ESRI Developer Summit

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Working with Image Services

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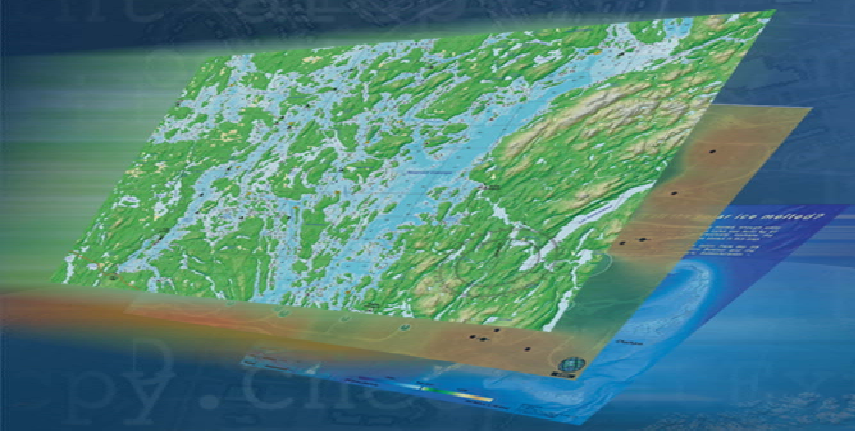


ESRI

Outline

- Image Services – a basic introduction
  - What is an image service
  - What is the Image Extension
  - What's new
- Preparing your data
  - Considerations
  - What is a mosaic dataset
- Serving
  - Capabilities and allowed operations
  - Parameters: Image, Catalog, Download, Output
- Using image services in Web applications
  - REST
  - Silverlight

What is an image service?

- It’s raster data made available by a server to a client application

- Accessible
  - ArcGIS Desktop
  - ArcGIS Explorer
  - Web APIs (Silverlight, Flex, JavaScript)
  - WMS, WCS, KML
  - 3rd Party Applications

Image Service source data

- Data sources
  - Raster datasets & layers
  - Mosaic datasets & layers *new*
- Why create and publish a layer
  - To control rendering
  - Preset some layer properties

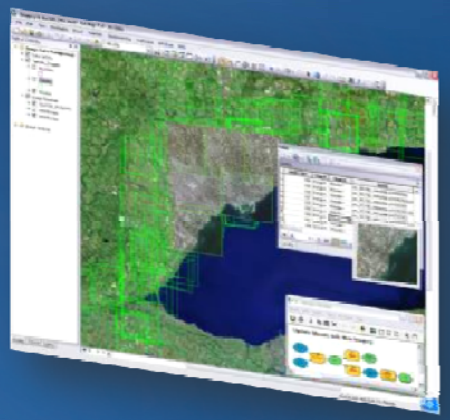
What can you do with an image service?

- Use it as an image (visual analysis)
- Use it as raster data (pixel analysis)

- Access it as a catalog (mosaic dataset)

What is the mosaic dataset?

- A new geodatabase data model for managing raster data
  - Not just designed for serving
- A hybrid of a raster catalog and raster dataset
  - A collection of raster datasets (images) stored as a catalog and viewed as a mosaicked image
- Indirect pixel management
  - Raster datasets can remain in their native format on disk or be loaded into the geodatabase
- Unlimited size*
- Provides dynamic mosaicking and on-the-fly processing



