



Implementation of OGC Web Services with MapServer

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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

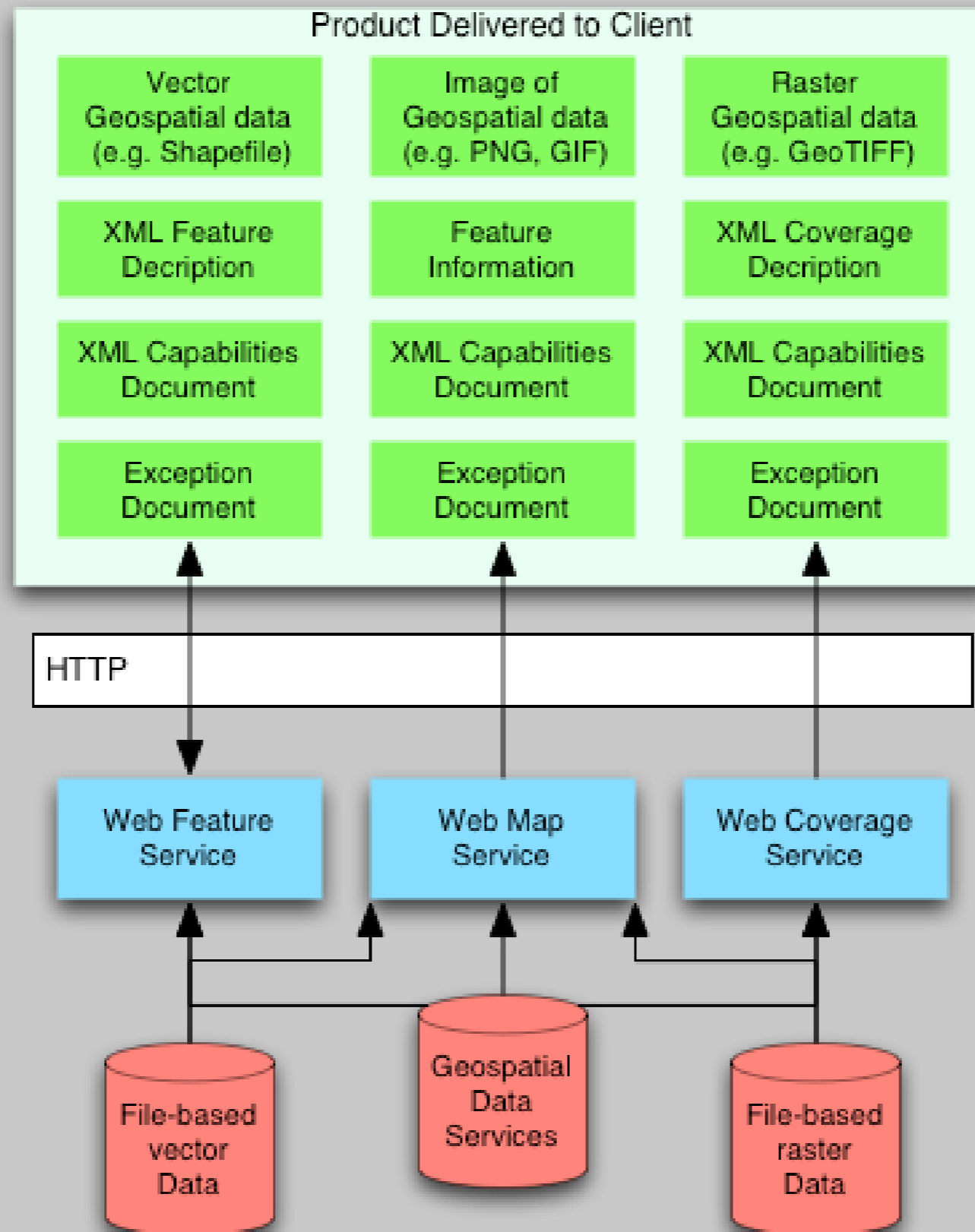


OGC Services Overview

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

- Web Map Services (images/maps)
- Web Feature Services (vector data)
- Web Coverage Services (raster data)

