# MapServer and OGC Web Services

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# Outline

- Web Services / Interoperability
- Applying OGC Web Services with MapServer:
  - OGC:WMS
    - with OGC:SLD
  - OGC:WFS/OGC:GML
  - OGC:WCS
  - OGC:SOS
  - OGC:WMC
  - OGC:Filter
  - Brokering to distributed Web Services for Geocoding
- Future goodies / Nice-to-Haves / Issues

# Workshop Package

- Install
  - Extract ms_ogc_workshop.zip (WinZip)
    - Extract to root of drive letter of ms4w location (i.e. C:\)
    - Make sure "Use Folder Names" is checked
    - Extracts into existing ms4w directory structure
- Base Directory:
  - \ms4w\apps\ms_ogc_workshop\
- Startup:
  - Start Apache:
    - \ms4w\Apache\cgi-bin\Apache.exe
  - Go to: http://127.0.0.1/ms_ogc_workshop/index.html

## Web Services / Interoperability

- Distributed data through services interface
  - Less redundant data
  - Authoritative
  - More effective data management
  - Connect rather than hoard
- Transparent / cooperative

## Web Services / Interoperability

- Based on open specifications
  - W3C, OGC
- Normalizes playing field, independent of:
  - Operating System
  - Programming Languages
  - Development Environments
- How?
  - Web Services!

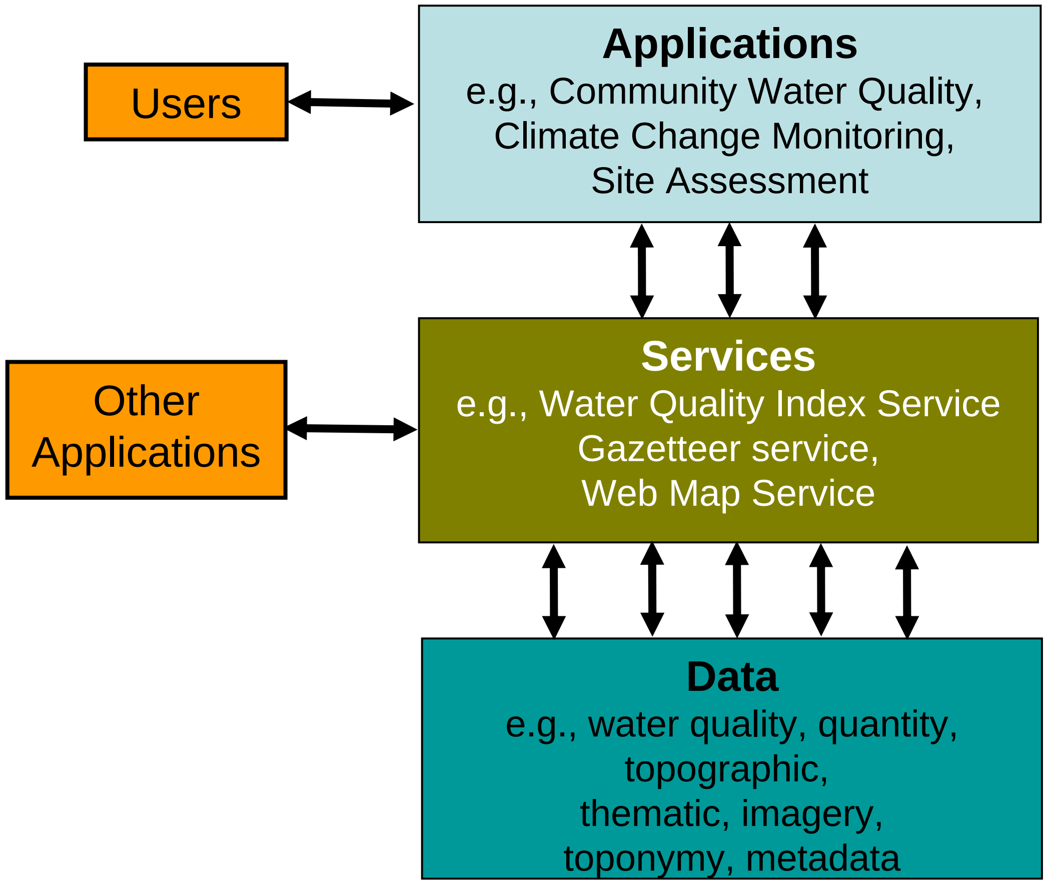
## Geospatial Interoperability

- *"Geospatial Interoperability* is the ability for two different software systems to interact with geospatial information. Interoperability between heterogeneous computer systems is essential to providing geospatial data, maps, cartographic and decision support services, and analytical functions. Geospatial interoperability is dependent on voluntary, consensus-based standards... These *geospatial standards* are essential to advancing data access and collaborations in e-Government, natural hazards, weather and climate, exploration, and global earth observation."
  - Geospatial Interoperability (GI) Return on Investment Study Report , NASA, April 2005
    - http://gio.gsfc.nasa.gov/docs/ROI%20Study.pdf

