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Web Processing Service Best Practices Discussion Paper

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Contents

i. Preface

The following document contains best practices for identifying input data formats for the OGC WPS 1.0.0. It was created due to a lack of interoperability between different WPS implementation based on non-standardized input identifiers.

ii. Submitting organizations

The following organizations submitted this Best Practice to the Open Geospatial Consortium Inc.:

1. 52°North

iii. Submission contact points

All questions regarding this submission should be directed to the editor or the submitters:

CONTACT	COMPANY
Bastian Schäffer	52°North

iv.   Revision history

Date	Release	Author	Paragraph modified	Description
2011-10-27	1.0	BSC	All	Initial version
2012-02-27	2.0	BSC	All	Re-iteration

v.   Changes to the OGC® Abstract Specification

The OGC® Abstract Specification does not require changes to accommodate this OGC® standard.

Foreword

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights (see above patent statement). Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights. However, to date, no such rights have been claimed or identified.

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 best practices set forth in this document, and to provide supporting documentation.

Introduction

The following document contains best practices for identifying input data formats for the OGC WPS 1.0.0. It was created due to a lack of interoperability between different WPS implementation based on non-standardized input identifiers.

1   Scope

This document discusses the following topics with respect to Web Processing Services

    a.   Identification of WPS data mime types

    b.   Identification of WPS data schemas

    c.   Identification of WPS dealing with WMS/WFS/WCS

2   Conformance

Not required.

3   Normative references

[1] OGC 08-091r6 , OGC Web Processing Service Specification 1.0.0

[2] GDAL Raster format list: http://www.gdal.org/formats_list.html

[3] GDAL Vector format list: http://www.gdal.org/ogr/ogr_formats.html

[4] IANA Best Practice on Media Type Specifications and Registration Procedures

http://tools.ietf.org/html/rfc4288

[5] OGC SimpleFeature specification (OGC 06-103r4):
http://portal.opengeospatial.org/files/?artifact_id=25355

4   Terms and definitions

5   Conventions

5.1   Symbols (and abbreviated terms)

5.2   UML Notation

Not Applicable

6   WPS Input/Output data format

6.1   Introduction

The WPS 1.0.0 standard allows two kinds of input and output formats: Literal Data and Complex Data. To identify input and output format for Complex Data, Table 23 in [1] requires a *mimeType* element and optionally a *schema* and *encoding* element. The primary identifier is therefore the mime type of the input. However, mime types are not well defined for most geospatial datasets (e.g. shapefile or geotiff). For this reason, different implementations used different mime types for conceptually the same data format. This is also true for XML based inputs such as GML mainly identified by the schema.

This document presents best practice to uniquely identify the format of geospatial input datasets.

6.2   Mime Type Best Practice

This document recommends to use the following mime types to identify geospatial data formats as shown in table 1. The table is composed of a survey on existing mime types (officially registered and de facto used) and a construct for creating mime types for non-existing mime types.

For non-existing mime types, the following mechanism is applied derived from the vendor specific specification for mime types defined by IANA [4] (see especially clause 3.4 in [4]):

application/x-ogc-[Identifier]

where [Identifier] is the Code used by GDAL in lower case letters. Blank characters are escaped by an underscore "_" character.

Optional Parameters:

"charset": Same as charset parameter of the "application/xml" media type as specified in RFC 3023.

"version": If provided, this parameter indicates the version used for the specific format if not included already in the subtype name.

All optional parameters shall be separated by "; "

Example:

application/x-ogc-wfs; version=1.1.0

Please note: These mime types shall be used for OGC Web Services and are not intended to be used beyond that scope.

In detail, this leads to the following mime type look-up table:

Format Name	Mime Type	Code	Mime Types also seen in the wild but NOT recommended
Arc/Info ASCII Grid	application/x-ogc-aaigrid	AAIGrid	text/plain
ACE2	application/x-ogc-ace2	ACE2	
ADRG/ARC Digitilized Raster Graphics (.gen/.thf)	application/x-ogc-adrg	ADRG	
Arc/Info Binary Grid (.adf)	application/x-ogc-aig	AIG	
AIRSAR Polarimetric	application/x-ogc-airsar	AIRSAR	
Magellan BLX Topo (.blx, .xlb)	application/x-ogc-blx	BLX	
Bathymetry Attributed Grid (.bag)	application/x-ogc-bag	BAG	
Microsoft Windows Device Independent Bitmap (.bmp)	image/bmp	BMP	image/x-bmp, image/x-bitmap, image/x-xbitmap, image/x-win-bitmap, image/x-windows-bmp, image/ms-bmp, image/x-ms-bmp, application/bmp, application/x-bmp, application/x-win-bitmap
BSB Nautical Chart Format (.kap)	application/x-ogc-bsb	BSB	
VTP Binary Terrain Format (.bt)	application/x-ogc-bt	BT	
CEOS (Spot for instance)	application/x-ogc-ceos	CEOS	
DRDC COASP SAR Processor Raster	application/x-ogc-coasp	COASP	
TerraSAR-X Complex SAR Data Product	application/x-ogc-cosar	COSAR	
Convair PolGASP data	application/x-ogc-cpg	CPG	
USGS LULC Composite Theme Grid	application/x-ogc-ctg	CTG	
Spot DIMAP (metadata.dim)	application/x-ogc-dimap	DIMAP	

