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Leveraging OGC Services in ArcGIS Server

Satish Sankaran <ssankaran@esri.com>

Yingqi Tang <ytang@esri.com>

Agenda

- **Interoperability Enablers**
- **OGC and esri**
- **OGC Web Services**
- **ArcGIS and OGC Web Services**
 - **@ version 10.0**
 - **@ version 10.1**

ArcGIS 10 — A Complete System



ArcGIS Server is Open & Interoperable

Using Standards to Integrate with Any System

Web

- REST, SOAP XML, KML, . . .

Any Client/Any Application

OGC

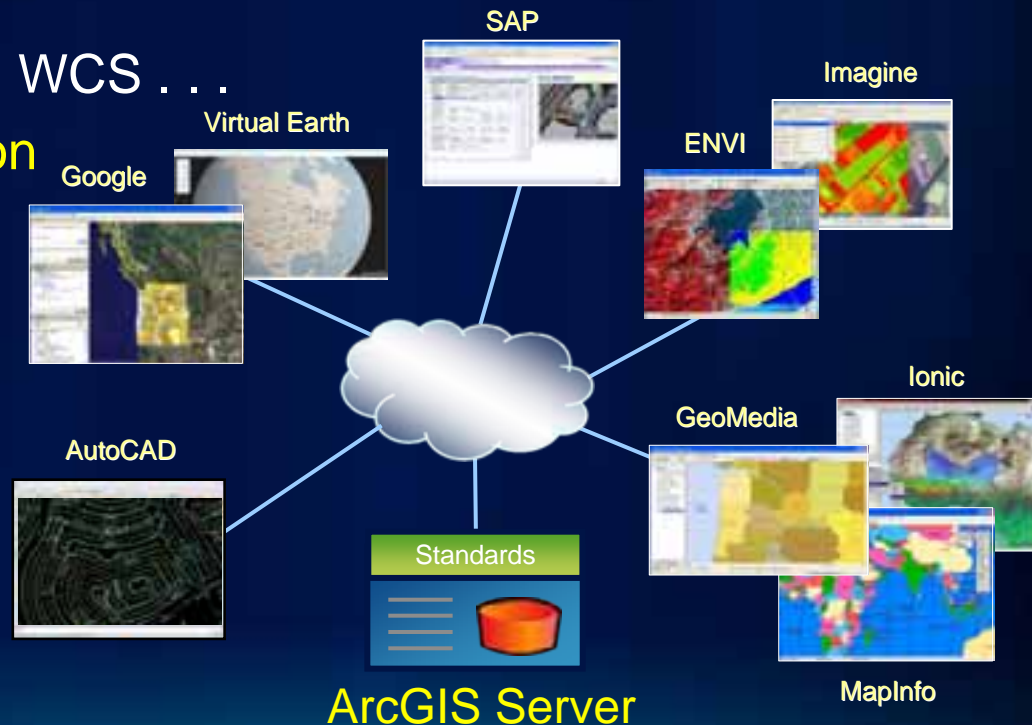
- GML, WFS, WMS, WCS . . .

Enterprise Integration

- SOAP, XML,
EJB, SQL

Application Content

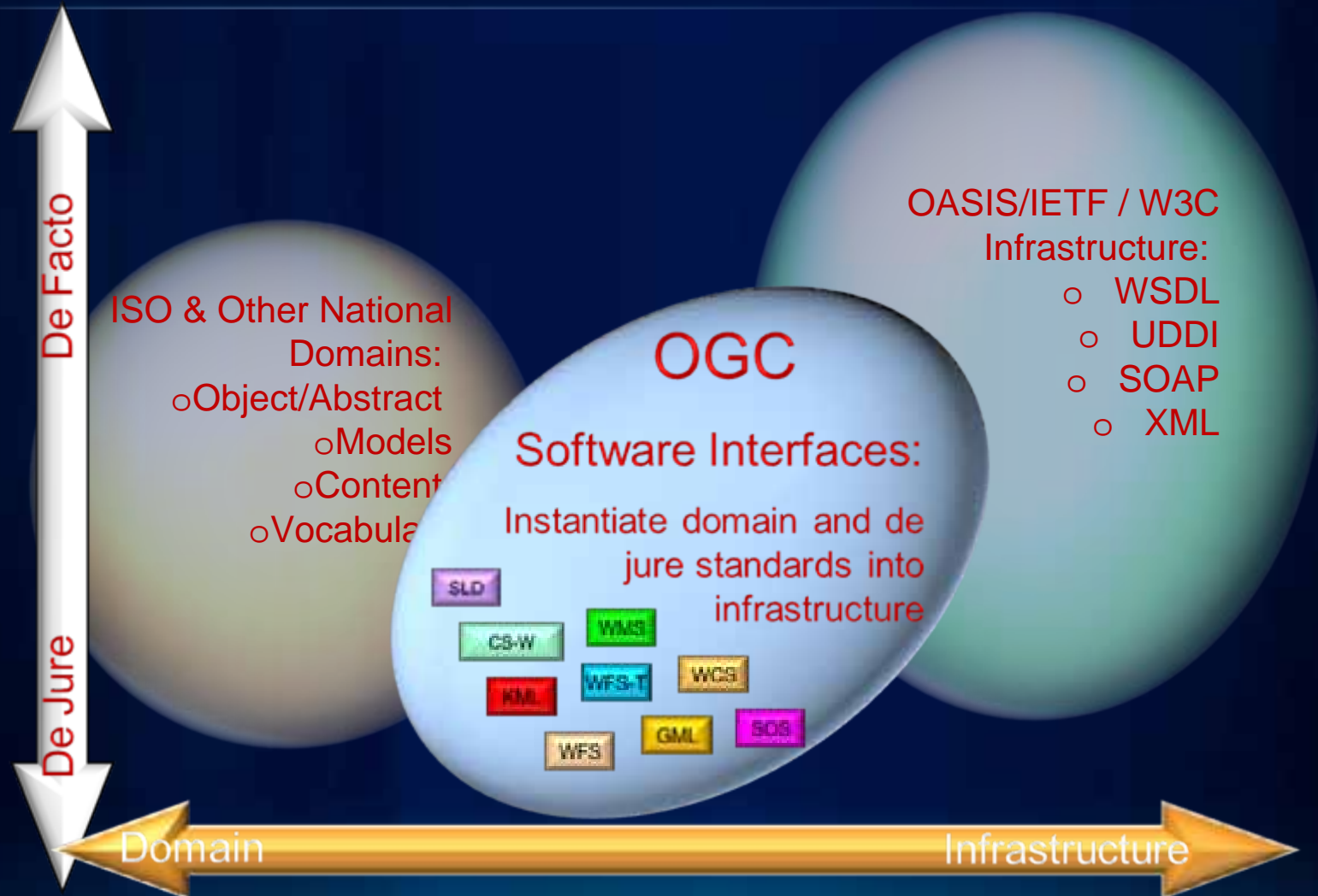
- CAD, Image, PDF



Interoperability Enablers

- ETL Interoperability
 - DGN, DWG, MIF
- Interoperability through Open Standards
 - OGC Simple Features - SF-SQL, SF-OLE/COM
 - GML, OGC KML
 - **OGC Web Services - WMS, WFS, WCS, CS-W, OGC KML, WPS, WMTS**
- Interoperability through Open Specifications
 - Shapefiles, File Geodatabase API, Geoservices Specification
 - GeoRSS, KML

Where does OGC fit in the 'standards' world?

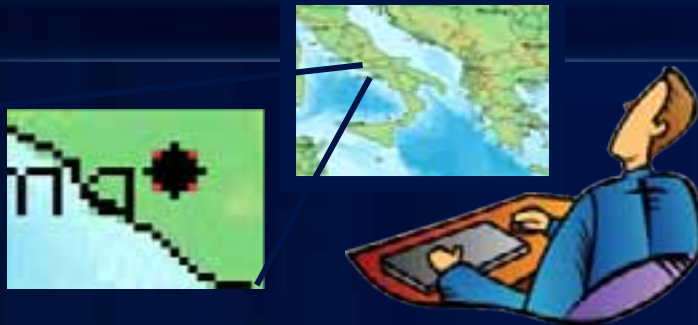


ESRI's OGC Participation

Serving many roles within OGC

- Principal member
- Actively participates:
 - Technical Committee
 - Planning Committee
 - Board of Directors
 - All three OGC programs
 - Interoperability program
 - Standards program
 - Community Outreach and Adoption program
- Architecture Board
- Chair Standards and Domain Working Groups