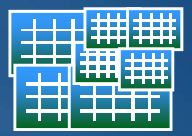
Mosaic dataset: provides solutions

Processing Time
Reduces processing

Storage
Reduces storage by removing redundancy

Overlapping Imagery
Maintain information

Multi-resolution Data
No need to sample up or down



Disparate Datasets
Handle large NoData areas

Maintenance
Update with new images

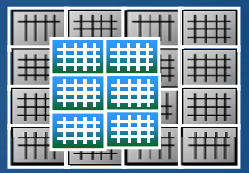


Image Quality
Reduces resampling

Maintain Metadata
Valuable information

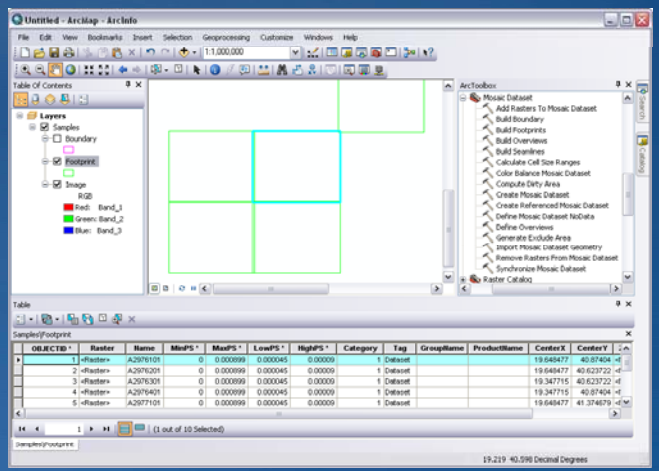
Mosaic Dataset: Mosaicking rules

- Mosaic Method defines the order
  - Closest to Center (default)
  - Closest to Nadir
  - North-west
  - By Attribute
  - Seamline

- Mosaic operators resolve the overlaps
  - First (Default)
  - Last/Min/Max
  - Mean/Blend

Building a mosaic dataset

- Stored in any geodatabase
- Uses geoprocessing tools
  - Automation with models or Python
- Nothing additional to install – part of core
- Can interactively edit and view in ArcMap
  - All layers are displayed
  - Edit and add fields in table window
- Simple workflow:
  - Create Mosaic Dataset
    + Add Rasters To Mosaic Dataset



Demo

BUILDING MOSAIC DATASETS

What is the ArcGIS Server Image Extension V 10?

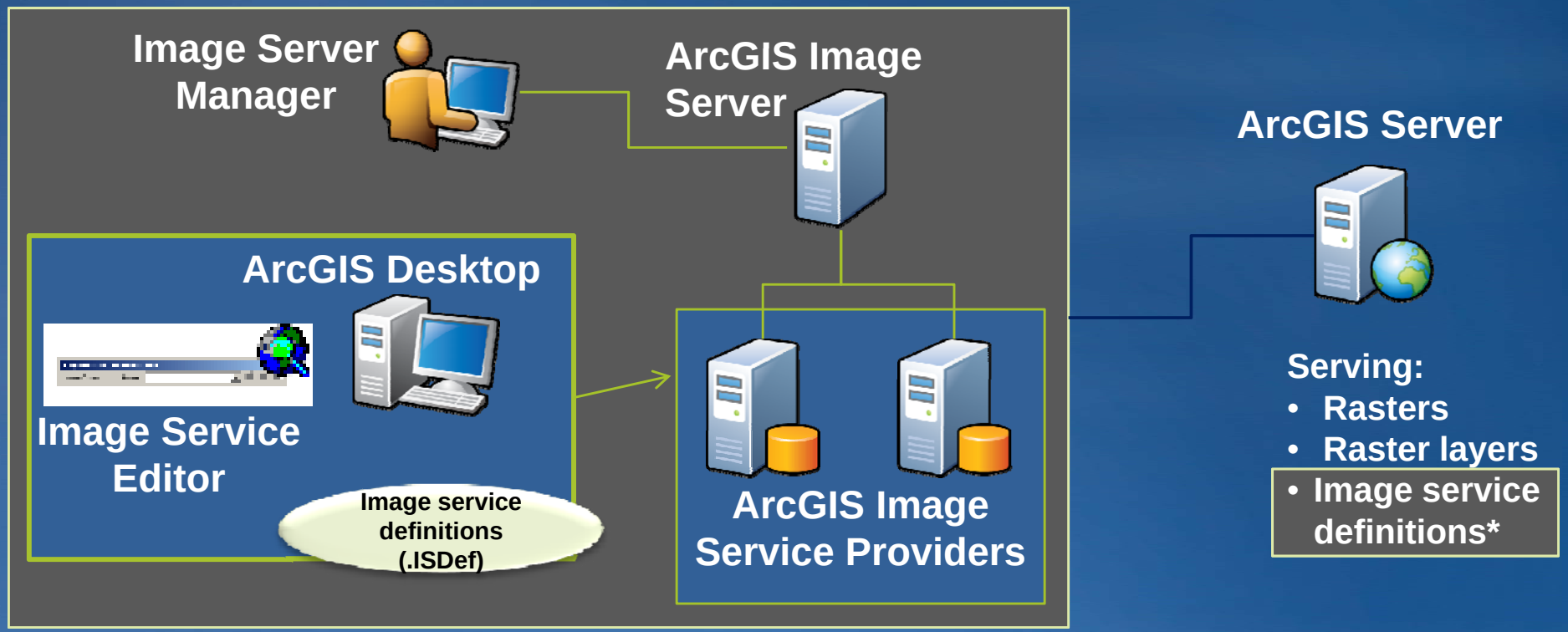
- It extends the capabilities of the raster data formats that can be served as image services
  - New data model: Mosaic datasets
- Image services accessible as:
  - Image
    - Dynamic mosaicking; On-the-fly processing; Identify with metadata; Export
  - Catalog
    - Geometry and attributes; Query; Selection; Preview; Download, with clipping