ELAS DIPEx	application/x-ogc-dipex	DIPEx	
DODS / OPeNDAP	application/x-ogc-dods	DODS	
First Generation USGS DOQ (.doq)	application/x-ogc-doq1	DOQ1	
New Labelled USGS DOQ (.doq)	application/x-ogc-doq2	DOQ2	
Military Elevation Data (.dt0, .dt1, .dt2)	application/x-ogc-dted	DTED	
Arc/Info Export E00 GRID	application/x-ogc-e00grid	E00GRID	
ECRG Table Of Contents (TOC.xml)	application/x-ogc-ecrgtoc	ECRGTOC	
ERDAS Compressed Wavelets (.ecw)	`image/x-imagewebserver-ecw`	ECW	
ESRI .hdr Labelled	application/x-ogc-ehdr	EHdr	
Erdas Imagine Raw (.raw)	application/x-ogc-eir	EIR	
NASA ELAS	application/x-ogc-elas	ELAS	
ENVI .hdr Labelled Raster	application/x-ogc-envi	ENVI	
Epsilon - Wavelet compressed images	application/x-ogc-epsilon	EPSILON	
ERMapper (.ers)	application/x-ogc-ers	ERS	
Envisat Image Product (.n1)	application/x-ogc-esat	ESAT	
EOSAT FAST Format	application/x-ogc-fast	FAST	
FIT	application/x-ogc-fit	FIT	
FITS (.fits)	application/x-ogc-fits	FITS	
Fuji BAS Scanner Image	application/x-ogc-fujibas	FujiBAS	
Generic Binary (.hdr Labelled)	application/x-ogc-genbin	GENBIN	
Oracle Spatial GeoRaster	application/x-ogc-georaster	GEORASTER	
GSat File Format	application/x-ogc-gff	GFF	

Graphics Interchange Format (.gif)	Image/Gif	GIF	
WMO GRIB1/GRIB2 (.grb)	application/x-ogc-grib	GRIB	
GMT Compatible netCDF	application/x-*netcdf-gmt*	GMT	
GRASS Rasters	application/x-ogc-grass	GRASS	
GRASS ASCII Grid	application/x-ogc-grass_asciigrid	GRASSASCII Grid	`image/asc` `image/arx`
Golden Software ASCII Grid	application/x-ogc-gsag	GSAG	
Golden Software Binary Grid	application/x-ogc-gsbg	GSBG	
Golden Software Surfer 7 Binary Grid	application/x-ogc-gs7bg	GS7BG	
GSC Geogrid	application/x-ogc-gsc	GSC	
TIFF / BigTIFF / GeoTIFF (.tif)	Image/tiff; subtype=geotiff	GTiff	image/geotiff
NOAA .gtx vertical datum shift	image/x-gtx	GTX	
GXF - Grid eXchange File	application/x-ogc-gfx	GXF	
Hierarchical Data Format Release 4 (HDF4)	application/x-hdf4	HDF4	
Hierarchical Data Format Release 5 (HDF5)	application/x-hdf5	HDF5	
HF2/HFZ heightfield raster	application/x-ogc-hf2	HF2	
Erdas Imagine (.img)	`application/x-erdas-hfa`	HFA	
Image Display and Analysis (WinDisp)	application/x-ogc-ida	IDA	
ILWIS Raster Map (.mpr,.mpl)	application/x-ogc-ilwis	ILWIS	
Intergraph Raster	application/x-ogc-ingr	INGR	
USGS Astrogeology ISIS cube (Version 2)	application/x-ogc-isis2	ISIS2	
USGS Astrogeology ISIS cube (Version 3)	application/x-ogc-isis3	ISIS3	