OGC Web Services



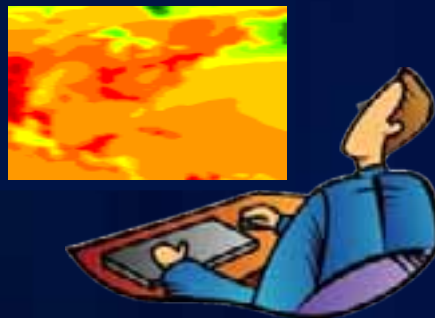
Web Map Service

Geospatial “picture”
publishing/viewing service



Web Feature Service

Geospatial feature
publishing/streaming service



Web Coverage Service

Imagery and gridded data
publishing/processing service

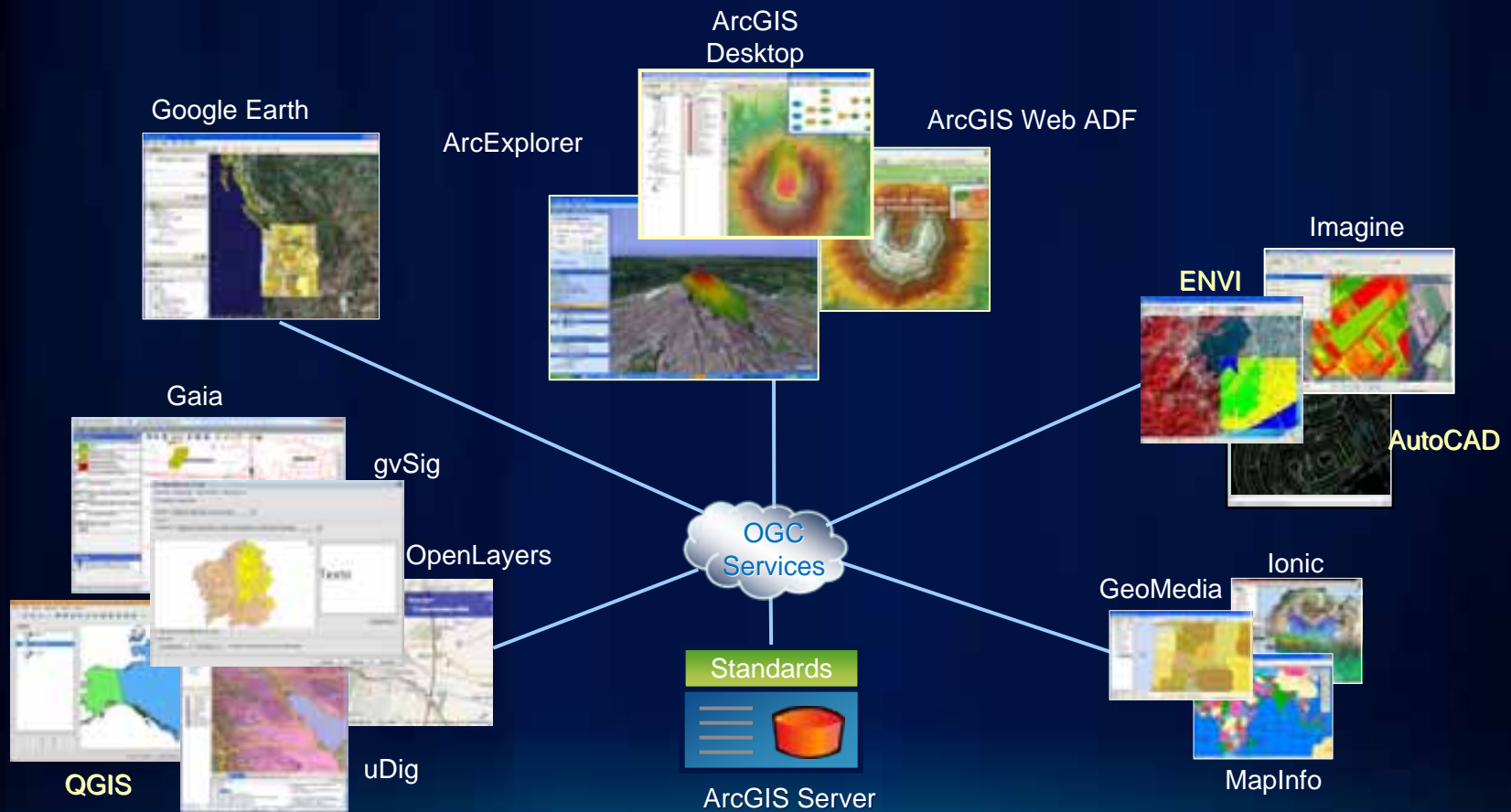


Keyhole Markup Language Service

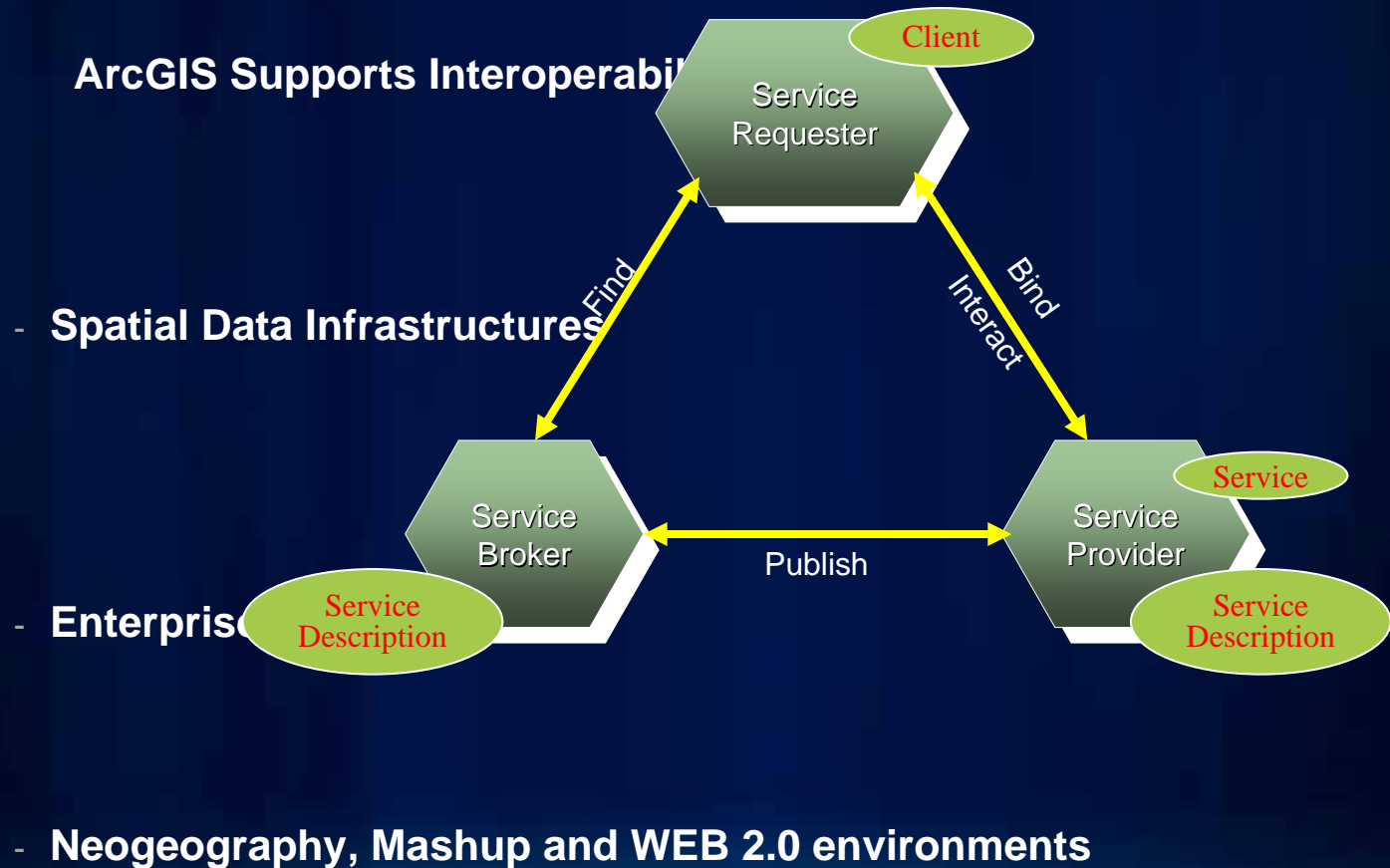
Geospatial feature
publishing/streaming service

ArcGIS Server - Supporting OGC Services

Building open and interoperable Systems



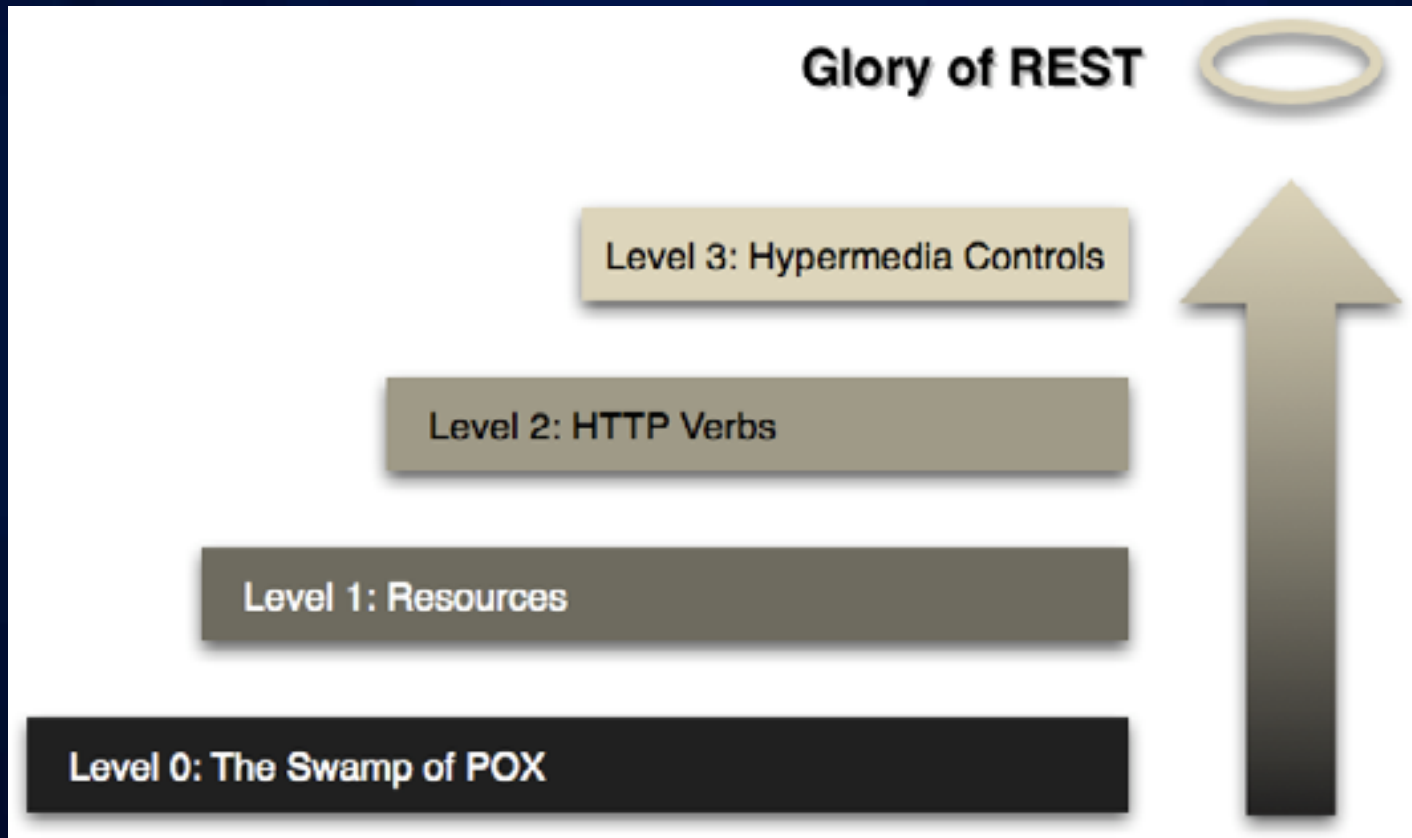
Service Oriented Architecture



OGC Service Encodings

- **Key Value Pair (KVP) - Using HTTP GET / POST**
- **SOAP**
- **RESTful**

RESTful Encoding / Style



Richardson Maturity Model

9.2

9.3

10.0

10.1

WMS

- WMS on MapService
- 1.0.0, 1.1.0, 1.1.1, 1.3.0
 - Add WMS on ImageService
- GetCapabilities
- GetMap
- GetFeatureInfo
- ArcGIS Desktop client
- WebADF client
- Filter Encoding (FE) in SLD
 - publish multiple styles at server side
 - send external styles through "SLD"
- Security (inherits ArcGIS Server Security Framework)
- Bug fixes

KML

- KML on MapService
- KML 2.1
- KML on ImageService and GeoDataService
- KML through ArcGIS REST API
- Bug fixes

WCS

- WCS on MapService
- WCS on ImageService
- WCS on GeoDataService
- 1.0.0, 1.1.0, 1.1.1
 - GetCapabilities
 - DescribeCoverage
 - GetCoverage
- "Make WCS layer" GP tool
- ArcGIS Desktop client

WFS

- WFST on MapService
- WFST on GeoDataService
- 1.1.0
 - GetCapabilities
 - DescribeFeatureType
 - GetFeature
 - GetFeatureWithLock
 - Transaction
- Data Interoperability Extension
- WFS to FeatureClass GP tool

- Add WMS on optimized map service
- Support SLD_BODY
- Support GetStyle
- Support GetLegendGraphic
- Support WMS-T (TIME)

- Bug fixes

- KML 2.2 (to OGC namespace)
- Support TIME in KML
- Bug fixes

- Bug fixes
- Updated "Make WCS layer" GP tool
- Add WCS on Optimized Map Service
- Ass TIME support

- Add WFST 1.0.0 (9.3 SP1)
- Add WFS on Optimized MapService
- Add WFST on non-versioned geodatabase
- Bug fixes

- Bug fixes

WMTS

- Add WMTS on cached map service

- Bug fixes

- Bug fixes

- Performance enhancement
- Bug fixes

WPS

- Add WPS on Geoprocessing Service

OGC Services Support

9.2 – 10.1

OGC Services in ArcGIS Server - Architecture

Implemented as capabilities of ArcGIS Server services

- **Map Service**
 - WMS, WCS, WFS, KML, **WMTS (10.1)**
- **Image Service**
 - WMS, WCS, KML
- **GeoData Service**
 - WCS, WFS, KML
- **Geoprocessing Service**
 - **WPS (10.1)**