## Web Services Defined

- Web Service = any software which makes itself available over the Internet and uses a standard XML messaging system
- XML makes this happen
- Provides more control to application developer (raw vs. refined goods)

# Web Services Architecture Approach


Users
Other Applications
**Applications**
e.g., Community Water Quality, Climate Change Monitoring, Site Assessment
**Services**
e.g., Water Quality Index Service Gazetteer service, Web Map Service
**Data**
e.g., water quality, quantity, topographic, thematic, imagery, toponymy, metadata

For Example…

A community website which calculates water quality for a given community

uses
Gazetteer service,
Water Quality Index Service
Web Map Service

based on
Geographical Names,
Road network features
Base maps

## Open Geospatial Consortium (OGC)

- Circa 1994
- Web Services for Geospatial Interoperability
- “Develop first, then spec” approach

## OGC Specifications

- **WMS**
- **WFS**
- **WCS**
- **Web Map Context Documents**
- **GML**
- **SLD**
- **Filter**
- Catalog
- WCTS
- GO-1
- OWS Common
- Grid Coverages
- Location Services
- Simple Features
  - CORBA
  - SQL
  - OLE/COM

**Bold = Supported by MapServer**

# MapServer and OWS

- Enabling OWS in MapServer
  - Build software with:

```
--with-wms \
--with-wmsclient \
--with-wfs \
--with-wfsclient \
--with-wcs
--with-sos
```

  - NB: dependent libraries needed
    - Read documentation

## MapServer and OWS

- Enabling OWS in MapServer
  - Same old MapServer; just populate mapfiles with appropriate directives
  - MapServer OGC documentation HOWTOs

## MapServer and OWS

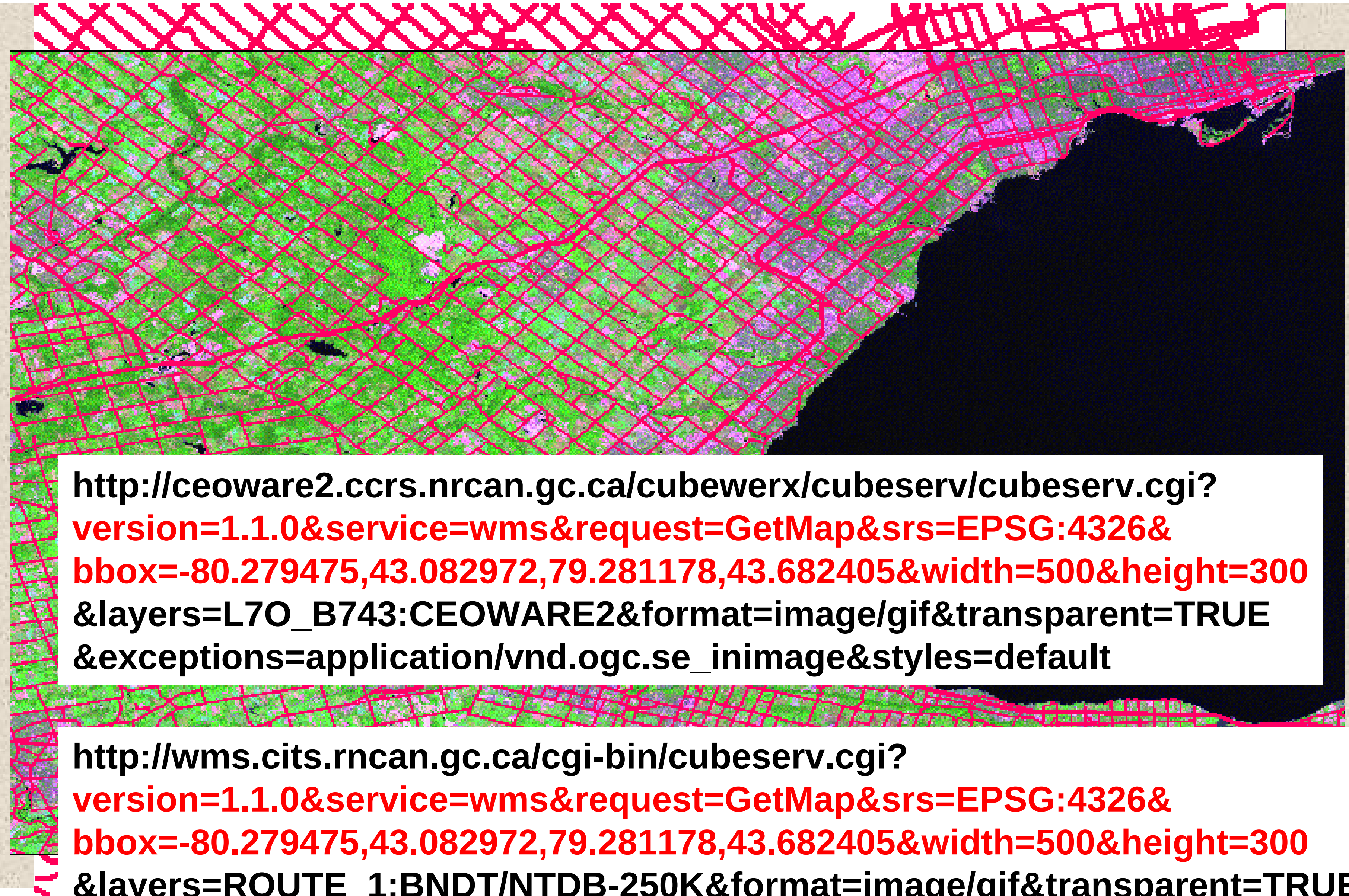
- Unified OWS Metadata!!
  - MapServer now supports “ows_*” type metadata declarations
  - OWSs with common metadata element names can use this
  - Cuts down on mapfile size
  - Less management of metadata

