

# Leveraging the OGC Capabilities of ArcGIS Server

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# Content

- **OGC and OGC Standards**
- **OGC in ArcGIS Server**
- **Web Map Service (WMS) + Demos**
- **Web Feature Service (WFS/WFST) + Demos**
- **Web Coverage Service (WCS) + Demos**
- **Q&A**

# Background – OGC

- **What does OGC stand for?**
  - **Open Geospatial Consortium**
  
- **What is Open Geospatial Consortium?**
  - **Standards organization**
  - **International, non-profit and has 395 (from wiki) members**
  - **Develop standards for geospatial and location based services**
  
- **What is the purpose of OGC standards?**
  - **Achieve openness and interoperability in Geospatial domain**
    - Work with other standards bodies W3C, OASIS, WfMC and IETF
    - Build upon IT standards (HTTP, XML, SOAP, REST, ..., etc.)
    - Results of many commercial, governmental, and research organizations collaborating in an open consensus process
    - Adopt/evolve existing de-facto standards

# Popular OGC standards

- **Simple Features for SQL**

- Define a standard SQL schema that supports storage, retrieval, query and update of simple geospatial feature collections
- SQL

- **Geographic Markup Language (GML)**

- An XML grammar written in XML schemas for modeling, transport and storage of geographic information
- XML

- **Keyhole Markup Language (KML)**

- An XML language focused on geographic visualization, including annotation of maps and images
- XML and HTML

# Popular OGC standards – continue

- **Web Map Service (WMS)**

- Produces maps of spatially referenced data dynamically from geographic information
- HTTP GET and POST (RESTful KVP encoding)

- **Web Feature Service (WFS/WFST)**

- Defines interfaces for data access (read) and manipulation (write) operations on geographic features
- HTTP GET and POST (RESTful KVP and SOAP encoding)

- **Web Coverage Service (WCS)**

- Defines interfaces for retrieving geospatial data as “coverage”
- HTTP GET and POST (RESTful KVP and SOAP encoding)

# Popular OGC standards – continue

- **Catalog Service for Web (CSW)**
  - Specifies the interfaces, bindings, and a framework for defining application profiles required to publish and access digital catalogues of geospatial metadata
  - HTTP GET and POST (RESTful KVP and SOAP encoding)
  - XML

# ArcGIS Server is open and interoperable

- **OGC web services implemented in ArcGIS Server**
  - **GIS Visualization**
    - WMS
    - KML
  - **GIS Data sharing**
    - WCS
    - WFS & WFST
    - KML
  - **Metadata (GeoPortal Toolkit)**
    - CSW (OGC Core, ISO 19139, ebRIM)

9.2

9.3

9.3.1

10.0 +

### WMS

- WMS on MapService
- 1.0.0, 1.1.0, 1.1.1, 1.3.0
- GetCapabilities
- GetMap
- GetFeatureInfo
- ArcGIS Desktop client
- WebADF client

- add WMS on ImageService
- Styled Layer Descriptors (SLD)
  - publish multiple styles at server side
  - send external styles through "SLD"
- Filter Encoding (FE) in SLD
- Security (inherits ArcGIS Server Security Framework)
- bug fixes

- add WMS on Optimized MapService
  - performance is up
  - functionally equal to classic MapService
- bug fixes

- enhanced SLD support
  - "SLD\_BODY"
  - GetStyle
- add Time support
- add GetLegendGraphics
- bug fixes

### KML

- KML on MapService
- KML 2.1

- KML on ImageService and GeoDataService
- KML through ArcGIS REST API
- bug fixes

- KML 2.2 (to OGC namespace)
- bug fixes

- support KM
- 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

- bug fixes
- updated "Make WCS layer" GP tool

- add WCS on Optimized MapServer
- add Time support
- bug fixes

### WFS

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

- add WFST 1.0.0 (9.3 SP1)
- bug fixes

- add WFS on Optimized MapService
- add WFST on non-versioned geodatabase
- bug fixes



# What are we looking at after 10.0

- **Improvements on existing OGC implementations**
- **Web Map Tiled Service (WMTS)**
- **Web Processing Service (WPS)**

# ArcGIS Server is open and interoperable – continue

- Other OGC standards implemented in ArcGIS

- GML

- Simple Feature GML
    - OS Master Map, Top10NL, NATO, CityGML

- Metadata

- ISO 19139

- A complete list

- <http://www.esri.com/library/whitepapers/pdfs/supported-ogc-iso-standards.pdf>
  - [http://www.esri.com/software/standards/standards\\_tables.html#certification](http://www.esri.com/software/standards/standards_tables.html#certification)

