OGC® Web Coverage Service 2.0 Interface Standard - KVP Protocol Binding Extension

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i. Preface

This document specifies an extension to the OGC Web Coverage Service (WCS) 2.0 core to allow for client/server communication using HTTP GET with key/value pair (KVP) encoding.

ii. Terms and definitions

This document uses the specification 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.

iii. Submitting organizations

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

- Jacobs University Bremen
- National Center for Atmospheric Research (NCAR)
- Oracle USA
- PCI Geomatics Inc.
- ERDAS, Inc.
- EOX IT Services GmbH
- Spot Image
- BAE Systems - C3I Systems
- Natural Environment Research Council (NERC)
- George Mason University
iv. Document Contributor Contact Points

<table>
<thead>
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<tr>
<td>Peter Baumann</td>
<td>Jacobs University Bremen, rasdaman GmbH</td>
</tr>
</tbody>
</table>

v. Revision history

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<th>Date</th>
<th>Release</th>
<th>Author</th>
<th>Paragraph modified</th>
<th>Description</th>
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<tr>
<td>2009-08-22</td>
<td>0.0.1</td>
<td>PB</td>
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vi. Changes to the OpenGIS® Abstract Specification

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

vii. Future Work

Nothing foreseen currently.
Foreword

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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 Inc. 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) supports electronic retrieval of geospatial data as "coverages" – that is, digital geospatial information representing space/time-varying phenomena.

This document specifies an extension to the OGC Web Coverage Service (WCS) 2.0 core to allow for client/server communication using HTTP GET with key/value pair (KVP) encoding.
OGC® Web Coverage Service 2.0 Interface Standard - KVP Protocol Binding Extension

1 Scope

This document specifies how Web Coverage Service (WCS) clients and servers can communicate over the Internet using HTTP GET with key/value pair (KVP) encoding.

2 Conformance

Standardization target are WCS 2.0 implementations (currently: servers).

This document establishes a single requirements class, get-kvp, of URI http://www.opengis.net/spec/WCS_protocol-binding_get-kvp/1.0/req/get-kvp with a single pertaining conformance class, get-kvp, of URI http://www.opengis.net/spec/WCS_protocol-binding_get-kvp/1.0/conf/get-kvp. Requirements and conformance test URIs defined in this document are relative to http://www.opengis.net/spec/WCS_protocol-binding_get-kvp/1.0/.

Annex A lists the conformance tests which shall be exercised on any software artefact claiming to implement an OGC WCS using this extension.

3 Normative references

This OGC WCS 2.0 KVP Protocol Binding Extension specification consists of the present document and an XML Schema. The complete specification is identified by OGC URI http://www.opengis.net/spec/WCS_protocol-binding_get-kvp/1.0, the document has OGC URI http://www.opengis.net/doc/ISx/WCS_protocol-binding_get-kvp/1.0.

The complete specification is available for download from http://www.opengeospatial.org/standards/wcs; additionally, the XML Schema is posted online at http://schemas.opengis.net/wcs/2.0 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 following normative documents 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.

OGC 06-121r9, OGC Web Service Common Specification, version 2.0

Conformance classes used:
- HTTP GET
- KVP encoding

OGC 09-110r3, OGC® Web Coverage Service 2.0 Interface Standard - Core, version 2.0

Conformance classes used:
- Core
4 Terms and definitions

For the purposes of this document, the terms and definitions given in the above references apply.

5 Conventions

5.1 UML notation

All the diagrams that appear in this specification are presented using the Unified Modeling Language (UML) static structure diagram, as described in Subclause 5.2 of OGC Web Service 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.

6 HTTP/GET with KVP

6.1 General

**Requirement 1 /req/get-kvp/extension-identifier:**

A WCS service implementing this extension shall include the following URI in the Profile element of the ServiceIdentification in a GetCapabilities response:

http://www.opengis.net/spec/WCS_protocol-binding_get-kvp/1.0

**Requirement 2 /req/get-kvp/url-encoding:**

Operation responses shall URL-encode special characters as defined in [2].

Example Use “%3F” to represent a question mark, “?”.

**Requirement 3 /req/get-kvp/case-sensitivity:**

Keys shall be case insensitive, values shall be case sensitive.

While this requirement is strict, the corresponding conformance test tentatively does not stamp an implementation non-conformant if it is elastic in also recognizing a wrong case in values, as long as this does not cause a conflict.

Example “REQUEST=GETCAPABILITIES” allows unambiguous recognition of the canonical value “GetCapabilities”. For coverage identifiers, on the other hand, case distinction is essential.

6.2 GetCapabilities

A GetCapabilities request in the get-kvp conformance class consists of an URL with KVP parameters, while the response – a capabilities document – is an XML document.

