

# Implementation of OGC's WPS standard: PyWPS

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In this file, you can find the description of installation and configuration of PyWPS script. At the end, you can learn, how to add your own process to the list of processes.

PyWPS project has been started on April 2006 with support of DBU – Deutsche Bundesstiftung Umwelt (<http://dbu.de>) and with help of GDF-Hannover (<http://gdf-hannover.de>) and Help Service Remote Sensing (<http://bnhelp.cz>) companies.

Source code can be found at <http://les-eis.org/?cat=pywps>

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# 1 Bugs

Known bugs and limitations to

- Process Inputs definition is made on very primitive way. But it works.
- Sometimes, when there is e.g. `SyntaxError` in the process, temporary file `/tmp/pywps*` is not deleted, which leads to `ServerBussy` exception and the files have to be removed by hand.
- If inputs are of type `LiteralValue` and its type is string, it is not controlled properly. Take care on your inputs and do not use it directly in scripts to avoid your server to be hacked.

Please report all problems or unexpected handling.

# 2 Installation

Required packages:

- Web Server (e.g. Apache)
- python
- python-xml

Recommended packages:

- GIS GRASS
- PROJ.4
- GDAL/OGR

## 2.1 Installation the quick 'n' dirty way

For installing pywps to your server simply unzip the archive to the directory, where cgi programs are allowed to run.

## 2.2 Installation the 'clean' way

Unzip the package

```
$ tar -xzf pywps-VERSION.tar.gz
```

and run

```
$ python setup.py install
```

## 2.3 Testing after installation

For test, just run `wps.py` in your command line:

```
\$ ./wps.py
Content-type: text/xml

<?xml version="1.0" ?>
<ExceptionReport version="1.0.0" xmlns="http://www.opengis.net/ows"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <Exception exceptionCode="MissingParameterValue" locator="request"/>
</ExceptionReport>
```

If you got some other message, like e.g.:

```
Traceback (most recent call last):
  File "trunk/index.py", line 53, in ?
    from Wps import wpsexceptions
  File "/home/jachym/prog/pywps/trunk/Wps/wpsexceptions.py", line 8, in ?
    from xml.dom.minidom import Document
ImportError: No module named xml.dom.minidom
```

Than something is wrong with your Python installation or with the program. This message means, that the `xml.dom.minidom` package is not installed in your system.

## 3 Configuration

Before you start to tune your `pywps` program, you should get your copy of OpenGIS(R) Web Processing Service document (OGC 05-007r4) version 0.4.0 from <http://www.opengeospatial.org/specs/>

NOTE: Note, that the configuration options are CASE SENSITIVE

`Pywps` configuration takes place in two files. The files are actually python scripts, so it does not harm, if you have some experience in python programming language. But you should be able to setup the program without any python knowledge.

The first file is in `etcsettings.py` and (optional) the second file is `etcgrass.py` which has to be setup if you do want to use GRASS GIS modules in your scripts. Some special "tuning" can be done in `processes/_init_.py` file

### 3.1 etc/settings.py

This file has got two sections: `WPS` and `serverSettings`

In the `WPS` section, the main configuration is set, which appears mostly in `GetCapabilities` request. The *mandatory* parameters, which should be set up are (with default/recommend values):

```
'version': "0.4.0",
'ServiceIdentification': {
```

```

        'Title': "Jachym's WPS server",
        'ServiceType': "WPS",
        'ServiceTypeVersion': "0.1.0",
        'Abstract': 'Abstract to this WPS',
    },
    'ServiceProvider': {
        'ProviderName' : "Your Company",
        'IndividualName': "Your Name",
        'PositionName': "Your Position",
        'Role': "your role",
        'DeliveryPoint': "Street",
        'City': "City",
        'PostalCode': "00000",
        'Country': "Your country",
        'ElectronicMailAddress': "your.email@address",
    },

    'OperationsMetadata': {
        'ServerAddress' : "http://localhost/cgi-bin/wps/wps.py",
    },
    'Keywords' : ['GRASS', 'GIS', 'WPS'],