# Client support for OGC We Services

- **ArcGIS Desktop**

- WMS, WFS, Simple Feature GML, WCS, KML
- CSW, WMC (Portal Toolbar add-on)
- WFS, GML with other application schema (Data Interoperability Extension)

- **ArcExplorer**

- WMS, KML
- CSW, WMC (custom tasks)

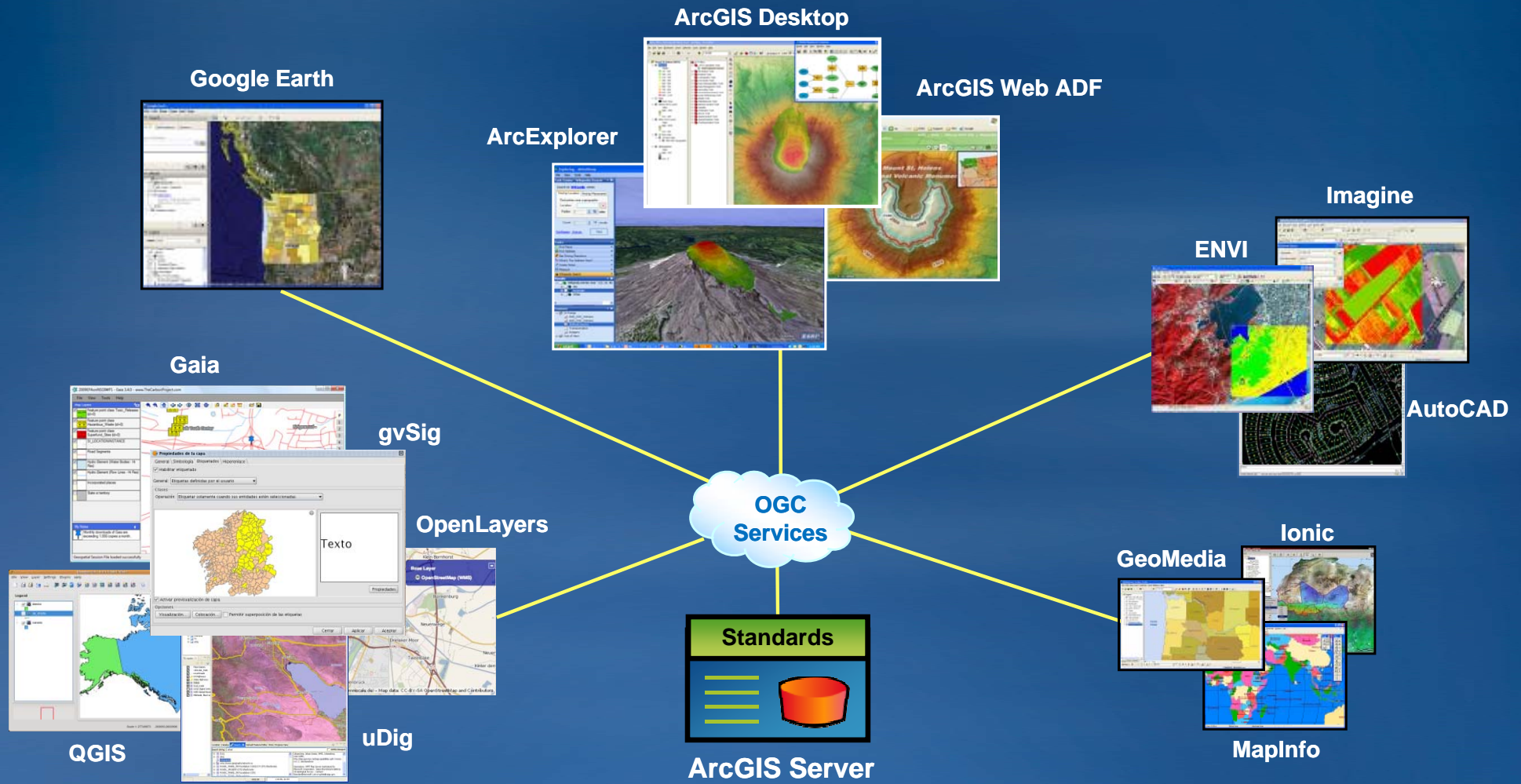
- **ArcGIS Web ADF**

- WMS

- **Portal Toolkit MapViewer**

- WMS, WFS, WCS

# ArcGIS Server is open and interoperable – continue



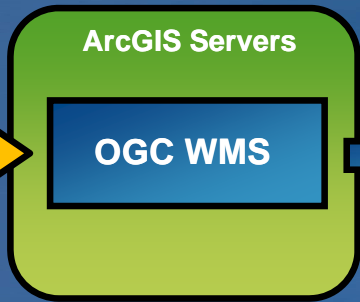
# OGC Services in ArcGIS Server Architecture

