OGC® Web Coverage Service Interface Standard -
Range Subsetting Extension

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i. Abstract

This document specifies parameters to the OGC Web Coverage Service (WCS) GetCoverage request which allow extraction of specific fields, according to the range type specification, from the range set of a coverage during server-side processing of a coverage in a GetCoverage request.

Suggested additions, changes, and comments on this draft document are welcome and encouraged. Such suggestions may be submitted by email message or by making suggested changes in an edited copy of this document.

ii. Keywords

ogcdoc, wcs, Big Data, range_subsetting, extension, band extraction, channel extraction

iii. Terms and definitions

This document uses the standard terms defined in Subclause 5.3 of [OGC 06-121r9], 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.

iv. Submitting organizations

The following organizations have submitted this Interface Specification to the Open Geospatial Consortium, Inc.:

- Jacobs University Bremen
- Fuzhou University

v. Document Contributor Contact Points

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<th>Organization</th>
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<td>Jacobs University Bremen, rasdaman GmbH</td>
</tr>
<tr>
<td>Jinsongdi Yu</td>
<td>Fuzhou University</td>
</tr>
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vi. Revision history

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<th>Author</th>
<th>Paragraph modified</th>
<th>Description</th>
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<td>0.0.1</td>
<td>Peter Baumann</td>
<td>All</td>
<td>Created</td>
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<tr>
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<td>0.0.2</td>
<td>Peter Baumann</td>
<td>6+; Annex A</td>
<td>Conformance classes for the protocol bindings</td>
</tr>
<tr>
<td>2013-12-17</td>
<td>1.0.0</td>
<td>Peter Baumann</td>
<td>Several</td>
<td>Editorial finalization</td>
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vii. Changes to the OGC® Abstract Specification

The OGC® Abstract Specification does not require any changes to accommodate the technical contents of this (part of this) document.

viii. Future Work

Among the topics for future development are the following items:

- Establish a conformance class for subsetting of array-valued range types, i.e., fields whose definition in the coverage range type is described by a `<swe:DataArray>`.

- Establish a conformance class for subsetting of nested range types, i.e., fields whose definition in the coverage range type is described by an arbitrary nesting of `<swe:DataRecord>` and `<swe:DataArray>` components.
Foreword

This WCS Range Subsetting extension is an OGC Interface Standard which relies on WCS Core [OGC 09-110r4] and the GML Application Schema for Coverages [OGC 09-146r2].

This document includes one normative Annex.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights.

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 OGC Web Coverage Service (WCS) – Range Subsetting Extension defines an extension to the WCS Core [OGC 09-110r4] to request and obtain a coverage with the original domain set but a reduced (extracted) range set as compared to the coverage addressed.

Selection is based on the coverage’s range type definition where identifiable components are given; in some domains these range components defined in the range type are referred to as “channels”, “bands”, or “variables”. Various methods are provided for specifying the range components to be retained in the result, such as individual components, lists of components, intervals (based on the range type order), and combinations thereof.

NOTE This standard does not address encoding issues such as whether the number and data type of range fields selected can be represented by the encoding format chosen. See the WCS format encoding extensions for details such aspects.
OGC® Web Coverage Service Interface Standard - Range Subsetting Extension

1 Scope

This OGC WCS Range Subsetting Extension defines retrieval of selected range components from coverages offered by a WCS server. According to the GML 3.2.1 Application Schema – Coverages [OGC 09-146r2], all range cells (commonly called “pixel” or “voxel” in various application domains) of a coverage share a common type, the range type. This range type is built on the DataRecord and DataArray type construction mechanisms established in SWE Common [OGC 08-094r1]; in other words, a range cell can be a record, or an array, or a nesting of these constructors.

This OGC WCS Range Subsetting Extension establishes how a client can request an extract from such composite range elements from a WCS server. The core conformance class of this standard, record-subsetting, defines extraction from unnested records (such as hyperspectral satellite imagery). In a future revision of this standard, optional conformance class array-subsetting will define such extraction from nested arrays, and optional conformance class nested-subsetting, will define access to nested record and array range types.