JAXA PALSAR Product Reader (Level 1.1/1.5)	application/x-ogc-jaxapalsar	JAXAPALSAR	
Japanese DEM (.mem)	application/x-ogc-jedm	JDEM	
JPEG JFIF (.jpg)	image/jpeg	JPEG	
JPEG-LS	image/jpeg	JPEGLS	
JPEG2000 (.jp2, .j2k)	image/jp2	JPEG2000	
JPEG2000 (.jp2, .j2k)	image/jp2	JP2ECW	
JPEG2000 (.jp2, .j2k)	image/jp2	JP2KAK	
JPEG2000 (.jp2, .j2k)	image/jp2	JP2MrSID	
JPEG2000 (.jp2, .j2k)	image/jp2	JP2OpenJPEG	
JPIP (based on Kakadu)	image/*jpip*-stream	JPIPKAK	
KMLSUPEROVERLAY	application/x-ogc-kmlsuperoverlay	KMLSUPEROVERLAY	
NOAA Polar Orbiter Level 1b Data Set (AVHRR)	application/x-ogc-l1b	L1B	
Erdas 7.x .LAN and .GIS	application/x-*erdas-lan*	LAN	
FARSITE v.4 LCP Format	application/x-ogc-lcp	LCP	
Daylon Leveller Heightfield	application/x-ogc-leveller	Leveller	
NADCON .los/.las Datum Grid Shift	application/x-ogc-loslas	LOSLAS	
In Memory Raster	application/x-ogc-mem	MEM	
Vexcel MFF	application/x-ogc-mff	MFF	
Vexcel MFF2	application/x-ogc-mff2	MFF2 (HKV)	
MG4 Encoded Lidar	application/x-ogc-mg4lidar	MG4Lidar	
Multi-resolution Seamless Image Database	`image/x-mrsid`	MrSID	`image/x.mrsid, image/x-mrsid-image`
Meteosat Second Generation	application/x-ogc-mgs	MSG	
EUMETSAT Archive native (.nat)	application/x-ogc-msgn	MSGN	
NLAPS Data Format	application/x-ogc-ndf	NDF	
NOAA NGS Geoid Height Grids	application/x-ogc-ngsgeoid	NGSGEOID	
NITF	application/x-ogc-	NITF	

	nitf		
NetCDF	application/netcdf	netCDF	
NTv2 Datum Grid Shift	application/x-ogc-NTv2	NTv2	
Northwood/VerticalMapper Classified Grid Format .grc/.tab	application/x-ogc-nwt_grc	NWT_GRC	
OGDI Bridge	application/x-ogc-ogdi	OGDI	
OZI OZF2/OZFX3	application/x-ogc-ozi	OZI	
PCI .aux Labelled	application/x-ogc-paux	PAux	
PCI Geomatics Database File	application/x-ogc-pcidsk	PCIDSK	
PCRaster	application/x-ogc-pcraster	PCRaster	
Geospatial PDF	application/x-ogc-pdf	PDF	
NASA Planetary Data System	application/x-ogc-pds	PDS	
Portable Network Graphics (.png)	image/png	PNG	
PostGIS Raster (previously WKTRaster)	application/x-ogc-postgisraster	PostGISRaster	
Netpbm (.ppm,.pgm)	application/x-ogc-pnm	PNM	
R Object Data Store	text/x-r	R	
Rasdaman	application/x-ogc-rasdaman	RASDAMAN	
Rasterlite - Rasters in SQLite DB	application/x-ogc-rasterlite	Rasterlite	
Swedish Grid RIK (.rik)	application/x-ogc-rik	RIK	
Raster Matrix Format (*.rsw, .mtw)	application/x-ogc-rmf	RMF	
Raster Product Format/RPF (CADRG, CIB)	application/x-ogc-rpftoc	RPFTOC	
RadarSat2 XML (product.xml)	application/x-ogc-rs2	RS2	
Idrisi Raster	application/x-ogc-rst	RST	
SAGA GIS Binary format	application/x-ogc-saga	SAGA	