- **Implemented as RESTful services over HTTP**
- **Implemented as capabilities of ArcGIS Server services**
  - **Map Service**
    - WMS, WCS, WFS, KML
  - **Image Service**
    - WMS, WCS, KML
  - **GeoData Service**
    - WCS, WFS, KML
- **Inherit from ArcGIS Server services**
  - **Scalability and Durability in distributed environment**
  - **Performance**
  - **Security mechanism**

- **Serving map/legend images (png, jpeg, etc.), styles and limited feature data**
  - **Version implemented**
    - 1.0.0, 1.1.0, 1.1.1 and 1.3.0
  - **WMS interfaces implemented**
    - **GetCapabilities** (service level metadata)
    - **GetMap** (map images)
    - **GetFeatureInfo** (limited feature data, no geometry)
    - **GetStyles** (styles in SLD xml, which are symbologies + filters) – requires ArcGIS Server 10.0
    - **GetLegendGraphic** (legend images) – requires ArcGIS Server 10.0
  - **Highlights**
    - **Support SLD 1.0**
      - **Filter encoding and Symbology encoding**
      - **“SLD” and “SLD\_BODY”** (demo)
      - **GetStyles and GetLegendGraphic**
    - **TIME** (demo)
    - **Customize GetFeatureInfo response through XSLT** (demo)
    - **Security** (http basic, digest and token based)

# WMS Demo 1 – Map navigation and identify

Map document



GeoExt + OpenLayers

Default XSLT template for GetFeatureInfo response

layer names: 'fields'			
OBJECTID	Shape	FIELD_NAME	ALT_FLD_NM
5	Polygon	Greater Burgan	Null

layer names: 'wells'	
country	Kuwait
lat	29.291459
lon	47.868988
well name	Khashman 6
current operator	Kuwait Oil Co Ltd
wiki link	<a href="#">Oil Well</a>

video

XSLT template to embed videos

last load date 7/24/2009 7:38:15 PM

XSLT template to embed pictures

layer names: 'wells'	
country	Kuwait
lat	29.160568
lon	47.569167
well name	Umm Ruais 1
current operator	Kuwait Oil Co Ltd
wiki link	<a href="#">Dry Hole w/Oil Storage</a>

picture

XSLT template to embed pictures

last load date 7/24/2009 10:41:08 PM

layer names: 'wells'	
country	Kuwait
lat	29.15
lon	47.85
well name	Madaniyat 1
current operator	Kuwait Oil Co Ltd
wiki link	<a href="#">Dry Hole w/Oil and Gas Show</a>

3d map

XSLT template to embed JS code

last load date 7/24/2009 7:07:40 PM

Feature Attributes	
Name	Value
OBJECTID	19
SHAPE	Polyline
PIPECID	100000096736
PIPE_NAME	Iraq - Kuwait
PIPE_TYPE	Gas
PIPE_STATUS	Operating
PIPE_LENGTH	152
PIPE_IS_OFF	Onshore
SITUATION	Null
REGION_NM	Middle East
COMM_DT_T	9/15/1986

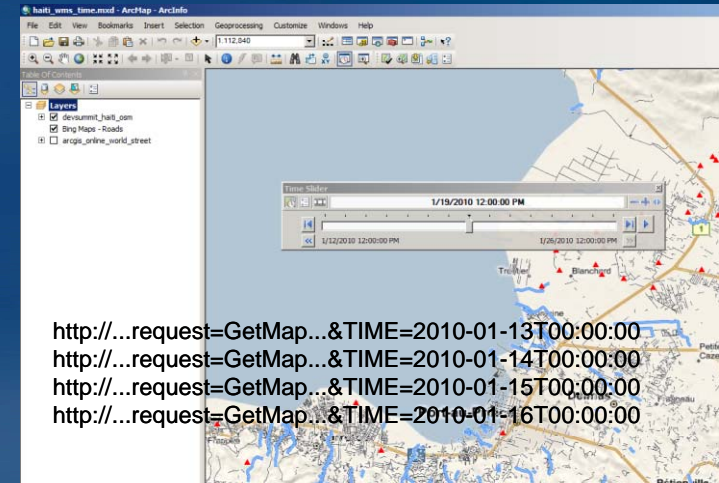
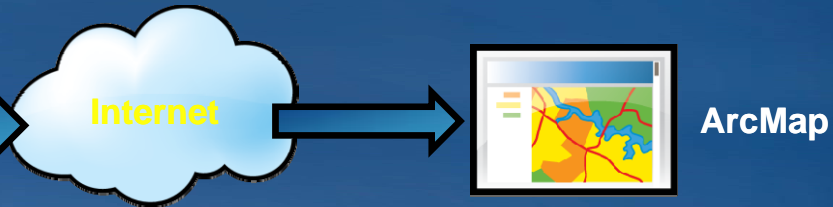
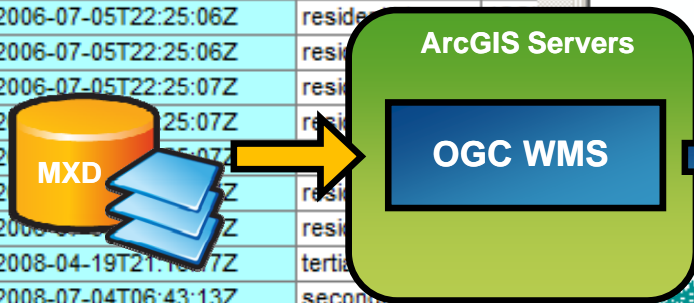
Map Navigation and Identify

