))}

  # Redefine Atom rules
  atomFeed = [
    element atom:feed { atomFeedConstruct }

  atomEntry =[
    s:pattern [ name="Check for HTML Content"
      s:rule [ context = "atom:entry" s:assert [ test = "atom:content"
        "An atom:entry must have one atom:content MUST have content "
        ~ "element in a format understandable by generic Atom readers"
        ~ " ( @type equal to 'html' is recommended)"]]]
  ]
  element atom:entry { atomEntryConstruct }
}
# EOF

```

Annex C (informative)

Example XML documents

C.1 OpenSearch Description with Geo and Time Extensions

```

<?xml version="1.0" encoding="utf-8"?>
<OpenSearchDescription
xmlns:time="http://a9.com/-/opensearch/extensions/time/1.0/"
xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/"
xmlns="http://a9.com/-/spec/opensearch/1.1/">
  <ShortName>Supersite</ShortName>
  <LongName>GEO Geohazards Supersite Natural Laboratories</LongName>
  <Description>
The Supersites have data for the study of natural hazards in geologically
active regions, including information from Synthetic Aperture Radar (SAR), GPS
crustal deformation measurements, and earthquakes. The data are provided in the
spirit of GEO, ESA, NASA and the National Science Foundation (NSF), that easy
access to Earth science data will promote their use and advance scientific
research, ultimately leading to reduced loss of life from natural hazards. This
OpenSearch Service allows the discovery of the different search feeds available
at this Supersite.
  </Description>
  <Tags>Supersite ASAR SAR GPS GEO</Tags>
  <Contact>info@terradue.com</Contact>
  <Image height="38" width="120" type="image/png">
http://www.terradue.com/images/terradue.png
  </Image>
  <Image height="16" width="16" type="image/vnd.microsoft.icon">
http://www.terradue.com/images/terradue.ico
  </Image>
  <Query role="example" geo:box="138,35,143,41" searchTerms="ASAR Wide Swath"/>
  <Developer>Terradue Geospatial Development Team</Developer>
  <Attribution>
Terradue Srl. Copyright 2008-11, All Rights Reserved
  </Attribution>
  <SyndicationRight>open</SyndicationRight>
  <AdultContent>>false</AdultContent>
  <Language>en-us</Language>
  <OutputEncoding>UTF-8</OutputEncoding>
  <InputEncoding>UTF-8</InputEncoding>
  <Url type="application/rdf+xml" indexOffset="0" pageOffset="0"
template="http://eo-virtual-
archive4.esa.int/search/rdf/?count={count?}&startIndex={startIndex?}&q=
{searchTerms?}&bbox={geo:box?}&start={time:start?}&stop={time:end?}
"/>
  <Url type="text/html" indexOffset="0" pageOffset="0"
template="http://eo-virtual-
archive4.esa.int/search/html/?count={count?}&startIndex={startIndex?}&q=
{searchTerms?}&bbox={geo:box?}&start={time:start?}&stop={time:end?}
"/>
  <Url type="application/atom+xml" indexOffset="0" pageOffset="0"
template="http://eo-virtual-
archive4.esa.int/search/atom/?count={count?}&startIndex={startIndex?}&q=
{searchTerms?}&bbox={geo:box?}&start={time:start?}&stop={time:end?}
"/>
</OpenSearchDescription>

```

C.2 Atom response with search engine resource entry