## MapServer and OWS

- Instead of:
  - “wms_title” “Land Use”
  - “wfs_title” “Land Use”
- How about:
  - “ows_title” “Land Use”
  - Satisfies anything “[wms|wfs|wcs]_title”
- You can still set service-specific metadata if you need to, which overrides “ows_*”

## OGC WMS

- Provides images of map data defined by a geographic / spatial component
- Provides point based query functionality
- Interoperable means of map compositing from n servers
- ‘just-in-time’ approach



http://ceoware2.ccrs.nrcan.gc.ca/cubewerx/cubeserv/cubeserv.cgi?
version=1.1.0&service=wms&request=GetMap&srs=EPSG:4326&
bbox=-80.279475,43.082972,79.281178,43.682405&width=500&height=300
&layers=L7O_B743:CEOWARE2&format=image/gif&transparent=TRUE
&exceptions=application/vnd.ogc.se_inimage&styles=default

http://wms.cits.rncan.gc.ca/cgi-bin/cubeserv.cgi?
version=1.1.0&service=wms&request=GetMap&srs=EPSG:4326&
bbox=-80.279475,43.082972,79.281178,43.682405&width=500&height=300
&layers=ROUTE_1:BNDT/NTDB-250K&format=image/gif&transparent=TRUE
&exceptions=application/vnd.ogc.se_inimage&styles=default

# OGC WMS

- HTTP based (GET or POST)
- Currently version 1.1.1
- Operations
  - GetCapabilities
  - GetMap
  - GetFeatureInfo
    - Operation **keywords** are CaSe-InSeNsItIvE
    - Opearation **values** are case-sensitive

# OGC WMS

- GetCapabilities
  - Provides XML of service functionality metadata, and layer metadata
  - Parameters
    - Version (version of specification)
    - Service (multiple services may exist from this service, e.g. WMS, WFS, WCS)
    - Request (GetCapabilities)
- E.g.
- http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/config.map&version=1.1.1&service=WMS&request=GetCapabilities

## OGC WMS

- Formats
  - transparency
- Exceptions
- Choose accordingly
- Layers
  - Data offerings
  - Nesting / Grouping

## OGC:WMS

- DescribeLayer
  - OPTIONAL operation to provide more information about a WMS layer (WFS, etc.)
  - Parameters
    - VERSION
    - SERVICE
    - REQUEST
    - LAYERS
  - http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/config.map&version=1.1.1&service=WMS&request=DescribeLayer&layers=rivers

## Web Map Service (WMS)

- GetMap
  - Returns graphic image of data based on area of interest, data, etc.
  - Image, not features, not attributes