# WMS DEMO 1

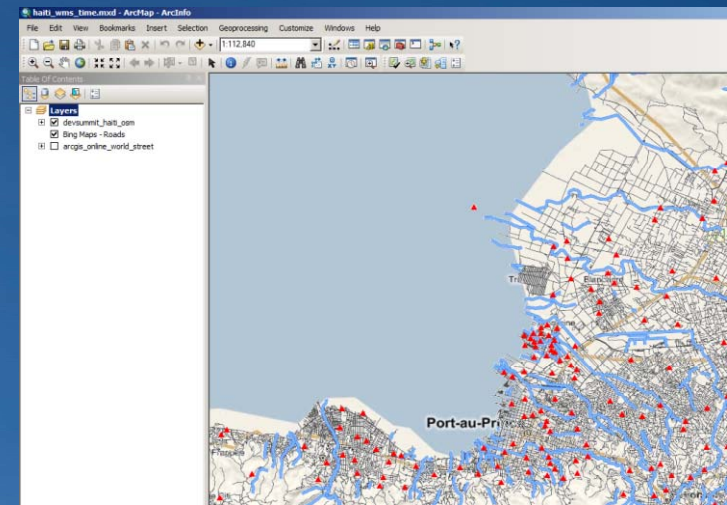


# WMS Demo 2 – TIME

id	timestamp	highway	c
2271244	2006-07-05T22:24:57Z	residential	JOSI
8123370	2006-07-05T22:24:57Z	residential	JOSI
8123371	2006-07-05T22:24:57Z	residential	JOSI
2271251	2006-07-05T22:25:04Z	residential	JOSI
2271253	2006-07-05T22:25:06Z	residential	JOSI
8123376	2006-07-05T22:25:06Z	residential	JOSI
2271254	2006-07-05T22:25:07Z	residential	JOSI
2271255	2006-07-05T22:25:07Z	residential	JOSI
8123377	2006-07-05T22:25:07Z	residential	JOSI
8123378	2006-07-05T22:25:07Z	residential	JOSI
8123379	2006-07-05T22:25:07Z	residential	JOSI
23864291	2008-04-19T21:16:17Z	tertiary	JOSI
25339774	2008-07-04T06:43:13Z	secondary	JOSI
27157100	2008-09-18T19:16:51Z	residential	JOSI



