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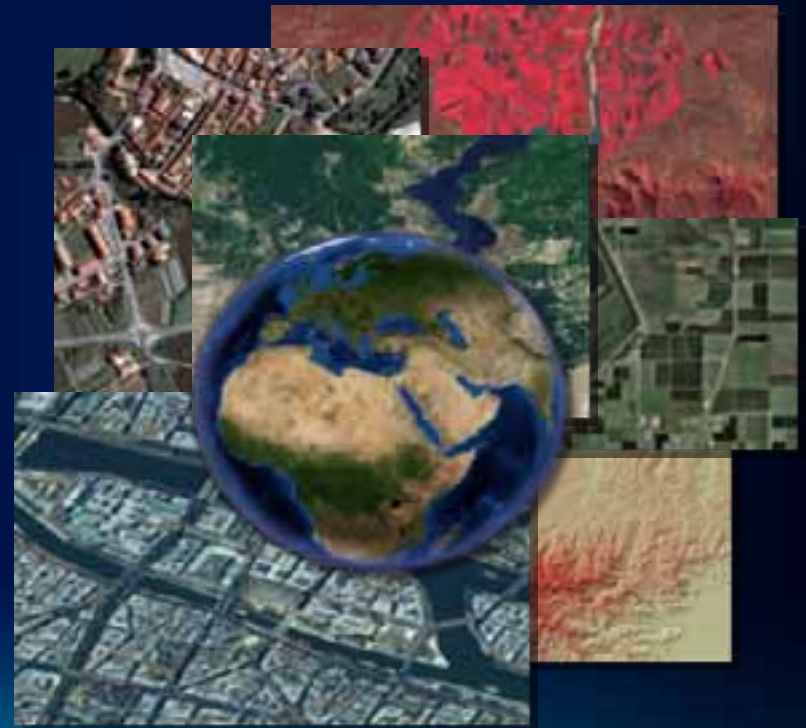
Sharing imagery and raster data in ArcGIS

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Outline

- **About the data**
- **How to share imagery**
 - Packaging
 - Serving
- **Where to share imagery**
 - Locally
 - Web
 - ArcGIS.com
 - Cloud
- **Using image services**



About the data

- **Data sources**
 - Raster datasets
 - Mosaic datasets
 - Raster or mosaic layers
 - To control rendering
 - Preset some layer properties
 - Predefined query



What is the mosaic dataset?

- A geodatabase data model used to catalog and process your collections of imagery
- Indirect pixel management
- Unlimited size*
- Provides dynamic mosaicking and on-the-fly processing