## Web Map Service (WMS)

- Parameters
  - version (version of specification)
  - service (multiple services may exists from this service, e.g. WMS, WFS, WCS)
  - request (GetMap)
  - format (image format to be returned)
    - Get this from GetCapabilities info

## Web Map Service (WMS)

- Parameters
  - bbox (spatial area of interest, i.e. minx,miny,maxx,maxy)
  - srs (reference system / projection of bounding box coordinates
    - EPSG (http://www.epsg.org/)
    - Get supported SRSs from GetCapabilities
  - Most widely used SRS is EPSG:4326
    - Lat/long geographic (WGS84)

## Web Map Service (WMS)

- Parameters
  - width (output image width)
  - height (output image height)
  - layers  (data desired to be visualized)
    - Get this from GetCapabilities info
    - Comma-separated list
      - Eg. Layers=elevation,roads,railways,…
      - First list item is bottom most output layer

## Web Map Service (WMS)

- Parameters
  - TIME
    - ISO 8601 formatted timestring
    - Single point
    - Frequency
    - Range
    - Current
  - Not all WMS implementations support TIME

# Web Map Service (WMS)

- Parameters
  - Styles (desired portrayal of data)
    - Get this from GetCapabilities info per layer
    - Comma-separated list
      - e.g.. layers=elevation,roads,railways&styles=default,red,blue
      - Style list MUST align with layer list
      - Empty list value for non styled layers
      - e.g. to style ONLY railways layer: layers=elevation,roads,railways&styles=,,blue

# Web Map Service (WMS)

- Parameters
  - Styles and SLD
    - SLD enables remote classification and symbolization of data
    - Overrides server-based styles if request from user
    - To use in GetMap, SLD document must exist over HTTP, and cited in GetMap request
      - &sld=http://localhost/ms_ogc_workshop/sld/rivers.sld
      - OR &sld_body=<entire_sld_document>
      - (consider HTTP POST for SLD_BODY)
    - More info on SLD later

## Web Map Service (WMS)

- Parameters
  - transparent (whether to make non-opaque data pixels transparent
    - Either TRUE or FALSE
    - Useful for layering data from multiple remote WMS services atop eachother for map composition
    - Depends on image format (JPEG is not transparent)
    - Depends on web browser support
      - GIF transparency is supported in all browsers
      - PNG transparency support in newer browsers
  - bgcolor (optional background color of image)

## Web Map Service (WMS)

- Parameters
  - Exceptions (how to handle errors)
  - Can be caused by:
    - Server malfunction
    - Invalid client syntax (missing required values, etc.)
  - application/vnd.ogc.se_xml
  - application/vnd.ogc.se_inimage
  - application/vnd.ogc.se_blank

# Web Map Service (WMS)

- Parameters
  - Exceptions
    - Which one should I use?
    - application/vnd.ogc.se_inimage
      - Useful for easily visualizing errors in your app
      - Can also be ugly to the end-user / audience
    - application/vnd.ogc.se_blank
      - Returns a blank image
      - Difficult to recognize what type or error has occurred
    - application/vnd.ogc.se_xml
      - Returns an XML exception document
      - Difficult to decode if your app is requesting an image type
  - Choose accordingly

## Web Map Service (WMS)

- E.g.:
- http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/config.map&version=1.1.1&service=WMS&request=GetMap&srs=EPSG:4326&bbox=-180,-90,180,90&format=image/png&layers=land_shallow_topo_2048,rivers&styles=,&transparent=true&width=500&height=300

# Web Map Service (WMS)

- GetFeatureInfo
  - Performs point-based queries on map data
  - No ability for complex, expression-like queries
    - This is covered the WFS specification

# Web Map Service (WMS)

- GetFeatureInfo
  - Parameters
  - <all GetMap parameters>
    - request=GetFeatureInfo instead of GetMap
    - Pass on ALL GetMap keyword-value pairs as if performing a GetMap request
    - x (pixel value in X image coordinates)
    - y (pixel value in Y image coordinates)
    - query_layers (layers to be queried)
      - Can be one or multiple layers
      - This does not substitute passing the layers parameter

# Web Map Service (WMS)

- Parameters
  - info_format
    - Get this from GetCapabilities info
    - Common formats
      - HTML
        - » difficult to parse
      - GML.1
        - » XML-based
        - » Lacks common definition structure between vendor implementations
    - See http://127.0.0.1/ms_ogc_workshop/ for examples

## OGC:WMS

- Enabling in MapServer
  - MapServer must be built with --with-wms
  - Through metadata elements in mapfile
    - “ows_*” or “wms_*” type metadata
      - These drive interface content
    - see wms-server howto