ArcGIS Server

Serving:
- Rasters
- Raster layers
- *Mosaic datasets
- *Mosaic dataset layers

Image Extension: V 9.3/9.3.1

- Separate product install; ArcGIS Image Server
- Separate license file
- Create image service definitions
- Stand-alone server; could be registered with ArcGIS Server



How to migrate ISDef to mosaic dataset

- Create Mosaic Dataset + Add Raster To Mosaic Dataset

- Image service definition is a supported raster type
- Raster process definition file is a supported raster type
- Rebuild from scratch

Publishing an image service

- Same process as publishing an service with ArcGIS Server
- Properties unique to image services
  - Capabilities
  - Parameters
- Some capabilities are specific to the data

Image Service Capabilities

- **limits what operations users can do with your Web service**

Image	Allows the image to be displayed (Absorbed the Mosaic operation in 9.3x)
Metadata	Allows the client to see metadata for the image service and for each raster in a mosaic dataset
Catalog	Allows the client to open the table of a mosaic dataset when it is served
Download	Allows rasters to be downloaded when serving a mosaic dataset
Pixels	Allows the API developer to access the pixel blocks of the individual rasters in a mosaic dataset

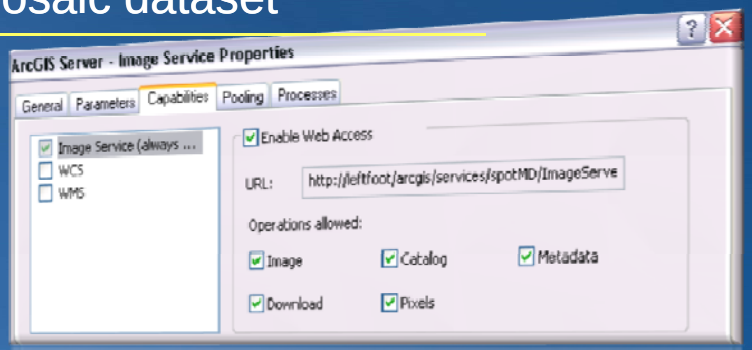
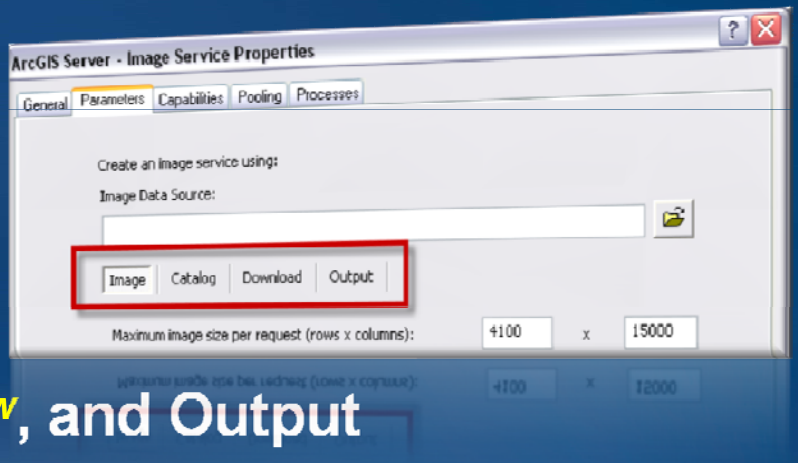


Image Service Parameters



- Control the image data
- Image*new*, Catalog*new*, Download*new*, and Output
- These parameters are not applicable to all image services and depend on the input for the image service
- Many are set when you create the mosaic dataset, but some can be altered by the server administrator
- Server administrator cannot exceed limitations for some of the parameters
  - Such as: allowed mosaic methods, the maximum number of rasters per mosaic

Image Service Parameters: Image

- **Affect the image that users connected to the image service will see**

	RD	MD	Layers
Max image size per request	✓	✓	✓
Default resampling method	✓	✓	✓
Compression methods and quality	✓	✓	✓
Max # of rasters per mosaic		✓	
Allowed mosaic methods		✓	