2 Conformance

This document establishes the following requirements and conformance classes:

- record-subsetting, of URI http://www.opengis.net/spec/WCS_service-extension_range-subsetting/1.0/req/record-subsetting; the corresponding conformance class is record-subsetting, with URI http://www.opengis.net/spec/WCS_service-extension_range-subsetting/1.0/conf/record-subsetting.

This is the mandatory core conformance class for this extension.

Standardisation target of all requirements and conformance classes are WCS implementations (currently: servers).

Requirements URIs defined in this document are relative to http://www.opengis.net/spec/WCS_service-extension_range-subsetting/1.0/req, conformance test URIs are relative to http://www.opengis.net/spec/WCS_service-extension_range-subsetting/1.0/conf.

Annex A lists the conformance tests which shall be exercised on any software artefact claiming to implement WCS.

3 Normative references

This OGC WCS Range Subsetting Extension standard consists of the present document and an XML Schema. The complete standard is identified by OGC URI
The standard is available for download from [http://www.opengeospatial.org/standards/wcs](http://www.opengeospatial.org/standards/wcs); additionally, the XML Schema is posted online at [http://schemas.opengis.net/wcs/range-subsetting/1.0](http://schemas.opengis.net/wcs/range-subsetting/1.0) as part of the OGC schema repository. In the event of a discrepancy between bundled and schema repository versions of the XML Schema files, the schema repository shall be considered authoritative.

The normative documents listed in Table 1 contain provisions that, through reference in this text, constitute provisions of this specification. 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.

### Table 1 — Conformance class dependencies

<table>
<thead>
<tr>
<th>Range subsetting conformance class</th>
<th>Dependency document</th>
<th>Dependency conformance class</th>
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<tbody>
<tr>
<td>record-subsetting</td>
<td>OGC 09-146, <em>GML 3.2.1 Application Schema for Coverages</em>, version 1.0</td>
<td>gml-coverage</td>
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<tr>
<td></td>
<td>OGC 09-110, <em>OGC® Web Coverage Service 2.0 Interface Standard - Core</em>, version 2.0</td>
<td>core</td>
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</table>

## 4 Terms and definitions

For the purposes of this document, the terms and definitions given in the above references apply. In addition, the following terms and definitions apply. An arrow “→” indicates that the following term is defined in this Clause.

- None defined here -

## 5 Conventions

### 5.1 UML notation

Unified Modeling Language (UML) static structure diagrams appearing in this specification are used as described in Subclause 5.2 of OGC Web Services Common [OGC 06-121r9].

### 5.2 Data dictionary tables

The UML model data dictionary is specified herein in a series of tables. The contents of the columns in these tables are described in Subclause 5.5 of [OGC 06-121r9]. The contents of these data dictionary tables are normative, including any table footnotes.
5.3 Namespace prefix conventions

The following namespaces are used in this document. The prefix abbreviations used constitute conventions used here, but are **not** normative. The namespaces to which the prefixes refer are normative, however.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Namespace URI</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>xsd</td>
<td><a href="http://www.w3.org/2001/XMLSchema">http://www.w3.org/2001/XMLSchema</a></td>
<td>XML Schema namespace</td>
</tr>
<tr>
<td>gml</td>
<td><a href="http://www.opengis.net/gml/3.2">http://www.opengis.net/gml/3.2</a></td>
<td>GML 3.2.1</td>
</tr>
<tr>
<td>gmlcov</td>
<td><a href="http://www.opengis.net/gmlcov/1.0">http://www.opengis.net/gmlcov/1.0</a></td>
<td>GML Application Schema for Coverages</td>
</tr>
<tr>
<td>wcs</td>
<td><a href="http://www.opengis.net/wcs/2.0">http://www.opengis.net/wcs/2.0</a></td>
<td>WCS Core</td>
</tr>
<tr>
<td>rsub</td>
<td><a href="http://www.opengis.net/wcs/range-subsetting/1.0">http://www.opengis.net/wcs/range-subsetting/1.0</a></td>
<td>WCS Range Subsetting Extension</td>
</tr>
</tbody>
</table>

5.4 Multiple representations

When multiple representations of the same information are given in a specification document these are consistent. Should this not be the case then this is considered an error, and the XML schema shall take precedence.