# OGC:WMS

- The Server URL thing
- MapServer needs CGI “map” keyword (i.e. MS_MAPFILE environment variable) to drive interface
- This can be tacked on to server URL as the base WMS server URL prefix
- If you want, you can hide mapfile via HTTPD settings
- See:
  - http://127.0.0.1/ms_ogc_workshop/service/hide-mapfile-location.php

## Publishing OGC:WMS

- Go to dir: /ms4w/apps/ms_ogc_workshop/service/
- Open exercise.map
- Add all WMS contact information in mapfile WEB METADATA
- Try new server URL:
  - http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/exercise.map
  - Perform a GetCapabilities request

## Publishing OGC:WMS

- Add the rivers layer to the mapfile to publish as a WMS layer
- See wms-server howto
- Color should 0 0 255
- Data is in
  - /ms4w/apps/ms_ogc_workshop/data/rivers

## Publishing OGC:WMS

- Save to disk?
  - Capabilities responses for WMS use a MIME type which web browsers are not familiar with:
    - application/vnd.ogc.wms_xml
  - You can configure your web browser to launch a specific application when it encounters this MIME type
    - i.e. Firefox: add to mimeTypes.rdf:

```
<RDF:Description
 RDF:about="urn:mimetype:handler:application/vnd.ogc.wms_xml"
                  NC:alwaysAsk="true"
                  NC:saveToDisk="true">
   <NC:externalApplication
 RDF:resource="urn:mimetype:externalApplication:text/xml"/>
 </RDF:Description>
```

## OGC:SLD

- “Add-on” specification to OGC:WMS
  - “SLD-enabled WMS”
- Enables custom styling
  - Data at the server does not have to change
  - Client sends SLD XML document for symbolization, etc.
    - Either as URL or within BODY of the request
      - If URL, it MUST be resolvable and accessible by the WMS server

## OGC:SLD

- Additional OGC:WMS operations with OGC:SLD:
  - GetLegendGraphic
  - GetStyles
  - PutStyles

## OGC:SLD

- GetLegendGraphic
- Dynamic legend icon for a given layer
- Parameters
  - VERSION
  - SERVICE
  - REQUEST
  - FORMAT
  - LAYER
  - SLD

## OGC:SLD

- GetStyles
- Returns OGC:SLD for a given layer
- Parameters
  - VERSION
  - SERVICE
  - REQUEST
  - LAYERS

## OGC:SLD

- PutStyles
- Stores SLD document on WMS server
- Not supported by MapServer

## OGC:SLD

- Enabling in MapServer
- Not much, really
  - MapServer code (CGI) basically exposes and converts CLASS objects to SLD constructs
  - Also via PHP MapScript to mapObj or layerObj
  - See here for SLD examples:
    - http://127.0.0.1/ms_ogc_workshop/index.html

## Consuming OGC:WMS

- MapServer, on your behalf, can connect to OGC:WMS as well
- Takes care of client code specifics (whew!)
- Specific LAYER METADATA elements in mapfile
- See wms-client-howto
- http://127.0.0.1/ms_ogc_workshop/client/wms/demo_init.html
- http://127.0.0.1/ms_ogc_workshop/client/wms/demo.map

## Consuming OGC:WMS

- Go to dir:
  - /ms4w/apps/ms_ogc_workshop/client/wms/satellite/
- Add a WMS layer to demo.map
  - MODIS global imagery
  - Server:
    - » http://mapserv2.esrin.esa.it/cubestor/cubeserv/cubeserv.cgi
  - Layer name:
    - » WORLD_MODIS_1KM:MapAdmin
  - Hints:
  - Do a GetCapabilities to get more info on the layer, formats, projections, version, etc.
  - See wms-client-howto
  - More examples of remote global layers in:
    - » http://127.0.0.1/ms_ogc_workshop/client/wms/satellite/servers.txt

# Consuming OGC:WMS and SLD

- Go to dir:
  - /ms4w/apps/ms_ogc_workshop/client/wms/satellite/
- Add another WMS layer to demo.map
  - Bird Studies Canada Important Bird Locations
  - Server:
    - http://www.bsc-eoc.org/cgi-bin/bsc_ows.asp
  - Layer name:
    - IBA
- Add the following SLD document:
    - http://devgeo.cciw.ca/ms_tmp/iba_sld.xml
- Hints:
  - Look at the SLD document to get a feel of what's going on
  - See sld-howto and workshop SLD examples
  - If you're ambitous, set "wms_sld_body" to "AUTO", and generate a CLASS object, which generates the SLD on the fly in the WMS GetMap request