Image Service Parameters: Catalog

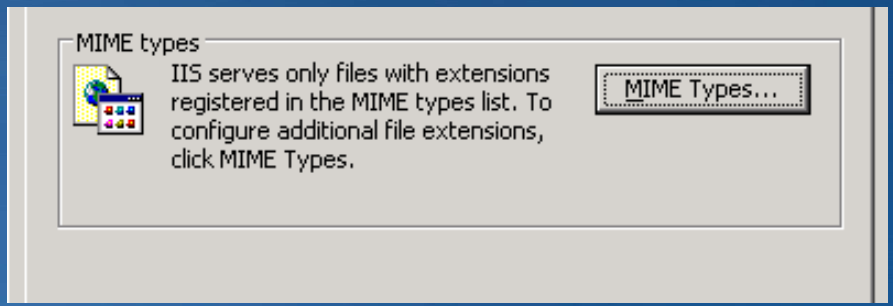
- **Control or limit the access users have to metadata and the catalog fields**
- **Limit the requests for records from the mosaic dataset tables.**
- **Can affect the load on the server**
  - **The more you allow a user to view and query, the greater the draw on the server**

	MD
Max # of records returned per request	✓
Raster metadata level	✓
Allowed fields	✓

Image Service Parameters: Download

- Affect the load on the server and the access users have to the source images
- Mosaic dataset only
  - Maximum number of items downloadable per request
  - Directories
    - The list of physical directories where the images to be downloaded are located
    - Important for the REST download
  - Virtual directory: where the image URLs will be mapped

- Define your MIME
  - Part of your IIS properties
  - Add your extensions to the list

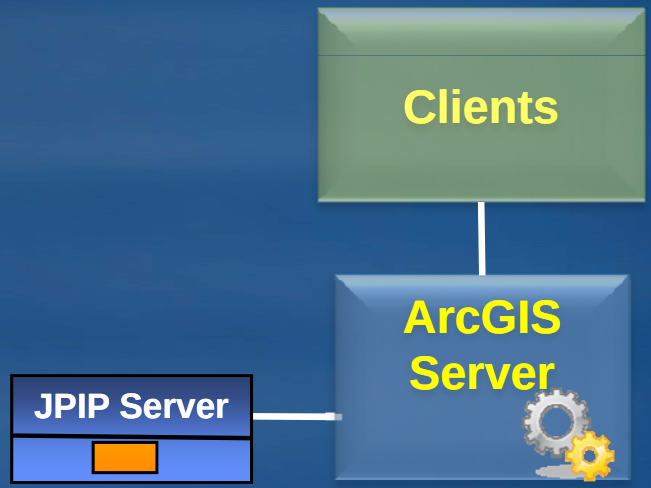


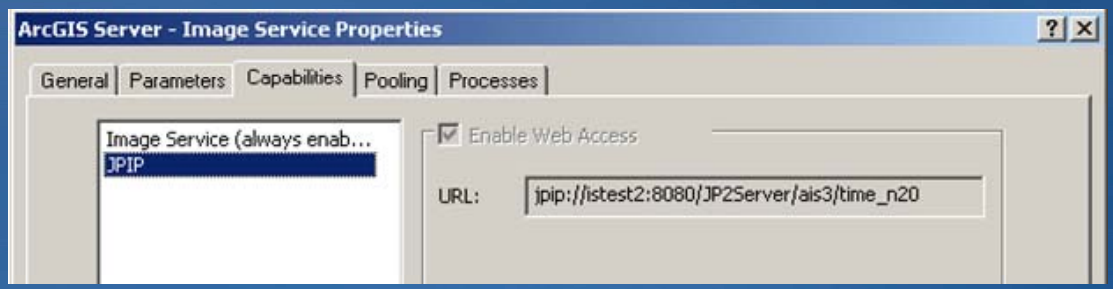
OGC Capabilities

- Web Coverage Service (WCS)
  - Serves actual pixel information from source data
  - Supported in many image analysis and processing software packages
  - Useful for image analysis applications where full pixel depth (bits and bands) are required
  - NEW: Query, Time, Limit exporting
- Web Map Service (WMS)
  - Supported for “rendered” image services
  - Useful for imagery base maps

JPIP Capabilities

- Available when registered with JPIP server from ITTVIS
- Available for source in JPEG 2000 (JP2, JPX)
- Good for low bandwidth connection





Demo

PUBLISHING AND ACCESSING IMAGE SERVICES

Best practices

- One raster dataset or many raster datasets?
- For viewing as an image or as input for analysis?
- Does the data have multiple bands or need to be enhanced?
- Is any processing required?

