Providing Interoperability Using the Open GeoServices REST Specification

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Agenda

Esri’s participation in Standards Bodies

Interoperability Challenges
  - Tackling Interoperability challenges using Service Standards

Service Standards
  - The Open GeoServices REST Specification
  - The W*S Open Geospatial Consortium Standards

ArcGIS Online – Leveraging Interoperability
ESRI Participates in Many Standards Organizations

- ISO
- OGC
- ANSI/INCITS
- OASIS
- IHO
- OMA
- FGDC
- CEN
- GSDI
- DGIWG
- FGDC
- GSDI
- ASPRS
- EPSG
ISO Participation

- ESRI provides leadership role in ISO TC 211 Standards Development:
  - ISO 19115: Metadata (Project Leader)
  - ISO 19115-2: Metadata – Imagery extension (Editor)
  - ISO 19125: Simple Feature Access (Editor)
    - Part 1 – Common Architecture
    - Part 2 – SQL Option
  - ISO 19139: Metadata – Implementation Specification (Project Leader – supported Editor/committee process)
  - ISO 19142: Web Feature Service (Editing committee member representing USA)
  - ISO 19143: Filter Encoding (Editing committee member representing USA)

- Provide technical experts on many WI project teams

  - SQL Multimedia and Application Packages – Part 3: Spatial
OGC Participation

• ESRI
  - Principal member

  - Actively participates:
    - Technical Committee
    - Planning Committee
    - Board of Directors
    - All three OGC programs
      - Interoperability program
      - Standards program
      - Community Outreach and Adoption program

  - Current chair
    - Metadata Working Group
    - Web Map Service Working Group

  - Has an elected member in the OGC Architecture Board
Interoperability

- **Challenges**

  - Multiple Platforms (Operating Systems, Databases, …)
  - Multiple Architecture (Local, Enterprise, Web, Cloud, …)
  - Multiple Clients (Desktop, Web, Mobile, …)
  - Multiple Developer Environments (.NET, Java, …)
  - Multiple Protocols (SOAP, REST, OGC, …)
  - Multiple Encodings (XML, Raster Formats, GML, JSON, …)
ArcGIS

Easier
More Powerful
and Everywhere

• Discover
• Create
• Manage
• Visualize
• Analyze
• Collaborate

Cloud
Enterprise
Local

Web
Mobile
Desktop
ArcGIS - is Open & Interoperable

Standards:
- OGC
- ISO
- WCS
- KML
- INSPIRE
- WMS
- WFS
- WWW
- SQL

Open API’s / Open Specifications:
- File GDB
- Shapefile
- Geoservices REST

Open Data Access

ETL

Vendor Specific Files
Interoperability Enablers

• **Data Standards**
  - Simple Features Model, …
  - WKT, WKB, Spatial Types, GML, netCDF, …

• **Metadata Standards**
  - ISO 19115, 119, 139, FGDC, …

• **Service Standards**
  - GeoServices REST Specification
  - OGC Web Services - WMS, WFS, WCS, CS-W, WMTS, WPS
Digital Government Strategy

• Make Open Data, Content, and Web APIs the New Default.

• Make Existing High-Value Data and Content Available through Web APIs

• …from Digital Government - Building a 21st Century Platform to Better Serve the American People
Interoperability

- **Challenges**
  - Multiple Platforms (Operating Systems, Databases, …)
  - Multiple Architecture (Local, Enterprise, Web, Cloud, …)
  - Multiple Clients (Desktop, Web, Mobile, …)
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- **Solution**
  - Build interoperable Web services across platforms, applications, and programming languages.
ArcGIS for Server - Vision

Powerful GIS capabilities
Delivered as Web services
To help solve real problems
ArcGIS for Server

Web, Mobile and Desktop Clients

Administrator

Publisher

Web Server

Web Adaptor

GIS Server(s)

Data Server
ArcGIS Server - Building open and interoperable Systems

Popular Mass market Mapping Environments
- Google Maps
- Microsoft VE
- Yahoo Maps

Esri Client Solutions
- ArcGIS for Desktop
- ArcGIS for Mobile
- ArcGIS Online

GIS Software
- Intergraph
- Autodesk
- PitneyBowes

Solution Developer Frameworks
- php
- Ruby
- Python

Business Applications
- SAP
- Sharepoint
- IBM WebSphere Portal
Supporting Multiple Protocols

- Representational State Transfer (REST)
- Simple Object Access Protocol (SOAP)
- Open Geospatial Consortium (OGC)

Catering to Multiple Communities:

Spatial Data Infrastructures (SDI)
Enterprise Architectures (EA)
Neogeography/ Mashup (WEB 2.0)
ArcGIS Server - Building open and interoperable Systems

Representational State Transfer (REST)
## REST – The Elevator Pitch

<table>
<thead>
<tr>
<th>4 Key Principles*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification Of Resources</td>
<td>Everything is a URL</td>
</tr>
<tr>
<td>Manipulation Of Resources Through Representations</td>
<td>Exchange standard formats using standard verbs</td>
</tr>
<tr>
<td>Self-Descriptive Messages</td>
<td>Every request asks the full question, every response includes the full answer</td>
</tr>
<tr>
<td>Hypermedia As The Engine Of Application State</td>
<td>Hyperlinks &lt;a href=&quot;url&quot;&gt;Yeah!&lt;/a&gt;</td>
</tr>
</tbody>
</table>

[http://www.intertwingly.net/blog/2198.html](http://www.intertwingly.net/blog/2198.html)
ArcGIS Server - Building open and interoperable Systems

- Google Maps
- Microsoft VE
- Yahoo Maps
- SAP
- Sharepoint
- IBM WebSphere Portal
- REST Services

Programming Languages:
- Flex
- Silverlight
- Javascript
- iOS
- Android
- Windows Mobile
- Python
- php
- Ruby
- Microsoft VE
- Yahoo Maps
- SAP
- Sharepoint
- IBM WebSphere Portal
- REST Services
- ArcGIS Server
ArcGIS Server – REST API

- The ArcGIS Server REST API provides a simple, open Web interface to services hosted by a Server.