## OGC:WFS

- Feature level access to spatial data (vectors)
- Rich query interface
- Returns GML
- Transactional capability
- Security considerations for OGC:WFS-T
  - – MapServer supports basic WFS
    - No transactions

## OGC:WFS

- Operations
  - GetCapabilities
  - DescribeFeatureType
  - GetFeature

# OGC:WFS

- GetCapabilities
- Same idea as OGC:WMS GetCapabilities
- Parameters
  - VERSION
  - SERVICE
  - REQUEST
- http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/config.map&version=1.0.0&service=WFS&request=GetCapabilities

# OGC:WFS

- DescribeFeatureType
- Provides an outline of the structure of a feature type (fields, etc.)
- Analogous to SQL describe <table> command
- Parameters
    - VERSION
    - SERVICE
    - REQUEST
    - TYPENAME
- http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/config.map&version=1.0.0&service=WFS&request=DescribeFeatureType&typename=rivers

## OGC:WFS

- GetFeature
- Gimme data!
- Parameters
  - VERSION
  - SERVICE
  - REQUEST
  - TYPENAME
  - FILTER (optional)
  - BBOX (can also be done through FILTER)

  - E.g.: see index.html

## OGC:WFS

- Enabling in MapServer
  - MapServer must be built with --with-wfs
  - Through metadata elements in mapfile
    - “ows_*” or “wfs_*” type metadata
      - These drive interface content
    - see wfs-server howto
    - Layers must contain “DUMP TRUE”

# Consuming OGC:WFS

- MapServer, on your behalf, can connect to OGC:WFS as well
- Takes care of client code specifics (whew!)
- Specific LAYER METADATA elements in mapfile
- See wfs-client-howto
- http://127.0.0.1/ms_ogc_workshop/client/wfs/demo_init.html
- http://127.0.0.1/ms_ogc_workshop/client/wfs/demo.map

## OGC:GML

- Text-based, portable data format
- Self-describing, XML
- GML schemas define geospatial objects for you
- YOU define what’s specific to your data
  - attributes, etc.

## OGC:GML

- Any GML parser can read your data!!
- Smarter components which are based on the GML standard

## Serving OGC:GML

- GML usually comes from a OGC:WFS
- MapServer can also serve up static files
  - OGR supports GML2
  - Certain structure required for OGR to recognize content model
  - Dataset/record type hierarchy
- You can serve up GML:
  - From GML documents you made yourself
  - From GML documents you copied from elsewhere
  - By doing nothing; OGC:WFS offers GML already

## Serving OGC:GML

- Making it happen
  - CONNECTIONTYPE OGR
  - CONNECTION “/path/to/gml/document”
  - The rest is like any other LAYER object definition in the mapfile
- OGR processing
  - Creates and caches *.gfs overview type file when first reading the data
  - Quicker for subsequent data scans

# Serving OGC:GML

- MapServer now supports GML3!
  - via WFS supports both GML2 and GML3
  - Same as serving GML2 for WFS
  - WFS requests should have:
    - » DescribeFeatureType “outputFormat=XMLSCHEMA”
    - » DescribeFeatureType “outputFormat=SFE_XMLSCHEMA”
    - » GetFeature “outputFormat=GML3”
    - » GetFeature “outputFormat=GML2”

## Serving OGC:GML

- Check out mums.gml for an example
- Check out mums.xsd for the XML Schema definition
  - MapServer doesn’t necessarily use the .xsd
  - Good practice nonetheless for validating XML parsers

## Serving OGC:GML

- Try creating your own document by copying/pasting the mums examples
- Update reference to your new data in demo.map
- Now you’re a GML guru ☺

## OGC:Filter

- “Add on” specification to OGC:WFS
- Custom XML query language
- SQL in XML, almost
- Spatial and aspatial query capabilities
  - Logical
  - Spatial
  - Comparative

## OGC:Filter

- SQL:
  - select * from roads where roadtype = 1
- OGC:Filter:

```
<Filter>
    <PropertyIsEqualTo>
        <PropertyName>roadtype</PropertyName>
        <Literal>1</Literal>
    </PropertyIsEqualTo>
</Filter>
```

## OGC:Filter

- Enabling in MapServer
- Not much, really
  - Handled by MapServer OGC:WFS code
  - E.g.:
    - http://127.0.0.1/ms_ogc_workshop/filter/index.html
  - See MapServer Filter howto

