

ESRI Developer Summit

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Using the ArcGIS Server REST API

Jeremy Bartley and Keyur Shah



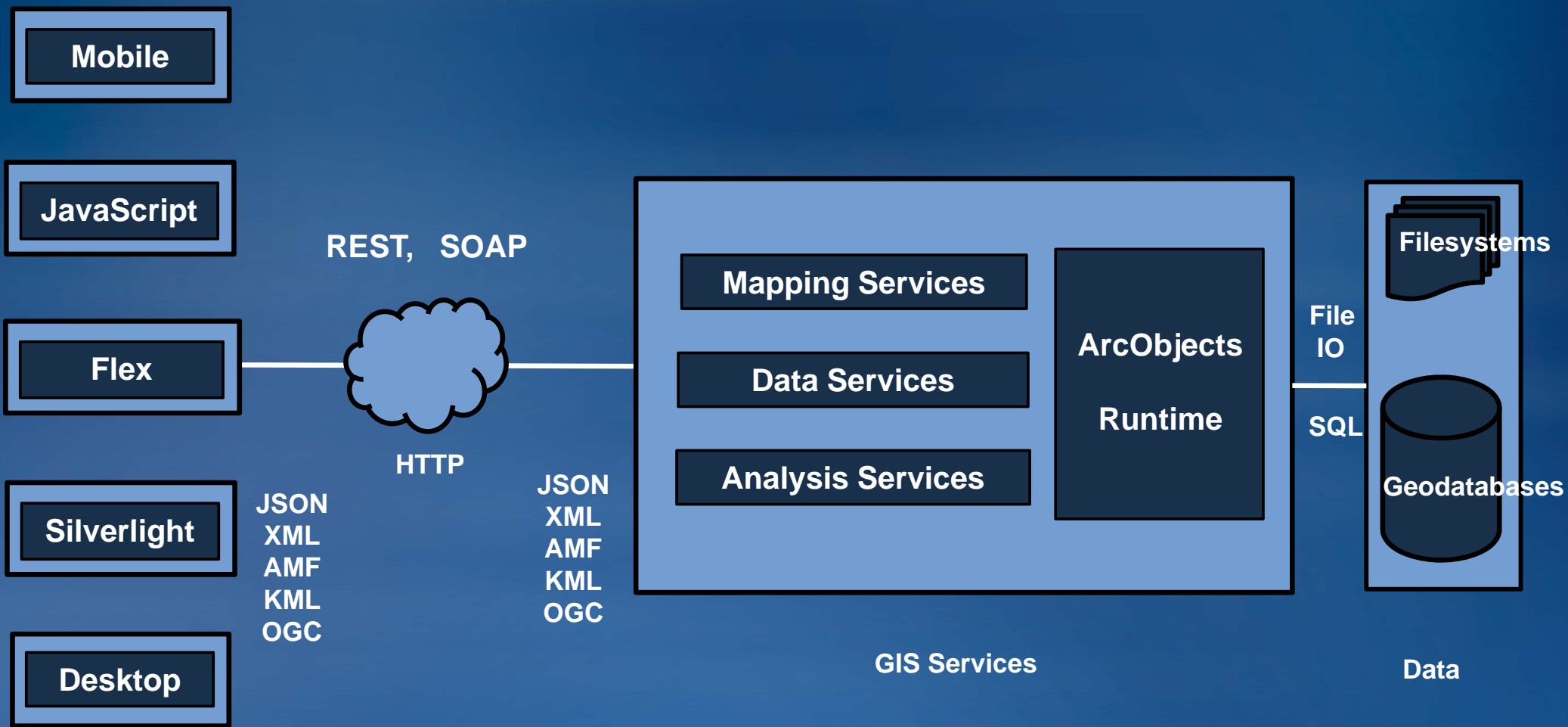
Agenda

- **Introduction**
- **Design and Concepts**
- **Service by Service Walkthrough**
- **REST-enabled SOEs**
- **Conclusion**

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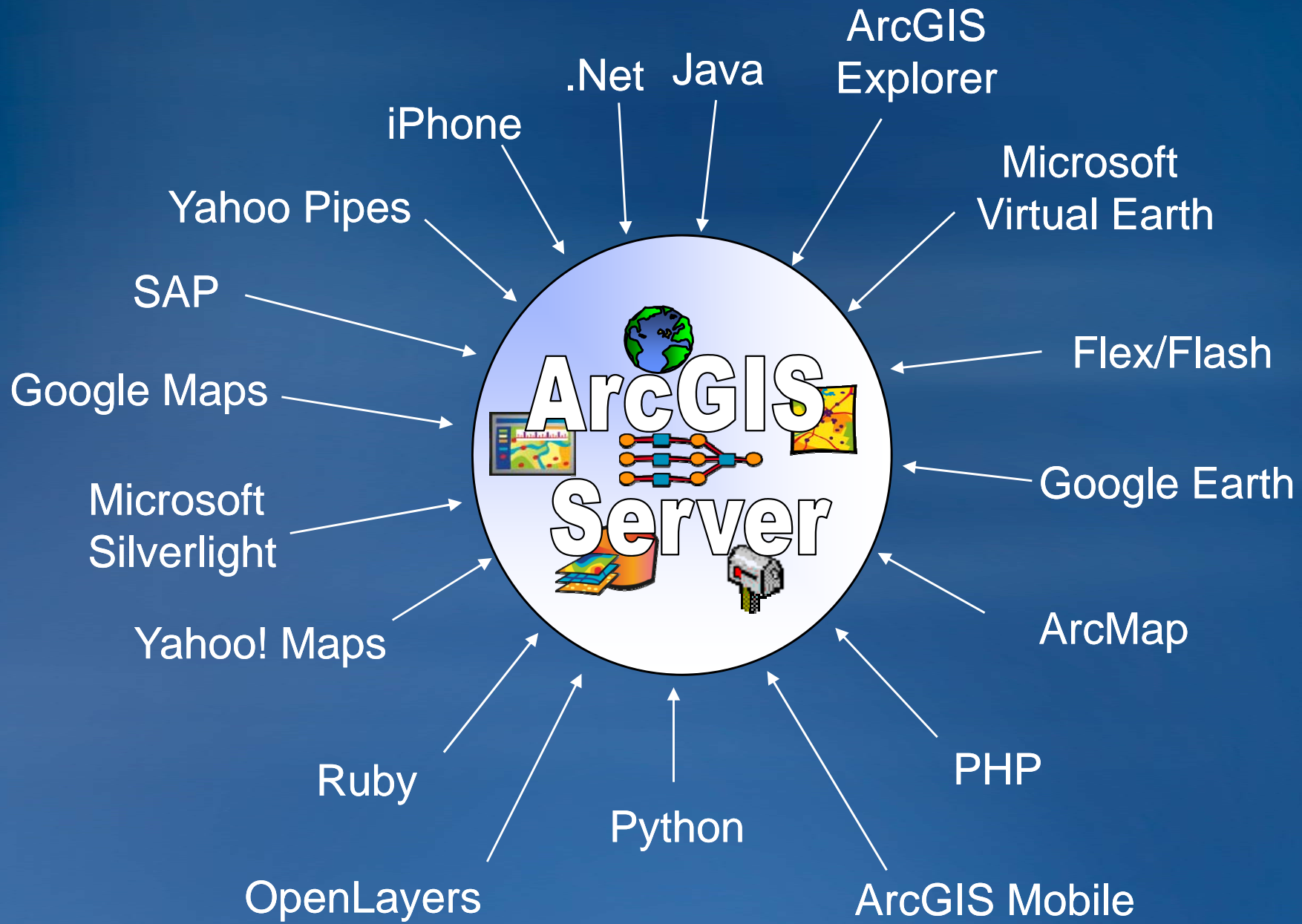
The ArcGIS Server System – Architecture