6 record-subsetting requirements class

6.1 Overview

This Clause 6 establishes the mandatory WCS Range Subsetting Extension core conformance class, record-subsetting. This conformance class specifies how to request and obtain coverages where multiple range field components are extracted from a record-valued range field, i.e., a range field whose definition in the coverage range type is described by a `<swe:DataRecord>`.

Note This is the core requirements class because the range type of a coverage, as per GMLCOV [09-146r2], always is a `<swe:DataRecord>`.

The records are flat, i.e., no nesting of record components is addressed here.

6.2 Modifications to GetCapabilities

A server announces support of the Range Subsetting Extension to a client by adding the URL identifying this extension to the list of supported extensions delivered in the Capabilities document.

**Requirement 1 extension-identifier:**
A WCS service implementing conformance class record-subsetting of this Range Subsetting Extension **shall** include the following URI in the Profile element of the ServiceI-
identification in any GetCapabilities response:
http://www.opengis.net/spec/WCS_service-extension_range-subsetting/1.0/conf/record-subsetting

6.3 Modifications to DescribeCoverage

None.

6.4 Modifications to GetCoverage

6.4.1 GetCoverage request

A range subsetting request parameter consists of a sequence of range component selections. Such a selection item can either be a range component name as defined in the range type of the coverage queries, or a range interval specifying a sequence consisting of all range components between the first (start) element of the interval and the last (end) element of the interval, including start and end.

Requirement 2 getCoverage-request-syntax:
A GetCoverage request shall adhere to Figure 1, Table 3, and the XML schema defined for this Range Subsetting Extension whereby, in the XML request encoding, the GetCoverage wcs:Extension element shall contain exactly one RangeSubset element.
**Figure 1 — GetCoverage with range subsetting support UML diagram**

**Table 3 — Components of RSub::GetCoverageWithRangeSubset structure**

<table>
<thead>
<tr>
<th>Name</th>
<th>Definition</th>
<th>Data type</th>
<th>Multiplicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>RangeItem</td>
<td>List of range components to be extracted</td>
<td>RangeComponent or RangeInterval</td>
<td>one or more (mandatory)</td>
</tr>
<tr>
<td>RangeComponent</td>
<td>Range component name</td>
<td>RangeComponent</td>
<td>one (mandatory)</td>
</tr>
<tr>
<td>RangeInterval</td>
<td>Pair of range interval lower and upper bound</td>
<td>Pair of RangeComponent</td>
<td>one (mandatory)</td>
</tr>
</tbody>
</table>

**Requirement 3** getCoverage-subsetting-list:
The RSub::RangeSubset parameter in a GetCoverage request, if present, shall have as its
value a non-empty RSub::RangeItem list as specified in Table 2, whereby each
RSub::RangeItem is either a RSub::RangeComponent or a RSub::RangeInter-
val.

Note this implies that a mixing of rangeComponent and rangeInterval is possible – see
example following Requirement 12.

The range subsetting parameter may only refer to existing range type components of the tar-
get coverage.

Requirement 4  getCoverage-existing-component:
In the RSub::RangeSubset parameter of a GetCoverage request, for each
RSub::RangeComponent there shall exist a corresponding component name in the range
type of the coverage addressed.

Note Duplicate range components are allowed; for example, a single component can be tripled into
an RGB representation of that (grayscale) “channel”. In GET/KVP syntax (cf. Subclause 0) transforming
the red channel into RGB can be written as follows:
...& RANGESUBSET=red,red,red &...

Interval addressing is a short-hand for enumerating a sequence of components in the order
they appear in the original coverage’s range type.