```

<?xml version="1.0" encoding="utf-8"?>
<feed xml:lang="en" xmlns="http://www.w3.org/2005/Atom"
      xmlns:dc="http://purl.org/dc/elements/1.1/"
      xmlns:georss="http://www.georss.org/georss"
      xmlns:gml="http://www.opengis.net/gml"
      xmlns:os="http://a9.com/-/spec/opensearch/1.1/"
      xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/"
      xmlns:time="http://a9.com/-/opensearch/extensions/time/1.0/" >
  <title>Discovery feed for Search Services</title>
  <subtitle type="html">
    One result found for &lt;i&gt;Wide Swath&lt;/i&gt;
  </subtitle>
  <generator uri="http://www.terradue.com" version="1.4.0">Terradue
CAS</generator>
  <author><name>GEOSS Supersites</name></author>
  <updated>2012-05-30T15:41:15Z</updated>
  <id>http://eo-virtual-archive4.esa.int/search/atom/</id>
  <link rel="self" type="application/atom+xml" href="http://eo-virtual-
archive4.esa.int/search/atom/?count=20&startIndex=0&q=Wide
Swath&bbox=138,35,143,41&start=1992-01-01&stop=2013-05-30"/>
  <link rel="search" type="application/opensearchdescription+xml"
href="http://eo-virtual-archive4.esa.int/search/description/">
  <os:totalResults>1</os:totalResults>
  <os:startIndex>0</os:startIndex>
  <os:itemsPerPage>20</os:itemsPerPage>
  <os:Query role="request" searchTerms="Wide Swath" count="20" startIndex="0"
geo:box="138,35,143,41" time:start="1992-01-01" time:end="2013-05-30" />
  <georss:polygon>35 138 41 138 41 143 35 143 35 143 35 138</georss:polygon>
  <entry>
    <id>http://eo-virtual-archive4.esa.int/search/ASA_WS__0P/atom</id>
    <title>ASAR Wide Swath Level 0 product (ASA_WS__0P)</title>
    <dc:identifier>ASA_WS__0P</dc:identifier>
    <published>2011-06-10T11:05:29.511Z</published>
    <updated>2013-05-16T22:25:57.124Z</updated>
    <dc:date>2004-02-19T03:03:23.736Z/2010-09-12T15:57:36.072Z</dc:date>
    <link rel="alternate" type="text/html" title="HTML web age"
href="http://eo-virtual-archive4.esa.int/search/ASA_WS__0P/html" />
    <link rel="search" type="application/opensearchdescription+xml"
href="http://eo-virtual-archive4.esa.int/search/ASA_WS__0P/description/"
title="Search the ASA_WS__0P" />
    <link rel="via" type="application/rdf+xml" title="RDF metadata entry"
href="http://eo-virtual-archive4.esa.int/search/ASA_WS__0P/rdf?count=0" />
    <content type="html">
      &lt;b&gt; Search Feed &lt;/b&gt;&lt;ul&gt;
        &lt;li&gt; Title: ASAR Wide Swath Level 0 product (ASA_WS__0P)
&lt;/li&gt;&lt;li&gt; Abstract: The WS Mode Level 0 product consists of time-
ordered AISPs collected while the instrument is in WS Mode. The echo samples in
the AISPs have been compressed to 4 bits/sample using FBAQ. This is a high-
rate, wide swath (ScanSAR) mode so data is only acquired for partial orbit
segments and is composed of data from five image swaths (SS1 to SS5). The Level
0 product is produced systematically for all data acquired within this mode.
&lt;/li&gt;
&lt;li&gt; Subject: Radar Imagery, Solid Earth (Tectonics/Seismic Activity),
Water (Water Management), Natural Disasters (Oil Slick), Land
(Topography/Mapping,Soil,Vegetation) Ocean and Coast (Ocean Currents and
Topography,Ocean Waves,Coastal Geomorphology) &lt;/li&gt;
      </content>
    </entry>
  </feed>

```


C.3 Atom response with access to data files

```

<?xml version="1.0" encoding="utf-8"?>
<feed xml:lang="en" xmlns="http://www.w3.org/2005/Atom"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:georss="http://www.georss.org/georss"

  xmlns:os="http://a9.com/-/spec/opensearch/1.1/"
  xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/"
  xmlns:time="http://a9.com/-/opensearch/extensions/time/1.0/" >

  <title>Feed for ENVISAT ASAR Wide Swath Mode (ASA_WSM_1P)</title>

  <subtitle type="html">Found 2 results.</subtitle>
  <author><name>GEOSS Supersites</name></author>

  <generator uri="http://www.terradue.com" version="1.4.0">
Terradue CAS
  </generator>