Example To request a Capabilities document, a client can issue the following minimal GetCapabilities operation request encoded as KVP:
http://hostname:port/path?service=WCS&request=GetCapabilities

**Requirement 4** /req/get-kvp/getCapabilities-response-structure:
The response to a successful *GetCapabilities* request **shall** be a valid XML document of type *wcs:CapabilitiesType*.

Example See [OGC 09-110r3].

### 6.3 DescribeCoverage

**Requirement 5** /req/get-kvp/describeCapabilities-request-structure:
The KVP encoding of a *DescribeCoverage* request **shall** be as defined in Table 1.

#### Table 1 — DescribeCoverage request URL encoding

<table>
<thead>
<tr>
<th>Name</th>
<th>Definition</th>
<th>Data type</th>
<th>Multiplicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>service</td>
<td>Identifier of the OGC service</td>
<td>String, fixed to &quot;WCS&quot;</td>
<td>One (mandatory)</td>
</tr>
<tr>
<td>version</td>
<td>Request protocol version</td>
<td>String</td>
<td>One (mandatory)</td>
</tr>
<tr>
<td>request</td>
<td>Request type name</td>
<td>String, fixed to &quot;DescribeCoverage&quot;</td>
<td>One (mandatory)</td>
</tr>
<tr>
<td>coverageId</td>
<td>List of coverage identifiers to be described</td>
<td>Comma-separated NCName list</td>
<td>One (mandatory)</td>
</tr>
</tbody>
</table>

Example The following KVP structure requests information about the coverages with identifiers C0002, C0003, and C0004, resp.:

```
http://www.myserver.org:port/path?
  service=WCS
  &version=2.0
  &request=DescribeCoverage
  &coverageid=C0002,C0003,C0004
```

### 6.4 GetCoverage

**Requirement 6** /req/get-kvp/getCoverage-request-structure:
The KVP encoding of a *GetCoverage* request **shall** be as defined in Table 2.

#### Table 2 — GetCoverage request KVP encoding

<table>
<thead>
<tr>
<th>Name</th>
<th>Definition</th>
<th>Data type</th>
<th>Multiplicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>service</td>
<td>Identifier of the OGC service</td>
<td>String, fixed to &quot;WCS&quot;</td>
<td>one (mandatory)</td>
</tr>
<tr>
<td>version</td>
<td>Request protocol version</td>
<td>String</td>
<td>one (mandatory)</td>
</tr>
<tr>
<td>request</td>
<td>Request type name</td>
<td>String, fixed to &quot;GetCoverage&quot;</td>
<td>one (mandatory)</td>
</tr>
<tr>
<td>coverageId</td>
<td>Identifier of coverage to be inspected</td>
<td>NCName</td>
<td>one (mandatory)</td>
</tr>
<tr>
<td>subset</td>
<td>boundaries of coverage subset</td>
<td>SubsetSpec as defined in</td>
<td>zero or more</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(optional)</td>
</tr>
</tbody>
</table>

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Requirement 7 /req/get-kvp/getCoverage-request-subsetspec:
Each SubsetSpec shall adhere to this EBNF syntax:

```
SubsetSpec:  dimension [ , crs ] ( intervalOrPoint )
dimension:    NCName
crs         anyURI
intervalOrPoint:  interval | point
interval:      low < high
low:          point | *
high:         point | *
point:        number | "token" // _ = ASCII 0x42
```

Syntax rules are as follows [3]: underlined tokens represent literals which appear “as is” ("terminal symbols"), other tokens represent sub-expressions to be substituted ("non-terminals"). A vertical bar ("|") denotes alternatives, items in brackets ("["] are optional. Non-terminals NCName, number, token, and anyURI follow the resp. XML definitions.

NOTE Allowed values for points are determined by the CRS used. This ranges from 2009-11-06 for time over -41.5 for lat/long to 41°5’ for lat/long whereby non-numeric values have to be enclosed in double quotes.

Example The following KVP-encoded GetCoverage request addresses service path on server www.myservice.org at port port retrieves all range fields of coverage 42 in the domain specified by the bounding box with longitude (-71,47) and latitude (-66,51), expressed in spatial CRS WGS84 2D and temporal CRS ISO:8601 (which are assumed to be supported for the coverage):

```
http://www.myserver.org:port/path?
service=WCS
&version=2.0
&request=GetCoverage
&coverageId=C0002
&subset=lon,http://www.opengis.net/def/crs/EPSG/0/4326(-71,47)
&subset=lat,http://www.opengis.net/def/crs/EPSG/0/4326(-66,51)
```

7 Exceptions

Requirement 8 /req/get-kvp/exceptions:
When a WCS server encounters an error described in column “meaning of exception code” in Table 3 then it shall return the corresponding exception report message with the contents of the locator parameter value as specified in the right column of Table 3.

```
<table>
<thead>
<tr>
<th>exceptionCode value</th>
<th>HTTP code</th>
<th>Meaning of code</th>
<th>locator value</th>
</tr>
</thead>
<tbody>
<tr>
<td>InvalidEncodingSyntax</td>
<td>400</td>
<td>Document received does not conform with protocol syntax</td>
<td>key of violating element</td>
</tr>
</tbody>
</table>
```