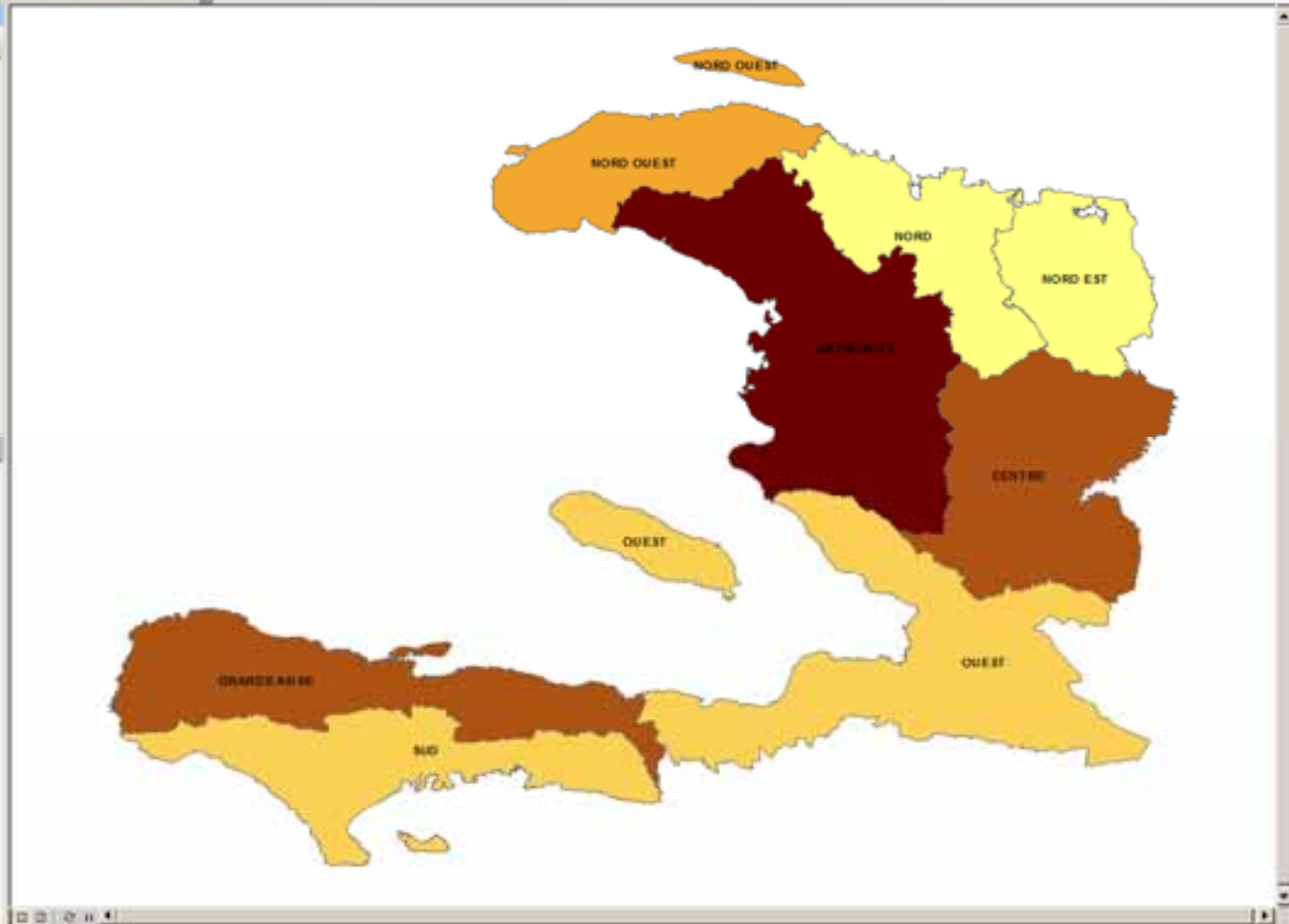
OGC Services in ArcGIS Server - Architecture

- **Inherit from ArcGIS Server services**
 - **Rich features from ArcObjects**
 - cartography, geodatabase, caching, geoprocessing etc.
 - **Good authoring and publishing work flow**
 - **Scalability and Durability in distributed environment**
 - **Performance**
 - **Security mechanism**



- Layers**
- ☒ places
 - ☒ roads
 - ☒ buildings
 - ☒ elevation
 - ☒ **provinces**

