Geospatial Web Services

Introduction to Geospatial Web Services

An introduction and inventory of geospatial web services and their importance to interoperability in the geospatial domain.
Learning Objectives

After completing this module the student can:

- Explain the difference between a website, a web service, and a geospatial web service
- Differentiate between types of geospatial web services and how they are used
- Explain the purpose of the Open Geospatial Consortium (OGC)
Websites

- Provide HTML pages and forms for human users to navigate and perform functions
  - Searching, Shopping, Interaction
- Front end user interfaces through the browser

Example: www.google.com

Web Services

- NOT websites
- Operations that can be called to return information
- Invoked automatically through a program
- Publicly available and standardized for use by all programmers

Example:

```xml
<ArrayOfString xmlns:xs="http://www.w3.org/2001/XMLSchema"
                xmlns:s="http://www.w3.org/2001/XMLSchema-instance"
                xmlns="http://www.alethea.net/webservices">
    <string>Herndon, VA</string>
</ArrayOfString>
```
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Types of Geospatial Web Services

Web based services with a focus on geospatial information

1. Data Discovery: Provide search and discovery to geospatial data and services

2. Data Visualization – Provide visualization images of the actual geospatial data

3. Data Access – Provides access to the actual geospatial data
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Geospatial Web Service Types

User Applications

Geospatial Web Services

Data Discovery

Data Visualization

Data Access

Content Repositories

Features

Coverages

national spatial data infrastructure training program
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Geospatial Web Service Example

Request to a web service for an image of a map

Web Map Service (WMS)
http://100.200.128.70/wms/process.cgi?REQUEST=GetMap&FORMA T=image/gif&WIDTH=640&HEIGHT=480&LAYERS=relief,bound&SRS =EPSG:4326&BBOX=-137,14,-50.,52&VERSION=1.1.1
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Geospatial Web Service Example

Request to a web service for attribute information for a specific point

**Web Feature Service (WFS)**

http://100.200.128.70/geoserver/wfs?request=GetFeature&version=1.0.0&typeName=massgis:GISDATA.TOLLBOOTHES_POLY

```xml
  <gf:featureMember>
    <massgis:GISDATA.TOLLBOOTHES_PT id="GISDATA.TOLLBOOTHES_PT.1">  
      <massgis:ID xsi:nil="true"/>  
      <massgis:OWNER>Massachusetts Turnpike Authority</massgis:OWNER>  
      <massgis:DESCRIPTION> 통해气味</massgis:DESCRIPTION>  
      <massgis:LOCATION>Mass Pike Exit 1</massgis:LOCATION>  
      <massgis:NOTES:FREETEXT>West Stockbridge</massgis:NOTES:FREETEXT>  
      <massgis:NOTES:W2:400/>  
      <massgis:SHAPE/>  
    </massgis:GISDATA.TOLLBOOTHES_PT>  
  </gf:featureMember>  
</gf:FeatureCollection>
```
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Geospatial Interoperability

- Ability for different systems to exchange/use geospatial information
  - Web services provide interoperability
- Interoperability drives costs down and productivity up
  - How many hours does it take to transform, translate and understand “free” data you download from the web?
  - Are you even certain it is “fresh” after all that processing?
- Spatial Data Infrastructures (SDI’s) use web services to access and publish data, services and metadata
  - Need to be interoperable with other SDI systems world wide
Vision:
Develops standards for geospatial web services

Mission:
A world in which everyone benefits from geographic information and services made available across any network, application, or platform
OGC Provides Interoperability

- OGC Specifications are agreed upon by a broad constituency of the geospatial community and are supported by many software vendors.

- OGC links geographic data with mainstream Information Technology (IT).

- Vendor implementation in products enables the direct access and use of data produced by programs from many vendors.
Example Members

**Integrators**

- Lockheed Martin, QuenitQ, SAIC, BAE Systems, Boeing, General Dynamics, Computer Sciences Corporation, Schlumberger Information Solutions …

**Major Hardware and Software Companies**

- Sun Microsystems, Oracle, HP, Microsoft…

**Developers of GeoSpatial Technologies and Services**

- Intergraph, AutoDesk, ESRI, LaserScan, MapInfo, SICAD, GE Network Solutions, PCI Geomatics, Leica Geosystems,

**Government agencies that depend on geoprocessing**

- United Nations, National Government Agencies from: United States, Canada, United Kingdom, France, Germany, Australia, Japan, Republic of Korea; Sub-National Governments: California, Consellería de Medio Ambiente (Spain), NRW….