Requirement 5  getCoverage-subsetting-expansion:
In the RSub::RangeSubset parameter of a GetCoverage request, if present, an RSub::Range-
Interval with RSub::startComponent a and RSub::endComponent b shall be
equivalent to a sequence of rₙ, ..., rₙ where r₁=a and rₙ=b and each rᵢ is a range compo-
nent name in the original coverage’s range type and the sequence is sorted in document order
of the original coverage’s range type.

Example Assume that the original coverage has a range type definition consisting of the compone-
t sequence (band1, band2, band3, band4, band5). Then, a RangeSubset selection of
band2:band4
is equivalent to a selection of band2, band3, band4.

Requirement 6  getCoverage-subsetting-interval-order:
In a RSub::RangeInterval with RSub::startComponent a and RSub::end-
Component b contained in the RangeSubset parameter of a GetCoverage request, range
component a shall be before b or equal to b (in document order) in the range component
sequence of the RangeType of the coverage addressed.

Note This requirement forbids range intervals where the lower bound of the interval is higher than
the upper bound, in terms of the range type definition.

Example Using the previous RGB example, the following is disallowed and will lead to an exception:
blue:red

6.4.2  GetCoverage response

The range subsetting parameter effectuates that only those range components mentioned are
returned to the client, and in the sequence requested (which may be different from the se-
quence of components in the range type definition of the coverage queried).
Requirement 7  getCoverage-response-no-subsetting:
The response to a successful GetCoverage request containing no RSub::RangeSubset parameter shall consist of a coverage whose range type contains exactly the original coverage’s range type elements in the proper sequence of this list.

Requirement 8  getCoverage-response-components:
The response to a successful GetCoverage request containing a RSub::RangeSubset parameter consisting of list $r_1, \ldots, r_n$ of range component names, for some $n>0$, shall consist of a coverage whose range type contains exactly the original coverage’s range type elements identified by $r_1, \ldots, r_n$, in the proper sequence of this list.

Example  Assume that the original coverage has a range type definition consisting of the component sequence (band1, band2, band3, band4, band5). Then, a RangeSubset selection of band1,band5,band3 will result in a coverage with range type sequence (band1,band5,band3).

Requirement 9  getCoverage-response-contents:
The response to a successful GetCoverage request containing a RSub::RangeSubset parameter consisting of list $r_1, \ldots, r_n$ of range component names, for some $n>0$, shall consist of a coverage whose range set contains, for each domain coordinate of the coverage returned, exactly those components of the original coverage’s range set values which are identified by $r_1, \ldots, r_n$, in the proper sequence of this list.

Example  Assume that the original coverage has a range type definition consisting of the component sequence (band1, band2, band3, band4, band5) and a single range value (1,2,3,4,5). Then, a RangeSubset selection of band1,band5,band3 will result in a coverage containing the range value (1,5,3).

6.5 Parameter Encoding

6.5.1 Overview

This Clause establishes conformance classes specifying how requests containing range subsetting operations shall be encoded, depending on the protocol binding used by the request.

6.5.2 GET/KVP Encoding

Requirement 10  request-encoding-kvp-list:
In a GetCoverage request encoded in GET/KVP, the encoding of a RangeSubset parameter consisting of list $r_1, \ldots, r_n$ of RSub::RangeItems, for some $n>1$, shall consist of an ordered, comma-separated list of the $r_i$ in their proper order.

Requirement 11  request-encoding-kvp-component:
In a GetCoverage request encoded in GET/KVP, the encoding of an RSub::rangeComponent in a RSub::RangeSubset parameter shall consist of this component name.