- ☒ Current Session
- ☒ Previous Session
- ☒ Shared



Layers

- ☒ places
- ☒ roads
- ☒ buildings
- ☒ elevation
- ☒ provinces

Results

- ☒ Current Session
- ☒ Previous Session
- ☒ Shared



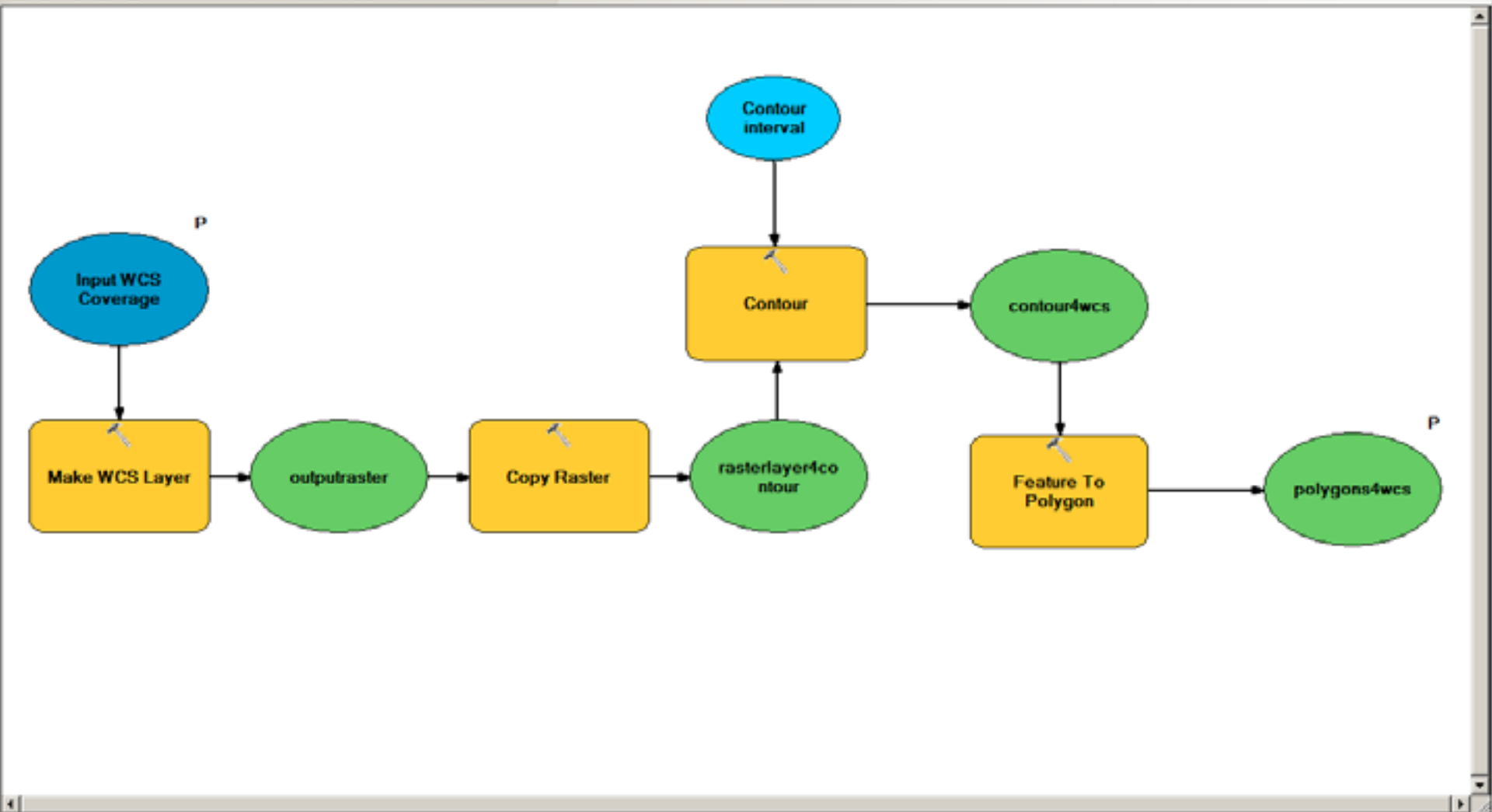




Table Of Contents

- Layers
 - ☐ polygons4wcs
 - ☒ digital elevation model

- Recent
 - Current Session
 - Previous Session
 - Shared



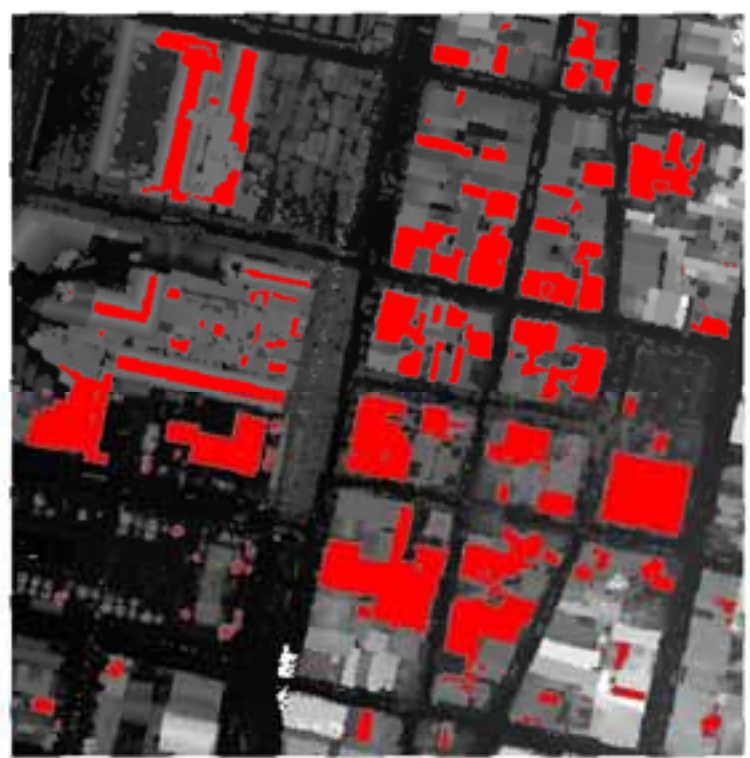


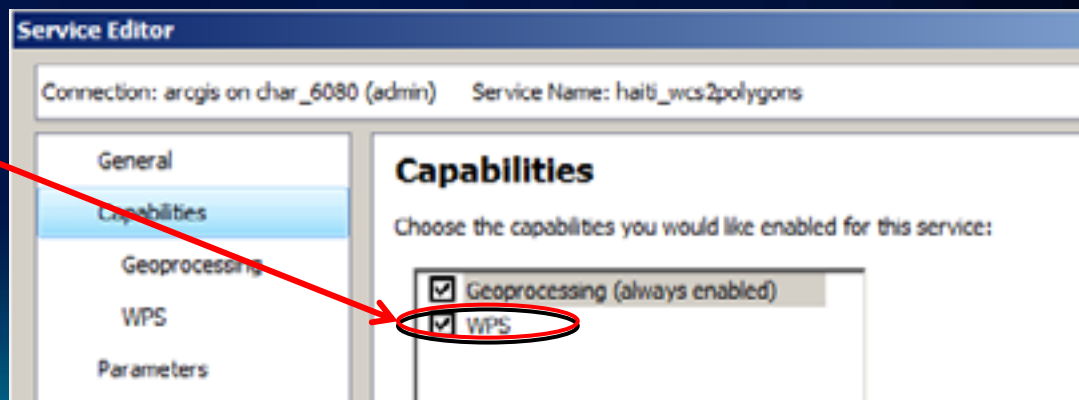
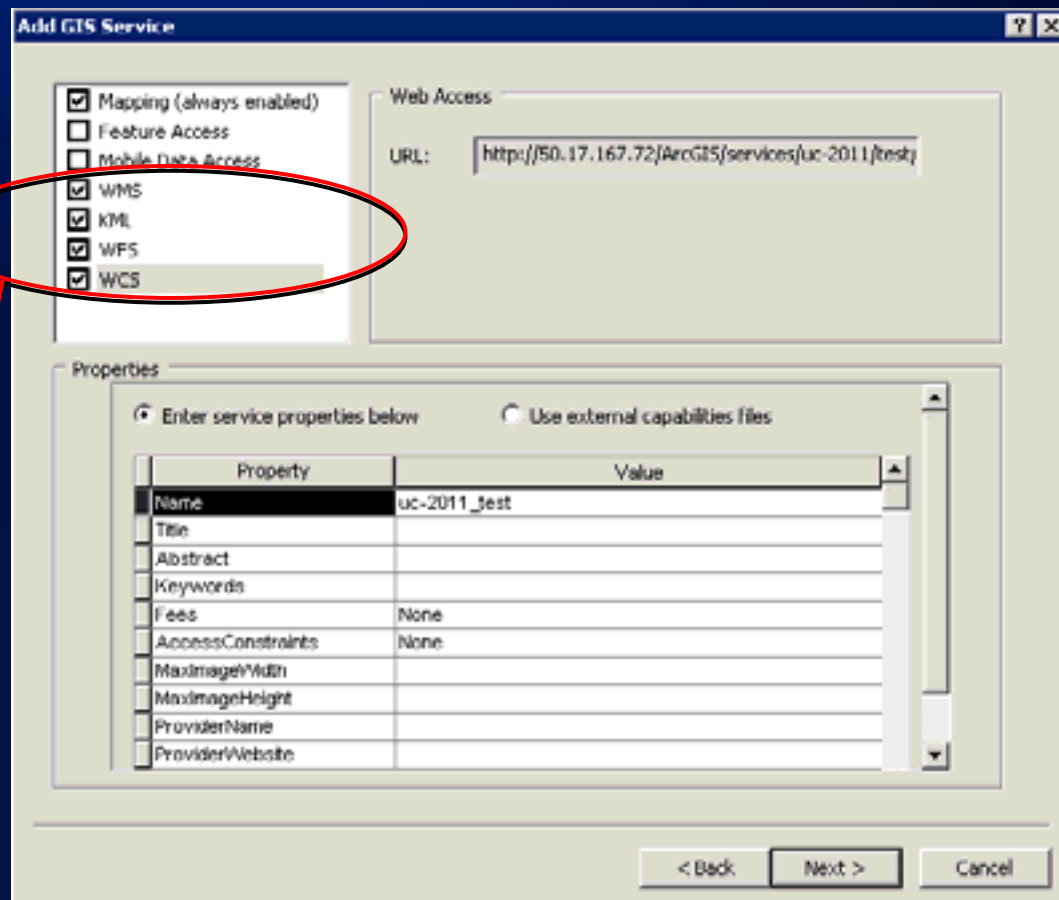
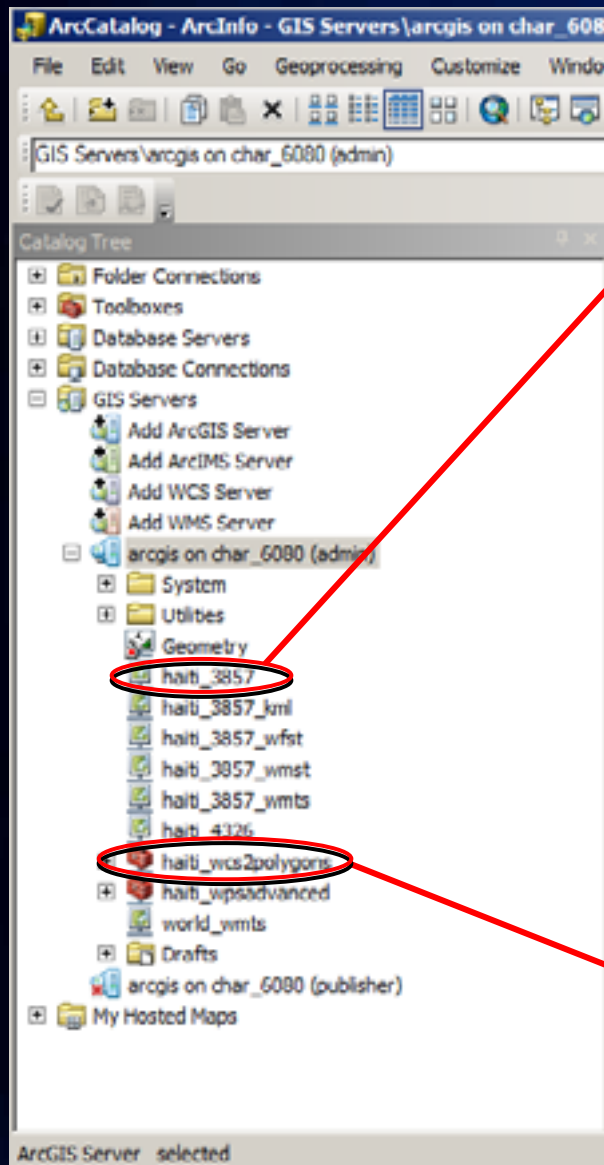
Table Of Contents



- Layers
 - ☒ polygons
 - ☒ digital elevation model

- Current Session
- Previous Session
- Shared





WMS in ArcGIS Server

- **Serving map, legend, styles and limited feature data**
 - **Supported versions**
 - 1.0.0, 1.1.0, 1.1.1, 1.3.0
 - **Supported operations**
 - GetCapabilities
 - GetMap
 - GetFeatureInfo
 - GetStyle
 - GetLegendGraphic

WMS in ArcGIS Server – Cont.

- **Highlights**

- **Styled Layer Descriptor (SLD)**

- Support both OGC Symbology and Filter encoding spec
 - Support SLD and SLD_BODY parameter
 - GetStyles and GetLegendGraphic

- **TIME**

- **XSLT template for GetFeatureInfo**

- **Security (http basic, digest, token based)**

SLD work flow

Step 1: Data and map document



ArcGIS Servers

OGC WMS

Internet

Step 4: Push SLD back to server using "SLD_BODY"

WMS clients

Step 3: GetStyles return SLD definition for Named-style

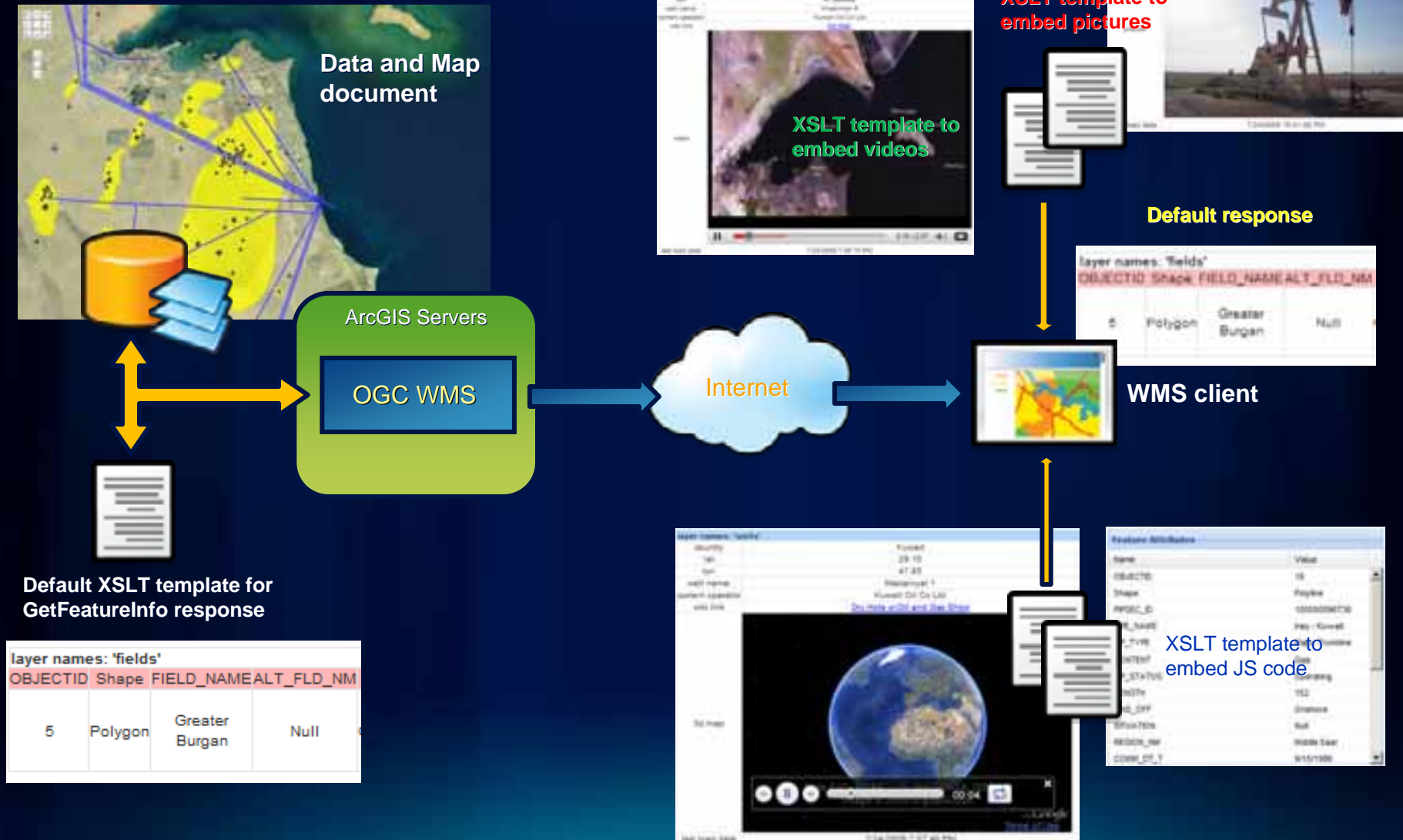
Step 2: publish additional "Named-Style"