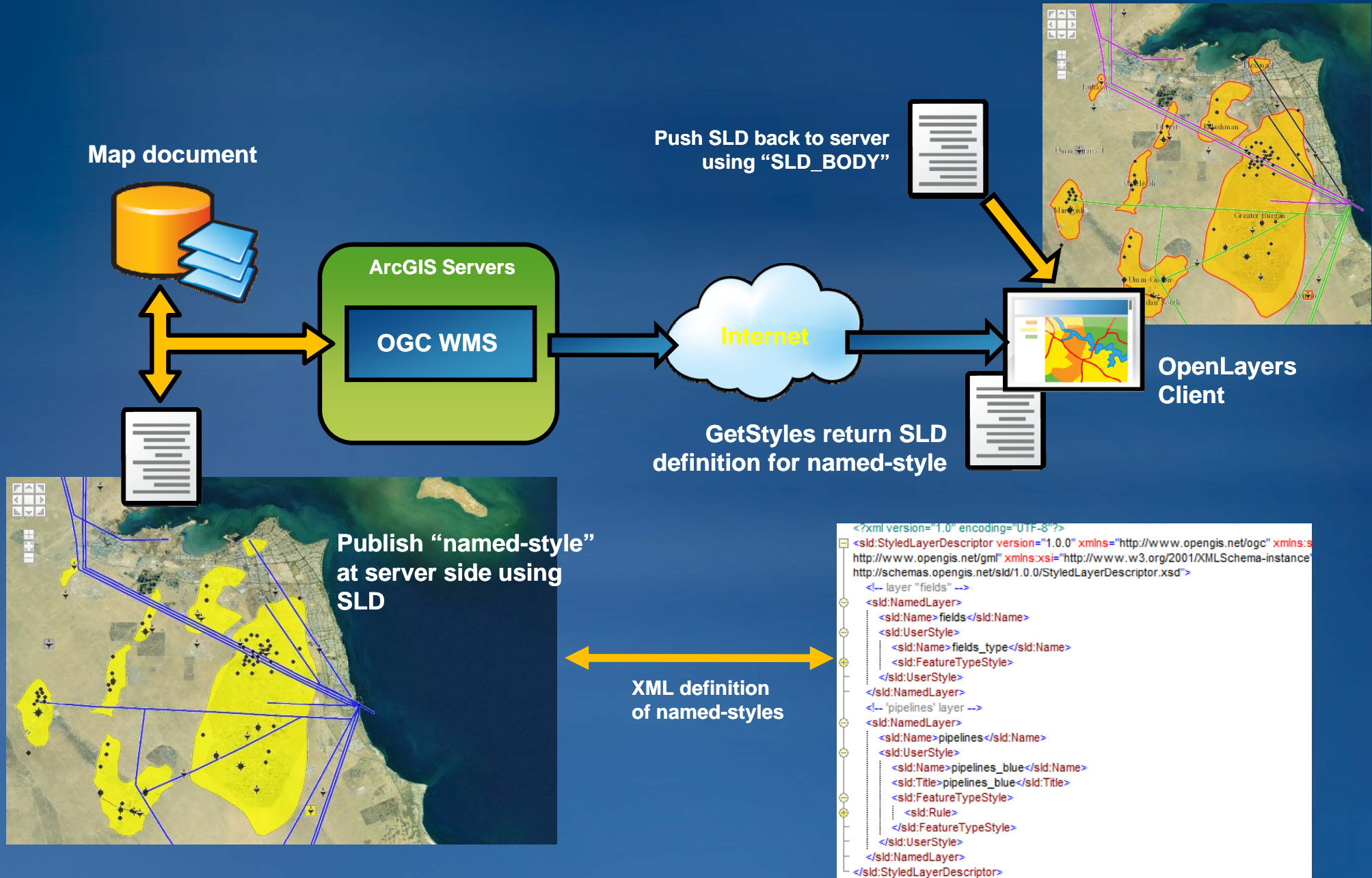
<http://...request=GetMap...&TIME=2010-01-13T00:00:00>  
<http://...request=GetMap...&TIME=2010-01-14T00:00:00>  
<http://...request=GetMap...&TIME=2010-01-15T00:00:00>  
<http://...request=GetMap...&TIME=2010-01-16T00:00:00>



TIME

**WMS DEMO 2**

# WMS Demo 3 – Styled Layer Descriptors (SLD)



Styled Layer Descriptors (SLD)

# WMS DEMO 3

# WFS Services

- A data service (features)
- “GML over HTTP”
- Features organized in Feature Types
  - equivalent to ArcGIS’ feature classes
- WFS – T (Web Feature Service with transactions)
  - Features can be updated by client

# WFS Services

- **Implements WFS 1.0 and 1.1**
- **Uses the Simple Features GML Profile**
  - A subset of GML 3.1
- **You can publish either a geodatabase or a map**
  - enable WFS capabilities
- **Clients applications use a URL to access the WFS service**
- **Works with both versioned and non-versioned geodatabases**
  - Personal GDB, File GDB and ArcSDE
  - ArcSDE Geodatabase required for WFS-T

# WFS Services – New at ArcGIS 10.0

- **Query Layers**
  - Layer or stand-alone table that is defined by a SQL query
  - Query layers are read-only, WFS-T is not supported
- **Field Alias and field visibility**
  - Field Alias can be set in the map document or geodatabase
  - Field Visibility can be set in the map document
  - Map services only
- **Supports setting the DefaultMaxFeatures property**
  - Set in the configuration file or external capabilities
- **WFS-T editing is now supported with versioned and non-versioned data**
  - Simple data types

# WFS Service – Supported Methods

- **GetCapabilities**
- **DescribeFeatureType**
- **GetFeature**
  - Includes Filter support
- **GetFeatureWithLock**
- **Transaction**
  - insert, update, delete