SAR CEOS	application/x-ogc-sar_ceos	SAR_CEOS	
ArcSDE Raster	application/x-ogc-sde	SDE	
USGS SDTS DEM (*CATD.DDF)	application/x-ogc-sdts	SDTS	
SGI Image Format	*image*/x-*sgi*	SGI	
Snow Data Assimilation System	application/x-ogc-snodas	SNODAS	
Standard Raster Product (ASRP/USRP)	application/x-ogc-srp	SRP	
SRTM HGT Format	application/x-ogc-srtmhgt	SRTMHGT	
Terragen Heightfield (.ter)	application/x-ogc-terragen	TERRAGEN	
EarthWatch/DigitalGlobe .TIL	application/x-ogc-til	TIL	
TerraSAR-X Product	application/x-ogc-tsx	TSX	
USGS ASCII DEM / CDED (.dem)	application/x-ogc-usgsdem	USGSDEM	
GDAL Virtual (.vrt)	application/x-ogc-vrt	VRT	
OGC Web Coverage Service	application/x-ogc-wcs	WCS	
WEBP	application/x-ogc-webp	WEBP	
OGC Web Map Service	application/x-ogc-wms	WMS	
X11 Pixmap (.xpm)	image/x-xpixmap	XPM	image/x-xbitmap, image/xpm, image/x-xpm
ASCII Gridded XYZ	application/x-ogc-xyz	XYZ	
ZMap Plus Grid	application/x-ogc-zmap	ZMap	
Aeronav FAA files	application/x-ogc-aeronacfaa	AeronavFAA	
ESRI ArcObjects	application/x-ogc-arcobjects	ArcObjects	
Arc/Info Binary Coverage	application/x-ogc-avcbin	AVCBin	
Arc/Info .E00 (ASCII) Coverage	application/x-ogc-avce00	AVCE00	
Arc/Info Generate	application/x-ogc-arcgen	ARCGEN	

Atlas BNA	application/x-ogc-bna	BNA	
AutoCAD DXF	application/x-*dxf*	DXF	application/x-*autocad*, application/*dxf*
Comma Separated Value (.csv)	text/*csv*	CSV	
CouchDB / GeoCouch	application/x-ogc-couchdb	CouchDB	
DODS/OPeNDAP	application/*opendap-dods*	DODS	
EDIGEO	application/x-ogc-edigeo	EDIGEO	
ESRI FileGDB	application/x-ogc-filegdb	FileGDB	
ESRI Personal GeoDatabase	application/x-ogc-pgeo	PGeo	
ESRI ArcSDE	application/x-ogc-sde	SDE	
ESRI Shapefile	application/x-zipped-*shp*	ESRI Shapefile	
FMEObjects Gateway	application/x-ogc-fmeobjects_gateway	FMEObjects Gateway	
JSON	`application/json`		
GeoJSON	`application/`*geojson*	GeoJSON	`application/`*geo+json*
Géoconcept Export	application/x-ogc-geoconcept	Geoconcept	
Geomedia .mdb	application/x-ogc-geomedia	Geomedia	
GeoRSS-simple	application/x-ogc-georss-simple	GeoRSS	
GeoRSS-GML	application/x-ogc-georss-gml	GeoRSS	
GeoRSS-W3C	application/x-ogc-georss-w3c	GeoRSS	
Google Fusion Tables	application/x-ogc-gft	GFT	
GML	Application/gml+xml	GML	text/xml, text/gml
GMT	application/x-ogc-gmt	GMT	

9

GPSBabel	application/xml-loc	GPSBabel	
GPX	application/x-gpx+xml	GPX	
GRASS Vector data	application/grass-vector-ascii	GRASS	application/grass-vector-binary
GPSTrackMaker (.gtm, .gtz)	application/x-gtar	GPSTrackMaker	
Hydrographic Transfer Format	application/x-ogc-htf	HTF	
Idrisi Vector (.VCT)	application/x-ogc-idrisi	Idrisi	
Informix DataBlade	application/x-ogc-idb	IDB	
INTERLIS	application/x-ogc-interlis	Interlis 1 and "Interlis 2"	
INGRES	application/x-ogc-ingres	INGRES	
KML	application/vnd.google-earth.kml+xml	KML	
KMZ	application/vnd.google-earth.kmz	KMZ	
LIBKML	application/vnd.google-earth.kml+xml	LIBKML	
Mapinfo File	application/x-ogc-mapinfo_file	MapInfo File	
Microstation DGN	image/vnd.dgn	DGN	
Access MDB (PGeo and Geomedia capable)	application/x-msaccess	MDB	application/msaccess, application/vnd.msaccess, application/vnd.ms-access, application/mdb, application/x-mdb
MySQL	application/x-ogc-mysql	MySQL	
NAS - ALKIS	application/x-ogc-nas	NAS	
Oracle Spatial	application/x-ogc-oci	OCI	
ODBC	application/x-ogc-odbc	ODBC	
MS SQL Spatial	application/x-ogc-mssqlspatial	MSSQLSpatial	