# Exercise

- Add WFS client layer and client side filter encoding to /ms4w/apps/ms_ogc_workshop/client/wfs-filter/demo.map
- Use OWS server:
    - http://www2.dmsolutions.ca/cgi-bin/mswfs_filter
  - Add as remote WFS layer
  - Create the following filters:
    - WHERE NAME = 'Digby'
    - WHERE NAME LIKE 'Syd%'
    - WHERE NAME = 'Digby' or NAME LIKE 'Syd%'
- Application http://127.0.0.1/ms_ogc_workshop/client/wfs-filter/demo_init.html
- Helpers
  - http://www2.dmsolutions.ca/cgi-bin/mswfs_filter?SERVICE=WFS&version=1.0.0&Request=GetCapabilities
  - http://www2.dmsolutions.ca/cgi-bin/mswfs_filter?SERVICE=WFS&version=1.0.0&Request=DescribeFeatureType&TYPENAME=popplace
  - See Filter examples for help
  - See MapServer Filter howto and MapServer WFS client howto

result map map file /ms4w/apps/ms_ogc_workshop/client/wfs-filter/demo_answer.map

result application : http://127.0.0.1/ms_ogc_workshop/client/wfs-filter/demo_init_answer.html

```
LAYER
  NAME popplace
  GROUP "VECTOR"
  TYPE POINT
  STATUS ON
  CONNECTIONTYPE WFS
  CONNECTION "http://www2.dmsolutions.ca/cgi-bin/mswfs_filter?"
  PROJECTION
   "init=epsg:42304"
  END
  METADATA
   "wfs_connectiontimeout" "60"
   "wfs_version" "1.0.0"
   "wfs_service" "WFS"
   "wfs_typename" "popplace"
   "wfs_latlonboundingbox" "-65.4238 43.3796 -60.2557 47.7669"
   # WHERE NAME = 'Digby'
   #"wfs_filter"  "<PropertyIsEqualTo><PropertyName>NAME</PropertyName><Literal>Digby</Literal></PropertyIsEqualTo>"
```

```
LABELITEM "NAME"
 CLASS
  NAME "popplace"
  STYLE
   COLOR 255 0 0
   SYMBOL 'circle'
   SIZE 6
  END
  LABEL
   COLOR  255 0 0
   FONT fritqat-italic
   TYPE truetype
   SIZE 8
   POSITION AUTO
   PARTIALS FALSE
  END
 END #class

END#layer
```

## OGC:WCS

- The raster equivalent to OGC:WFS
- Provides “real” raster data
  - DEM
  - GeoTIFF

## OGC:WCS

- Operations
  - GetCapabilities
  - DescribeCoverage
  - GetCoverage

## OGC:WCS

- GetCapabilities
- Same idea as OGC:WMS GetCapabilities
- Parameters
  - VERSION
  - SERVICE
  - REQUEST
- http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/config.map&version=1.0.0&service=WCS&request=GetCapabilities

# OGC:WCS

- DescribeCoverage
- Provides an outline of the structure of a coverage
  - bands
  - resolution
- Parameters
    - VERSION
    - SERVICE
    - REQUEST
    - COVERAGE
- http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/config.map&version=1.0.0&service=WCS&request=DescribeCoverage&coverage=toronto

# OGC:WCS

- GetCoverage
- Gimme data!
- Parameters
  - VERSION
  - SERVICE
  - REQUEST
  - COVERAGE
  - CRS
  - BBOX

  - E.g.: see index.html

## OGC:WCS

- Enabling in MapServer
  - MapServer must be built with --with-wcs
  - Through metadata elements in mapfile
    - “ows_*” or “wcs_*” type metadata
      - These drive interface content
    - Layers must contain “DUMP TRUE”
    - see wcs-server howto

# OGC:SOS

- Provides Observations and Measurements
  - Sensors
  - In-situ
  - Monitoring
  - e.g. water quality / quantity, weather, air quality
- Can Support / Enable:
  - Data extraction
  - Graphing and trend analysis

## OGC:SOS

- Operations
  - GetCapabilities
  - DescribeSensor
  - GetObservation

# OGC:SOS

- GetCapabilities
- Same idea as OGC:WMS GetCapabilities
- Parameters
  - VERSION
  - SERVICE
  - REQUEST
- http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/config.map&version=0.0.31&service=SOS&request=GetCapabilities