ArcGIS Server REST API

- **Developers should do simple things simply**
- **ArcGIS Server is REST enabled**
 - Available in both Java and .NET Server
- **ArcGIS Server embraces open web standards**

ArcGIS Server can work with many different clients





--Ernst Eijkelenboom

ArcGIS Server REST API

- New at 9.3, greatly enhanced at 10.0
- Simple view of ArcGIS Server
- ArcGIS Server hosts a Services Directory
 - Used by developer while building application
- Powers Web APIs
- Discoverable, accessible, and useable

ArcGIS Services Directory

[Home](#) > [Fire](#) > [Sheep \(MapServer\)](#) > [Points of Interest](#)

Layer: Points of Interest (ID: 0)

Display Field: DESCRIPTION

Type: Feature Layer

Geometry Type: esriGeometryPoint

Description:

Definition Expression:

Copyright Text:

Min. Scale: 0

Max. Scale: 0

Default Visibility: True

Extent:

XMin: -121.595581025
YMin: -27.9988892929999
XMax: 153.406838438
YMax: 63.3138329860001
Spatial Reference: 4326

Has Attachments: False

Fields:

- OBJECTID (Type: esriFieldTypeOID, Alias: OBJECTID)
- TYPE (Type: esriFieldTypeInteger, Alias: Type)
- DESCRIPTION (Type: esriFieldTypeString, Alias: DESCRIPTION)
- SHAPE (Type: esriFieldTypeGeometry, Alias: SHAPE)

Relationships:

Supported Interfaces: [REST](#)

Supported Operations: [Query](#)

ArcGIS Server Services

- **Map**
 - Based on a Map Document (.mxd) authored using ArcMap
 - Can be used to identify features on the map
 - Can be used to query individual layers in the map
- **Geocode**
 - Published locator file that can be used to perform find address and find location
- **Geometry**
 - A computational service, not bound to any data on the server.
New at 9.3
 - Provides basic geometric operations for use by web service clients

ArcGIS Server Services

- **Geoprocessing**
 - Allows organizations to centralize both data and processing on the server
 - Exposes spatial analysis functionality as easy to use tasks
 - Allows GIS Analysts to easily author and publish geoprocessing models
- **ImageServer**
 - Imagery management and analysis
- **Network Analysis**
 - Routing, Service Area, Closest Facility

ArcGIS Server REST API

- **All GIS Services are exposed as resources**
 - Service level metadata
- **Some resources have operations**
 - Map Service (export, find, identify)
 - Map Service Layers (query)
 - Image Services (export)
 - Geocode Service (findAddressCandidates, Reverse Geocode)
 - Geoprocessing (execute, submit job)
 - Network Analyst (solve route)
 - Geometry Service (project, buffer, and others)

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REST – The Elevator Pitch

4 Key Principles*	
Identification Of Resources	Everything is a URL
Manipulation Of Resources Through Representations	Exchange standard formats using standard verbs
Self-Descriptive Messages	Every request asks the full question, every response includes the full answer
Hypermedia As The Engine Of Application State	Hyperlinks <code>Yeah!</code>

*Thank you: <http://www.intertwingly.net/blog/2198.html>

Everything is a URL

- **Hierarchy of resources**
 - Catalog, Services (Map, Geocode, etc.), Layers, Tasks, etc.
- **JavaScript, Flex, Silverlight... Java, .NET... Ruby, Python... iPhone, Android... wget, curl**
 - *interoperable*
- **Searchable**
- **Bookmark-able**
- **Browser is the new command line**

HTTP Goodness

- HTTP as an *application* protocol
 - Cache-Control headers
 - ETags (Conditional GETs)
 - Compression (gzip)
 - Status codes

Supported Formats

- All REST URLs support an `f` (format) parameter
 - Default is `html`
- List of supported formats
 - `html` (Services Directory)
 - `json`
 - `amf` (new at 10.0)
 - `kmz`
 - `image`
 - `help`
 - `lyr, nmf, jsapi, gmaps, ve`

`f=html`

- **Services Directory – simple and instant access to Service Level Metadata**
- **Designed to be a developer tool**
- **Developers who work with the Web APIs might not work with the `json` responses directly, but will work with the Services Directory.**

f=json

- Used by the Web APIs
 - Can be used by any programming language
- JSON with callbacks
 - `f=json&callback=myMethod`
- Pretty JSON
 - `f=pjson`
 - More readable
 - For debugging purposes only
- Faster JSON at 10.0 for certain operations
- www.json.org and www.jsonlint.org

f=amf

- **New at 10.0**
- **Supported by certain operations**
 - query, queryRelatedRecords
- **Native Flex format**
 - Significantly better performance for Flex clients

REST API Admin

- `http://<host>:<port>/arcgis/rest/admin`
- **Supported operations**
 - Disable Services Directory
 - Clear REST Cache
 - Generate Admin Token (**New at 10.0**)
- **New at 10.0 : Scriptable REST Admin**
- **Important Note: Always clear the REST API Cache whenever you add, delete or update services**