OGDI Vectors (VPF, VMAP, DCW)	application/x-ogc-ogdi	OGDI	
OpenAir	application/x-ogc-openair	OpenAir	
PCI Geomatics Database File	application/x-ogc-pcidsk	PCIDSK	
PDS	application/x-ogc-pds	PDS	
PGDump	application/x-ogc-postgresql_sql_dump	PostgreSQL SQL dump	
PostgreSQL/PostGIS	application/x-ogc-postgresql_postgis	PostgreSQL/ PostGIS	
EPIInfo .REC	application/x-ogc-rec	REC	
S-57 (ENC)	application/x-ogc-s57	S57	
SDTS	application/x-ogc-sdts	SDTS	
SEG-P1 / UKOOA P1/90	application/x-ogc-segukooa	SEGUKOOA	
SEG-Y	application/seismic-segy	SEGY	
Norwegian SOSI Standard	application/x-ogc-sosi	SOSI	
SQLite/SpatiaLite	application/x-sqlite3	SQLite	
SUA	application/x-ogc-sua	SUA	
SVG	`image/svg+xml`	SVG	
UK .NTF	application/x-ogc-uk._ntf	UK. NTF	
U.S. Census TIGER/Line	application/x-ogc-tiger	TIGER	
VFK data	application/x-ogc-vfk	VFK	
VRT - Virtual Datasource	application/x-ogc-vrt	VRT	
OGC WFS (Web Feature Service)	application/x-ogc-wfs	WFS	
X-Plane/Flighgear aeronautical data	application/x-ogc-xplane	XPLANE	

Missing Mime Types

In case a desired mime type is not listed in table 1, a custom mime type shall be used accordingly to the mechanism described above, i.e. defining a unique identifier and applying it to the template.

For adding a missing mime type to the list, please write an email to: Carl Reed creed@opengeospatial.org, CC Bastian Schäffer b.schaeffer@52north.org

6.3   Schema Best Practice

When XML based data is used, the OGC WPS standard requires a *schema* element (if a schema is available). This section recommends best practise for any generic Geography Markup Language (GML) encoding, i.e. any kind of GML following a specific GML version, GML Application schemas, Geometry specific GML, i.e. GML following a specific GML version and requiring a specific geometry type.

6.3.1   Generic GML

This document recommends to use the following schema values for generic GML data:

Generic GML 2:

```
http://schemas.opengis.net/gml/[version]/feature.xsd
```

Example GML 2.1.2

```
http://schemas.opengis.net/gml/2.1.2/feature.xsd
```

Generic GML 3:

```
http://schemas.opengis.net/gml/[version]/base/feature.xsd
```

Example GML 3.2.1

```
http://schemas.opengis.net/gml/3.2.1/base/feature.xsd
```

Note:

It is recommended to use a <wfs:FeatureCollection> as root element for GML data coming from http://schemas.opengis.net/wfs/<version>/<path to schema>

Example:

<wfs:FeatureCollection numberOfFeatures="0" timeStamp="2012-02-27T12:08:14.422+01:00" xsi:schemaLocation="http://www.openplans.org/topp http://geoprocessing.demo.52north.org:8080/geoserver/wfs?service=WFS&version=1.1.0&request=DescribeFeatureType&typeName=topp%3Atasmania_roads http://www.opengis.net/wfs

```
http://geoprocessing.demo.52north.org:8080/geoserver/schemas/wfs/1.1.0/wfs.xsd"
xmlns:ogc="http://www.opengis.net/ogc" xmlns:tiger="http://www.census.gov"
xmlns:cite="http://www.opengeospatial.net/cite" xmlns:nurc="http://www.nurc.nato.int"
xmlns:sde="http://geoserver.sf.net" xmlns:wfs="http://www.opengis.net/wfs"
xmlns:topp="http://www.openplans.org/topp" xmlns:it.geosolutions="http://www.geo-solutions.it"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:diss="diss"
xmlns:sf="http://www.openplans.org/spearfish" xmlns:ows="http://www.opengis.net/ows"
xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink">
    <gml:featureMembers>
        <topp:tasmania_roads gml:id="tasmania_roads.1">
            <topp:the_geom>
                <gml:MultiLineString>
                    <gml:lineStringMember>
                        <gml:LineString>
                            <gml:posList>146.46858200000003 -41.241478 146.574768 -
41.251186 146.64041099999997 -41.255154 146.76612899999998 -41.332348
146.79418900000002 -41.34417 146.82217400000002 -41.362988 146.86343399999998 -
41.380234 146.899521 -41.379452 146.929504 -41.378227 147.008041 -41.356079 147.098343
-41.362919</gml:posList>
                        </gml:LineString>
                    </gml:lineStringMember>
                </gml:MultiLineString>
            </topp:the_geom>
            <topp:TYPE>street</topp:TYPE>
        </topp:tasmania_roads>
    </gml:featureMembers>
</wfs:FeatureCollection>
```

6.3.2   Application Schemas

If a specific application schema is used/required, the specific application schema URL shall be used.