SLD XML

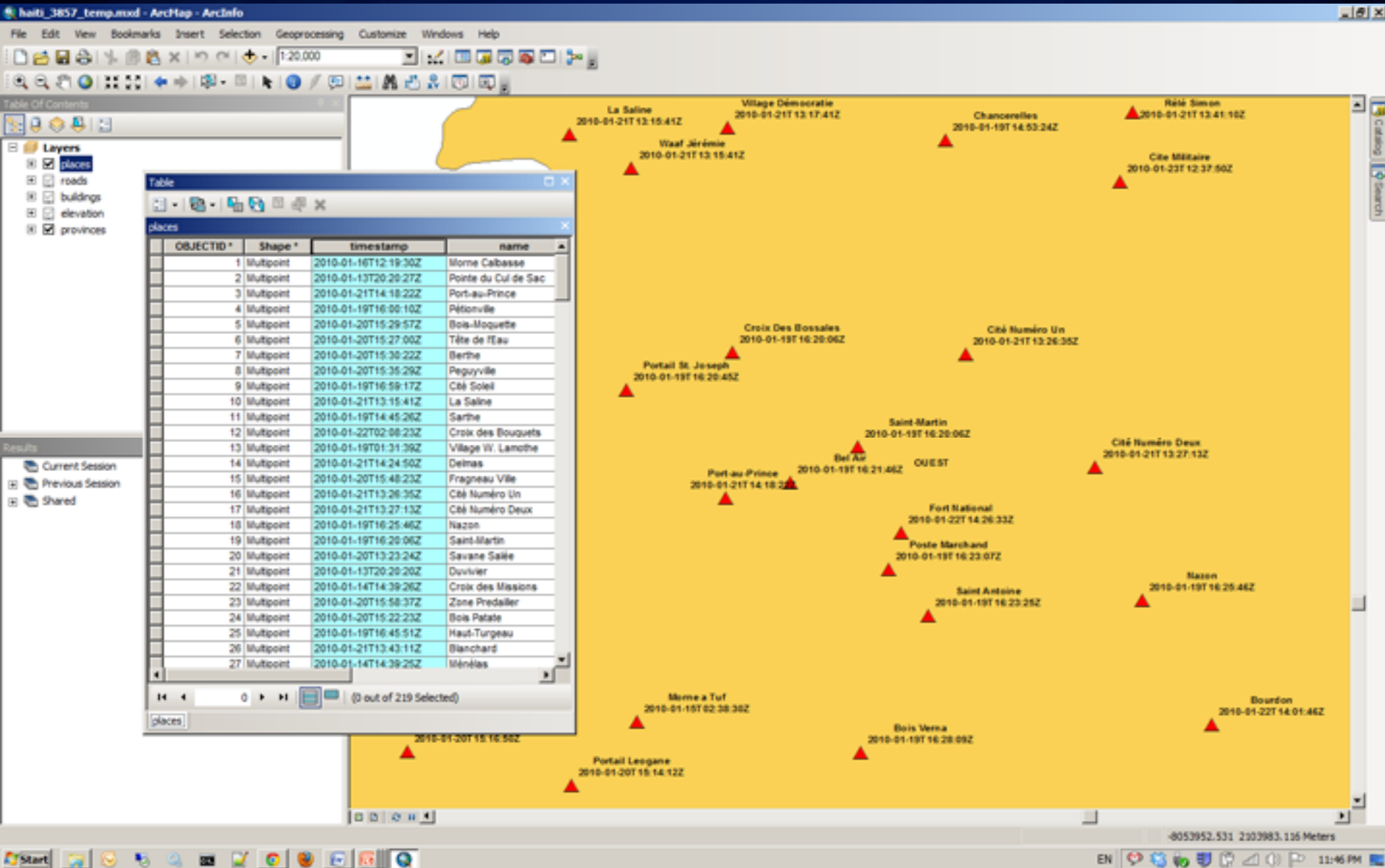
```
<?xml version="1.0" encoding="UTF-8"?>
<sl:StyledLayerDescriptor version="1.0.0" xmlns="http://www.opengis.net/sld" xmlns:sl="http://www.opengis.net/sld" xmlns:xsl="http://www.w3.org/2001/XMLSchema-instance" http://schemas.opengis.net/sld/1.0.0/StyledLayerDescriptor.xsd>
  <ol>
    <sl:NamedLayer>
      <sl:Name>fields</sl:Name>
      <sl:UserStyle>
        <sl:Name>fields_type</sl:Name>
        <sl:FeatureTypeStyle>
          <sl:UserStyle>
            <sl:NamedLayer>
              <sl:Name>pipelines</sl:Name>
            </sl:NamedLayer>
          </sl:UserStyle>
        </sl:FeatureTypeStyle>
      </sl:UserStyle>
    </sl:NamedLayer>
    <sl:NamedLayer>
      <sl:Name>pipelines</sl:Name>
      <sl:UserStyle>
        <sl:Name>pipelines_blue</sl:Name>
        <sl:Title>pipelines_blue</sl:Title>
        <sl:FeatureTypeStyle>
          <sl:Rule>
            <sl:FeatureTypeStyle>
              <sl:UserStyle>
                <sl:NamedLayer>
                  <sl:Name>fields</sl:Name>
                </sl:NamedLayer>
              </sl:UserStyle>
            </sl:FeatureTypeStyle>
          </sl:Rule>
        </sl:FeatureTypeStyle>
      </sl:UserStyle>
    </sl:NamedLayer>
  </ol>
</sl:StyledLayerDescriptor>
```



Customize GetFeatureInfo response using XSLT



WMS TIME support



Layer Properties

General | Source | Selection | Display | Symbology | Fields | Definition Query | Labels | Joins & Relates | Time | HTML Popup

☒ Enable time on this layer

Time properties

Layer Time: Each feature has a single time field

Time Field: timestamp Sample: '2010-01-16T12:19:30Z'

Selected field is not indexed. Index the fields for better performance.

Field Format: YYYY-MM-DD hh:mm:ss

Time Step Interval: 1.00 Days

Layer Time Extent: 1/13/2010 8:20:20 PM To: 1/23/2010 4:35:36 PM Calculate

☐ Data changes frequently so calculate time extent automatically.

Advanced settings

Time Zone: (UTC-08:00) Pacific Time (US & Canada)

☐ Values are adjusted for daylight savings

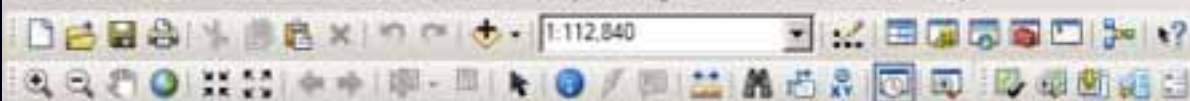
Time Offset: 0.00 Years

☒ Display data cumulatively

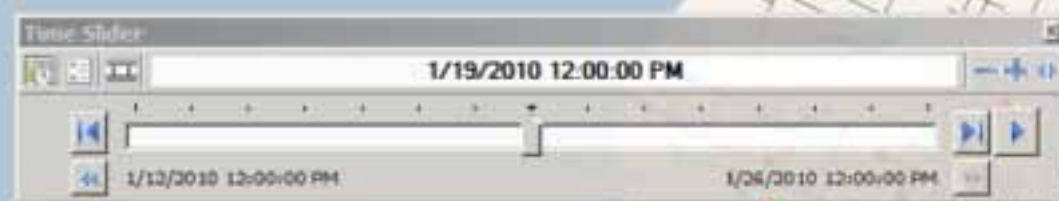
OK

Cancel

Apply



- Layers
 - ☒ devsummit_haiti_om
 - ☒ Bing Maps - Roads
 - ☐ arcgis_online_world_street



...

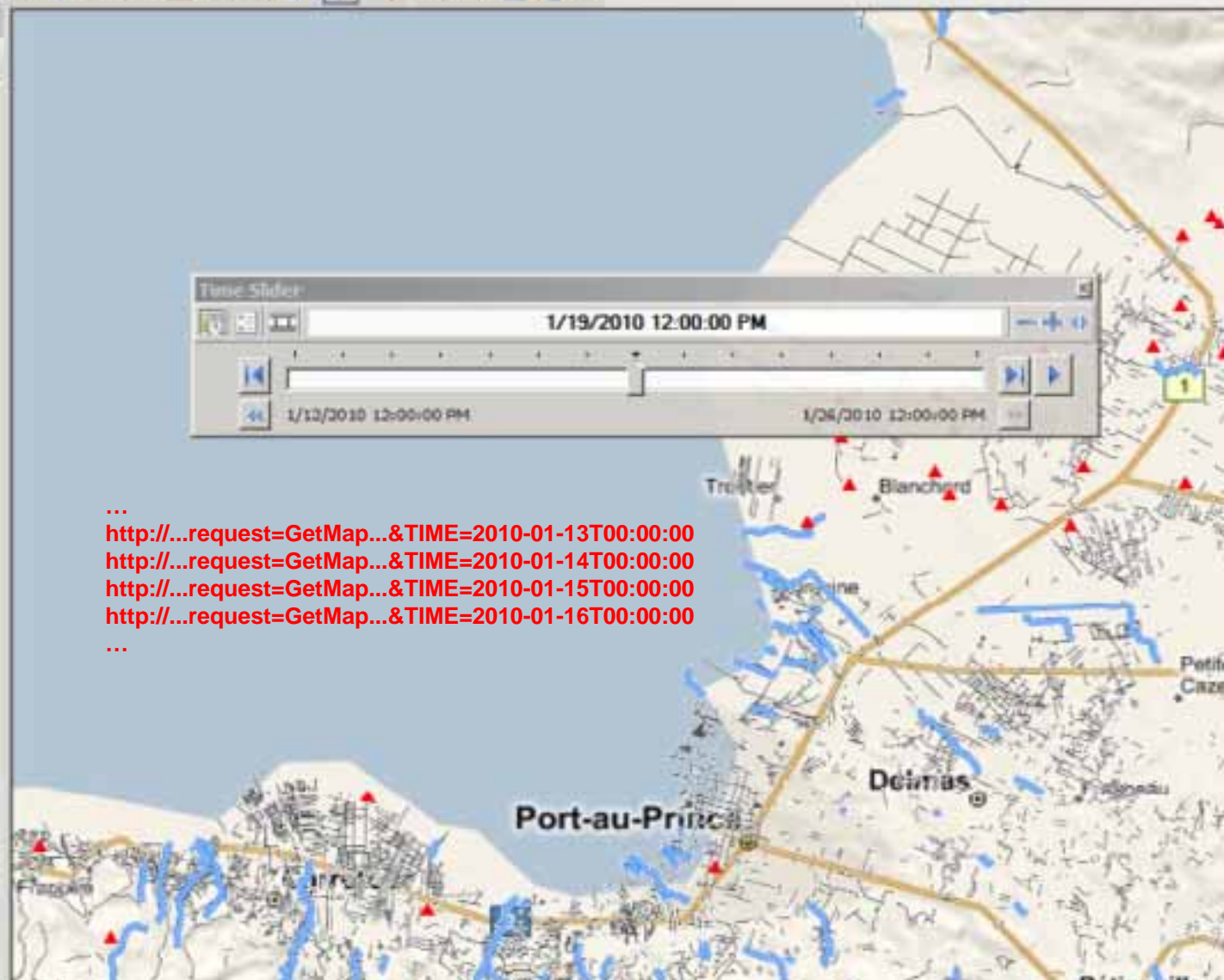
[http://...request=GetMap...&TIME=2010-01-13T00:00:00](#)

[http://...request=GetMap...&TIME=2010-01-14T00:00:00](#)

[http://...request=GetMap...&TIME=2010-01-15T00:00:00](#)

[http://...request=GetMap...&TIME=2010-01-16T00:00:00](#)

...



KML in ArcGIS Server

- **Serving dynamic/cached maps and imagery, 2D/3D vectors**
 - **Supported versions**
 - 2.2, no extensions
 - **Supported operations**
 - \GenerateKML (Mapping: 2D/3D vectors and/or GroundOverlays)
 - \Query (Mapping: 2D/3D vectors)
 - \Execute (GP only)
 - \ReverseGeocode (Geocode only)
 - **Supported resources**
 - \mapImage.kmz (Mapping and Imaging: Region based GroundOverlays)
 - \MapServer?f=kmz (footprint)
 - \ImageServer?f=kmz (footprint)

KML in ArcGIS Server – Cont.

- **Highlights**
 - **Regions for cached services**
 - **2D and 3D vectors with extrusion expressions**
 - **Simple renderers (lines and polygons) with transparency**
 - **Labeling for point placemarks**
 - **HTML popups with xsl styling**
 - **Time**
 - **Legends**

WMS and KML Demo

- Leverage ArcGIS Server WMS in QGIS
- Leverage ArcGIS Server WMS in ArcGIS.com
- Time Slider in ArcMap with Time enabled WMS
- Leverage KML in Google Earth