“Unsafe” operations

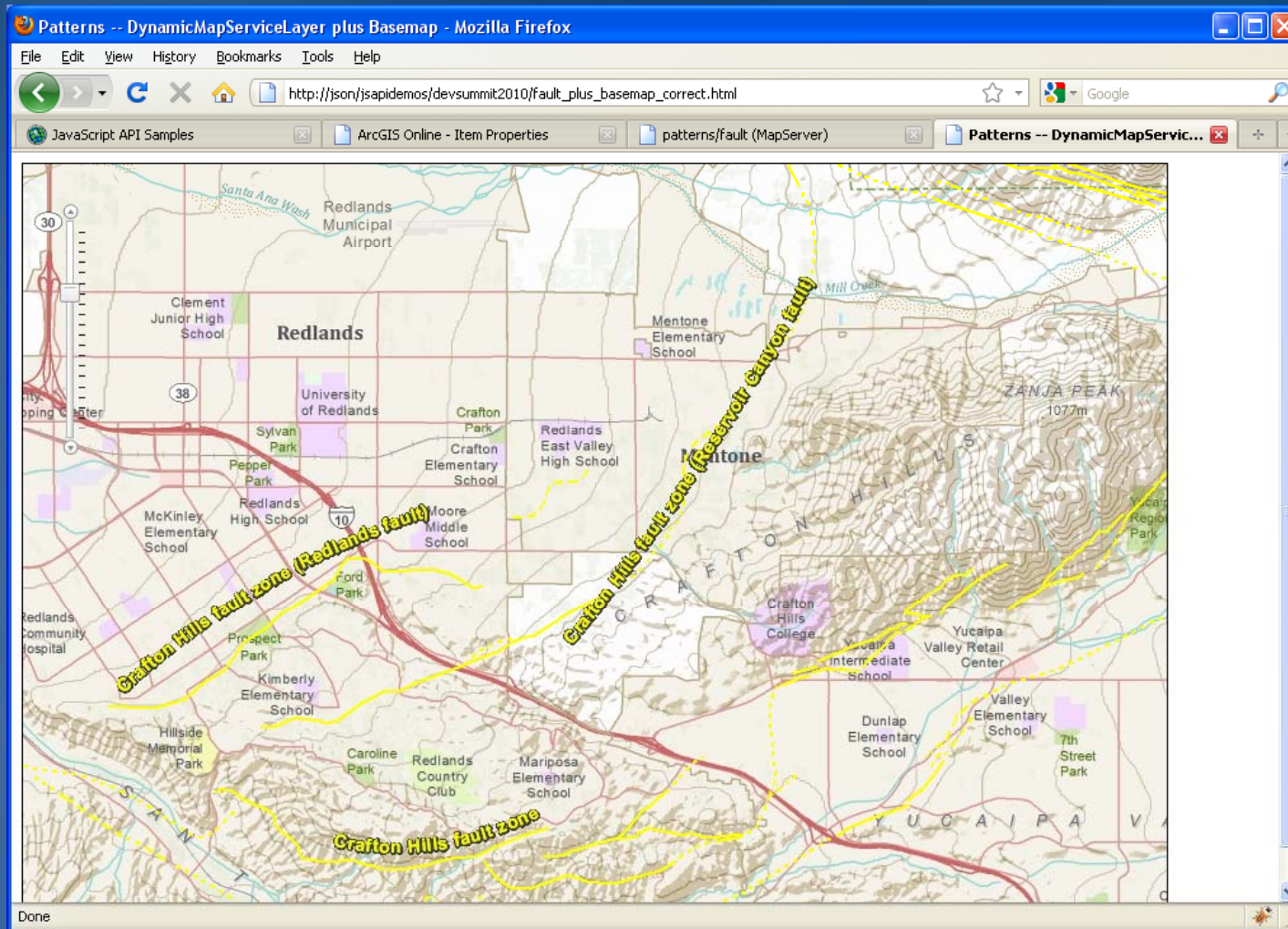
- **Till 9.3.1 all REST operations were “safe”**
 - Didn’t change the state of the system
- **10.0 introduces “unsafe” operations**
 - Operations that change the state of the system
 - Add / update / delete features and attachments
- **GETs not allowed for such operations**
- **PUT and DELETE have inconsistent support across various clients**
- **Unsafe operations only supported through POST**

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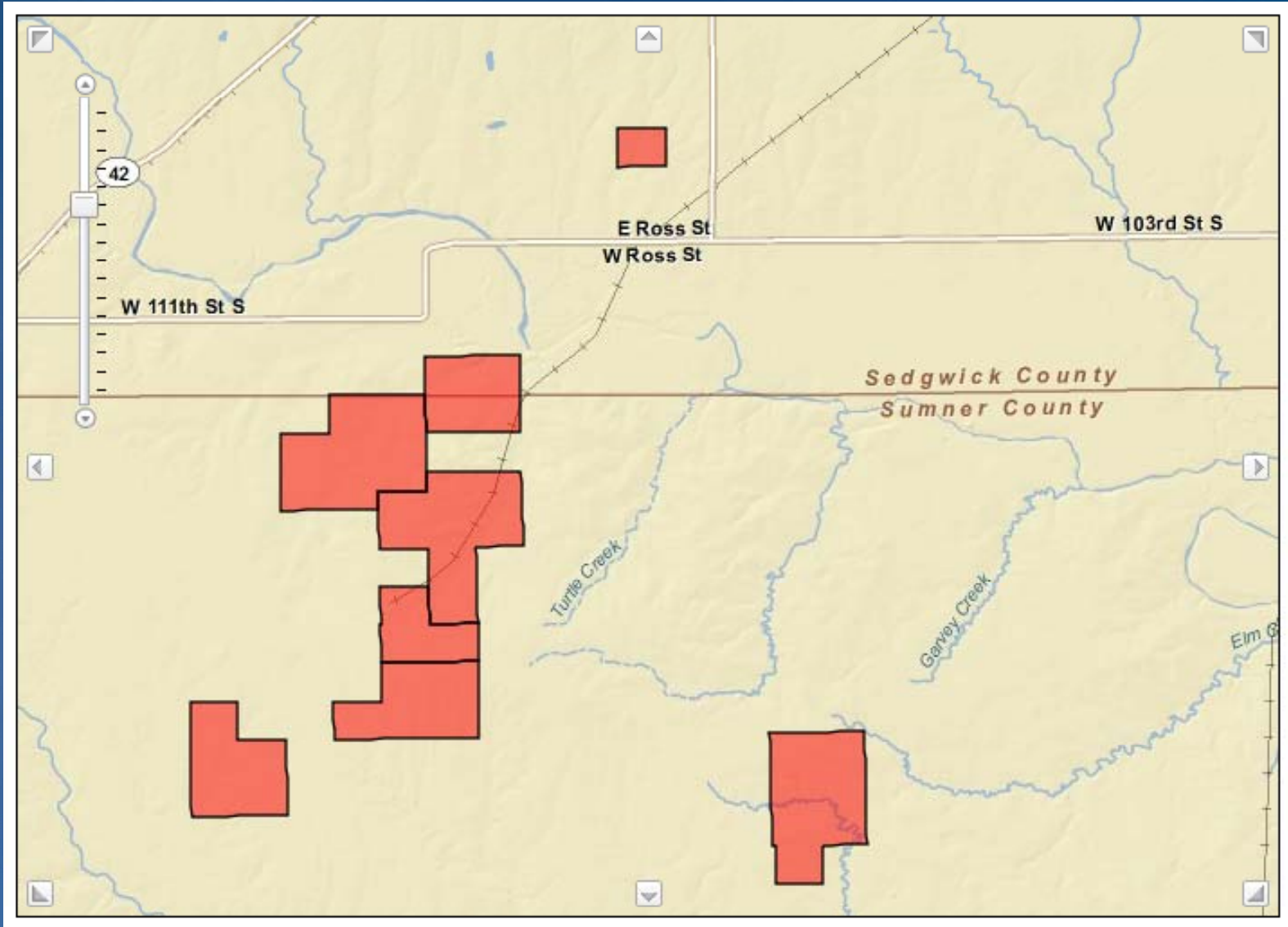
Service by Service Walkthrough -- MapServer