7 Exceptions

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<table>
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<td>key of violating element</td>
</tr>
</tbody>
</table>
```
Bibliography


A WCS implementing this extension shall pass all of the following tests, plus those of the WCS core [OGC 09-110r3], to be conformant with this specification.

A.1 Conformance Test Class: get-kvp

The OGC URI identifier of this conformance class is: 
http://www.opengis.net/spec/WCS_protocol-binding_get-kvp/1.0/conf-class/get-kvp.

Test identifiers below are relative to http://www.opengis.net/spec/WCS_protocol-binding_get-kvp/1.0/.

A.1.1 Extension identification

Test id: /conf/get-kvp/extension-identifier

Test Purpose: Requirement /req/get-kvp/extension-identifier:
A WCS service implementing this extension shall include the following URI in the Profile element of the ServiceIdentification in a GetCapabilities response:
http://www.opengis.net/spec/WCS_protocol-binding_get-kvp

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

A.1.2 Encode special characters

Test id: /conf/get-kvp/url-encoding

Test Purpose: Requirement /req/get-kvp/url-encoding:
Operation responses shall URL-encode special characters as defined in [2].

Test method: For each request type, send a request to the service under test which contains special characters and send a request such that the response contains special characters. Check correct handling of the special characters.

A.1.3 Proper case handling

Test id: /conf/get-kvp/case-sensitivity

Test Purpose: Requirement /req/get-kvp/case-sensitivity:
Keys shall be case insensitive, values shall be case sensitive.
**Test method:** For each request type:

- send requests to the server under test containing lower, mixed, and upper case keys. Check proper response.
- Send requests to the server under test with different case in values, except for the REQUEST and VERSION parameters. Check that the server differentiates in its response.

Test passes if all individual tests pass.

**A.1.4 GetCapabilities response structure**

**Test id:** /conf/get-kvp/getCapabilities-response-structure

**Test Purpose:** Requirement /req/get-kvp/getCapabilities-response-structure: The response to a successful GetCapabilities request shall be a valid XML document of type wcs:CapabilitiesType.

**Test method:** Send a valid GetCapabilities request. Pass test if an XML validator reports validity of the response document against its schema definition.

**A.1.5 DescribeCoverage request encoding**

**Test id:** /conf/get-kvp/describeCapabilities-request-structure

**Test Purpose:** Requirement /req/get-kvp/describeCapabilities-request-structure: The KVP encoding of a DescribeCoverage request shall be as defined in Table 1.

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

**A.1.6 GetCoverage request encoding**

**Test id:** /conf/get-kvp/getCoverage-request-structure

**Test Purpose:** Requirement /req/get-kvp/getCoverage-request-structure: The KVP encoding of a GetCoverage request shall be as defined in Table 2.

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

**A.1.7 GetCoverage subset specification**

**Test id:** /conf/get-kvp/getCoverage-request-subsetspec
Test Purpose: **Requirement /req/get-kvp/getCoverage-request-subsetspec:**

Each SubsetSpec **shall** adhere to this EBNF syntax:

```
SubsetSpec:  dimension [ , crs ] ( intervalOrPoint )
```

- **dimension:** `NCName`
- **crs:** `anyURI`
- **intervalOrPoint:** `interval | point`
- **interval:** `low , high`
- **low:** `point | *`
- **high:** `point | *`
- **point:** `number | "token" /* = ASCII 0x42`

**Test method:** Send `GetCoverage` requests to the service under test, evaluate whether responses are adequate (based on knowledge about a pre-existing coverages with at least 3 dimensions). Exercise tests for the following situations:

- No subsetting parameter
- Zero/one/two trimmings, no slicing
- Zero/one/two slicings, no trimming
- trim operations with trim coordinates and with "*" for low and high bound (independently)

Each test in the above set shall be performed

- Once for each dimensionality supported by the server
- Without CRS parameter provided in the request, and with a valid CRS parameter provided (if the server supports a CRS extension).

Pass if coverage responses indicate (by range set inspection) that the operation has been recognized and executed properly.

A.1.8 **Exceptions**

**Test id:** `/conf/get-kvp/exceptions`

**Test Purpose:** **Requirement /req/get-kvp/exceptions:**

When a WCS server encounters an error described in column “meaning of exception code” in Table 3 then it **shall** return the corresponding exception report message with the contents of the `locator` parameter value as specified in the right column of Table 3.

**Test method:** Send requests of all types supported to the server under test. Each request shall include all (mandatory and) optional parameters and shall be valid except for one parameter which shall contain an encoding error described in the exception specification. Test passes if exception is reported according to requirement.