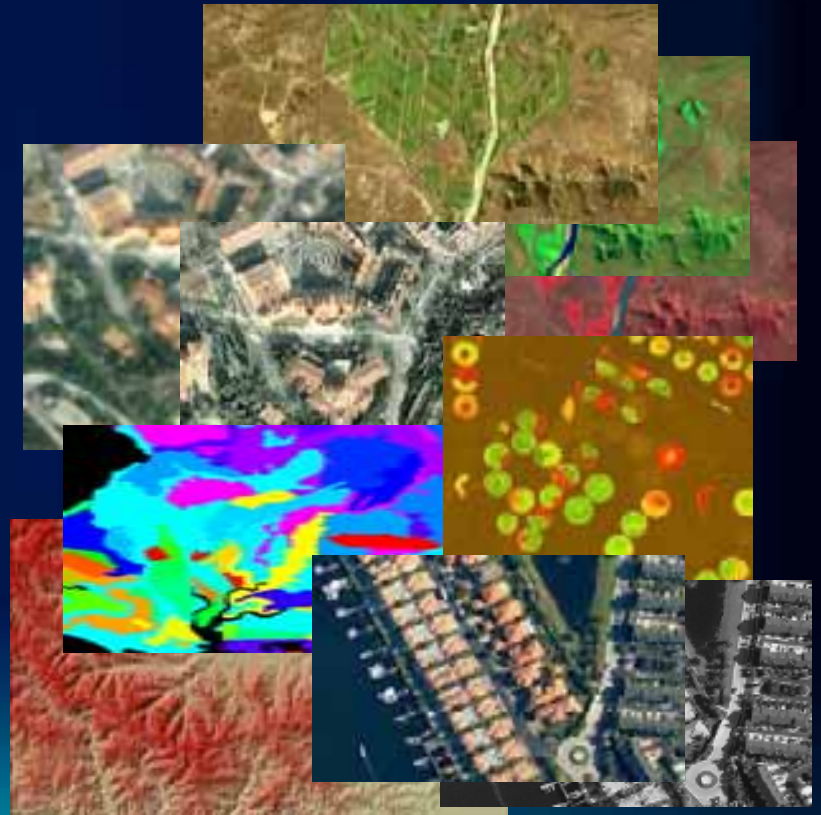
Dynamic mosaicking

- **Footprints are used to clip imagery**
- **Mosaic rules**
 - Order of displayed imagery
 - By Attribute
 - Closest to Center
 - Ensure best imagery is on top
 - Can be controlled by user
- **Queries**
 - Refine selection of imagery



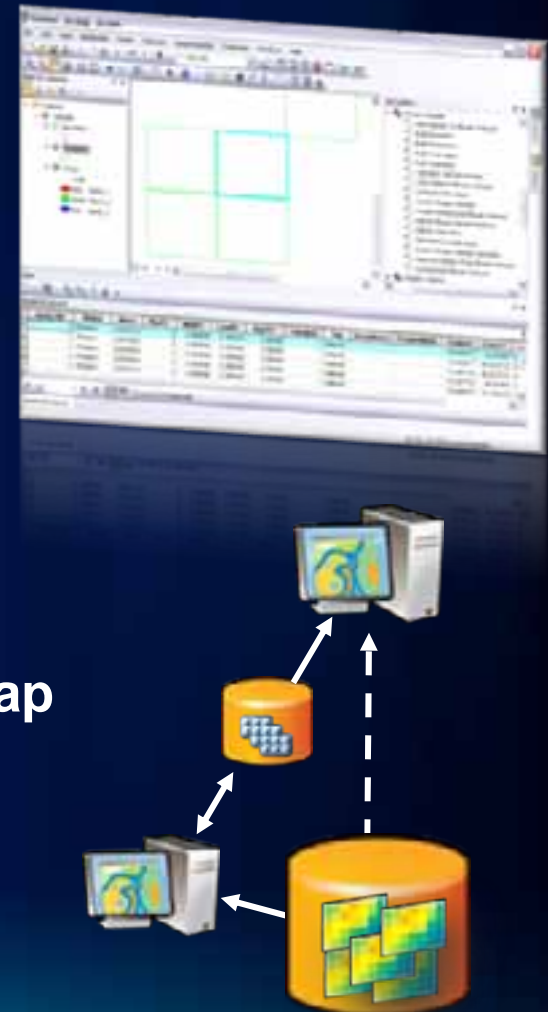
On-the-fly processing

-
- A collage of various images including satellite imagery, a colorful abstract pattern, and a close-up of a textured surface. The collage features several distinct elements: a top-left satellite view of a coastal area with a prominent yellow line; a top-right satellite view of a green landscape; a middle-left satellite view of a coastal area with a prominent yellow line; a middle-right satellite view of a green landscape; a bottom-left satellite view of a coastal area with a prominent yellow line; a bottom-right satellite view of a coastal area with a prominent yellow line; a central abstract pattern with vibrant colors like blue, yellow, and red; and a bottom-center close-up of a textured surface with a grid-like pattern.



Building a mosaic dataset

- **Store in a geodatabase**
 - Build with geoprocessing tools
 - Automation with models or Python
- **Simple workflow**
 1. Create mosaic dataset
 2. Add imagery
 3. Optionally, edit properties and functions
- **Can interactively edit and view in ArcMap**
 - All layers are displayed
 - Edit and add fields in table window



Sharing as a package



What is a package?

- **Map package**
 - Bundle of all map contents, including the layers and their source data with other maps items, including graphics, legends, and north arrows
 - Creates a .mpk file
- **Layer package**
 - Bundle of the symbology and source data, whether it's a single or grouped layer.
 - Creates a .lpx file

Creating a package

- **From within ArcGIS applications**
- **Using Package Map or Package Layer tools**
- **Imagery may be re-packed into a file geodatabase**
- **Imagery may be re-packed into a folder**
- **Size limitations are limited by the system**

How are packages used

- To provide to colleagues who don't have direct access to the data
- To provide as deliverables
- To share and highlight missing data or data that needs to be updated
- For archiving
- For standardization

