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OGC®
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OGC® WPS 2.0.2 INTERFACE STANDARD CORRIGENDUM 2

STANDARD
Conceptual model & encoding

APPROVED

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ABSTRACT

In many cases geospatial or location data, including data from sensors, must be processed before the information can be used effectively. The OGC Web Processing Service (WPS) Interface Standard provides a standard interface that simplifies the task of making simple or complex computational processing services accessible via web services. Such services include well-known processes found in GIS software as well as specialized processes for spatio-temporal modeling and simulation. While the OGC WPS standard was designed with spatial processing in mind, it can also be used to readily insert non-spatial processing tasks into a web services environment.

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KEYWORDS

In many cases geospatial or location data, including data from sensors, must be processed before the information can be used effectively. The OGC Web Processing Service (WPS) Interface Standard provides a standard interface that simplifies the task of making simple or complex computational processing services accessible via web services. Such services include well-known processes found in GIS software as well as specialized processes for spatio-temporal modeling and simulation. While the OGC WPS standard was designed with spatial processing in mind, it can also be used to readily insert non-spatial processing tasks into a web services environment.



PREFACE

This standard is a continuation of WPS 1.0, a standard for web-based processing of geospatial data. It incorporates a range of change requests that have been submitted since the release of WPS 1.0 and further follows the OGC standard for modular specifications [OGC 08-131r3].

In contrast to the prior version, WPS 2.0 provides a core conceptual model that may be used to specify a WPS in different architectures such as REST or SOAP.

The WPS process model has been encapsulated into separate requirements and conformance classes, so it may be used independently from WPS servers in process catalogs and metadata records. The expressive power of process descriptions has been enhanced by permitting structured (or nested) inputs and outputs. The concept of process profiles has been clarified and extended to support process descriptions at different levels of abstraction.

Conversely, the process model itself has been largely decoupled from the WPS protocol, allowing the use of other domain-specific descriptions of processes, e.g. those defined in SensorML, and to execute them on a WPS server.

This specification also provides a Basic WPS conformance class that comprises the synchronous and asynchronous execution protocol, the WPS process model, and implements HTTP/POST+XML and HTTP/GET+KVP encodings.

Future work will target the definition of process interfaces for common processes based on the process model conformance class. Such profiles will encourage the development of well-defined, reliable, interoperable and exchangeable process implementations.

If OGC baseline and related specifications should further progress towards REST-oriented interfaces, the development of a REST-oriented WPS interface standard should be considered.

SUBMITTING ORGANIZATIONS

The following organizations submitted this Document to the Open Geospatial Consortium

| | |
|------------------------|--------------------------|
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| 52°North | CRP Henri Tudor |
| Intergraph Corporation | Airbus Defence and Space |

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INTRODUCTION

The WPS standard provides a robust, interoperable, and versatile protocol for process execution on web services. It supports both immediate processing for computational tasks that take little time and asynchronous processing for more complex and time consuming tasks. Moreover, the WPS standard defines a general process model that is designed to provide an interoperable description of processing functions. It is intended to support process cataloguing and discovery in a distributed environment.

1

SCOPE

This document specifies the interface to a general purpose Web Processing Service (WPS). A WPS is a web service that enables the execution of computing processes and the retrieval of metadata describing their purpose and functionality. Typically, these processes combine raster, vector, and/or coverage data with well-defined algorithms to produce new raster, vector, and/or coverage information.

The WPS protocol supports both synchronous and asynchronous execution of processes. Synchronous execution may be used in simple and quick computation scenarios, where the data processing takes little to almost no time. Asynchronous processing is particularly well suited for complex computation scenarios which may take significant time.

The specification uses a core and extensions model to organize its features:

- a) A core conceptual model, defining basic requirements for a web based processing service,
- b) A process model to support the description and discovery of processes on the web,
- c) A basic data model that supports arbitrary (standard or non-standard) data formats for inputs and outputs,
- d) A WPS service model and encoding based on OGC baseline standards, and
- e) A Dismiss extension to allow clients to terminate asynchronous processing jobs.



2

CONFORMANCE

Conformance with this standard shall be checked using all the relevant tests specified in Annex A (normative) of this document. 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 website¹.