Requirement 12  request-encoding-kvp-interval:
In a GetCoverage request encoded in GET/KVP, the encoding of an RSub::RangeInterval in a RSub::RangeSubset parameter shall consist of the RSub::startComponent name followed by a colon (“:”) followed by the RSub::endComponent name.
Example 1 The following KVP request snippet extracts the component named “red” from the coverage addressed (assuming that these components are defined in the coverage’s range type):

```text
...& RANGESUBSET=red &...
```

Example 2 The following KVP request snippet extracts the three components named “nir”, “red”, and “green” from the coverage addressed (assuming that these components are defined in the coverage’s range type):

```text
...& RANGESUBSET=nir, red, green &...
```

Example 3 The following KVP request snippet extracts the three components named “red”, “green”, and “blue” from the coverage addressed (assuming that these components are defined in the coverage’s range type), but changes its sequence over the original coverage range type definition:

```text
...& RANGESUBSET=green, red, blue &...
```

Example 4 The following KVP request snippet extracts a number of components from the coverage addressed, starting from component “nir” up to component “green”. Assuming that the coverage’s range type contains, in contiguous XML document order, “nir”, “red”, and “green”, the resulting coverage will contain these three range components “nir”, “red”, and “green”:

```text
...& RANGESUBSET=nir:green &...
```

Example 5 The following KVP request snippet shows mixing of the previously exemplified component selection; for a range type consisting of band01 to band36 (with the obvious order of bands), the request results in a record containing the components band01, band03, band04, band05, band19, band20, band21:

```text
...& RANGESUBSET=band01, band03:band05, band19:band21 &...
```

6.5.3 POST/XML Encoding

**Requirement 13 request-encoding-xml:**

In a **GetCoverage** request encoded in XML/POST, the encoding of an RSub::rangeSubset shall consist of a structure as defined in the XML schema accompanying this standard.

Example The following XML rsub:rangeSubset selects band1, band3, band4, and band5 from a coverage whose range type contains bands1 through band5:

```xml
<wcs:GetCoverage xmlns:wcs=http://www.opengis.net/wcs/2.0
oxmlns:gml=http://www.opengis.net/gml/3.2
xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
xmlns:crs=http://www.opengis.net/wcs_service-extension_crs/1.0
   service="WCS" version="2.0.1">
  <wcs:Extension>
    <rsub:RangeSubset>
      <rsub:RangeItem>
        <rsub:RangeComponent>band1</rsub:RangeComponent>
      </rsub:RangeItem>
      <rsub:RangeItem>
        <rsub:RangeInterval>
          <rsub:startComponent>band3</rsub:startComponent>
          <rsub:endComponent>band5</rsub:endComponent>
        </rsub:RangeInterval>
      </rsub:RangeItem>
    </rsub:RangeSubset>
  </wcs:Extension>
</wcs:GetCoverage>
```
6.5.4 SOAP Encoding

**Requirement 14 request-encoding-soap:**
In a GetCoverage request encoded in SOAP, the encoding of an RSub::RangeSubset shall consist of a structure as defined in Figure 1, Table 2.

Example  See previous Subclause.

6.6 Exceptions

<table>
<thead>
<tr>
<th>exceptionCode</th>
<th>HTTP code</th>
<th>Meaning of exception code</th>
<th>locator value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NoSuchField</td>
<td>404</td>
<td>One or more range field names indicated in the request are not defined in range type of the coverage addressed</td>
<td>First offending range field name in the parameter list</td>
</tr>
<tr>
<td>IllegalFieldSequence</td>
<td>404</td>
<td>In a range field interval, the lower limit is above the upper limit, in range type document order</td>
<td>First offending range field name in the parameter list</td>
</tr>
</tbody>
</table>
Bibliography

[1] OGC 08-094r1, OGC® SWE Common Data Model Encoding Standard, version 2.0
Annex A
(normative)

Abstract test suite

A Range Subsetting Extension implementation must satisfy the following system characteristics to be conformant with this specification.

Test identifiers below are relative to http://www.opengeospatial.org/portal/spec/WCS/2.0/WCS_service-extension_range-subsetting/1.0/conf.

A.1  Conformance Test Class: record-subsetting

The OGC URI identifier of this conformance class is:
http://www.opengeospatial.org/portal/spec/WCS/2.0/conf/WCS_service-extension_range-subsetting/1.0/conf/record-subsetting.