Sharing packages on ArcGIS.com

- Can be pushed to ArcGIS.com when package is created
- ArcGIS.com size limits:
 - Up to 2 GB of total storage space
 - Single items up to 1 GB
- User downloads package, then unpacks it to view contents

Or add an image service to your ArcGIS.com

Creating and sharing a package on ArcGIS.com



Sharing via ArcGIS Server



How to share imagery using ArcGIS Server

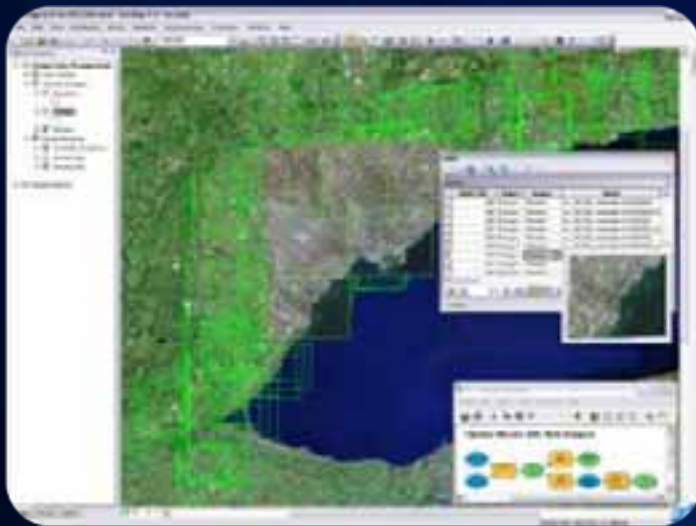
- **Image service**
 - Image or raster data made available by a server to a client application
- **Map service**
 - Published map document containing an image layer
- **Other**
 - Globe service, mobile service, geodata service...

Image service versus map service

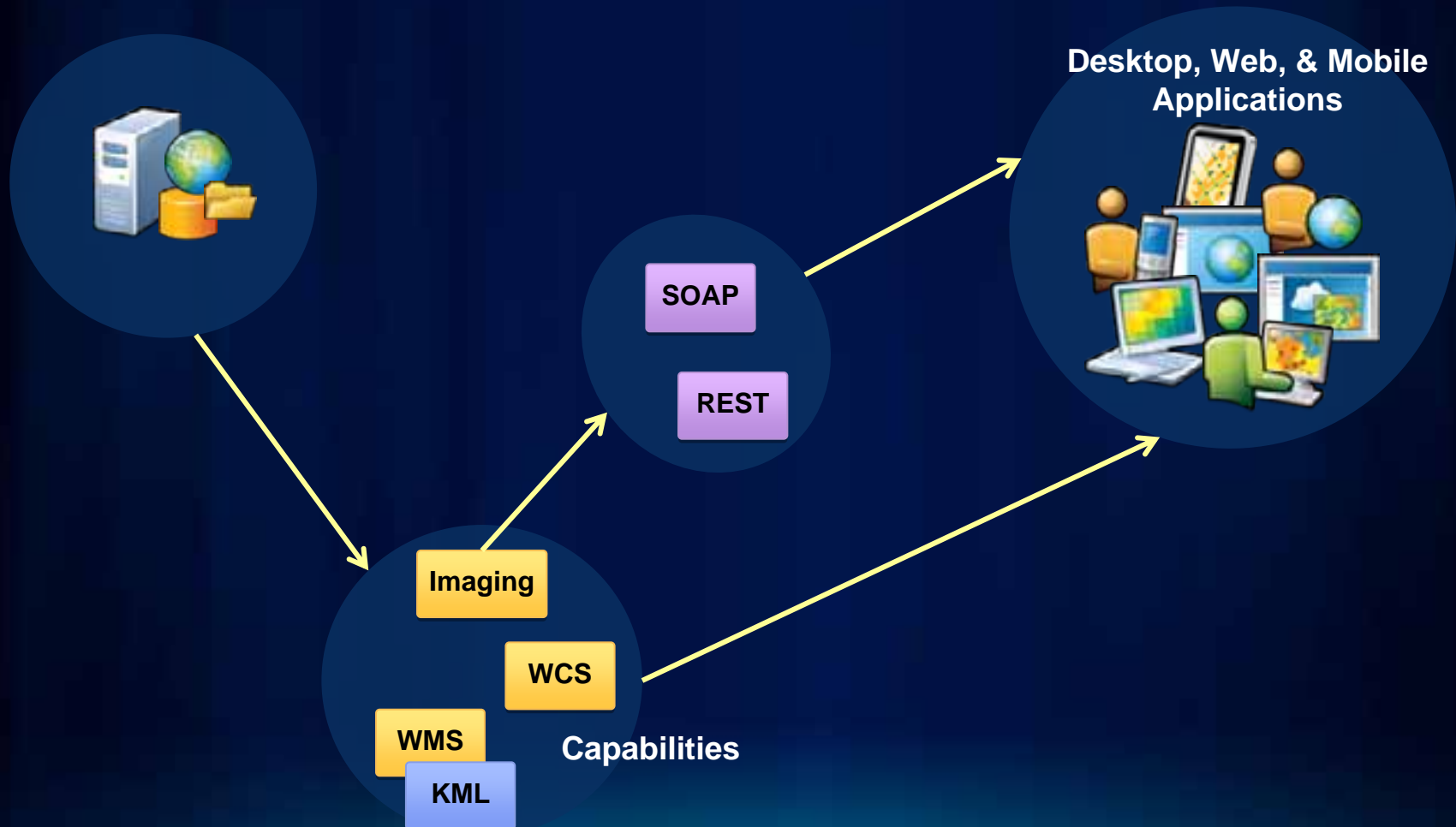
Image service	Map service
Serves imagery (raster data) directly	Serves a map document containing imagery or vector data
Layer properties can be altered by client <ul style="list-style-type: none">• Compression• Rendering• Band combinations	Client views map service as it was designed Client cannot change layer properties
Can be saved as a layer and used as a data source	Can build cache