- Format

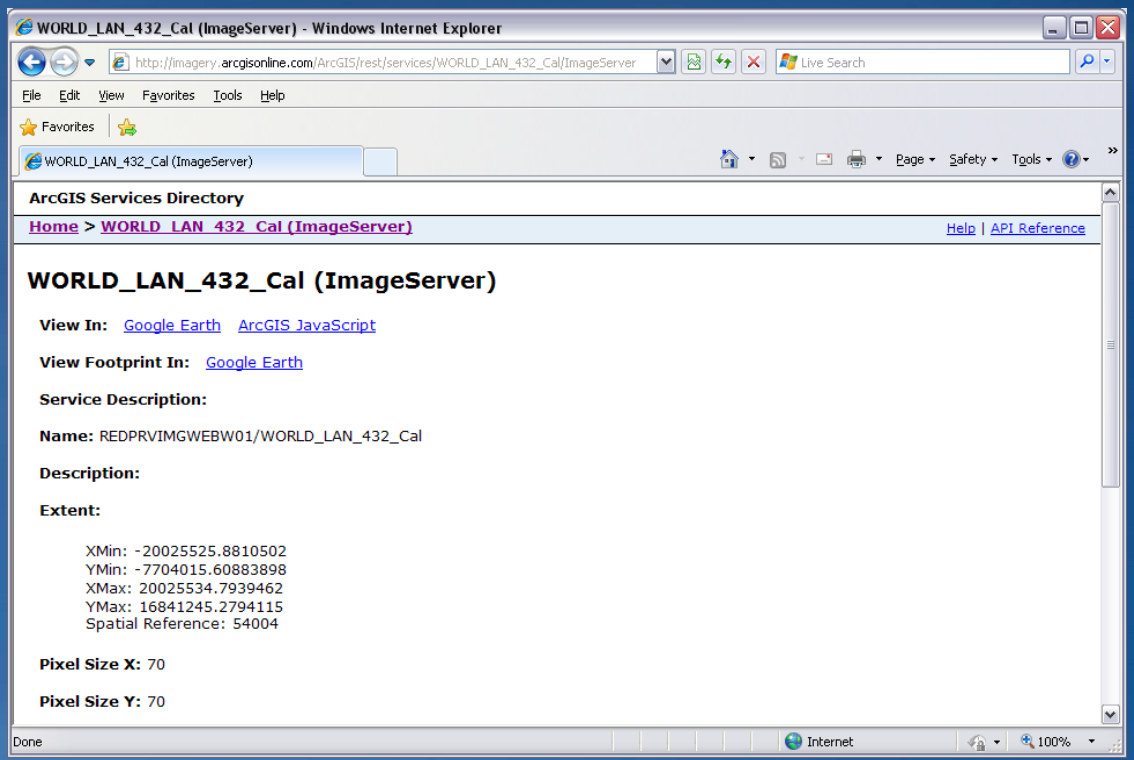
- Combining mosaic dataset

Image Service versus Map Service

Image service	Map service
Serves raster data directly	Serves a map document containing raster or vector data
Image service layer properties can be altered by client • Compression • Rendering • Band combinations	Client views map service as it was designed Client cannot change layer properties
Can be saved as a layer and used as a data source	Can build cache

Image Services and Web Applications

- Supported through SOAP, REST, WMS, or WCS
- Open to allow mash-ups
- Accessible through ArcGIS Server APIs
  - JavaScript
  - Flex
  - Silverlight



What can you do with image services in Web applications?