  <updated>2012-05-30T17:27:57Z</updated>
  <id>http://eo-virtual-archive4.esa.int/search/ASA_WSM_1P/atom/</id>
  <dc:identifier>ASA_WSM_1P</dc:identifier>
  <link rel="self" type="application/atom+xml"
href="http://eo-virtual-archive4.esa.int/search/ASA_WSM_1P/atom/?
startIndex=0&start=1992-01-01&stop=2013-05-30&bbox=138,35,143,41"/>

  <link rel="search" type="application/opensearchdescription+xml"
href="http://eo-virtual-archive4.esa.int/search/ASA_WSM_1P/description"/>

  <os:totalResults>2</os:totalResults>
  <os:startIndex>0</os:startIndex>
  <os:itemsPerPage>20</os:itemsPerPage>
  <os:Query role="request" start="1992-01-01" time:start="1992-01-01"
time:end="2013-05-30" geo:box="138,35,143,41"/>

  <georss:polygon>35 138 41 138 41 143 35 143 35 143</georss:polygon>

  <entry>
    <id>http://eo-virtual-
archive4.esa.int/search/ASA_WSM_1P/ASA_WSM_1CNPDK20110320_123008_000000673100_0
0340_47337_9284.N1/atom/</id>
    <title>
      ASA_WSM_1CNPDK20110320_123008_000000673100_00340_47337_9284.N1
    </title>
    <dc:identifier>ASA_WSM_1CNPDK20110320_123008_000000673100_00340_47337_9284.N
1</dc:identifier>
    <published>2012-04-19T23:27:01.000Z</published>
  <updated>2013-05-16T22:25:57.124Z</updated>
    <dc:date>2011-03-20T12:30:08.155Z/2011-03-20T12:31:15.451Z</dc:date>

    <georss:polygon>37.6925 138.984 38.4046 143.598 38.7665 143.52 39.1284
143.442 39.4902 143.364 39.852 143.286 40.2137 143.207 40.5754 143.128 40.937
143.049 41.2987 142.97 41.6603 142.89 42.0218 142.81 41.3083 137.948 40.947
138.055 40.5857 138.161 40.2243 138.266 39.8628 138.371 39.5013 138.475 39.1397
138.578 38.778 138.68 38.4162 138.782 38.0544 138.883 37.6925
138.984</georss:polygon>

    <link rel="alternate" type="text/html" title="HTML page"
      href="http://eo-virtual-archive4.esa.int/search/ASA_WSM_1P/
ASA_WSM_1CNPDK20110320_123008_000000673100_00340_47337_9284.N1/html" />
    <link rel="via" type="application/rdf+xml" title="RDF metadata entry"
      href="http://eo-virtual-archive4.esa.int/search/ASA_WSM_1P/
ASA_WSM_1CNPDK20110320_123008_000000673100_00340_47337_9284.N1/rdf" />

```

```

<link rel="enclosure" type="application/binary" length="65660258"
  title="ASA_WSM_1CNPDK20110320_123008_000000673100_00340_47337_9284.N1"
  href="https://eo-virtual-archive4.esa.int/supersites/ASA_WSM_1CNPDK2011
0320_123008_000000673100_00340_47337_9284.N1" />

<content type="html">
  <ul><li> Sensor: ASAR </li>
  <li> <b>Date</b>; 2011-03-20
  <br>
  (2011-03-20T12:30:08.155Z / 2011-03-20T12:31:15.451Z) </li>
  <li> <b>Orbit Number</b>; 47337 </li>
  <li> <b>Processing Center</b>; PDHS-K </li>
  <li> <b>Processing Date</b>; 2011-03-20 </li>
  </ul>
</content>
</entry>