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)



How can you access an image service?



Publishing an image service

- **Same process as publishing any service with ArcGIS Server**
 - via ArcCatalog
 - via Server Manager
- **Properties unique to image services**
 - Capabilities
 - Parameters
- **Some capabilities are specific to the data**

ArcGIS Server 10 Image Extension

- A license (not a separate install)
- It extends the capabilities to serve mosaic datasets or a raster layer using the Mosaic function

Serving:

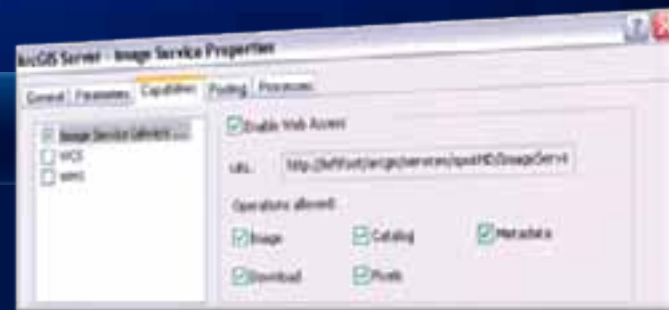
- Rasters
- Raster layers
- *Mosaic datasets
- *Mosaic dataset layers



ArcGIS Server



Image service capabilities



- Limits what 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: 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

- Controls or limits the access users have to metadata and the catalog fields
- 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

Sharing your image service

- On premise
- Web
- **ArcGIS.com**
- Cloud

Publishing image services

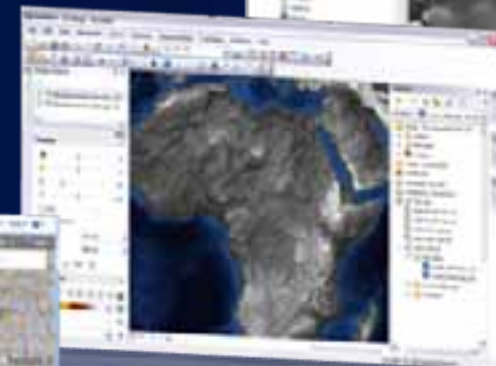


Using image services



Example Desktop applications

- **ArcGIS (ArcMap, ArcGlobe, Explorer)**
 - Access to image services supported through ArcGIS Server connections
 - Image services behave like other raster layers
- **Google Earth (using KMZ/KML)**
- **Gaia (OGC services)**



ArcGIS Explorer Online

Using image services in geoprocessing

- Image services can be used in geoprocessing tools as raster data
- Use Make Image Server Layer tool when:
 - Using an image service in a model or script
 - To define an extent
 - When using it within a geoprocessing service