MapServer Resource, Tile Access, Export Operation



New at 10: All Layers Resource

MapServer Layer Resource, Query Operation



New at 10: Drawing Info, Field Domains

MapServer Layer/Table Resource, Query for IDs, Query Operation

Total records = 24 | Search: (phase designation) | [Prev Page](#) 1/2 [Next Page](#)

Unit ID	Serial number	Manufacturer	Phase designation	Housing type	Housing rating	Link type	Link rating
FUSU17	FU7341K	CPR	4	DRC	100	K	200
FUSU9	FSC4064	S&C	4	DRC	100	X	200
null	null	S&C	0	DRC	100	K	200
FUSU7	FU7341K	SS	4	DRC	100	K	200
FUSU8	FSC4064	ABB	4	DRC	100	K	200
FUSU11	FSC4064	CPR	1	DRC	100	K	200
FUSU18	FU7341K	CPR	5	DRC	100	K	200
FUSU19	KL1410	CPR	6	DRC	200	K	200
FUSU15	KL1410	S&C	1	DRC	100	K	200
			0	DRC	100	K	200
sfg	sfdg	UNK	7	MXC	50	H	20
FUSU2	adasdsa	S&C	6	OPL	100	K	200
FUSU20	KL1410	CPR	7	OPL	200	K	200
FUSU6	FU7341K	CPR	6	OPL	100	K	200
FUSU3	SSK2701	SS	5	MXC	100	K	200

New at 10: Table Support, Query for IDs, Query with IDs

MapServer Layer/Table Relationships

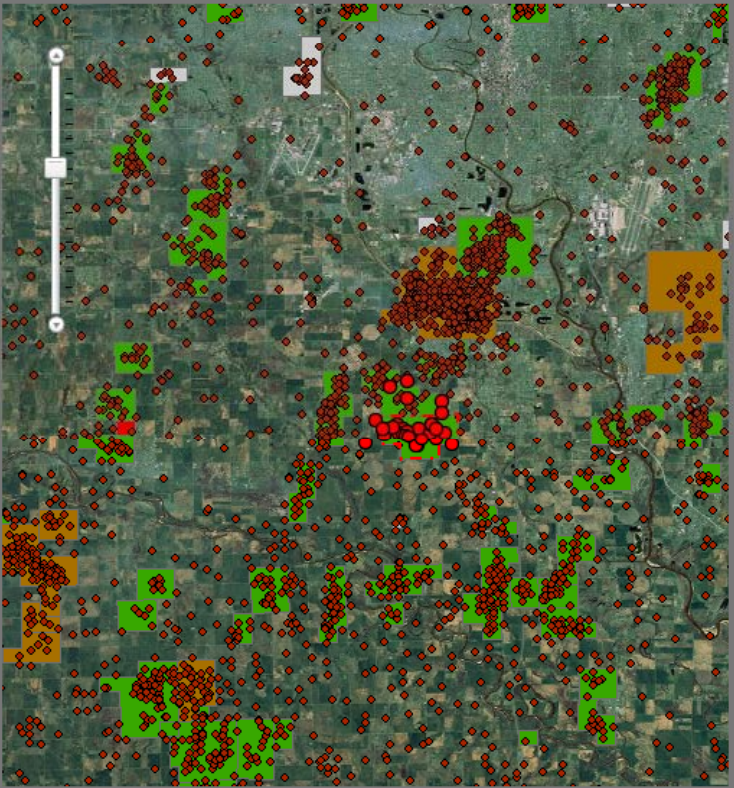
Query RelatedRecords Example - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://resources.esri.com/help/webapi/javascript/arcgis/demos/featurelayer/fl_query_related_multiple.html

JavaScript API Sampl... Query RelatedRe... View Records ArcGIS Online - Item ... patterns/fault (MapS... jbartley1 - /jsapidem...

Click on map to select a field, the wells related to the selected field, and the top records related to the selected wells.



ID	API NUMBER	ELEVATION	FORMATION TOP
1011966	15-173-7181	1282	Lansing Group 2415
1011965	15-173-7181	1282	Heebner Shale Member 2146
1011968	15-173-7181	1282	Mississippian System 3319
1011967	15-173-7181	1282	Kansas City Group 2757
76533	15-173-0150	1286	Mississippian System 3338
76532	15-173-0150	1286	Kansas City Group 2770
76535	15-173-0169	1279	Mississippian System 3324
76534	15-173-0169	1279	Kansas City Group 2767
77048	15-173-0169	1282	Kinderhookia Stage 3690
77047	15-173-0169	1282	Mississippian System 3354
77049	15-173-0169	1282	Simpson Group 3755
77046	15-173-0169	1282	Kansas City Group 2784

Transferring data from serverapi.arcgisonline.com...