<entry>
  <id>http://eo-virtual-
archive4.esa.int/search/ASA_WSM_1P/ASA_WSM_1CNPDK20110320_122913_000000673100_0
0340_47337_9284.N1/atom</id>
  <dc:identifier>ASA_WSM_1CNPDK20110320_122913_000000673100_00340_47337_9284.N
1</dc:identifier>
  <title>
ASA_WSM_1CNPDK20110320_122913_000000673100_00340_47337_9284.N1
</title>
  <published>2012-04-19T23:38:54.000Z</published>
  <updated>2013-05-16T22:25:57.124Z</updated>
  <dc:date>2011-03-20T12:29:13.095Z/2011-03-20T12:30:20.391Z</dc:date>
  <georss:polygon>34.4328 139.862 35.1461 144.287 35.5083 144.211 35.8705
144.135 36.2326 144.059 36.5947 143.982 36.9568 143.906 37.3188 143.829 37.6808
143.752 38.0427 143.675 38.4046 143.598 38.7665 143.52 38.0544 138.883 37.6925
138.984 37.3306 139.084 36.9686 139.183 36.6065 139.282 36.2444 139.38 35.8822
139.478 35.5199 139.575 35.1576 139.671 34.7952 139.767 34.4328
139.862</georss:polygon >

  <link rel="alternate" type="text/html" title="HTML page"
  href="http://eo-virtual-archive4.esa.int/search/ASA_WSM_1P/ASA_WSM_1C
NPDK20110320_122913_000000673100_00340_47337_9284.N1/html"/>
  <link rel="via" type="application/rdf+xml" title="RDF metadata entry"
  href="http://eo-virtual-archive4.esa.int/search/ASA_WSM_1P/ASA_WSM_1C
NPDK20110320_122913_000000673100_00340_47337_9284.N1/rdf"/>
  <link rel="enclosure" type="application/binary" length="65651223"
  title="ASA_WSM_1CNPDK20110320_122913_000000673100_00340_47337_9284.N1"
  href="https://eo-virtual-archive4.esa.int/supersites/ASA_WSM_1CNPDK20
110320_122913_000000673100_00340_47337_9284.N1" />

  <content type="html">
  <ul><li> Sensor: ASAR </li>
  <li> <b>Date</b>; 2011-03-20
  <br>
  (2011-03-20T12:29:13.095Z / 2011-03-20T12:30:20.391Z) </li>
  <li> <b>Orbit Number</b>; 47337 </li>
  <li> <b>Processing Center</b>; PDHS-K </li>
  <li> <b>Processing Date</b>; 2011-03-20 </li>
  </ul>
  </content>
</entry>
</feed>

```

C.4 Atom response with access to data files and foreign elements