```

In the `ServerSettings` section, the variables are set, which have impact on the whole server.

```

# NOTE: You have to create this directory manually and set rights, so
#       the program is able to store data in there
'outputPath': '/var/www/wpsoutputs',

#
# 'outputUrl' - URL of the directory, where the outputs will be stored
'outputUrl': 'http://192.168.1.31/wpsoutputs',

#
# tempPath - path to directory, where temporary data will be stored.
# NOTE: the pywps has to have rights, to create directories and files
#       in this directory
'tempPath': '/tmp',

#
# maxOperations - maximum number of operations, which is allowed to low
# on this server at ones
# default = 1
'maxOperations': 1,

#

```

```
# maxSize: maximum input file size in bytes
# NOTE: maximum file size is 5MB, no care, if this number is higher
'maxSize':5242880, # 5 MB

#
# maxInputParamLength: maximal length of input values
# NOTE: maximum length of input parameters is 256, no matter, how height
#       is this number
'maxInputParamLength':256,
```

### 3.2 etc/grass.py

This file servers for configuration of GRASS GIS environment (if your processes need one). Everything is stored in `grassenv` structure.

```
# PATH in which your modules (processes) should be able the search.
# Default value:
'PATH': "/usr/local/grass-6.1.cvs/bin/:/usr/local/grass-6.1.cvs/scripts/:\
/usr/bin/:/bin/",

# Add eventually some other path, in which should GRASS search for modules
'GRASS_ADDON_PATH': "",

# Version of GRASS, you are using
'GRASS_VERSION': "6.1.cvs",

# GRASS_PERL, where is your PERL bin installed
'GRASS_PERL': "/usr/bin/perl",

# GRASS_GUI should be always "text" unless you know, what you are doing
'GRASS_GUI': "text",

# GISBASE is place, where your GRASS installation is
'GISBASE': "/usr/local/grass-6.1.cvs",

# LD_LIBRARY_PATH
'LD_LIBRARY_PATH': "/usr/local/grass-6.1.cvs/lib",

# HOME has to be set
'HOME': "/var/www",
```

## 4 Add your own processes

All processes are stored in the processes directory. Put your file e.g. `myprocess.py` in there.

Process is python class with two functions: `__init__(self)` and `execute(self)`. In the `__init__(self)` function, inputs, outputs and other configuration values are set. The GIS operations are called in `execute(self)` function. It is possible also to add as many your functions, as you wish.

#### 4.1 Process Configuration

The configuration part belongs to the `__init__` function of the `Process` class.

Mandatory variables are

```
# Myprocess name
self.Identifier = "spearpath"

# Myprocess version
self.processVersion = "0.1"

# Is it allowed, store the data on the server?
self.storeSupported = "true"

# Do not wait, till the calculation is done -> return XML with status
# immediately
self.statusSupported = "true"

# Myprocess Title
self.Title="Find the shortest path on the roads map on Spearfish dataset"
```

Eventually optional attributes can be found in the table 38 - "Parts of ExecuteResponse data structure"

If your process should happen in existing GRASS-Location, and you just need the input parameters for GRASS modules, you can specify it's name by `grassLocation` variable:

```
grassLocation="/var/grassdata/spearfish57/"
```

If this variable is set to `None`, new temporary GRASS Location && mapset will be generated and you can work in there. The projection of the location will be XY. If this variable is not set, GRASS will not be started.

**Metadata definition** is stored in array `self.Metadata` in `__init__` function:

```
# Metadata definition
self.Metadata = [
    {
        "Identifier":"point",
        "type":"point",
        "textContent":"Click in the map"
    },
]
```

This code will produce in DescribeProcess response document following element:

```
...
<ows:Metadata Identifier="point" type="point">
    Click in the map
</ows:Metadata>
...
```

#### 4.1.1 Data Inputs

Data inputs are defined in `self.Inputs` array. Each input is an dictionary with several (mostly mandatory) parameters. Each input type (`LiteralValue`, `ComplexValue`, `ComplexValueReference`, `BoundingBoxValue`) **must** be a Python's dictionary ("`{}`") structure, which *can* be filled with additional attributes.

- Example of `LiteralInput`: `LiteralValues` are used for individual text entry. Your process can either support any text entry or the entry must be from list of allowed values. `LiteralValues` of types `AnyValue` and `AllowedValues` are supported. Range of values is not yet implemented.