Comparison of Service Models





Functional Characteristics: WMS

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



Request Parameters: WMS

Parameter	Request		
	<i>GetCapabilities</i>	<i>GetMap</i>	<i>GetFeatureInfo</i>
VERSION	O	M	M
SERVICE	M		
REQUEST	M	M	M
FORMAT	O	M	<i>GetMap</i>
UPDATESEQUENCE	O		
LAYERS		M	<i>GetMap</i>
STYLES		M	<i>GetMap</i>
CRS		M	<i>GetMap</i>
BBOX		M	<i>GetMap</i>
WIDTH		M	<i>GetMap</i>
HEIGHT		M	<i>GetMap</i>
TRANSPARENT		O	<i>GetMap</i>
BGCOLOR		O	<i>GetMap</i>
EXCEPTIONS		O	O
TIME		O	<i>GetMap</i>
ELEVATION		O	<i>GetMap</i>
other dimensions		O	<i>GetMap</i>
QUERY_LAYERS			M
INFO_FORMAT			M
FEATURE_COUNT			O
I			M
J			M

M=Mandatory, O=Optional



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



Request Parameters: WFS

Parameter	Request					
	<i>GetCapabilities</i>	<i>DescribeFeatureType</i>	<i>GetFeature & GetFeatureWithLock</i>	<i>GetGmlObject</i>	<i>LockFeature</i>	<i>Transaction</i>
VERSION	O	M	M	M	M	M
SERVICE	M	M	M	M	M	M
REQUEST	M	M	M	M	M	M
NAMESPACE	O	O	O	O	O	O
TYPENAME		O	O/M		O/M	O/M
OUTPUTFORMAT		O	O			
RESULTTYPE			O			
PROPERTYNAME			O			
FEATUREVERSION			O			
MAXFEATURES			O			
EXPIRY			O		O	
SRSNAME			O			
FEATUREID			O		O	O
FILTER			O		O	O
BBOX			O		O	O
SORTBY			O			
TRAVERSELINKDEPTH			O ^a	M		
TRAVERSELINKEXPIRY			O ^a	M		
PROPTRAVLINKDEPTH			O ^a			
PROPTRAVLINKEXPIRY			O ^a			
GMOBJECTID				M		
LOCKACTION					O	
OPERATION						M
RELEASEACTION						O
Vendor specific	O	O	O	O	O	O

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

Parameter	Request		
	<i>GetCapabilities</i>	<i>DescribeCoverage</i>	<i>GetCoverage</i>
REQUEST	M	M	M
VERSION	O	M	M
SERVICE	M	M	M
SECTION	O		
UPDATESEQUENCE	O		
COVERAGE		O	M
CRS			M
RESPONSE_CRS			O
BBOX			M ^a
TIME			M ^a
PARAMETER			O
WIDTH			M ^b
HEIGHT			M ^b
DEPTH			M ^b
RESX			M ^b
RESY			M ^b
RESZ			M ^b
FORMAT			M
EXCEPTIONS			O

M=Mandatory, O=Optional

^aEither BBOX or TIME is mandatory

^bEither 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.



Required MapServer Components

- 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)

- 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,-104.24601
5087937,36.2531220444378&FORMAT=image/
png&STYLES=&LAYERS=doqq05&WIDTH=500&HEIGHT=500`



- **RGIS Previews**
- **AMIS Services**

- ***GetCapabilities Request:***

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

- ***GetMap Request***

```
http://amis.unm.edu/cgi-bin/mapserv?map=amis/  
amis_demo.map&WMTVER=1.1.1&SERVICE=WMS&request=GetMap  
&BBOX=-109.428,31.2527,-102.873,37.1093&FORMAT=image/  
png&STYLES=&LAYERS=NMBoundary&WIDTH=500&HEIGHT=500
```

```
http://amis.unm.edu/cgi-bin/mapserv?map=amis/  
amis_demo.map&WMTVER=1.1.1&SERVICE=WMS&request=GetMap  
&BBOX=-109.428,31.2527,-102.873,37.1093&FORMAT=image/  
png&STYLES=&LAYERS=NMBoundary,Landsat,Cities,Highways  
&WIDTH=500&HEIGHT=500
```



- 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&REQU  
EST=GetCapabilities
```

- *GetMap* Request:

```
http://phairs-devel.unm.edu:8080/cgi-bin/mapserv?  
map=dream_p25_demo.map&VERSION=1.1.1&service=WMS&REQU  
EST=GetMap&BBox=-120.000,26.000,-97.000,44.000&SRS=EP  
SG:  
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=GetFe  
ature&typename=Highways,NMBoundary
```



- **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**



- 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>