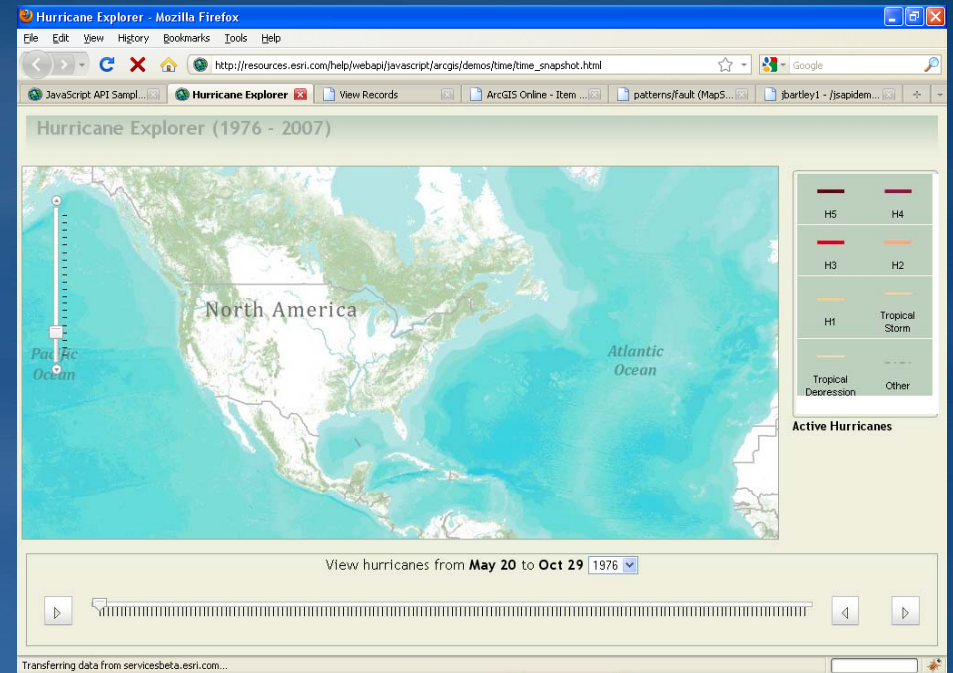
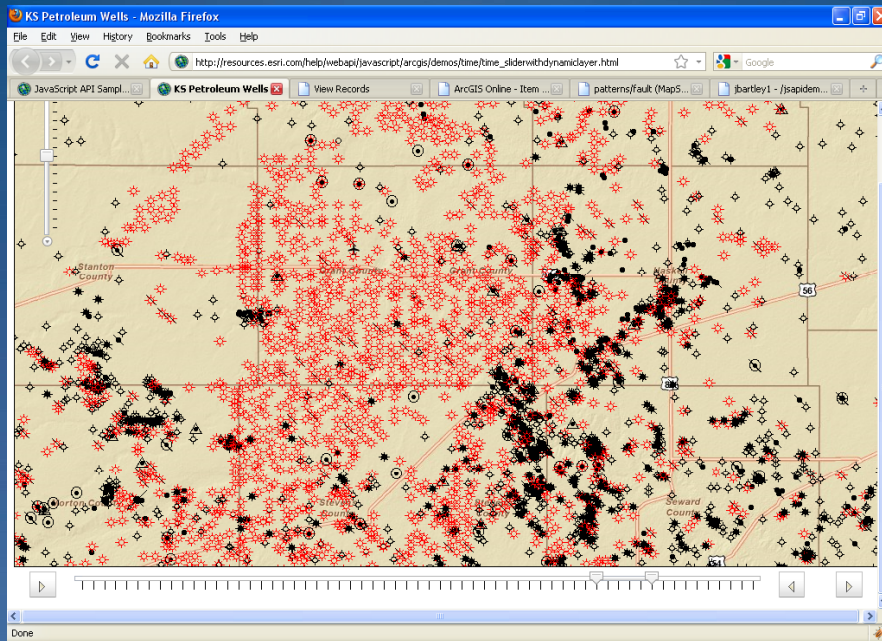
New at 10: Advertise Relationships, Query for Related Features

MapServer Feature Access and Attachments



New at 10: Feature access. Query Attachments

MapServer Support for Time



New at 10: Advertise Time properties, Export and Query by Time

MapServer – Everything Else new at 10

- Generalize Query Results
- Identify and Find operations support Layer Definitions
- Faster JSON generation in Query
 - example
- Query results as AMF
 - http://bjorn/demos/devsummit/Compare_JSON_AMF.html

Service by Service Walkthrough -- FeatureServer

FeatureServer – FS Layer resource similar to MapServer Layer resource

Incident Mapping - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://resources.esri.com/help/webapi/javascript/arcgis/demos/editor/ed_default_editingwidget.html

Request Service JavaScript API Sampl... Incident Mapping New Geometry Servi... Folder: / What's New in the La...

Section Five Martin's Additions

Rock Creek Park

Takoma Park

Chillum

Univ of Maryland College Park

Riverdale Park

Hyattsville

East Riverdale Edmonston

Brentwood Mount Rainier

Bladensburg

Cottage City

Colmar Manor

Cheverly

Washington

Fairmount Heights

Capitol Heights

Suitland

Incident Points

Hydro-Meteorological	Public Health	Civil Disturbance	Fire
Air	Rail	Geologic	Infestation

Transferring data from server.arcgisonline.com...