WFS in ArcGIS Server

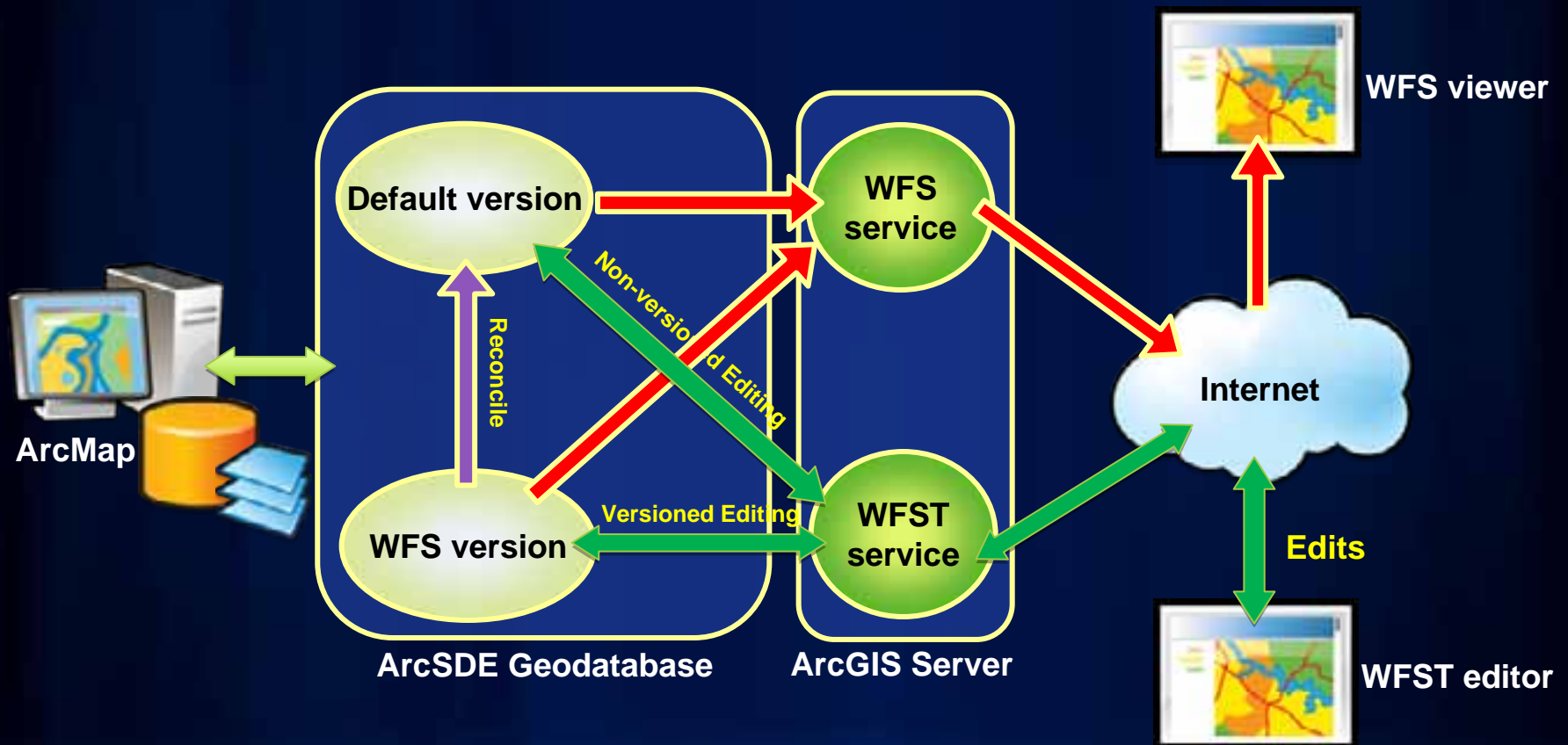
- Data service, serving out geographic feature data
 - **Version implemented**
 - 1.0.0, 1.1.0
 - **WFS interfaces implemented**
 - GetCapabilities
 - DescribeFeature
 - GetFeature
 - Transaction

WFS in ArcGIS Server

- **Highlights**

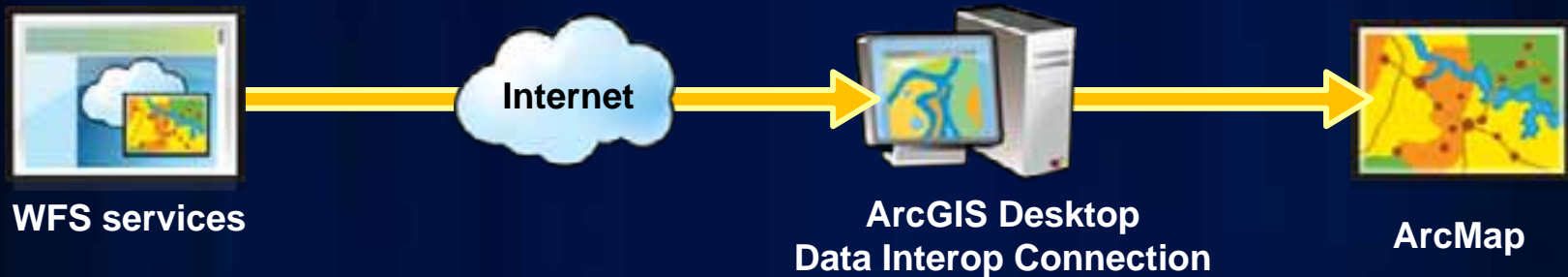
- Simple Features GML
- Transactions on versioned data
- Transactions on non-versioned data
- Field Aliases and Visibility Constraints
- DefaultMaxFeatures property
- Security (http basic, digest and token based)

WFS/WFST work flow



ArcGIS as a WFS Client

Data Interoperability Extension



WFS to Feature Class GP tool



WFS Demo

- Web editing through WFST in OpenLayers
- Web editing through Gaia (screenshots)

File View Tools Help





Map background showing a street grid and a green hatched area labeled "SwampA".




WFS-T - Manage Transactional Sources



Select layer:
SwampA

URL:
http://carbon_velen_1/ArcGIS/services/SDE_WFST/ArcSDE_WFS/GeoDataServer/WFSServer?

☒ Insert ☒ Delete ☒ Update ☒ Lock   Refresh from Schema [View XML](#)

	Name	Type	Length	Default Value	Min Value
<input type="checkbox"/>	RSTRN_RELEASEABILITY	TEXT	255		
<input type="checkbox"/>	SCALE	TEXT	255		
<input type="checkbox"/>	SEC_CLASS	TEXT	255		
<input type="checkbox"/>	SPEC_ID	TEXT	255		
<input type="checkbox"/>	Z_VALUE_TYPE	TEXT	255		
<input checked="" type="checkbox"/>	SHAPE	POLYGON			
<input type="checkbox"/>	SHAPE.area	DOUBLE			

WFS-T Tools:  Insert  Delete  Update

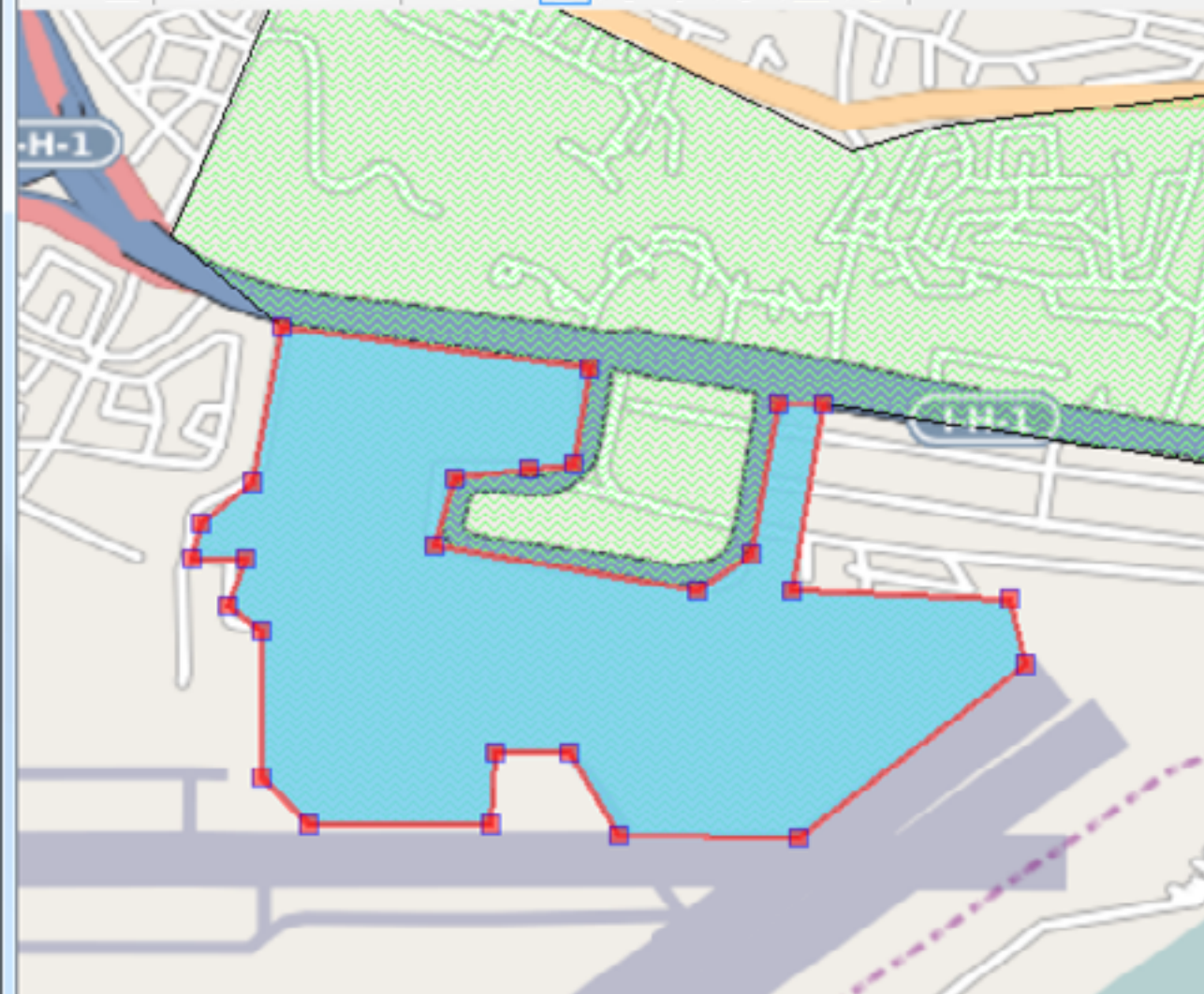
Snap:  Current  To Any

Geospatial Session File loaded successfully

Close Transactions CRS: urn:ogc:def:crs:EPSG::4326

Ready...

File View Tools Help



WFS-T Tools: Insert Delete Update Commit Config

Snap: Current To Any

Geospatial Session File loaded successfully

-157.9139,21.3442

WFS Transactional Tool

Update Feature

Select layer:

SwampA

http://carbon_velen_1/ArcGIS/services/SDE_WFST/ArcSDE_WFS/

Select Feature

1 out of 1 feature

- ☐ SDE_WFST/ArcSDE_WFS:SwampA
 - ... VEG
 - ... COMMENTS = Swampland near airf
 - ☐ SHAPE
 - ... Polygon



Properties

Geometry

Name	Value
VEG	
COMMENTS	Swampland near airfield

INSERT at 9/14/2009 2:18:33 PM

Select

Geometry

New Geom

Update Feature

File View Tools Help



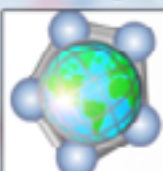
WFS Transactional Tool

Commit Transactions

Select layer:

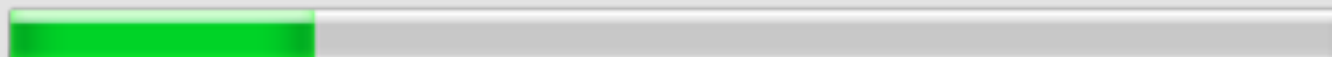
PointAnnotations

Executing Transaction



Web Features Service Transactional

Sending Transaction to Server



> Start @ 9/14/2009 2:34:31 PM
> Operations: 1 insert. 0 deletes. 1 update
> Sending transaction.