- All GIS Services are exposed as resources

- All resources exposed by the REST API are accessible through a hierarchy of endpoints or Uniform Resource Locators (URLs) for each GIS service published with the Server.

- Some resources have operations
  - Ex. Map Resource (export, find, identify)

Example:  http://sampleserver3.arcgisonline.com/arcgis/rest/services
Types of GIS Services

Map
- View or query a 2D map on the server

Geocode
- Perform address matching on the server

Geometry
- Provides geometric calculations such as buffer, simplify, and project.

Geoprocessing
- Provides spatial analysis and data processing services.

Image
- Provide access to raster data through a Web service

Feature
- Provide access to feature querying and editing

http://resources.arcgis.com/content/web/gis-services
Client Libraries – Consuming the REST Services

- Client Libraries

- ArcGIS Developer Tools support for REST API
  - Web API
    - ArcGIS API for JavaScript
    - ArcGIS API for Flex
    - ArcGIS API for Silverlight
  - Mobile Runtime SDK’s
    - ArcGIS Runtime SDK for iOS
    - ArcGIS Runtime SDK for Windows Phone
    - ArcGIS Runtime SDK for Android
Open Layers - Supporting ArcGIS REST Services

ArcGIS Server

http://openlayers.org/dev/examples/arcgis93rest.html
“Starting with OGR 1.8.0, the GeoJSON driver can read the JSON output of Feature Service request following the GeoServices REST Specification, like implemented by ArcGIS Server REST API”

http://www.gdal.org/ogr/drv_geojson.html
The Geoservices REST Specification

ArcGIS Server’s REST API is an “Open” Specification
Esri – Open Specifications


....in Progress

• The Geoservices REST Specification has been submitted to the OGC for Consideration
Can I support Esri’s REST Specification on my non ArcGIS Server Platform?
Arc2Earth and the Geoservices REST Specification

https://www.arcgis.com/home/webmap/viewer.html?webmap=e1cdc4855ea54edf8ff9451e32fff5cb
Geometry Service

http://dl.dropbox.com/u/35158796/REST%20Demo1.wmv
ArcGIS Server - Building open and interoperable Systems

REST Services

- Google Maps
- Microsoft VE
- Yahoo Maps
- SAP
- Sharepoint
- IBM WebSphere Portal
- Flex
- Silverlight
- Javascript
- iOS
- Android
- Windows Mobile
- php
- Ruby
- Python

ArcGIS Server
ArcGIS Server - Building open and interoperable Systems
ArcGIS Server - Building open and interoperable Systems

Open GeoSpatial Consortium (OGC)
OGC Standards

OGC Services

- Web Map Service
- Web Map Tiling Specification
- Web Coverage Service
- Web Feature Service
- Web processing service
- OGC Keyhole Markup Language
OGC Support in ArcGIS Server

- Inherits from ArcGIS Server
  - Cartography
  - Security Framework
  - Performance & Scalability
  - Authoring, Publishing & Sharing

WMTS and WPS Support – New in 10.1
OGC / ISO standards support (ArcGIS 10.1)

- **WMS**
  + SLD
  + Filter Encoding Support
  + Time Support

- **WFS**
  + Transactions
  + Filter Encoding Support

- **WCS**
  + GeoTiff, NITF, HDF, JPEG, JPEG2000, PNG

- **WMTS**
  + REST & KVP Encoding

- **WPS**
  + Synchronous
  + Asynchronous
  + Data and Services as inputs

- **CSW**
  + OGC Core
  + ISO 19139
  + ebRIM

ArcGIS Support for OGC Web services

- Server
  - ArcGIS Server
  - Esri Geoportal Server
  - …..

- Client
  - Desktop Applications
  - API’s
  - Viewers
  - …..

- More Information

- ESRI Web Site : White papers, Product Support Matrix, OGC compliancy
ArcGIS 10.1 – OGC Compliancy

Compliance Certificates available for

- WMS
- WFS
- WCS
- CS-W
- Simple Features

http://www.opengeospatial.org/resource/products/compliant#ESRI
ArcGIS Online

A complete, cloud-based, collaborative content management system for working with geographic information.

Supporting Interoperability thru GeoServices REST Specification, OGC WMS, CSV, OGC KML, OGC WMTS, ....
ArcGIS Online

Create and Collaborate on Maps and Apps

ArcGIS Online is a cloud-based, collaborative content management system for maps, apps, data, and other geographic information.

Learn More »

http://www.arcgis.com
GIS

- Creating and Managing Geo Information Products
  - Proprietary
  - Open Specifications
  - Standards

- Dissemination of Geo Products
  - Proprietary
  - Open Specifications
  - Standards
Thank you!