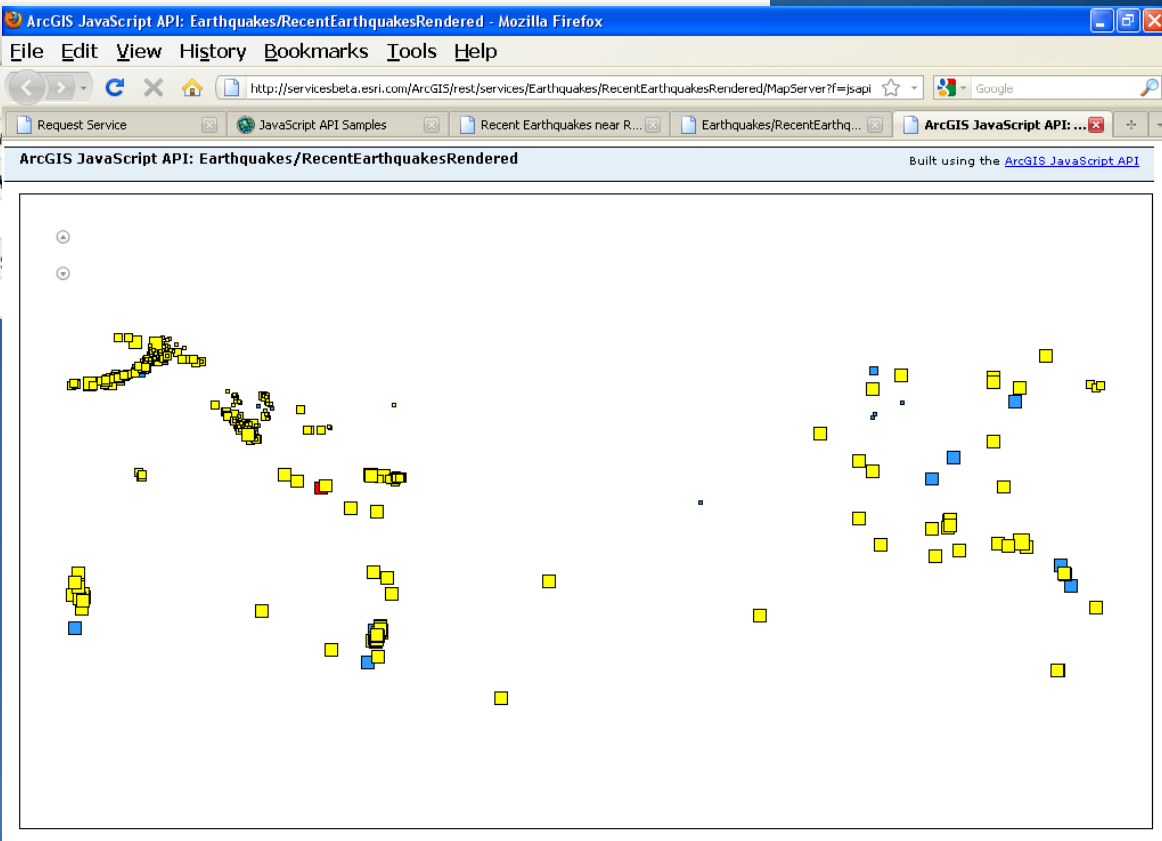
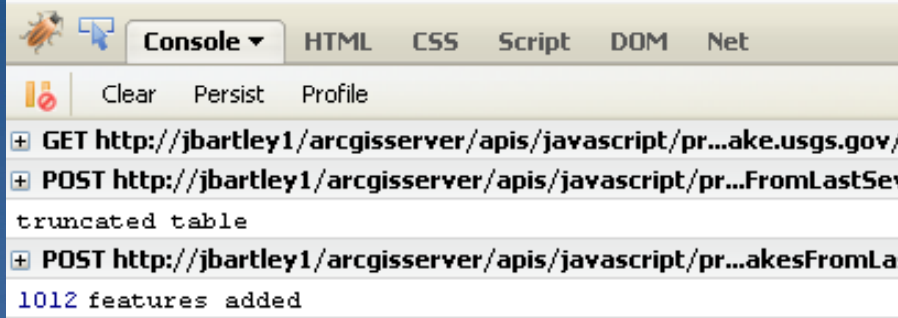
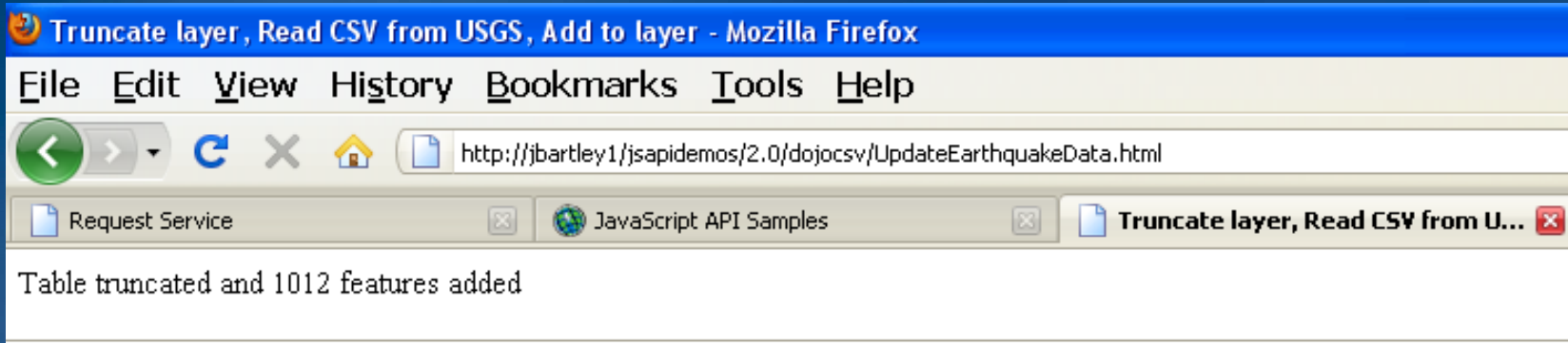
Advertise Templates for editing, apply edits operation

FeatureServer Feature Access and Attachments



New at 10: Feature access. Add/Delete Attachments

FeatureServer – Push near real-time events into the geodatabase



Service by Service Walkthrough -- GeometryServer

GeometryService Operations

New Geometry Service Operations at 10.0 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://servicesbeta.esri.com/gis10/RestSample.html

Request Service JavaScript API Reference New Geometry Service Operatio... JavaScript API Reference

New Geometry Service Operations at 10.0

Distance Union Generalize Offset Convex Hull Trim / Extend Cut Auto Complete Difference Intersect Reshape Clear

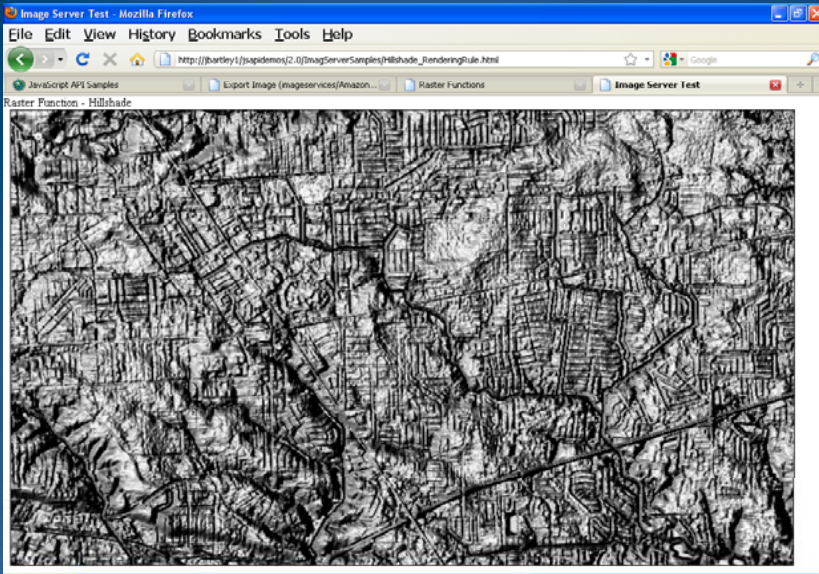
Auto completed polygons drawn on map.

Done

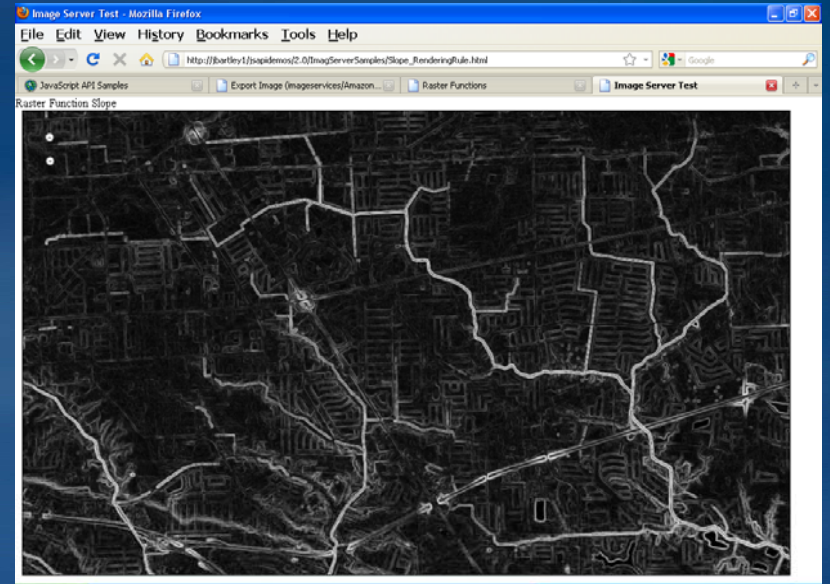
Enhanced at 10: editing, topologic operators, and geodesic measurements