Allowed values are set by array of values. If there is no `values` array or it contains "\*" in the array, `AnyValue` is assumed:

```
{  # example of "AnyValue" case with centimeters as default unit

    'Identifier': 'my_input_value',
    'Title': 'This is my input value',
    'LiteralValue': {'UOMs': ["cm"]},
    # alternative for any value:
    # 'LiteralValue': {'values': ["*"]},
    'dataType': type(0.0)
},
{  # example of "AllowedValues case with default units (meters)

    'Identifier': 'my_input_value',
    'Title': 'This is my input value',
    'LiteralValue': {values:[250, "300", '40', "a"]},
    # the default value:
    'value': 250,
},
```

- Example of `ComplexValueReference` input:

`ComplexValueReference` is URL to some raster/vector/text file, which can be later imported (e.g. to GRASS) and processed. PyWPS will be download the file for you and store it's name to `self.DataInputs["<Identifier>"]` variable.



**NOTE:** `ComplexValueReference` input is deprecated and should not be used. Use `ComplexValue` structure instead. PyWPS will recognise if the input is of type `ComplexValue` or `ComplexValueReference` and handle the input accordingly.

- Example of `ComplexValue` input: `ComplexValue` provides possibility to embed input (XML) file (e.g. GML) to input `ExecuteResponse` XML file. PyWPS will store this input in file on server's harddisk, so you can later handle it just like `ComplexValueReference`.

```
{
  'Identifier': 'vector',
  'Title': 'Input vector map',
  'Abstract':
    "This vector map must be part of the input XML document",
  'ComplexValue': {
    'Formats': [ "text/xml" ]
  },
},
```

For `Formats` attribute use MIME/TYPER encoding, like `text/xml`, `image/tiff` and similar.

- Example of `BoundingBoxValue` input: `BoundingBoxValue` provides possibility define your region borders. You can input this only to your `Execute` response XML file.

```
{
  'Identifier': 'bbox',
  'Title': 'Bounding box',
  'Abstract':
    "Bounding box",
  'BoundingBoxValue': {},
},
```

Resulting value in your `self.Input[NUMBER]['value']` will be array of four values in form `[Lower East, Lower North, Upper East, Upper North]`.

Default values can be set like follows: `'value': "Default value"`,

NOTE: If the `'dataType'` attribute is not set, control of the input value will not be possible, which could endanger your system

For more details look in the table 33 "Parts of `ValueFormChoice` data structure"

#### 4.1.2 Data Outputs

The `self.Outputs` structure defines the look of the outputs from your process. The definition is not much different from the `Input` structure:

```

{
    'Identifier': 'output',
    'Title': 'Resulting output map',
    'ComplexValue': {
        'Formats': ["text/xml"],
    }
},
{
    'Identifier': 'text',
    'Title': 'Some text',
    'Abstract': 'Some informative text',
    'LiteralValue': {
        {'UOMs': ["none"]},
    }
}
}

```

**BoundingBox Output** BoundingBoxValue is defined by two coordinates pairs: LowerCorner and UpperCorner. For creating BoundingBoxValue output, you have to make output array with this values:

```

{
    'Identifier': 'mybbox',
    'Title': 'Bounding Box of resulting map',
    'BoundingBoxValue': {},
    'value' : [0, 0, 10, 10],
},

```

## 4.2 Process Programming

The process must be defined in the `execute(self)` function. To each element in `self.Inputs` array, 'value' option will be added. Input variables are accessible via 'value' attribute of each element of the `self.Inputs` array.

Another way, how to access input values it to do so via new hash `self.DataInputs`. This way is more intiutive and less confusing. If order of `Inputs` will change, their identifiers in `DataInputs` structure remain same.

Also new variable `self.grassenv` will be in your process at your service.

Output values can be stored either directly to `self.Outputs[index]['value']` variable or to `self.DataOutputs['identifier']` hash on similar way, how `DataInputs` are used. This makes the usage again more intuitive.

```

def execute(self):
    if os.system("""g.region -d >&2"""):
        return "Could not set region to default"

    os.system("r.in.gdal -o in=%s out=my_map >&2" %\

```

```

                                (self.Inputs[0]['value']))
os.system("r.mapcalc my_output=my_map+%d >&2" %\
                                (self.DataInputs['value']))

if os.system("r.out.gdal type=Float32 out=map.tif in=my_output >&2"):
    return "Could not export resulting raster map [map.tif]"

self.Outputs[0]['value'] = "map.tif"
self.DataOutputs['location'] = self.grassenv['LOCATION_NAME']
return

```

That is all, folks!