TABLE 1: Conformance classes related to WPS 2.0

| CONFORMANCE CLASS | DESCRIPTION | CLAUSE |
|---|----------------------------|-----------|
| opengis.net/spec/WPS/2.0/conf/service/profile/basic-wps | Basic WPS service profile | Annex A.1 |
| opengis.net/spec/WPS/2.0/conf/service/synchronous-wps | Synchronous WPS | |
| opengis.net/spec/WPS/2.0/conf/service/asynchronous-wps | Asynchronous WPS | |
| opengis.net/spec/WPS/2.0/conf/process-model-encoding | WPS process model encoding | |
| opengis.net/spec/WPS/2.0/conf/service/dismiss-extension | Dismiss extension | |

¹www.opengeospatial.org/cite

3

NORMATIVE REFERENCES

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Arliss Whiteside Jim Greenwood : OGC 06-121r9, *OGC Web Service Common Implementation Specification*. Open Geospatial Consortium (2010). https://portal.opengeospatial.org/files/?artifact_id=38867

Policy SWG: OGC 08-131r3, *The Specification Model – Standard for Modular specifications*. Open Geospatial Consortium (2009). https://portal.opengeospatial.org/files/?artifact_id=34762&version=2

A. Phillips, M. Davis: IETF RFC 4646, *Tags for Identifying Languages*. Internet Engineering Task Force, Fremont, CA (2006-09). <https://xml2rfc.tools.ietf.org/public/rfc/bibxml/reference.RFC.4646.xml>



4

TERMS & DEFINITIONS

TERMS & DEFINITIONS

For the purposes of this document, the following terms and definitions apply.

This document uses the terms defined in Sub-clause 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.

For the purposes of this document, the following additional terms and definitions apply.

4.1 Dataset PREFERRED

collection of data, published or curated by a single agent, and available for access or download in one or more formats.

Note 1 to entry: The use of ‘collection’ in the definition from [DCAT] is broader than the use of the term collection in this specification.

Entry status: Valid

Source: DCAT

4.2 Distribution DEPRICATED

represents an accessible form of a dataset

Example: a downloadable file, an RSS feed or an API.

4.3 Feature ADMITTED

abstraction of real world phenomena

Note 1 to entry: For those unfamiliar with the term ‘feature’, the explanations on Spatial Things, Features and Geometry in the W3C/OGC Spatial Data on the Web Best Practice document provide more detail.

Source: ISO 19101-1:2014

4.4 Process

A process p is a function that for each input returns a corresponding output

$$\mu: X \rightarrow Y$$

where X denotes the domain of arguments x and Y denotes the co-domain of values y . Within this specification, process arguments are referred to as process inputs and result values are referred to as process outputs. Processes that have no process inputs represent value generators that

4.5 Process Description

A process description is an information model that specifies the interface of a process. A process description is used for a machine-readable description of the process itself but also provides some basic information about the process inputs and outputs.

| PREFIX | NAMESPACE URI | DESCRIPTION |
|--------|---|-----------------------------|
| ows | http://www.opengis.net/ows/2.0 | OWS Common 2.0 XML Schema |
| xlink | http://www.w3.org/1999/xlink | Definitions for XLINK |
| xml | http://www.w3.org/XML/1998/namespace | XML (required for xml:lang) |
| xs | http://www.w3.org/2001/XMLSchema | XML Schema |



5

CONVENTIONS

This section provides details and examples for any conventions used in the document. Examples of conventions are symbols, abbreviations, use of XML schema, or special notes regarding how to read the document.

5.1 Abbreviated terms

| | |
|-------------|--|
| GML | Geography Markup Language |
| GRS | Coordinate Reference System |
| HTTP | Hypertext Transfer Protocol |
| ISO | International Organization for Standardization |
| KVP | Keyword Value Pair |
| MIME | Multipurpose Internet Mail Extensions |
| OGC | Open Geospatial Consortium |
| UML | Unified Modeling Language |
| URI | Universal Resource Identifier |
| URL | Uniform Resource Locator |
| WPS | Web Processing Service |
| XML | Extensible Markup Language |

5.2 Use of the Term “Process”

The term process is one of the most used terms both in the information and geosciences domain. If not stated otherwise, this specification uses the term process as an umbrella term for any algorithm, calculation or model that either generates new data or transforms some input data into output data as defined in Clause 4.4.