Service by Service Walkthrough – Image Service

ImageServer – Raster functions



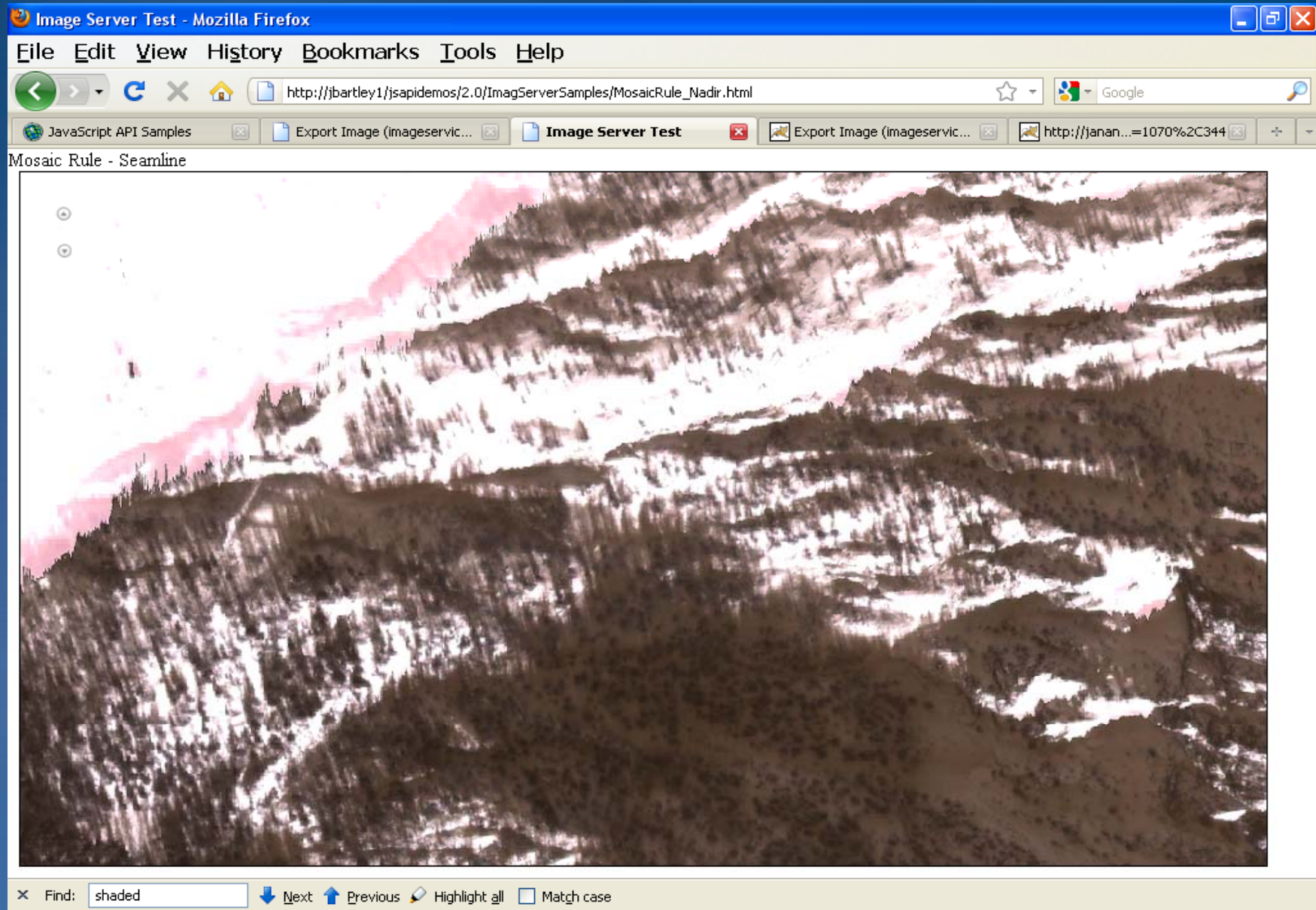
Hillshade



Slope

New at 10: Aspect, Slope, NDVI, Hillshade, custom colormaps,

ImageServer – Custom Mosaic Definition



New at 10: Aspect, Slope, NDVI, Hillshade, custom colormaps,

ImageServer – Query Raster Catalog

Southern California Imagery - Mozilla Firefox

File Edit View History Bookmarks Tools Help


http://nil/jsdemos/test/image.html

JavaScript API Sampl... Export Image (image... Image Server Test Southern Californ... counties_fgdb - usa... Continental US Coun...

Southern California Imagery

Hide Footprints Clear Mosaic

Click an image footprint to view details and to add it to the mosaic.

