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## **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

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#### v. Revision history

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#### vi. Changes to the OpenGIS<sup>®</sup> Abstract Specification

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

#### vii. Future Work

Nothing foreseen currently.

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## **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](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](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/](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](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](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**

Name	Definition	Data type	Multiplicity
service	Identifier of the OGC service	String, fixed to “WCS”	One (mandatory)
version	Request protocol version	String	One (mandatory)
request	Request type name	String, fixed to “DescribeCoverage”	One (mandatory)
coverageId	List of coverage identifiers to be described	Comma-separated NCName list	One (mandatory)

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**

Name	Definition	Data type	Multiplicity
service	Identifier of the OGC service	String, fixed to “WCS”	one (mandatory)
version	Request protocol version	String	one (mandatory)
request	Request type name	String, fixed to “GetCoverage”	one (mandatory)
coverageId	Identifier of coverage to be inspected	NCName	one (mandatory)
subset	boundaries of coverage subset	SubsetSpec as defined in	zero or more (optional)

	Requirement 7	
--	---------------	--

**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.myserver.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/EPSSG/0/4326(-71,47)
  &subset=lat,http://www.opengis.net/def/crs/EPSSG/0/4326(-66,51)
  &subset=t,http://www.opengis.net/def/trs/ISO-
  8601/0/Gregorian+UTC("2009-11-06T23:20:52Z")
    
```

**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 3 — Exception codes for XML/POST operations**

exceptionCode value	HTTP code	Meaning of code	locator value
InvalidEncodingSyntax	400	Document received does not conform with protocol syntax	key of violating element

## Bibliography

- [1] IETF RFC 2387, *The MIME Multipart/Related Content-type*. IETF, 1998
- [2] IETF RFC 2396, *Uniform Resource Identifiers (URI): Generic Syntax*. IETF, 1998
- [3] IETF RFC 2616, *Hypertext Transfer Protocol -- HTTP/1.1*. IETF, 1999
- [4] W3C Note 11, *SOAP Messages with Attachments*. W3C Note 11, 2000

## Annex A (normative)

### Abstract test suite

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](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/](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.

-- end of ATS --