# WFS Service – Transactions

- Transactions allow you to publish data so that it can be edited by WFS-T clients
- Uses pessimistic locking of features
  - GetFeatureWithLock
- Requires ArcSDE Geodatabase
  - New at ArcGIS 10.0 WFS-T supports both versioned and non-versioned data
  - All releases before 10.0 requires versioned data

# WFS Service – Transactions

- **Multiple remote editors**
- **Stateless**
- **Satisfied via pooled configurations**
  - Doesn't require a dedicated SOC process per editor
- **No ESRI software required on the client**
  - Gaia supports WFS-T

# WFS –T Workflow with Versioned Data

- **Create a child version for WFS editors**
- **Publish a WFS service based on that version**
  - **Enable transactions**
- **WFS editors can now edit the service using WFS transactions**
- **Periodically reconcile & post the WFS version with its parent version**
  - **Makes ArcMap edits visible to WFS editors**
  - **Makes WFS edits visible to ArcMap editors**

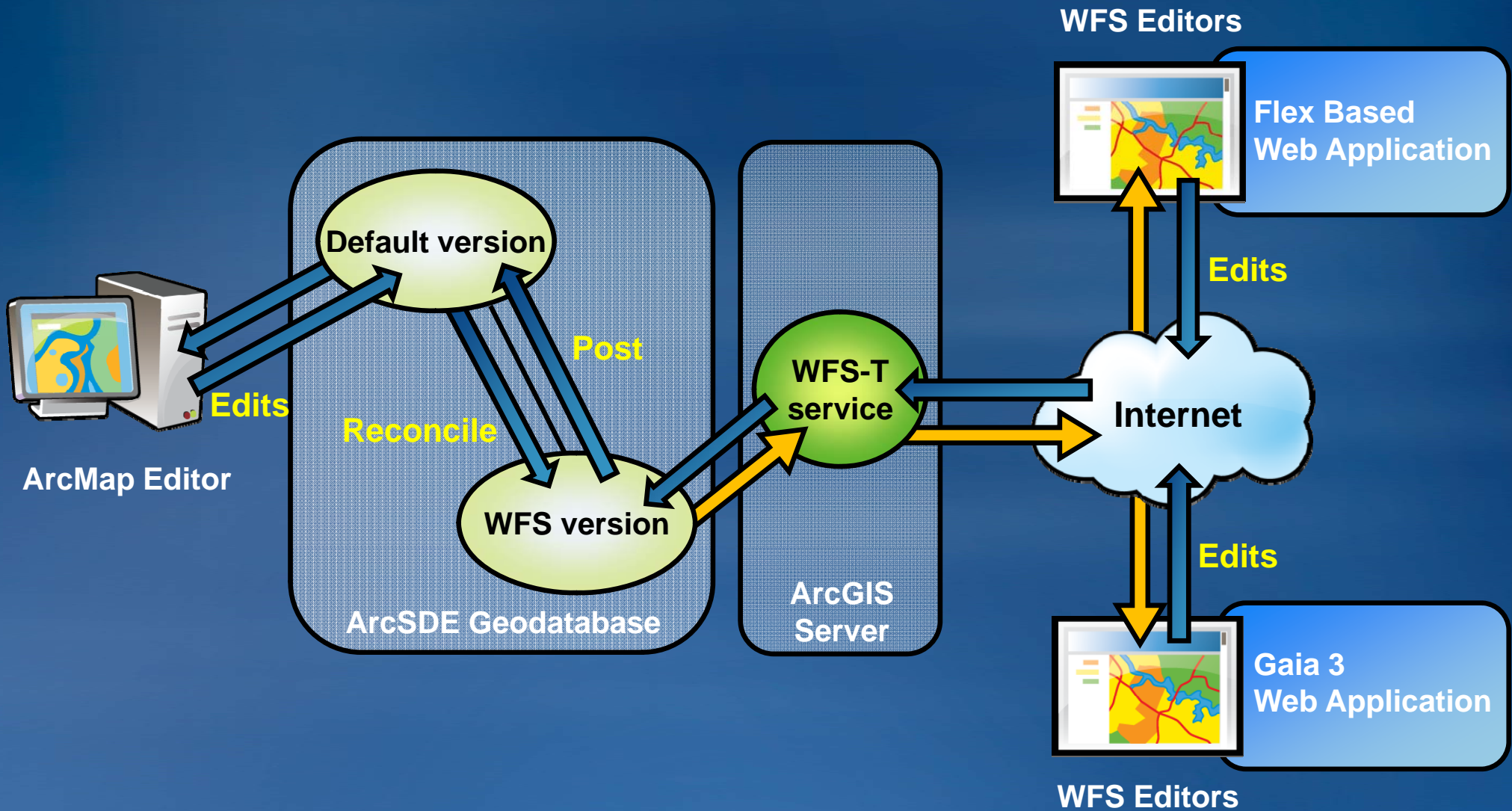
# WFS –T Workflow with Non-Versioned Data