5.3 Use of the Term “Process”

Unified Modeling Language (UML) static structure diagrams appearing in this specification are used as described in section 5.2 of OGC06-121r9. Further, the following conventions hold:

- UML elements having a package name of “OWS Common” are those defined in the UML model of OWS Common [OGC 06-121r9].
- UML data type Any is used here as an equivalence to XML’s xsd:any.
- UML elements not qualified with a package name are those defined in this standard.

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

5.4 Namespace 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.



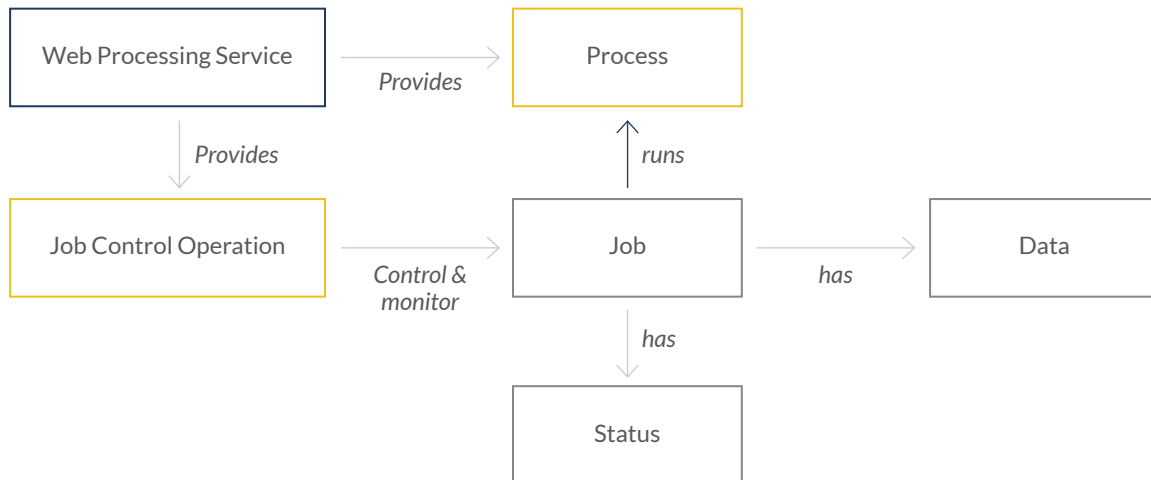
6

WPS CONCEPTUAL MODEL

WPS CONCEPTUAL MODEL

The WPS service model defines basic properties of any WPS server. A WPS server is a web service that provides access to pre-defined processes and provides job control operations to instantiate, control and monitor processing jobs (Figure 1).

FIGURE 1: Artifacts of the WPS service model



REQUIREMENT CLASS 1: <http://www.opengis.net/spec/WPS/2.0/req/conceptual-model>

| | |
|--------------------|---|
| Obligation | requirement |
| Target Type | Derived information model, encoding, and software implementation |
| Requirement 1-1 | <i>/req/conceptual-model/discovery Requirements class for service discovery.</i> |
| Requirement 1-2 | <i>/req/conceptual-model/capabilities Requirements class for service capabilities.</i> |
| Recommendation 1-1 | <i>/req/conceptual-model/process-model Requirements class for supported process models.</i> |
| Requirement 1-3 | <i>/req/conceptual-model/job-control Requirements class for job control.</i> |
| Requirement 1-4 | <i>/req/conceptual-model/process-execution Requirements class for process execution.</i> |
| Requirement 1-5 | <i>/req/conceptual-model/data-transmission Requirements class for data transmission between service and client.</i> |
| Requirement 1-6 | <i>/req/conceptual-model/job-monitoring Requirements class for job monitoring.</i> |

6.1 Service Discovery

Any WPS server shall be self-contained, i.e. provide an initial endpoint that can be used by a WPS client to determine the server's capabilities.