#### 4.2.1 Error handling

At the end of the `execute` function, `None` value should be returned. Any other value means, that the calculation will be stopped and error report will be returned back to the client.

## 5 Note to grass programming

The simplest way, how to call GRASS's (and other shell) commands is via python's `os.system()` or `os.popen()` function. Before you do so, it is important to import the `os` python package (usually one of the first lines in the file). This approach might not be the best, but it is the simplest one. Feel free to use any other low-end functions.

Unfortunately, the GRASS modules are very verbose. Some messages are written to `STDOUT`, some to `STDERR`. The `STDERR` will be stored in the error file of your web server. But you have to "catch" the messages, sent to `STDOUT`. This can be done e.g. by using `"1;&2"` statement (redirecting `STDOUT` to `STDERR` in shell):

```

os.system("""
    echo "Rekni jim drazi, tatko, za to nic nedas." >&2
""")

```

## 6 Testing your new process

- GetCapabilities request:

```

wget -nv -q -O - --post-data="version=0.4.0&service=Wps&\
    request=getcapabilities" "http://localhost/cgi-bin/wps.py"

```

- DescribeProcess request:

```

wget -nv -q -O - --post-data="version=0.4.0&service=Wps&\
    request=DescribeProcess&Identifier=your_process" \
    "http://localhost/cgi-bin/wps.py"

```

- Execute request:

```
wget -nv -q -O - --post-data="version=0.4.0&service=Wps&\
request=Execute&Identifier=your_process&\
datainputs=input1,value1,input2,value2" \
"http://localhost/cgi-bin/wps.py"
```

## 7 Using the PyWPS

### 7.1 Input

To get response from PyWPS you have to formulate appropriate query string first. You can use HTTP GET style or HTTP POST style.

HTTP GET style is standard URL, with all parameters in one line. You can not set any ComplexValue data in your process via HTTP GET. Example:

```
wget -nv -q -O - --post-data="version=0.4.0&service=Wps&\
request=Execute&Identifier=your_process&\
datainputs=input1,value1,input2,value2"\
"http://localhost/cgi-bin/wps.py"
```

In HTTP POST style, you send one "request" parameter, which contains XML input. The XML file can contain also included ComplexValue data, e.g. GML file. Example:

```
wget --post-file=execute-post.txt \
"http://localhost/pywps/wps.py" -O - -nv -q
```

The execute-post.txt file can look like follows:

```
request=<?xml version="1.0" encoding="utf-8"?>
<Execute service="WPS" version="0.4.0" store="false" status="false"
xmlns="http://www.opengeospatial.net/wps"
xmlns:ows="http://www.opengeospatial.net/ows"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.opengeospatial.net/wps/wpsDescribeProcess.xsd">
  <ows:Identifier>searchpath</ows:Identifier>
  <DataInputs>
    <Input>
      <ows:Identifier>streetmap</ows:Identifier>
      <ows:Title>The map</ows:Title>
      <ows:ComplexValue>
        <Value>
<ogr:FeatureCollection
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ogr.maptools.org/ donut.xsd"
```

```

    xmlns:ogr="http://ogr.maptools.org/"
    xmlns:gml="http://www.opengis.net/gml">
<gml:boundedBy>
  <gml:Box>
    <gml:coord><gml:X>4.263256414560601e-14</gml:X>
      <gml:Y>-70.71067811865474</gml:Y></gml:coord>
    <gml:coord><gml:X>141.4213562373095</gml:X>
      <gml:Y>70.71067811865474</gml:Y></gml:coord>
  </gml:Box>
</gml:boundedBy>
<gml:featureMember>
  <ogr:donut fid="F0">
    <ogr:geometryProperty><gml:LineString><gml:coordinates>
      70.710678118654755,70.710678118654741,0 141.42135623730951,0.0,
      0 70.710678118654741,-70.710678118654741,0 0.0000000000000043,
      0.0000000000000057,0 70.710678118654755,
      70.710678118654741,0</gml:coordinates>
    </gml:LineString></ogr:geometryProperty>
  </ogr:donut>
</gml:featureMember>
<gml:featureMember>
  <ogr:donut fid="F0">
    <ogr:geometryProperty><gml:LineString><gml:coordinates>50.000000000000014,
      0.0000000000000021,0 71.213203435596427,-21.213203435596419,0
      92.426406871192853,0.0,0 71.213203435596427,21.213203435596423,0
      50.000000000000014,0.0000000000000021,0</gml:coordinates>
    </gml:LineString></ogr:geometryProperty>
  </ogr:donut>
</gml:featureMember>
</ogr:FeatureCollection>
  </Value>
</ows:ComplexValue>
</Input>

<Input>
  <ows:Identifier>x1</ows:Identifier>
  <ows:LiteralValue>591679.31</ows:LiteralValue>
</Input>
<Input>
  <ows:Identifier>y1</ows:Identifier>
  <ows:LiteralValue>4927205.07</ows:LiteralValue>
</Input>
<Input>
  <ows:Identifier>x2</ows:Identifier>
  <ows:LiteralValue>608642.625</ows:LiteralValue>
</Input>
<Input>