- **Publish a WFS service**
  - Enable transactions
- **WFS editors can now edit the service using WFS transactions**
- **The edits are being applied directly to the business tables in the geodatabase and will be available to anyone accessing the data source.**
- **Limitations**
  - Non-versioned editing only supports simple features
  - Once the edits have been applied to the GDB they cannot be rolled back.

# WFS Service – ArcGIS Clients

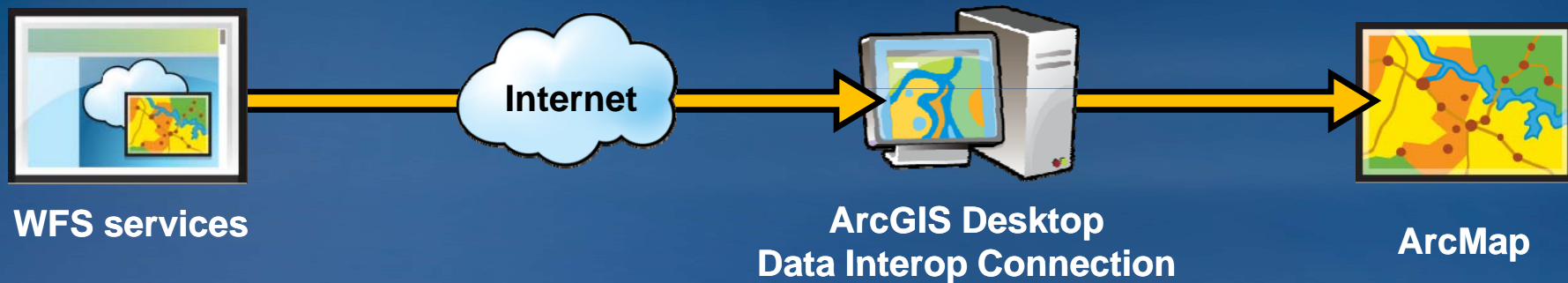
- **The Data Interoperability Connection can be used to work with WFS services**
  - A separate license of the data Interoperability Extension is not required to consume simple features GML (level 0)
- **WFS To Feature Class GP tool allows you to import data into a Geodatabase from a WFS Service**
  - Independent of the Data Interoperability Extension