A.1.1 Record-subsetting extension identifier

Test id: extension-identifier:
Test Purpose: A WCS service implementing conformance class record-subsetting of this Range Subsetting Extension shall include the following URI in the Profile element of the ServiceIdentification in any GetCapabilities response:
http://www.opengeospatial.org/portal/spec/WCS/2.0/conf/WCS_service-extension_range-subsetting/1.0/conf/record-subsetting

Test method: Send a GetCapabilities request to server under test, verify that the response contains a Profile element with said URI.

Test passes if all individual tests pass.

A.1.2 GetCoverage request syntax

Test id: getCoverage-request-syntax:
Test Purpose: A GetCoverage request shall adhere to Figure 1, Table 3, and the XML schema defined for this Range Subsetting Extension whereby, in the XML request encoding, the GetCoverage wcs:Extension element shall contain exactly one RangeSubset element.

Test method: Send GetCoverage requests testing server response on the cases distinguished in said reference. Check proper response.

Test passes if all individual tests pass.
A.1.3  GetCoverage subsetting list

Test id: getCoverage-subsetting-list:
Test Purpose: The RSub::RangeSubset parameter in a GetCoverage request, if present, shall have as its value a non-empty RSub::RangeItem list as specified in Table 2, whereby each RSub::RangeItem is either a RSub::RangeComponent or a RSub::RangeInterval.

Test method: Send GetCoverage requests to the service under test, evaluate whether responses are adequate. Exercise tests for each of the following situations:

- empty RSub::rangeItem
- RSub::rangeItem is a RSub::rangeComponent
- RSub::rangeItem is a RSub::rangeInterval

Test passes if all individual tests pass.

A.1.4  GetCoverage existing component

Test id: getCoverage-existing-component:
Test Purpose: In the RSub::RangeSubset parameter of a GetCoverage request, for each RSub::RangeComponent there shall exist a corresponding component name in the range type of the coverage addressed.

Test method: Send GetCoverage requests to the service under test, evaluate whether responses are adequate. Exercise tests for each of the following situations:

- For each RSub::rangeComponent there exists a corresponding component name in the range type of the coverage addressed
- There is a component name does not in the range type of the coverage addressed

Test passes if all individual tests pass.

A.1.5  GetCoverage subsetting expansion

Test id: getCoverage-subsetting-expansion:
Test Purpose: In the RangeSubset parameter of a GetCoverage request, if present, an RSub::RangeInterval with RSub::startComponent a and RSub::endComponent b shall be equivalent to a sequence of r_1, ..., r_n where r_1=a and r_n=b and each r_i is a range component name in the original coverage's range type and the sequence is sorted in document order of the original coverage's range type.

Test method: Send a GetCoverage request with an RSub::rangeInterval to the ser-
vice under test, check proper response.

Test passes if all individual tests pass.

**A.1.6 GetCoverage interval order**

**Test id:** getCoverage-subsetting-interval-order: 
**Test Purpose:** In a RSub::RangeInterval with RSub::startComponent a and RSub::endComponent b contained in the RangeSubset parameter of a GetCoverage request, range component a shall be before b or equal to b (in document order) in the range component sequence of the RangeType of the coverage addressed.

**Test method:** Send a GetCoverage request with a correct RSub::rangeInterval to the service under test; check that result is not an exception.

Send a GetCoverage request with an RSub::rangeInterval containing a lower interval bound higher than the upper bound, according to range type document order; check that result is an IllegalFieldSequence exception.

Test passes if all individual tests pass.

**A.1.7 GetCoverage response**

**Test id:** getCoverage-response-no-subsetting: 
**Test Purpose:** The response to a successful GetCoverage request containing no RSub::RangeSubset parameter shall consist of a coverage whose range type contains exactly the original coverage’s range type elements in the proper sequence of this list.

**Test method:** Send a GetCoverage request containing no RSub::rangeSubset parameter to the service under test, check that the result consists of a coverage whose range type contains exactly the original coverage’s range type elements in the proper sequence of this list.

Test passes if all individual tests pass.