```

```

        <ows:Identifier>y2</ows:Identifier>
        <ows:LiteralValue>4915876.31</ows:LiteralValue>
    </Input>
</DataInputs>
</Execute>

```

You can see, that there are 4 inputs in this process:

1. ComplexValue GML File
2. x1 coordinate
3. y1 coordinate
4. x2 coordinate
5. y2 coordinate

## 7.2 Output

The output from PyWPS can be either XML file or results of processes directly. In default configuration, no files are stored on the server, resulting values (maps) are returned to the client. If you want to return XML file with outputs encoding, you have to enable it in you process configuration with option `storeSupported`:

```
self.storeSupported = "true"
```

And you have to call the PyWPS with "store=true" option:

```
version=0.4.0&service=Wps&request=Execute&Identifier=your_process&\
datainputs=input1,value1,input2,value2&store=true
```

Or in XML input:

```
request=<?xml version="1.0" encoding="utf-8"?>
<Execute service="WPS" version="0.4.0" store="true" status="false"
xmlns="http://www.opengeospatial.net/wps"
xmlns:ows="http://www.opengeospatial.net/ows"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.opengeospatial.net/wps/wpsDescribeProcess.xsd">
...

```

This will cause PyWPS to look after `self.status` array in your process in form form

```
self.status = ["Message", Percent_Done]
```

and generate XML file in statusLocation with this embed message. E.g.

```
self.status = ["Generating raster map", 50]
```

will become

```
...
<Status>
    <ProcessStarted message="Generating raster map" percentCompleted="50"/>
</Status>
...
```

## A Sample process: addvalue

This sample process describes how to made your own WPS processes. Purpose of this process is:

- Download input raster map from some server
- Convert it to integer values
- Add input value to each raster cell
- Convert raster to vector
- Export raster to TIFF and vector to GML. Vector file will be embed ot output XML file.

```
"""
```

```
pywps process example:
```

```
addvalue: Adds some value to raster map
```

```
"""
```

```
# Author: Jachym Cepicky
```

```
#      http://les-ejk.cz
```

```
import os,time,string,sys
```

```
class Process:
```

```
    def __init__(self):
```

```
        #
```

```
        # Mandatory parameters
```

```
        #
```

```

# Identifier - name of this process
self.Identifier = "addvalue"

# processVersion - version of this process
self.processVersion = "0.1"

# Title - title for this process
self.Title="Add some value to raster map"

#
# Inputs
# Inputs = [ {input1},{input2},{...} ]
#
self.Inputs = [
    # This module has 2 inputs:
    # 1) Input raster map
    # 2) Value to be added

    # 0
    {
        'Identifier':'input',
        'Title': 'Input raster map',
        'ComplexValueReference': {
            'Formats': [ "image/tiff" ]
        },
        'value':None
    },

    # 1
    {
        'Identifier': 'value',
        'Title': 'Value to be added',
        'LiteralValue': {"values":["*"]}, # will cause "AnyValue"
        'dataType' : type(0.0),
        'value':None
    },
]

#
# Output
# The structure is not much different from the input structure
#
self.Outputs = [
    # 0
    {
        'Identifier': 'vector',
        'Title': 'Resulting vector map',