# Demo 4 – WFS and WFS-T services

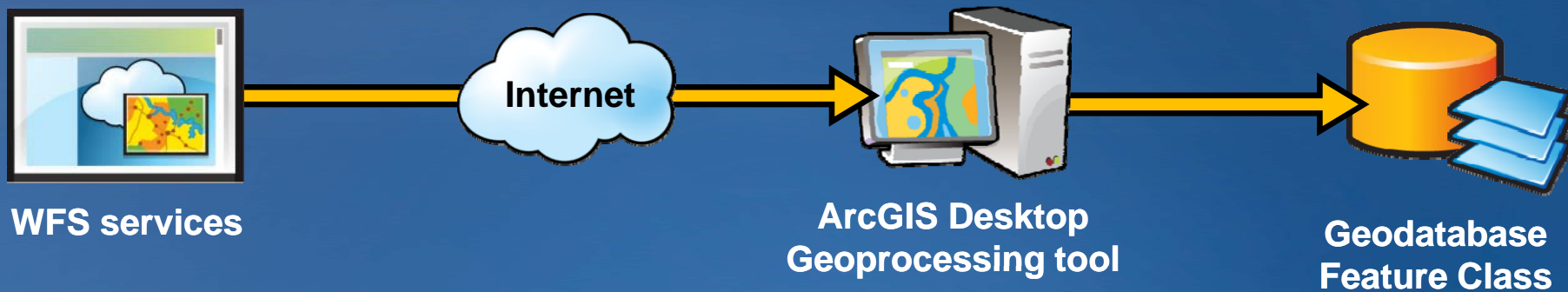


# Demo 5 – ArcGIS as a WFS Client

- The Data Interoperability Connection



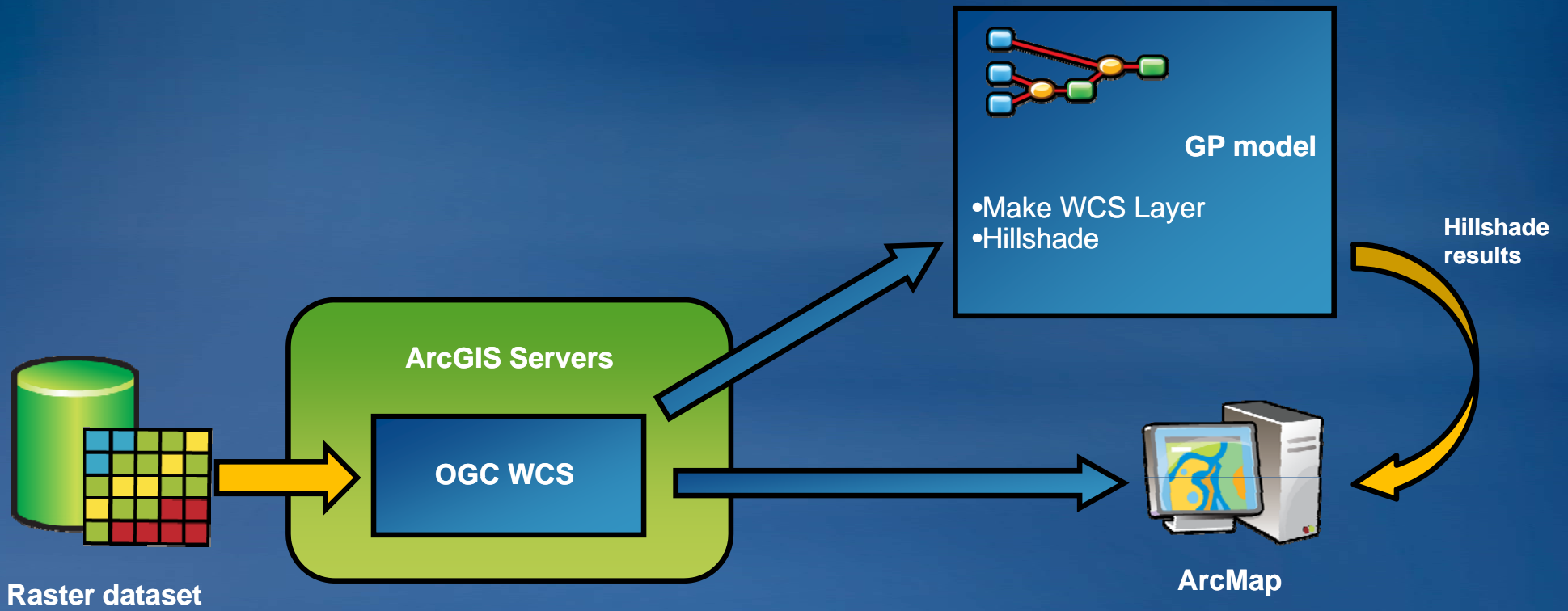
- WFS to Feature Class Geoprocessing tool



- **Data service, serving out geographic coverage data (not dummy image)**
  - **Version implemented**
    - 1.0.0, 1.1.0, and 1.1.1
  - **WMS interfaces implemented**
    - **GetCapabilities** (service level metadata)
    - **DescribeCoverage** (detailed coverage level metadata)
    - **GetCoverage** (coverage data)
  - **Highlights**
    - **Supported formats: GeoTiff, NITF, HDF, JPEG, JPEG2000, PNG;**
    - **TIME** (demo)
    - **“IMAGE”** (ESRI specific parameter to request an individual raster in a raster catalog)
    - **Security** (http basic, digest and token based)



# WCS Demo



**WCS DEMO**

# Resources and Links

- **ESRI Website**

- White papers
- Product support matrix
- OGC Compliance

<http://www.esri.com/standards>

- **Product Help**

- Metadata support

[http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=Metadata standards and the ArcGIS metadata format](http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=Metadata_standards_and_the_ArcGIS_metadata_format)

- Data Interoperability

[http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=An overview of Data Interoperability](http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=An_overview_of_Data_Interoperability)

- GML Support

[http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=An overview of GML support in ArcGIS](http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=An_overview_of_GML_support_in_ArcGIS)

# Resources

- **ESRI Web Site**
  - White papers
  - Product Support Matrix
  - OGC CompliancyLink: [Standards](#)
  
- **OGC Website**
  - Link: [Opengeospatial.org](http://Opengeospatial.org)
  
- **Product Help**
  - Metadata SupportLink: [Metadata Standards and the ArcGIS Metadata Format](#)
  - Data InteroperabilityLink: [Using the data Interoperability Extension](#)
  - GML SupportLink: [GML Support in ArcGIS](#)

Please fill out session surveys

**QUESTIONS?**