REQUIREMENT CLASS 2: <http://www.opengis.net/spec/WPS/2.0/req/conceptual-model/discovery>

Obligation: requirement

Target Type: Derived information model, encoding, and software implementation

Requirement 2-1: </req/conceptual-model/discovery/endpoint>

All WPS servers shall have an initial end-point (HTTP URI).

Requirement 2-2: </req/conceptual-model/discovery/capabilities>

The service shall provide a systematic discovery mechanism for all service capabilities.

Requirement 2-3: </req/conceptual-model/discovery/mechanism>

The discovery mechanism for the service capabilities shall be predictable from the initial endpoint.

6.2 Service Capabilities

The basic capabilities of any WPS server fall into two categories: The first category comprises capabilities for process discovery and retrieval of process descriptions. The second category comprises capabilities to manage and monitor processing jobs.

Since the processes provided by a WPS server may have different degrees of complexity, the server shall indicate the allowed job control capabilities mode per process offering.

Further service capabilities, i.e. for secure communication and user authentication may be provided with the service but are neither covered nor restricted by this specification as long as they do not alter or change the semantics of other job control capabilities.



7

WPS NATIVE PROCESS MODEL



ANNEX A (*normative*) ABSTRACT TEST SUITE



ANNEX A (normative) ABSTRACT TEST SUITE

Tests and requirement identifiers below are relative to <http://www.opengis.net/spec/WPS/2.0>

A.1 Basic WPS (Conformance Class)

The OGC URI identifier of this conformance class is:
<http://www.opengis.net/spec/WPS/2.0/conf/service/profile/basic-wps>

| EXAMPLE | |
|--------------------|---|
| Requirement A.1 | Test id: <i>conf/service/profile/basic-wps</i> |
| Recommendation A.1 | Test purpose: <i>Verify that the server implements the Basic WPS conformance class.</i> |
| Requirement A.2 | Test method: <i>Verify that the server implements the Synchronous WPS and/or the Asynchronous WPS conformance class. Verify that the requests and responses to a supported operation are syntactically correct. Verify that the service supports the Synchronous WPS Conformance class, the Asynchronous WPS Conformance class or both. Verify that all process offerings implement the native process model.</i> |



B

ANNEX B (*informative*) XML EXAMPLES

ANNEX B (*informative*) XML EXAMPLES

B.1 Data Types

B.1.1. Complex Data Description

```
<wps:ComplexData>
  <wps:Format mimeType="application/geotiff" encoding="raw"
default="true" />
  <wps:Format mimeType="application/geotiff" encoding="base64" />
</wps:ComplexData>
```

B.1.2. Literal Data Description

```
<wps:LiteralData>
  <wps:Format mimeType="text/plain" default="true" />
  <wps:Format mimeType="text/xml" />
  <LiteralDataDomain default="true">
    <ows:AllowedValues>
      <ows:Range>
        <ows:MinimumValue>1</ows:MinimumValue>
        <ows:MaximumValue>1000</ows:MaximumValue>
      </ows:Range>
    </ows:AllowedValues>
    <ows:DataType
ows:reference="http://www.w3.org/2001/XMLSchema#float">float
  </ows:DataType>
    <ows:UOM>meters</ows:UOM>
    <ows:DefaultValue>100</ows:DefaultValue>
  </LiteralDataDomain>
  <LiteralDataDomain>
    <ows:AllowedValues>
      <ows:Range>
        <ows:MinimumValue>1</ows:MinimumValue>
        <ows:MaximumValue>3000</ows:MaximumValue>
      </ows:Range>
    </ows:AllowedValues>
    <ows:DataType
ows:reference="http://www.w3.org/2001/XMLSchema#float">float
  </ows:DataType>
```



ANNEX C (*informative*) BIBLIOGRAPHY



BIBLIOGRAPHY

1. DCATW3C: **Data Catalog Vocabulary**, W3C Recommendation 16 January 2014, <https://www.w3.org/TR/vocab-dcat/>
2. SO: ISO 19101 (all parts), *Geographic information – Reference model*. International Organization for Standardization, Geneva (2002). <https://www.iso.org/standard/26002.html>



HEADER

C.1 Header

C.1.1. Header

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C.1.1.1 Header

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C.1.1.1.1 Header

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C.1.1.1.1.1 Header

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