Close

Show Transaction XML

Show Results XML

WFS-T Tools: Insert Delete Update Commit Config

Snap: Current To Any

Navigation controls: First, Previous, Next, Last

Submit Transaction

Remove

Geospatial Session File loaded successfully

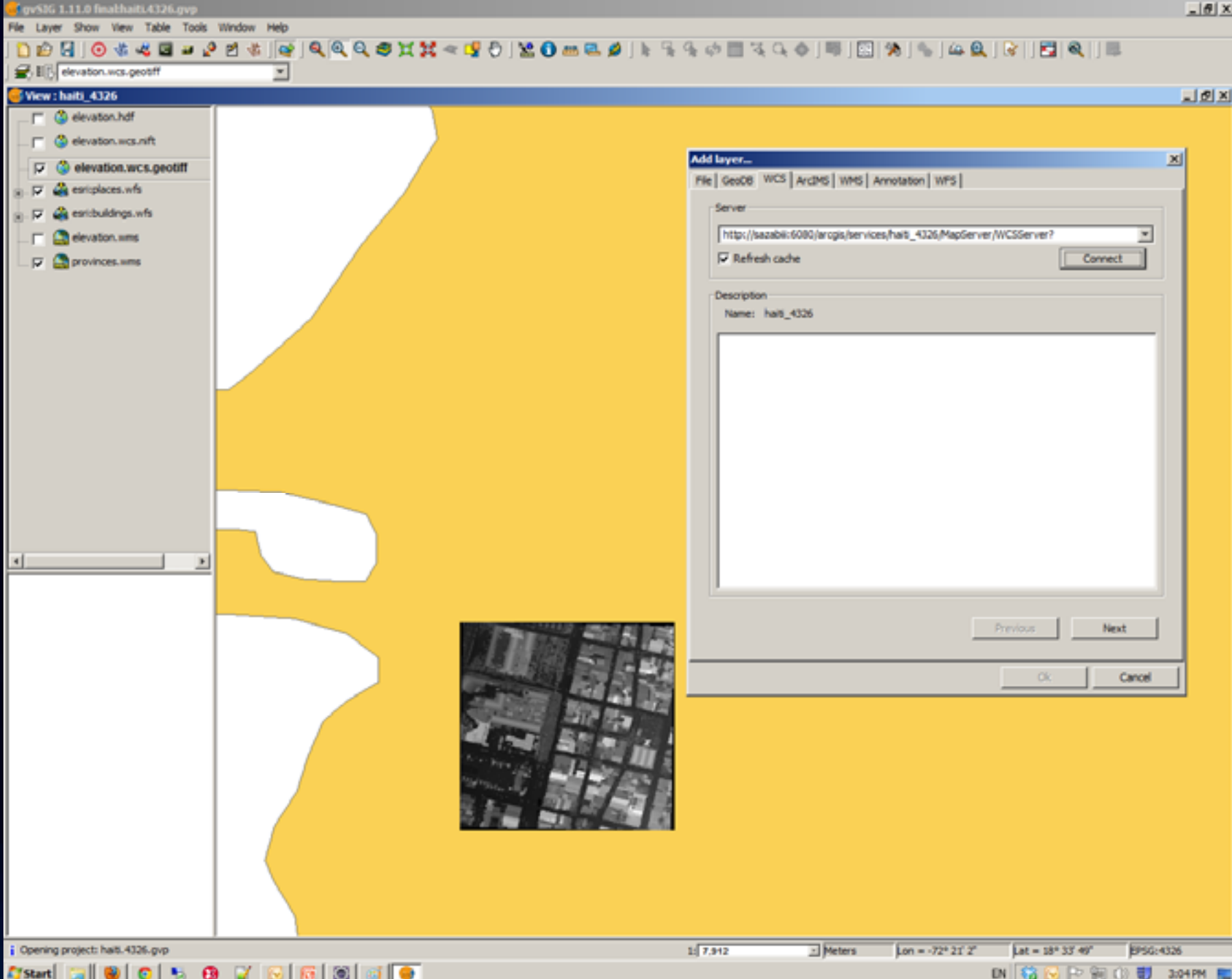
-157.8912,21.3334

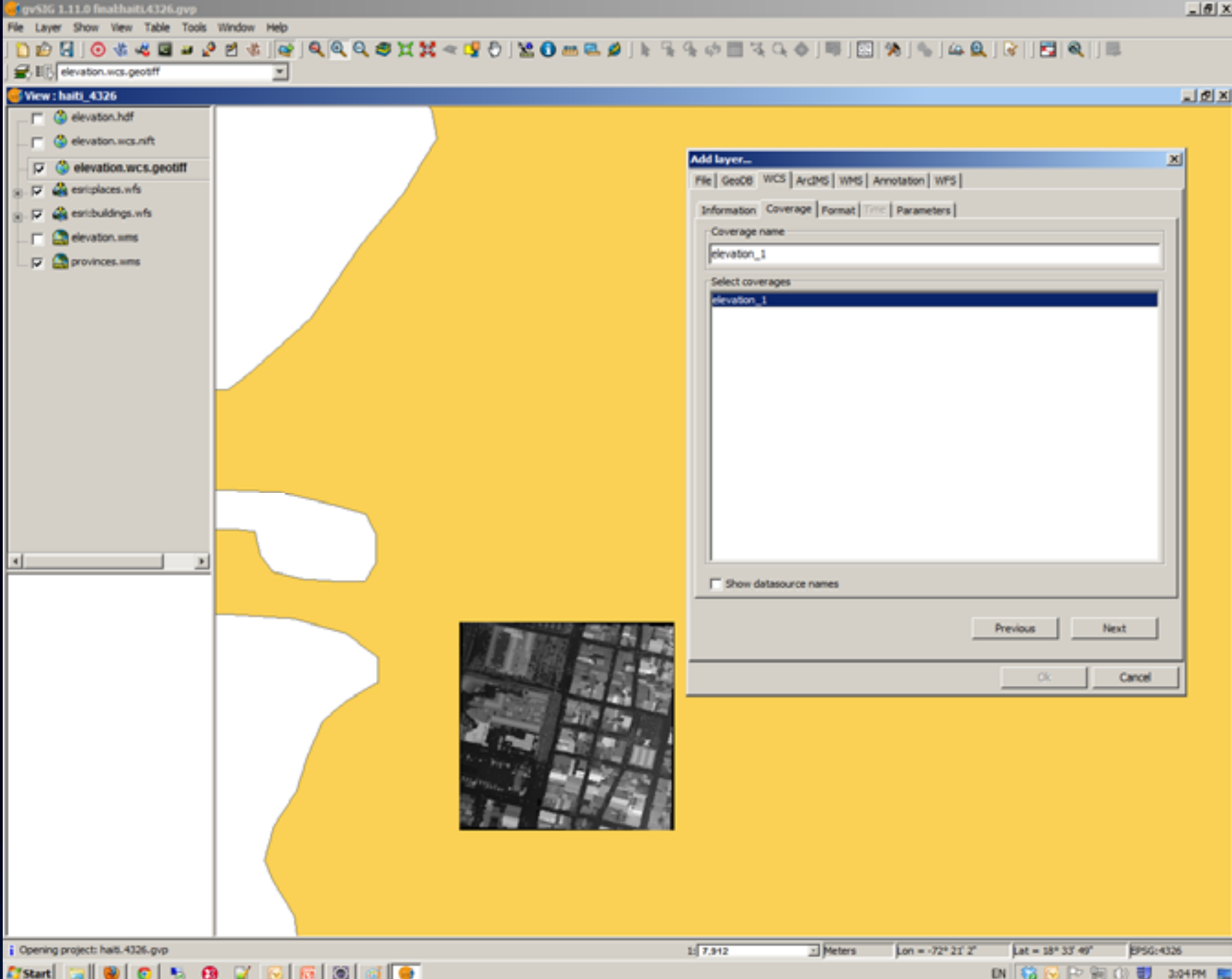
WCS in ArcGIS Server

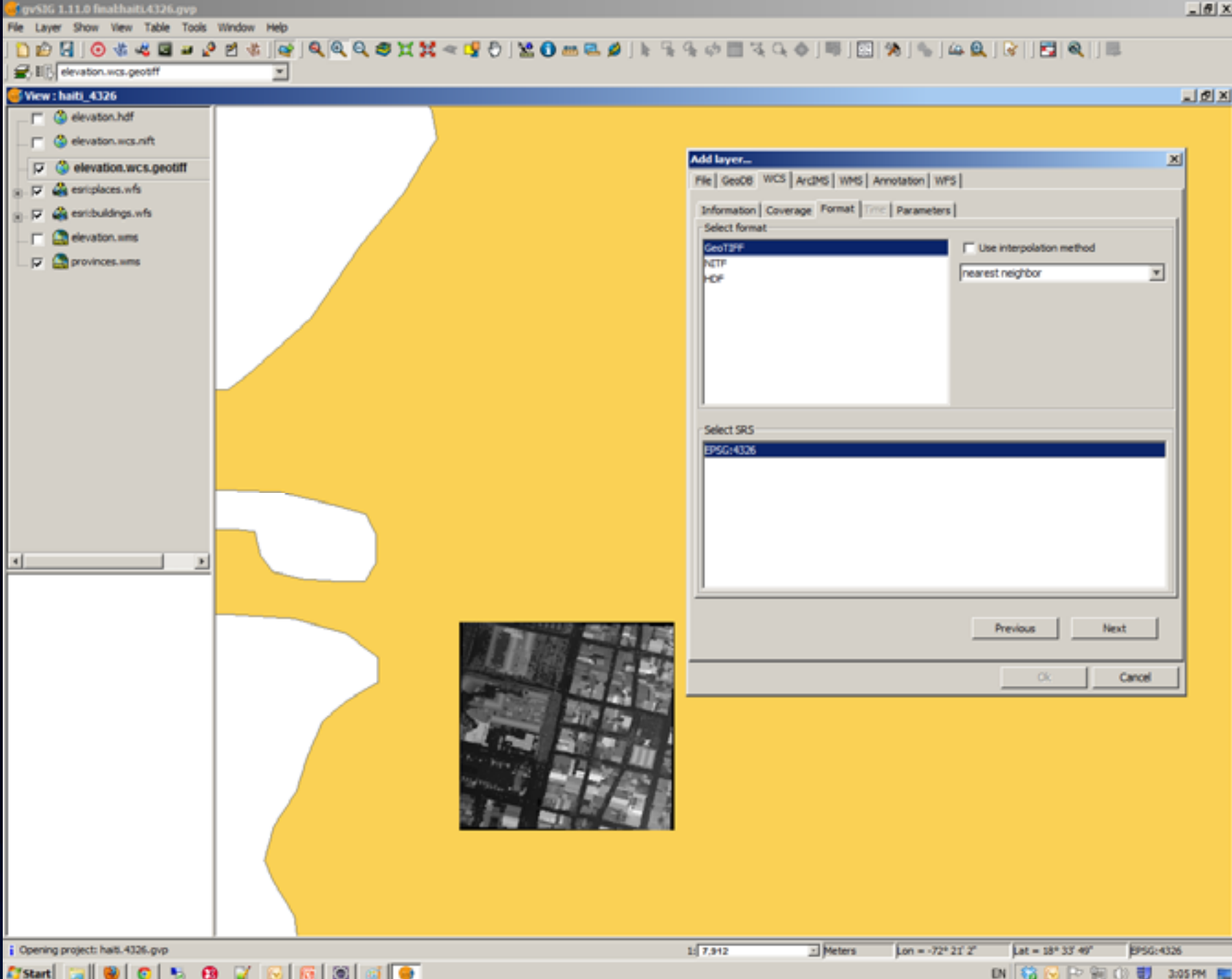
- Data service, serving out geographic coverage data
 - **Version implemented**
 - 1.0.0, 1.1.0, and 1.1.1
 - **WCS interfaces implemented**
 - GetCapabilities
 - DescribeCoverage
 - GetCoverage (coverage data)
 - **Highlights**
 - Supported formats: GeoTIFF, NITF, HDF, JPEG, JPEG2000, PNG;
 - TIME
 - “IMAGE” (ESRI specific parameter to request an individual raster in a raster catalog)
 - Security (http basic, digest and token based)