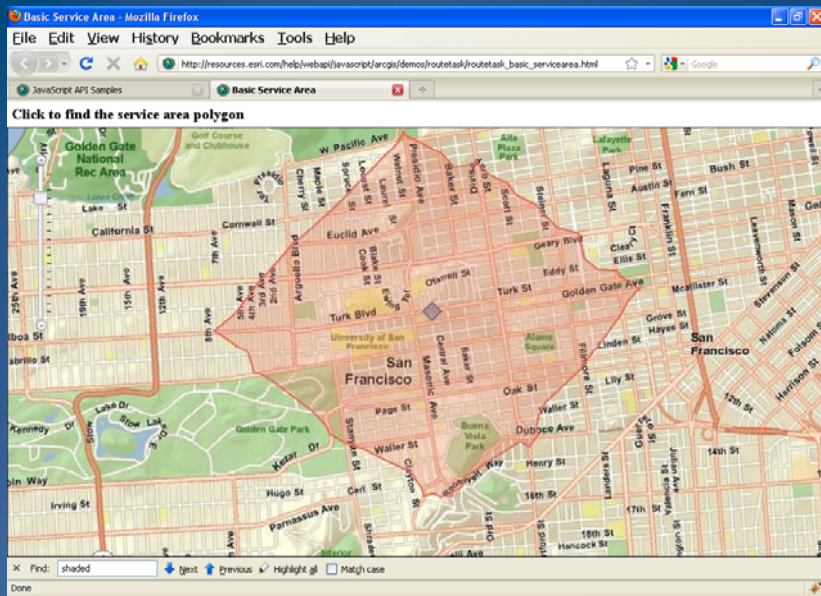


Find: shaded Next Previous Highlight all Match case

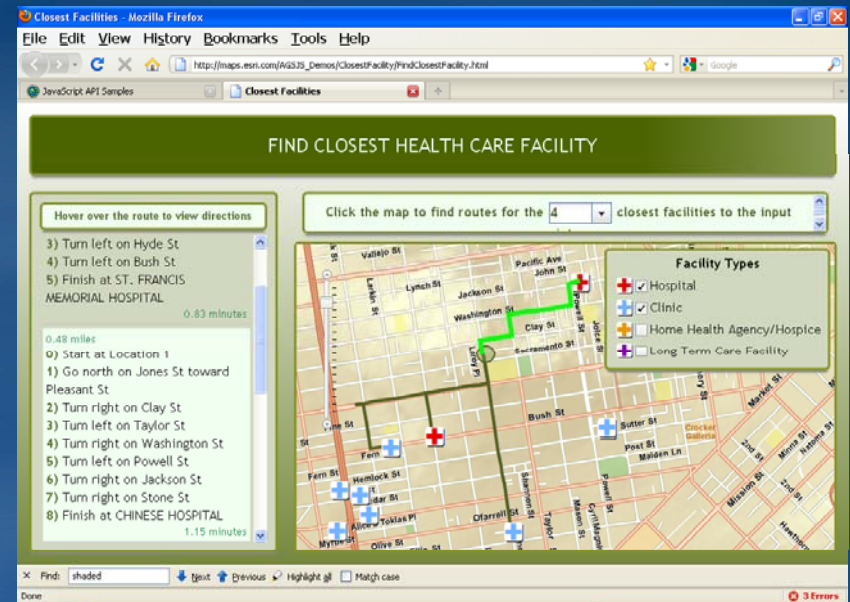
Done

Service by Service Walkthrough – Network Analyst

Network Analyst – More operations



Service Area



Closest Facility

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REST-enabled SOEs - Overview

- **Server Object Extensions (SOEs)**
 - Extend the ArcGIS Server
- **REST-enabled SOEs**
 - Expose SOEs through the REST API
- **Makes it available to all REST clients**
 - All Web APIs - JS, Flex, SilverLight, iPhone, etc.
 - Always keep the Web APIs in mind when designing REST SOEs
 - Follow ArcGIS Server REST API Interface standard for maximum reuse of Web API Classes

REST-enabled SOEs – What’s involved

- **Implement in Java or .NET**
- **IRESTRequestHandler interface**
 - `getSchema()`
 - `handleRESTRequest()`
- **Services Directory view**
 - Link to SOE under “Supported Extensions”
 - Links to resources and operations based on the schema
 - JSON generated by SOE transformed to HTML
 - HTML forms for operations based on parameters defined in the schema

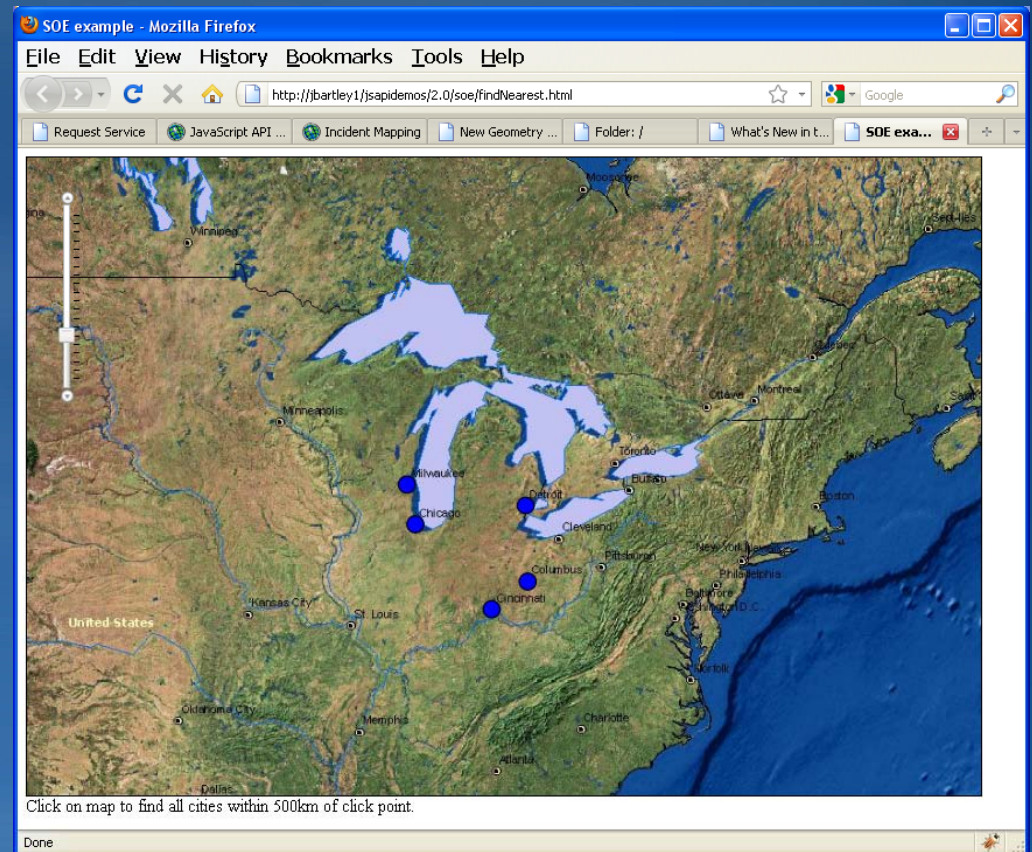
REST-enabled SOEs – DEMO

Keywords:

Supported Interfaces: [REST](#) [SOAP](#)

Supported Operations: [Export Map](#) [Identify](#) [Find](#) [Generate KML](#)

Supported Extensions: [FindNearFeaturesRESTSOE](#)



REST-enabled SOEs – Learn More

- **Extending ArcGIS Server Services Using .NET**
 - Wednesday 1:00 pm
 - Primrose A (PSCC)
- **Extending ArcGIS Server Services Using Java**
 - Wednesday 1:00 pm
 - Smoketree A - E

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Conclusion

- **Open API accessible from a gamut of clients**
 - Continues to evolve
 - New features, quality and performance improvements
- **Adheres to HTTP standards**
- **Services Directory = Instant access to service level metadata**
- **Custom Functionality = REST-enabled SOEs**
- **Add, delete, update services = Clear REST API Cache**

Post-Conclusion

3 points to remember...

- Everything is a URL

- Everything is a URL

- Everything is a URL