Implementation of OGC Web Services with MapServer

Karl Benedict, Sr. Research Scientist
Earth Data Analysis Center
University of New Mexico

Workshop presented at the ESIP Federation Meeting
LDEO, July 2006
Workshop Goals

- Introduce the OGC service models sufficiently to productively outline their implementation
- Illustrate the implementation of three core OGC services
  - Web Map Services
  - Web Feature Services
  - Web Coverage Services
Workshop Outline

- Overview of the specific OGC web services to be addressed in the workshop
  - Web Map, Web Feature, and Web Coverage Services
- Overview of MapServer’s configuration and deployment
- General strategy for implementation of OGC services in MapServer
- Specific implementation examples
  - WMS
  - WFS
  - WCS
- Other OGC specifications supported by MapServer
OGC Services Overview

There is support for several OGC services and specifications within MapServer. This presentation focuses on three:

- Web Map Services (images/maps)
- Web Feature Services (vector data)
- Web Coverage Services (raster data)
Comparison of Service Models

Product Delivered to Client

- Vector Geospatial data (e.g. Shapefile)
- Image of Geospatial data (e.g. PNG, GIF)
- Raster Geospatial data (e.g. GeoTIFF)
- XML Feature Description
- Feature Information
- XML Coverage Description
- XML Capabilities Document
- Exception Document
- XML Capabilities Document
- Exception Document
- XML Capabilities Document
- Exception Document

HTTP

- Web Feature Service
- Web Map Service
- Web Coverage Service

File-based vector Data
Geospatial Data Services
File-based raster Data
Functional Characteristics: WMS

- HTTP GET (required), HTTP POST (optional)
- Requests:
  - GetCapabilities
  - GetMap
  - GetFeatureInfo
- Returns
  - Mapped data
  - XML Capabilities Document, Feature Attributes
## Request Parameters: WMS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>GetCapabilities</th>
<th>GetMap</th>
<th>GetFeatureInfo</th>
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M=Mandatory, O=Optional
Functional Characteristics: WFS

- Either HTTP GET or POST required
- Requests
  - GetCapabilities
  - DescribeFeatureType
  - GetFeature/GetFeatureWithLock
  - GetGmlObject
  - LockFeature
  - Transaction
- Returns XML (GML), Capabilities, and Feature Data
### Request Parameters: WFS

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<th>DescribeFeatureType</th>
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M=Mandatory, O=Optional

$^a$ GetFeature only
Functional Characteristics: WCS

- Either HTTP GET or POST required

- Requests
  - GetCapabilities
  - DescribeCoverage
  - GetCoverage

- Returns
  - Geospatial data for coverage
  - XML Capabilities
## Request Parameters: WCS

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</table>

M = Mandatory, O = Optional

*Either BBOX or TIME is mandatory*

*Either WIDTH/HEIGHT/DEPTH or RESX/RESY/RESZ are mandatory*
MapServer Configuration

- MapServer may be configured both as a client and as a server for the core OGC web service specifications:
  - Client: WMS, WFS
  - Server: WMS, WFS, WCS

- This presentation concentrates on server configurations in which the basic software requirements are the MapServer CGI, compiled with supporting required libraries

- A basic map file that provides the base information required by any MapServer implementation

- Enhancements to this map file that provide the additional information needed by MapServer to provide complete/compliant OGC WxS services.
The software requirements for MapServer’s implementation of the OGC WxS specifications are typically met through the use of several open source programming libraries:

- **Proj4** - geospatial coordinate transformation (reprojection)
- **GDAL/OGR** - Raster and Vector data access, processing, and conversion libraries
- **GD** - Graphics generation libraries
- **Xerces** - XML libraries (for GML support)
Development of a Basic Map Service

- Install and configure the MapServer CGI - make sure that your version of MapServer supports the OGC specifications:
  
  ```
  $ mapserv -v ./mapserv -v
  MapServer version 4.8.3 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP OUTPUT=PDF OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER SUPPORTS=WMS_CLIENT SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER SUPPORTS=GEOS INPUT=EPPL7 INPUT=POSTGIS INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE
  ```

- Acquire required data and metadata (particularly projection information)

- Develop a map file for the basic service (refer to Peri’s previous talk)
Enabling OGC Services for a Map Service