**A.1.8 GetCoverage response component**

**Test Purpose:** getCoverage-response-components: 
The response to a successful GetCoverage request containing a RSub::RangeSubset parameter consisting of list $r_1, \ldots, r_n$ of range component names, for some $n>0$, shall consist of a coverage whose range type contains exactly the original coverage’s range type elements identified
by \( r_1, \ldots, r_n \), in the proper sequence of this list.

**Test method:** Send a *GetCoverage* request containing a \texttt{RSub::rangeSubset} parameter consisting of list \( r_1, \ldots, r_n \) of range component names to the service under test, check that the result consists of a coverage whose range type contains exactly the original coverage’s range type elements identified by \( r_1, \ldots, r_n \), in the proper sequence of this list.

Test passes if all individual tests pass.

### A.1.9 GetCoverage response content

**Test id:** getCoverage-response-contents

**Test Purpose:** The response to a successful *GetCoverage* request containing a \texttt{RSub::RangeSubset} parameter consisting of list \( r_1, \ldots, r_n \) of range component names, for some \( n>0 \), shall consist of a coverage whose range set contains, for each domain coordinate of the coverage returned, exactly those components of the original coverage’s range set values which are identified by \( r_1, \ldots, r_n \), in the proper sequence of this list.

**Test method:** Send a *GetCoverage* request containing a \texttt{RSub::rangeSubset} parameter consisting of list \( r_1, \ldots, r_n \) of range component names to the service under test, check that the result consists of a coverage whose range set contains, for each domain coordinate of the coverage returned, exactly those components of the original coverage’s range set values which are identified by \( r_1, \ldots, r_n \), in the proper sequence of this list.

Test passes if all individual tests pass.

### A.1.10 KVP request list encoding

**Test id:** request-encoding-kvp-list

**Test Purpose:** In a *GetCoverage* request encoded in GET/KVP, the encoding of a \texttt{RSub::RangeItem} parameter consisting of list \( r_1, \ldots, r_n \) of range component names, for some \( n>1 \), shall consist of an ordered, comma-separated list of the \( r_i \) in their proper order.

**Test method:** Send a GET/KVP *GetCoverage* request containing the encoding of a \texttt{rangeSubset} parameter consisting an ordered, comma-separated list of \texttt{RSub::rangeItems} (\( n>1 \)). Check proper response.

Test passes if all individual tests pass.

### A.1.11 KVP request component encoding

**Test id:** request-encoding-kvp-component

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Test Purpose: In a GetCoverage request encoded in GET/KVP, the encoding of an `RSub::rangeComponent` in a `RSub::RangeSubset` parameter shall consist of this component name.

Test method: Send a GET/KVP GetCoverage request containing the component name of an `RSub::rangeComponent`. Check proper response.

Test passes if all individual tests pass.

A.1.12 KVP request interval encoding

Test id: request-encoding-kvp-interval:
Test Purpose: In a GetCoverage request encoded in GET/KVP, the encoding of an `RSub::RangeInterval` in a `RSub::RangeSubset` parameter shall consist of the `RSub::startComponent` name followed by a colon (":") followed by the `RSub::endComponent` name.

Test method: Send a GET/KVP GetCoverage request containing the encoding of an `RSub::rangeInterval` parameter consisting of the `RSub::startComponent` name followed by a colon (":") followed by the `RSub::endComponent` name. Check proper response.

Test passes if all individual tests pass.

A.1.13 XML/Post request encoding

Test id: request-encoding-xml:
Test Purpose: In a GetCoverage request encoded in XML/POST, the encoding of an `RSub::rangeSubset` shall consist of a structure as defined in the XML schema accompanying this standard.

Test method: Send XML/POST GetCoverage requests testing server response on the cases distinguished in said reference. Check proper response.

Test passes if all individual tests pass.

A.1.14 SOAP request encoding

Test id: request-encoding-soap:
Test Purpose: In a GetCoverage request encoded in SOAP, the encoding of an `RSub::RangeSubset` shall consist of a structure as defined in Figure 1, Table 2.

Test method: Send SOAP GetCoverage requests testing server response on the cases distinguished in said reference. Check proper response.
Test passes if all individual tests pass.

-- end of ATS --