- Same display qualities of Desktop applications
- REST and SOAP support modifying all image service layer properties
  - Transmission compression
  - Band combinations
  - Mosaic methods and properties
  - Resampling
- Use Geoprocessing Services and Image Services

ArcGIS Web Mapping Applications

- WMAs built with ArcGIS Server Manager directly support image services (added at 9.3.1)
- Wizard allows for quick and easy configuration of the application
- Little to no programming required

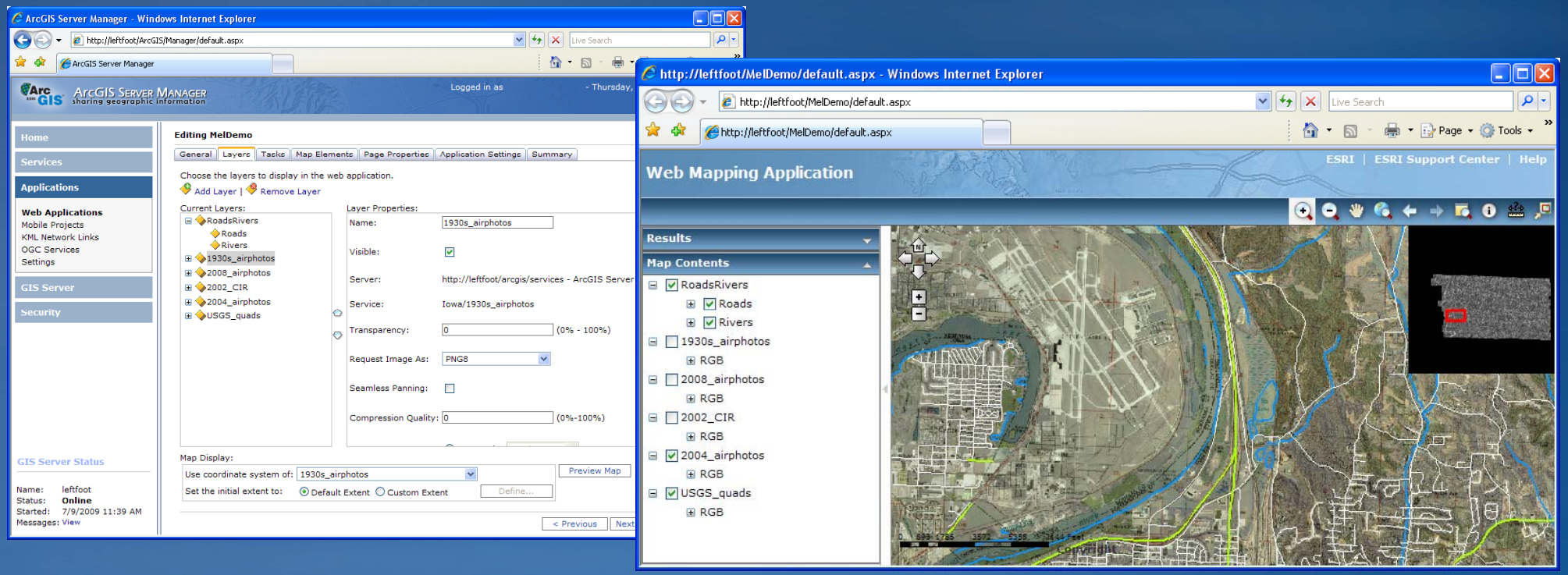


Image service REST API

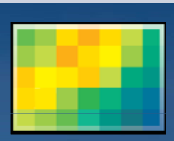
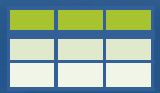
Sources	Operations	Results	
Mosaic dataset Raster dataset	ExportImage		An image in a supported format
Mosaic dataset	Query		A list of catalog items
Mosaic dataset	Download		A list of file IDs for download
Mosaic dataset Raster dataset	Identify	Pixel values and lists of catalog items	

Image Service Operations: ExportImage

- Properties: bbox, size, SR, pixel type, compression, etc.
- Format: png | png8 | png24 | jpg | bmp | gif | jpgpng
- RenderRule

```
{
    "rasterFunction" : "Slope",
    "rasterFunctionArguments" :
    { "ZFactor" : 0.3) },
    "variableName" : "DEM"
}
```