- Compile and add required metadata content to the map file to enable the OGC services
- Map metadata - attributes that relate to the service as a whole
- Layer metadata - attributes that relate to a specific data ‘layer’ within the service
- Test by submitting *GetCapabilities* requests
- Test by submitting other data-related requests
If you are developing a pure OGC server (i.e. not developing a MapServer client interface based on HTML or MapScript), the most straightforward strategy is one of:

- Bring together all needed data and metadata
- Develop a simple mapfile that contains the minimum required information (including enabling metadata content) for the service
- Test the provided information for completeness through issuing a `GetCapabilities` request to the server and reviewing the output capabilities document
- Test the service with other supported requests (i.e. `GetMap`, `GetFeatureInfo`, etc.)
WMS Requests Supportable by MapServer

- GetCapabilities
- GetMap
- GetFeatureInfo
- DescribeLayer
- GetLegendGraphic
• **RGIS Previews**

• **GetCapabilities Request:**
  
  http://edacdata1.unm.edu/cgi-bin/mapserv?map=doqq05/doqq05_demo.map&version=1.1.1&SERVICE=WMS&request=Get Capabilities

• **GetMap Request:**
  
  http://edacdata1.unm.edu/cgi-bin/mapserv?map=doqq05/doqq05_demo.map&version=1.1.1&SERVICE=WMS&request=Get Map&BBOX=-104.316429199742,36.184378915068,-104.246015087937,36.2531220444378&FORMAT=image/png&STYLES=&LAYERS=doqq05&WIDTH=500&HEIGHT=500
EDAC

Implementation Examples - WMS

- **RGIS Previews**

- **AMIS Services**

  - **GetCapabilities Request:**
    ```
    http://amis.unm.edu/cgi-bin/mapserv?map=amis/amis_demo.map&service=WMS&request=GetCapabilities
    ```

  - **GetMap Request**
    ```
    ```

    ```
    ```
• PHAiRS Animation (Time-enabled WMS)

  GetCapabilities Request:
  http://phairs-devel.unm.edu:8080/cgi-bin/mapserv?map=dream_p25_demo.map&VERSION=1.1.1&service=WMS&REQUEST=GetCapabilities

  GetMap Request:
  http://phairs-devel.unm.edu:8080/cgi-bin/mapserv?map=dream_p25_demo.map&VERSION=1.1.1&service=WMS&REQUEST=GetMap&BBox=-120.000,26.000,-97.000,44.000&SRS=EPSG:4326&Width=459&Height=360&Layers=GRASS_SHADED_RELIEF,D121503_t01_pm25,usa_states,epa_airnow_complete&TIME=2003-12-15T01
MapServer implemented requests:

- GetCapabilities
  
  http://amis.unm.edu/cgi-bin/mapserv?map=amis/amis_demo.map&SERVICE=WFS&request=GetCapabilities

- GetFeatures
  
  http://amis.unm.edu/cgi-bin/mapserv?map=amis/amis_demo.map&version=1.0.0&SERVICE=WFS&request=GetFeature&typename=Highways,NMBoundary
Implementation Examples - WCS

• WCS Requests Supportable by MapServer

  • GetCapabilities
    http://edacdata1.unm.edu/cgi-bin/mapserv?map=doqq05/doqq05_demo.map&SERVICE=WCS&request=GetCapabilities

  • DescribeCoverage
    http://edacdata1.unm.edu/cgi-bin/mapserv?map=doqq05/doqq05_demo.map&version=1.0.0&SERVICE=WCS&request=DescribeCoverage

  • GetCoverage
Other Supported OGC Specifications

- Styled Layer Descriptors (SLD)
- Map Context
- Sensor Observation Service
Resources

- WMS Server How-To:  
  http://mapserver.gis.umn.edu/docs/howto/wms_server

- WFS Server How-To:  
  http://mapserver.gis.umn.edu/docs/howto/wfs_server

- WCS Server How-To:  
  http://mapserver.gis.umn.edu/docs/howto/wcs_server
The NASA Earth Science Standards Process Group is seeking reviews and comments from the Earth Science community on the WMS 1.1.1 specification as a recommended community standard for NASA ES Data Systems.

The Standards Process working group web page: http://spg.gsfc.nasa.gov

The specific request for comment page: http://spg.gsfc.nasa.gov/rfc/ese-rfc-006