```

<?xml version="1.0" encoding="UTF-8"?>
<feed xmlns="http://www.w3.org/2005/Atom"
  xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/"
  xmlns:georss="http://www.georss.org/georss"
  xmlns:time="http://a9.com/-/opensearch/extensions/time/1.0/"
  xmlns:echo="http://www.echo.nasa.gov/esip"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:os="http://a9.com/-/spec/opensearch/1.1/">
  <updated>2011-02-09T22:15:15.397Z</updated>
  <id>https://api.echo.nasa.gov:443/echo-esip/search/granule.atom</id>
  <author><name>ECHO</name><email>echo@echo.nasa.gov</email></author>
  <title type="text">ECHO granule search results</title>
  <os:startIndex>1</os:startIndex>
  <os:totalResults>2</os:totalResults>
  <os:itemsPerPage>10</os:itemsPerPage>
  <os:Query role="request" echo:shortName="MOD02QKM" echo:versionId="5"
  echo:dataCenter="LAADS" time:start="2009-05-01T00:00:00-04:00" time:end="2009-
  05-04T00:00:00-04:00" ></os:Query>
  <subtitle type="text">Granule search for MOD02QKM.5 and the data center:
  LAADS with start time: 2009-05-01T00:00:00-04:00 with end time: 2009-05-
  04T00:00:00-04:00</subtitle>
  <entry><id>laads:250798497</id><dc:identifier>laads:250798497</dc:identifier>
  <title type="text">LAADS:250798497</title>
  <updated>2010-09-03T05:09:24.104Z</updated>
  <link title="" rel="enclosure"
  href="ftp://ladsftp.nascom.nasa.gov/allData/5/MOD02QKM/2009/121/MOD02QKM.A20091
  21.0020.005.2010241162125.hdf" hreflang="en-US" type="application/x-hdfeos" />
  <link rel="icon" length="660988"
  href="ftp://ladsftp.nascom.nasa.gov/allData/5/MOBRGB/2009/121/MOBRGB.A2009121.0
  020.005.2009126214738.jpg" hreflang="en-US" type="image/jpeg" title="" />
  <echo:datasetId>MODIS/Terra Calibrated Radiances 5-Min L1B Swath 250m
  V005</echo:datasetId>
  <dc:date>2009-05-01T00:20:00.000Z/2009-05-01T00:25:00.000Z</dc:date>
  <georss:polygon>53.803143 -20.003695 49.0732 -53.81698 63.68175 -74.32202
  72.10222 -19.447964</georss:polygon>
  <content type="html">&lt;p&gt;&lt;b&gt;Dataset ID : &lt;/b&gt;MODIS/Terra
  Calibrated Radiances 5-Min L1B Swath 250m
  V005&lt;/p&gt;&lt;p&gt;&lt;b&gt;Temporal Extent&lt;/b&gt;&lt;/p&gt;&lt;p&gt;
  &lt;b&gt;Start Time : &lt;/b&gt;2009-05-01T00:20:00.000Z &lt;b&gt;End Time :
  &lt;/b&gt;2009-05-01T00:25:00.000Z&lt;p&gt;&lt;b&gt;</content>
  </entry>
  <entry><id>laads:250797839</id><dc:identifier>laads:250797839</dc:identifier>
  <title type="text">LAADS:250797839</title>
  <updated>2010-09-03T05:09:24.797Z</updated>
  <link hreflang="en-US" type="application/x-hdfeos" rel="enclosure"
  href="ftp://ladsftp.nascom.nasa.gov/allData/5/MOD02QKM/2009/121/MOD02QKM.A20091
  21.0025.005.2010241162738.hdf" title="" />
  <link hreflang="en-US" type="image/jpeg" rel="icon" length="726966"
  href="ftp://ladsftp.nascom.nasa.gov/allData/5/MOBRGB/2009/121/MOBRGB.A2009121.0
  025.005.2009126222233.jpg" title="" />
  <echo:datasetId>MODIS/Terra Calibrated Radiances 5-Min L1B Swath 250m
  V005</echo:datasetId>
  <dc:date>2009-05-01T00:25:00.000Z/2009-05-01T00:30:00.000Z</dc:date>
  <georss:polygon>71.581665 -18.330479 63.81684 -73.79089 70.95812 -119.12558
  87.56117 64.28039</georss:polygon>
  <content type="html">&lt;p&gt;&lt;b&gt;Dataset ID : &lt;/b&gt;MODIS/Terra
  Calibrated Radiances 5-Min L1B Swath 250m V005&lt;/p&gt;&lt;p&gt;
  &lt;b&gt;Temporal Extent&lt;/b&gt;&lt;/p&gt;&lt;p&gt;&lt;b&gt;Start Time :
  &lt;/b&gt;2009-05-01T00:25:00.000Z &lt;b&gt;End Time : &lt;/b&gt;2009-05-
  01T00:30:00.000Z&lt;p&gt;&lt;b&gt;</content>
  </entry>
</feed>

```

C.5 Revision History

Date	Release	Editor	Primary clauses modified	Description
2010-09-20	0.0.1	Pedro Gonçalves		Initial Text with GeoSpatial and Temporal Extension Include OpenSearch specification in Annex
2010-02-09	0.0.2	Pedro Gonçalves		Alignment with the Modular Specification document Addition of Atom examples
2011-02-14	0.0.3	Pedro Gonçalves		Small typos and corrections
2013-03-15	0.0.4	Pedro Gonçalves		Improvement of examples, correction of typos, validation of HMA-S and ngEO requirements.
2013-05-30	0.0.5	Pedro Gonçalves		Removal of the annex with the OpenSearch specification
2013-08-07	0.0.6	Pedro Gonçalves		Corrections and inputs from HMA Project. Added Schemas in Annex B
2013-09-05	1.0.0r7	Pedro Gonçalves		New time:relation parameter
2013-12-20	1.0.0.r8	Pedro Gonçalves		Integration of corrections received from the public comments period