# OGC:SOS

- DescribeSensor
- Provides an outline of the structure of a coverage
  - bands
  - resolution
- Parameters
    - VERSION
    - SERVICE
    - REQUEST
    - SENSORID
- http://127.0.0.1/cgi-bin/mapserv.exe?map=/ms4w/apps/ms_ogc_workshop/service/config.map&version=0.0.31&service=SOS&request=DescribeSensor&sensorid=SOMEID

## OGC:SOS

- GetObservation
- Gimme data!
- Parameters
  - VERSION
  - SERVICE
  - REQUEST
  - SENSORID
  - CRS
  - BBOX

  - E.g.: see index.html

# OGC:SOS

- Enabling in MapServer
  - MapServer must be built with --with-sos (and prerequisites [libxml2])
  - Through metadata elements in mapfile
    - “ows_*” or “sos_*” type metadata
      - These drive interface content
    - Layers must contain “DUMP TRUE”
    - see sos-server howto

## OGC:WMC

- Web Map Context Documents
- Saves Web Mapping Application State
  - remote WMS layer pointers
- Like “project” files in common desktop GIS
- XML-based

# OGC:WMC

- Enabling in MapServer
- Check out mapcontext howto
  - Handled by MapServer CGI code
    - ‘hidden’ API param called “request=GetContext”
      - turned OFF by default
  - PHP Mapscript methods
      - saveMapContext
      - loadMapContext
- E.gs. and mapfile with context parameters defined:
    - http://127.0.0.1/ms_ogc_workshop/context/demo.map
    - http://127.0.0.1/ms_ogc_workshop/index.html

## OGC:WMC

- Enabling in MapServer
- Now MapServer CGI can ingest context
- CGI param “context=<url>”
- Check out mapcontext howto

## Mapscript WxS

- Allows for custom scripting of OGC Web Services via mapscript (perl, python, php, etc.)
- Can add intermediary layer of logic between OGC requests and responses
  - access control
  - custom metadata

# Wxs : PHP example

- http://localhost/ms_ogc_workshop/mapscript/php/ows.php?service=WMS&version=1.1.1&Request=GetCapabilities

```
<?php
dl("php_mapscript_4.10.0.dll");
$request = ms_newowsrequestobj();
$request->loadparams();
 /*forcing the version from 1.1.1 to 1.1.0 */
$request->setParameter("VeRsIoN","1.1.0");
ms_ioinstallstdouttobuffer();
$oMap = ms_newMapobj("../../service/exercise_answer.map");
$oMap->owsdispatch($request);
$contenttype = ms_iostripstdoutbuffercontenttype();
$buffer = ms_iogetstdoutbufferstring();
header('Content-type: application/xml');
echo $buffer;
ms_ioresethandlers();
?>
```

# Consuming Remote Web Services

- Distributed
  - Data stays at the source
  - You’re getting a ‘view’ of user-specified chunk of data

- “middleware”
  - Connect to Web Services with software (Perl, Java, PHP, etc.)
  - Consume XML
  - Reformat into HTML
  - Use JavaScript for interactive navigation

- E.g. Connecting to a world gazetteer WFS to ‘zoom to placename’:
  - http://127.0.0.1/ms_ogc_workshop/client/webservices/demo_init.html

## Consuming Remote Web Services

- Try rolling your own!
  - Add calling button in demo.html
  - Create middleware
    - Copy/paste gazetteer.php to start off
    - Choose a web service to connect to
    - Format request and input params
    - Figure out XML output structure
    - Output with HTML
    - Adjust JavaScript if needed

- Examples of XML Web Services and sample requests at:
  - webservices.txt

## Nice-to-Haves

- Official OGC Conformance
  - Rubber stamping
- Legends for Raster layers
- OGC:WMC
  - Allowing exposure of local data in a context document
- OGC:Filter
  - Enhanced support for spatial ops
    - Can we use GEOS?

## Future Goodies

- OWS Common
  - Unified Constructs
    - Metadata
    - Operations
    - Exceptions
  - Now adopted (1.0.0)
  - Will be implemented in OGC specs
- OGC SensorWeb is coming
  - Thoughts on SensorML, O & M, SOS

# Issues

- “Where can I find OGC Web Services”
- Canada:
  - http://geodiscover.cgdi.ca/gdp/search?action=searchForm&entryType=webService
- USA
  - http://edcw2ks15.cr.usgs.gov/fgdc/EDCgateway.html
  - http://gcmd.nasa.gov/
  - **Refractions OGC Survey Google API**
  - http://www.refractions.net/white_papers/ogcsurvey/
- User-friendliness of discovery of OGC layers/features/services, etc.

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## Thanks!

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