**Others**

- Content Providers, Power, Universities, Consultants, Startups…
OGC collaborates and work closely with:

- International Organization for Standardization (ISO) TC 211 and 204
- World Wide Web Consortium (W3C)
- Internet Engineering Task Force (IETF)
- OASIS
- Automotive Mobile Information Consortium
- Open Mobile Alliance
- And others…
## Introduction to Geospatial Web Services

### Approved OGC Specifications

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Name</th>
<th>SDI Suite 1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Discovery</strong></td>
<td>Catalog Service with CSDGM Metadata</td>
<td>Version 2.0 Z39.50 Protocol</td>
</tr>
<tr>
<td><strong>Data Visualization</strong></td>
<td>Web Map Service</td>
<td>Version 1.1.1</td>
</tr>
<tr>
<td></td>
<td>Style Layer Descriptor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Web Map Context</td>
<td></td>
</tr>
<tr>
<td><strong>Data Access</strong></td>
<td>Web Feature Service</td>
<td>Version 1.0</td>
</tr>
<tr>
<td></td>
<td>Web Coverage Service</td>
<td>Version 1.1</td>
</tr>
<tr>
<td></td>
<td>Geographic Markup Language</td>
<td>Version 2.1.2</td>
</tr>
<tr>
<td></td>
<td>Filter Encoding</td>
<td>Version 1.1</td>
</tr>
</tbody>
</table>
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A Concrete Example on Non-Interoperability

TerraServer - http://terraserver.microsoft.com
MapQuest - http://www.mapquest.com
EPA - http://www.epa.gov/enviro/enviromapper.html
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A Concrete Example of Interoperability

Interoperable Web Mapping

Server 1: Topography

Server 2: Water

Server 3: Boundaries

Viewer Client: Combined Map

GetMap

Catalog Service

national spatial data infrastructure training program
Central America demonstration developed for Global Spatial Data Infrastructure (GSDI) meeting in Cartagena, Colombia 2001 to demonstrate capabilities of WMS servers and client

Data Servers Established:

- FGDC – Reston
  - DCW Boundaries
  - Roads
  - Cities
  - Shaded Relief
- EROS Data Center – South Dakota
  - El Salvador Roads1 & 2
  - Cities
  - Departments
- UNITEC – Honduras
  - Rivers
  - Lakes
  - Land Use
  - Base Map
OpenGIS Multi-Server Web Mapping

Layers:
- DCW Boundaries [Reston]
- DCW Roads [Reston]
- DCW Cities [Reston]
- El Salvador Roads [EDC]
- El Salvador Cities [EDC]
- El Salvador Departments [EDC]
- Mitch Rivers [UNITEC]
- Mitch Lakes [UNITEC]
- Mitch Landuse [UNITEC]
- Mitch Base Map [UNITEC]
- WSI Shaded Relief [Reston]

Map: No currently visible layers...
OpenGIS Multi-Server Web Mapping

Layers:
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- DCW Cities [Reston]
- El Salvador Roads [EDC]
- El Salvador Cities [EDC]
- El Salvador Departments [EDC]
- Mitch Rivers [UNITEC]
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- Mitch Landuse [UNITEC]
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- WSI Shaded Relief [Reston]
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Redraw Map

Zoom In  Zoom Out  Re-Center
OpenGIS Multi-Server Web Mapping

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Redraw Map

Zoom In  Zoom Out  Re-Center
‘Near instant’ data interoperability
- Access and exploit a wide variety of spatial data on-demand
- No more time spent translating files to your format or projection

Supports web based services architecture
- Get your GIS over the web. Choice of web-based tools
- Locate information across a distributed environment using different vendor applications, different projections

No more data configuration management
- Get your answer from the latest data when you need it
- Reduce data maintenance costs. Access and maintain only the data you care about
Summary

This is the conclusion of: Introduction to Geospatial Web Services.

You should be able to:

- Explain the difference between a website, a web service, and a geospatial web service
- Differentiate between types of geospatial web services and how they are used
- Explain the purpose of the Open Geospatial Consortium (OGC)
The FGDC invites you to visit

http://www.fgdc.gov/training/nsdi-training-program/online-lessons

for additional lessons.