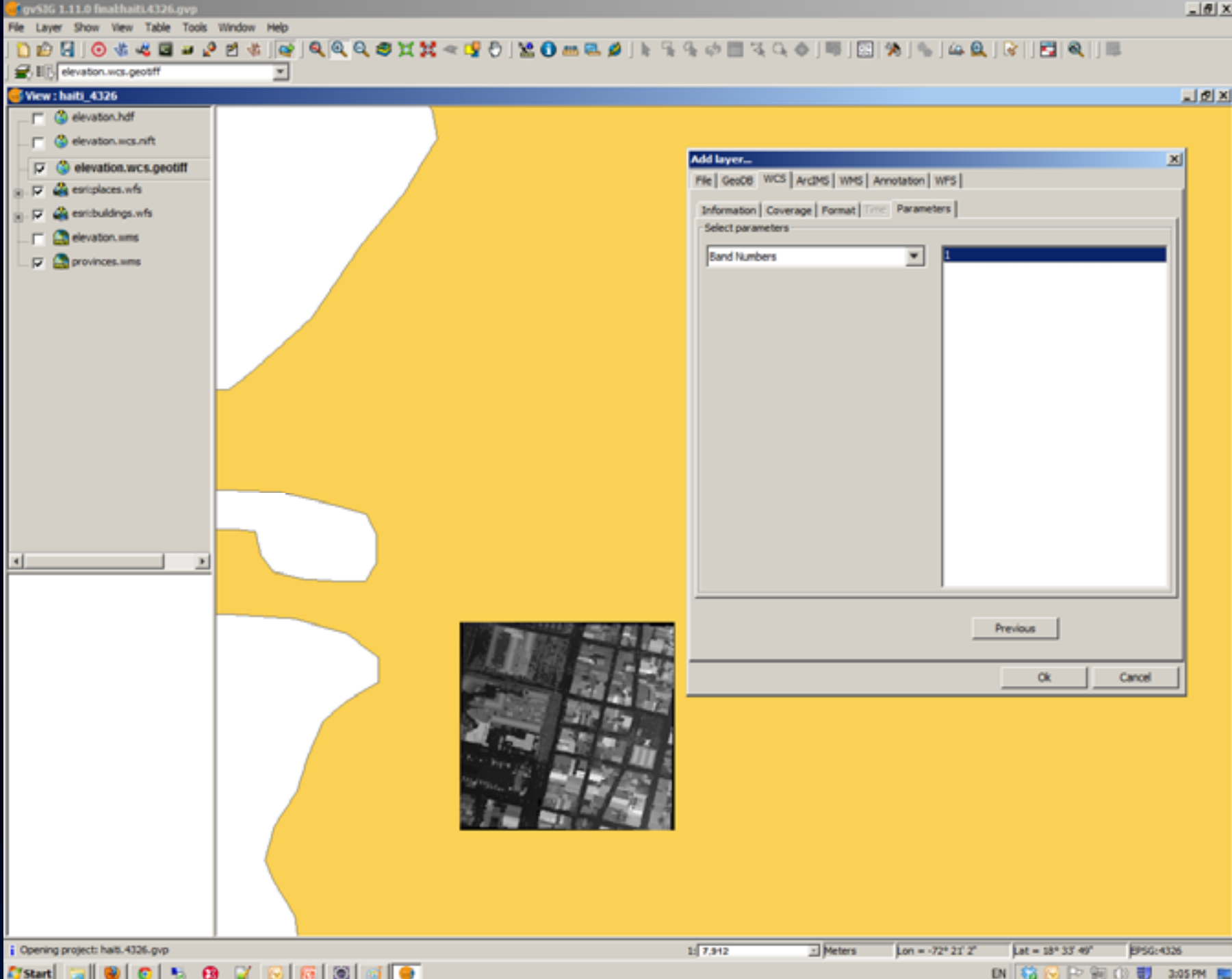
WCS Demo

- Leverage ArcGIS Server WCS in gvSIG (screenshot)









WMTS in ArcGIS Server (10.1 Only)

- Serving pre-cached map tiles
 - Version implemented
 - 1.0.0
 - WMTS interfaces implemented
 - GetCapabilities
 - GetTile

WMTS in ArcGIS Server (10.1 Only)

- **Highlights**
 - Cache creation and management tools
 - Performance and scalability

WMTS Clients

- **OpenLayers**
- **Gaia**
- **ArcGIS JavaScript API**
- **Other generic tile service client**
 - uDig
 - OpenScale
 - DeepEarth

WMTS Demo

- Leverage ArcGIS Server WMTS in OpenLayers
- Leverage ArcGIS Server WMTS in ArcGIS Script API
- Leverage ArcGIS Server WMTS in Gaia (screenshot)
- Leverage ArcGIS Server WMTS in uDig (screenshot)



☒ Groups

Map Parameters



Open Capabilities Analyzer

- Selected Layer Info



Name: bluemarble_wmts
Title: bluemarble_wmts
Namespace:
Keywords:

Supported file type: jpg (image/jpg)

* Matrix [1x2]: 0 [sd: 139613820.753333, size: 512x512]

Cancel

Map Layers

blumarble_wmts

My Notes

Gaia ready! [product version 3.4.2.0000]

Annotation

language of the string identified as recommended in the XML 1.0 W3C Recommendation, section 2.12.

Title of this resource, normally used for display to a human.

```

58 | <TileMatrixSetLink>
59 | | <TileMatrixSet>default028mm</TileMatr
60 | </TileMatrixSetLink>
61 | <TileMatrixSetLink>
62 | | <TileMatrixSet>default96dpi</TileMatrix
63 | </TileMatrixSetLink>
64 | <ResourceURL format="image/png" resou
http://alexandertown06080/arcgis/rest/services.
65 | </Layer>
66 | <...TileMatrixSet...>
67 | <TileMatrixSet>
68 | <ows.Title>Default TileMatrix using 0.28m
69 | <ows.Identifier>default028mm</ows.Iden
70 | <ows.SupportedCRS>urn:ogc:def:crs:EP
71 | <TileMatrix>
72 | <ows.Identifier>0</ows.Identifier>
73 | <ScaleDenominator>1.3961382075333
74 | <TopLeftCorner>90.0 -180.0</TopLeftC
75 | <TileWidth>512</TileWidth>
76 | <TileHeight>512</TileHeight>
77 | <MatrixWidth>1</MatrixWidth>

```



Snaps: Current To Any

WFS-T Tools: Insert Delete Update Commit

Gaia - Add Layer to Map

OGC Services

Base Maps

Files

Service Name	Type	Version	Address
	WMTS	1.0.0	http://zeon/resources/capabilities/wmts/world_...
	WMTS	1.0.0	http://zeon/resources/capabilities/wmts/bluem...
	WMTS	1.0.0	http://zeon/resources/capabilities/wmts/bluem...



Quick Search

Details

☒ Groups

blumarble_wmts

Map Parameters

Format: image/png

Style: default_style

WMTS Parameters

Set: default028mm

Dimensions:

Open Capabilities Analyzer

Preview



Add Layer

Selected Layer Info

Name: blumarble_wmts
 Title: blumarble_wmts
 Namespace:
 Keywords:

Supported file type: jpg (image/png)

Tile Matrix Set: default028mm (urn:ogc:def:crs:EPSG:4326)
 * Matrix [1x2]: 0 [id: 139613820.753333, size: 512x512]

OK

Cancel

Layer ready.

Web Map Tiles (OpenStreetMap, MapQuest Maps, ..)

Imports a Web Map Tiles Service into the catalog



- ☒ OpenStreetMap
 - ☐ Mapnik
 - ☐ Osmarender
 - ☐ Cycle Map
 - ☐ CloudMade
 - ☒ Custom Server
- ☐ NASA WorldWind Example
 - ☐ Demis World Map
- ☐ NASA
 - ☐ Global Mosaic, pan sharpened vis
 - ☐ Global Mosaic, pan sharpened, p
 - ☐ Global Mosaic, visual
 - ☐ Global Mosaic, pseudocolor
 - ☐ Daily Planet
 - ☐ Daily Afternoon
 - ☐ MODIS TERRA visual
 - ☐ MODIS AQUA visual
 - ☐ MODIS TERRA 721 pseudocolor
 - ☐ MODIS AQUA 721 pseudocolor
 - ☐ MODIS TERRA NDVI
 - ☐ MODIS AQUA NDVI
 - ☒ NASA BMNG
 - ☐ MODIS TERRA, BMNG backgroun
 - ☐ Global SRTM Elevation
 - ☐ Continental US Elevation

Are you running your own OpenStreetMap tileserver? Please enter the URL using the provided tags and select the zoom-level range, in which tiles are available. Note that the tiles must follow the [OpenStreetMap tiling scheme](#).

URL:

Zoom-Level:

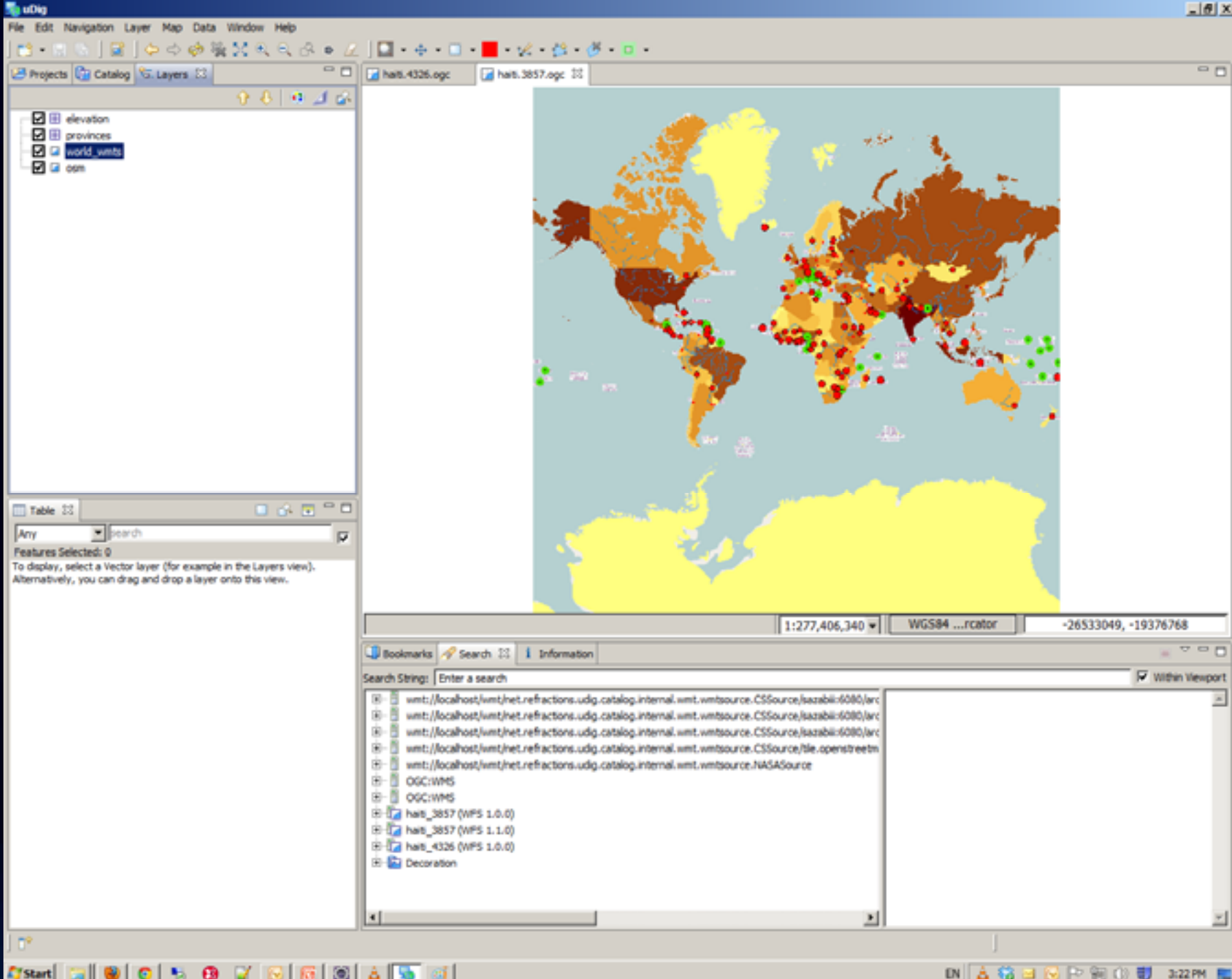
Min: Max:

Available Tags:

{z}: Zoom-Level

{x}: Column

{y}: Row



WPS in ArcGIS Server (10.1 Only)

- Geospatial processes over the web
 - Version implemented
 - 1.0.0
 - WPS interfaces implemented
 - GetCapabilities
 - DescribeProcess
 - Execute
 - Highlights
 - Out-of-the-box GP tools and scripts
 - Python scripting environment and Model Builder
 - Synchronous and Asynchronous execute mode
 - Input and output features as GML

WPS Clients

- **52North**
 - OpenLayers client (JavaScript)
 - uDig (Java)
- **OpenLayers**
- **QGIS**
- **PyWPS OpenLayers client (JavaScript)**
- **ZOO API (server-side JavaScript)**

WPS Demo

- WPS in OpenLayers