```



```

        'ComplexValue': {
            'Formats': ["text/xml"],
        },
        'value': None
    },
    # 1
    {
        'Identifier': 'raster',
        'Title': 'Resulting raster map',
        'ComplexValueReference': {
            'Formats': ["image/tiff"],
        },
        'value': None
    }
    # 2
    {
        'Identifier': 'bbox',
        'Title': 'Resulting map bbox',
        'BoundingBoxValue': {}
    }
}

]

#
# Optional attributes
#
#
# storeSupported = "true" or "false"
# should the resulting map be stored on our disk?
self.storeSupported = "true"

#
# statusSupported = "true" or "false" - run asynchronous
self.statusSupported = "true"

#####
# Execute part of the process
def execute(self):
    """
    This function
    1) Imports the raster map
    2) runs r.mapcalc out=in+value
    3) Exports the raster map
    4) Sets the bounding box of resulting map
    5) runs r.to.vect
    6) Exports the vector map

```

```

"""

# for asynchronous process:
self.status=["Importing the raster map", 5]

# 1) import
if os.system("r.in.gdal -o in=%s out=input >&2" %\
              (self.DataInputs['input'])):
    return "Could not import raster map

# check for more than one channel
for gdalinfo in os.popen("gdalinfo %s" % \
                          (self.DataInputs['input'])):
    if gdalinfo.split()[0] == "Band" and gdalinfo.split()[1] == "3":
        return "This module can work only with ONE channel raster maps"

# set right region
os.system("""g.region rast=input >&2""")

# for asynchronous process:
self.status=["Adding input value to raster map", 30]

# 2) add the value, convert to int
os.system("""r.mapcalc output="int(input+%.f)" """" % \
          (float(self.DataInputs['value'])))

# for asynchronous process:
self.status=["Exporting TIFF image", 50]

# 3) export the tiff
if os.system("r.out.gdal type=Int32 in=output out=%s 1>&2" %\
              "output.tif"):
    return "Could not export raster map"

# for asynchronous process:
self.status=["Converting raster to vector", 75]

# 4) setting the bounding box
region = {}
for b in os.popen("g.region -g"):
    b = b.strip()
    key,val = b.split("=")
    region[key] = val
self.DataOutputs['bbox'] = [region['s'],region['e'],region['n'],region['w']]

# 5) convert to vector
if os.system("r.to.vect in=output out=output feature=area >&2"):

```

```

        return "Could not convert raster to vector"

# for asynchronous process:
self.status=["Exporting GML file", 95]

# 6) export of vector map to GML
if os.system(
    ""v.out.ogr format=GML in=output dsn=output.gml olayer=output >&2"""):
    return "Could not export vector to GML"

# setting output variables
self.DataOutputs['vector'] = "output.gml"
self.DataOutputs['raster'] = "output.tif"

# end
return

```

## B KVP request encoding of addvalue

This process can be lunched with URL:  
<http://localhost/cgi-bin/wps.py?service=wps&version=0.4.0&identifier=addvalue&request=execute&\datainputs=input,http://localhost/data/raster.tif,value,250&status=true&store=true>

## C XML request encoding addvalue

```

request=<?xml version='1.0' encoding='UTF-8' standalone='yes'?>
<Execute service='wps' version='0.4.0' store='true' status='false'
  xmlns="http://www.opengeospatial.net/wps"
  xmlns:ows="http://www.opengeospatial.net/ows">
<ows:Identifier>addvalue</ows:Identifier>
<DataInputs>
  <Input>
    <ows:Identifier>input</ows:Identifier>
    <ComplexValueReference reference='http://localhost/wps/data/soils.tif' />
  </Input>
  <Input>
    <ows:Identifier>value</ows:Identifier>
    <LiteralValue>250</LiteralValue>
  </Input>
  <!-- Input>
    <ows:Identifier>bbox</ows:Identifier>
    <BoundingBoxValue>
      <BoundingBox>
        <LowerCorner>-1 -1</LowerCorner>

```

```

        <UpperCorner>10 10</UpperCorner>
      </BoundingBox>
    </BoundingBoxValue>
  </Input -->
</DataInputs>
</Execute>

```

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Version 2, June 1991

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