Image Service Operations: ExportImage

- **MosaicRule**

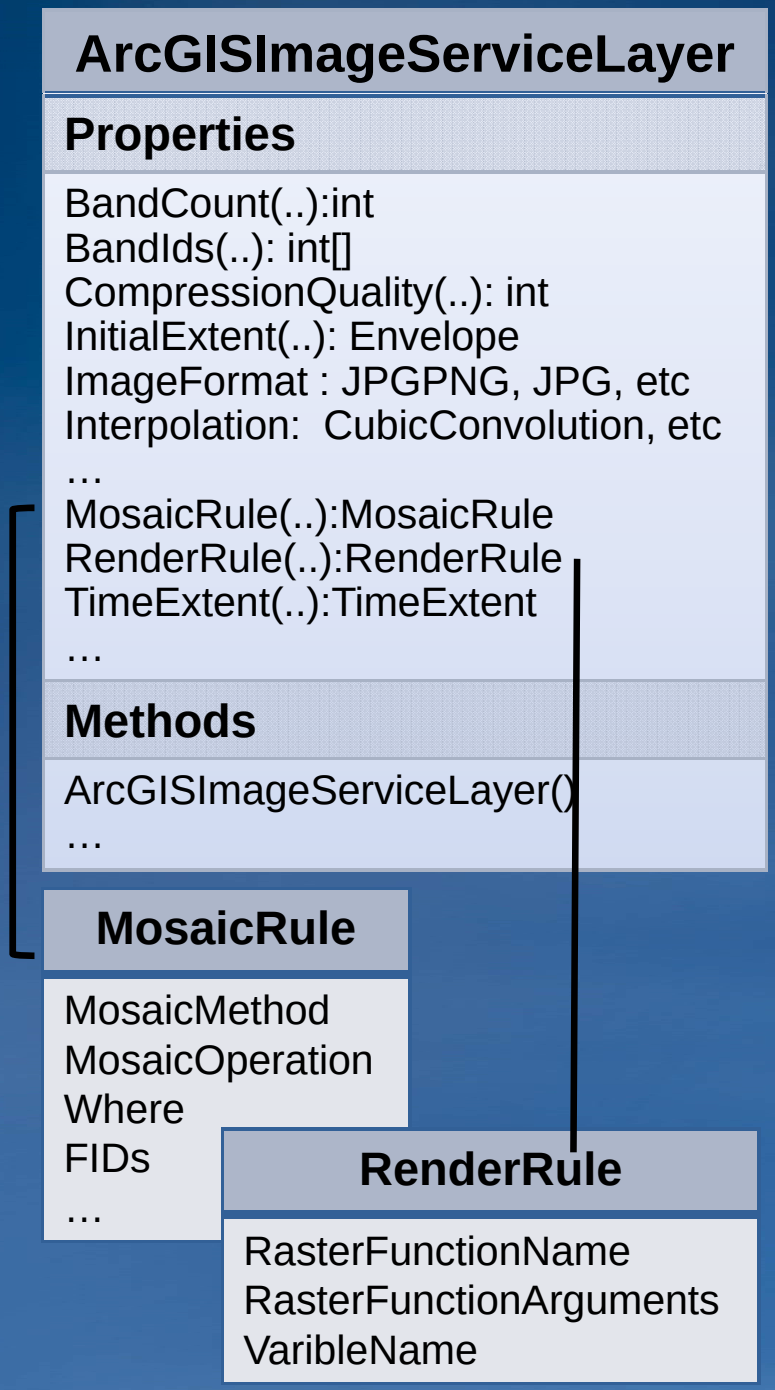
  { "mosaicMethod" : "esriMosaicLockRaster",
  "lockRasterIds" : [32, 454, 14]
  }

- **Time**

  ***Syntax*: time=<timeInstant>**
  time=1199145600000 (1 Jan 2008 00:00:00 GMT)

  ***Syntax*: time=<startTime>, <endTime>**
  time=1199145600000, 1230768000000
  (1 Jan 2008 00:00:00 GMT *to* 1 Jan 2009 00:00:00 GMT)

Image Service SilverLight APIs



- **ArcGISImageServiceLayer**
  - **Access the properties of image services**

```
<esri:Map>
<esri:ArcGISImageerviceLayer ID="MyImageLayer"
Url="http://ServerArcGIS/rest/services/name/ImageServer" />
</esri:Map>
```

- **MosaicRule**
  - **Defines how to mosaic images on-the-fly**
- **RenderRule**
  - **Defines how to render pixels through raster functions**
- **Support Query and Identify operations**

Demos: Image Service Web Application

1. Basic display
   - Source: a mosaic dataset of images of 12 months of MODIS
   - APIs used: ArcGISImageServerLayer, MosaicRule

2. DEM service
   - Source: a raster dataset of elevation
   - ArcGISImageServiceLayer, RenderRule, Identify

3. Query and Download

   Source: a mosaic dataset created from 100s of rasters
   - ArcGISImageServiceLayer, QueryDownload

- VS2008, Silverlight 3.0, ArcGIS Silverlight 2.0

QUESTIONS?