Using image services in mobile applications

- **Mobile applications make live connections to image services**
- **If not live**
 - **Export image from image service**
 - **Use map cache containing the image service (in mxd)**



Using image services in web applications



Image services and web applications


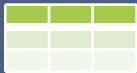

- Same display qualities of Desktop applications
- Supported through SOAP, REST, WMS, WCS, KML
- REST and SOAP support modifying all image service layer properties
 - Transmission compression
 - Band combinations
 - Mosaic methods and properties
 - Resampling
- Open to allow mash-ups
- Geoprocessing services can use image services

ArcGIS.com

- Where you can create maps you share over the web, desktop, and on mobile devices
- Connect to image services using REST
- My Map
- ArcGIS Explorer Online



Image service REST API

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

ExportImage enhancements

- Specifies how and what to get from the server
- bbox, size, SR, pixel type, compression, format, etc.
- MosaicRule

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

- RenderRule

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

Supported raster functions:

Aspect	ShadedRelief
Colormap	Hillshade
NDVI	Statistic
Slope	Stretch

ExportImage enhancements: Time

- Time

Syntax =<timeInstant>

Example: time=1199145600000

(1 Jan 2008 00:00:00 GMT)

Syntax: time=<startTime>, <endTime>

Example: time=1199145600000, 1230768000000

(1 Jan 2008 00:00:00 GMT to 1 Jan 2009 00:00:00 GMT)

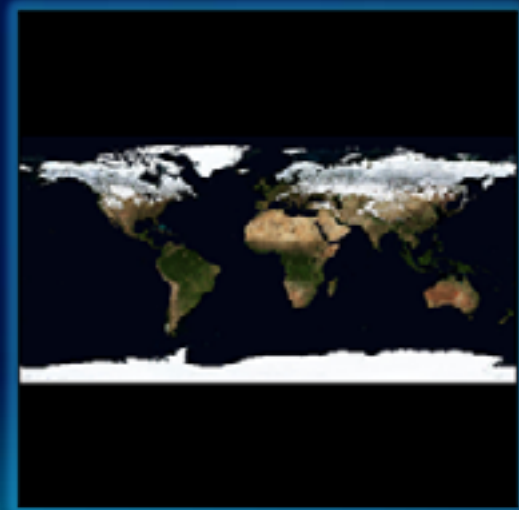
ExportImage enhancements: Image format

- `jpgpng | png | png8 | png24 | jpg | bmp | gif | tiff`
- **JPGPNG** returns a **JPG** if there are no transparent pixels in the requested extent, otherwise it returns a **PNG**.
 - **JPG** – smaller & faster
 - **PNG** – provides transparency
- ***Syntax example: format=png24***

REST address example

<http://<myserver>/ArcGIS/rest/services/<MyImage>/ImageServer/exportImage?>

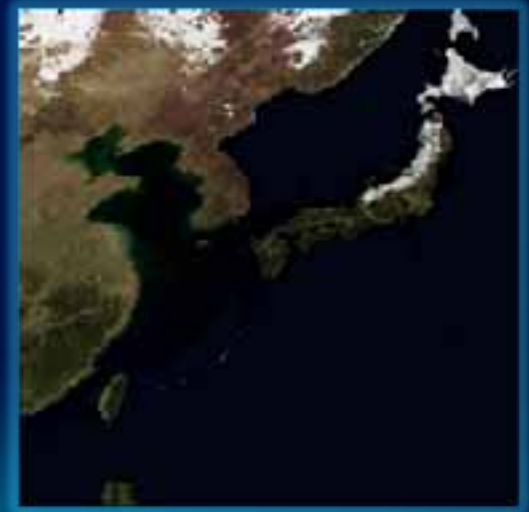
<http://sampleserver3.arcgisonline.com/ArcGIS/rest/services/World/MODIS/ImageServer/exportImage?>



REST address example

`http://<myserver>/ArcGIS/rest/services/<MyImage>/ImageServer`

`http://sampleserver3.arcgisonline.com/ArcGIS/rest/services/World/MODIS/ImageServer/exportImage?bbox=115,34,146,31&bboxSR=4326&format=jpg&pixelType=U8&interpolation=RSP_NearestNeighbor&compressionQuality=85`



ArcGIS services directory

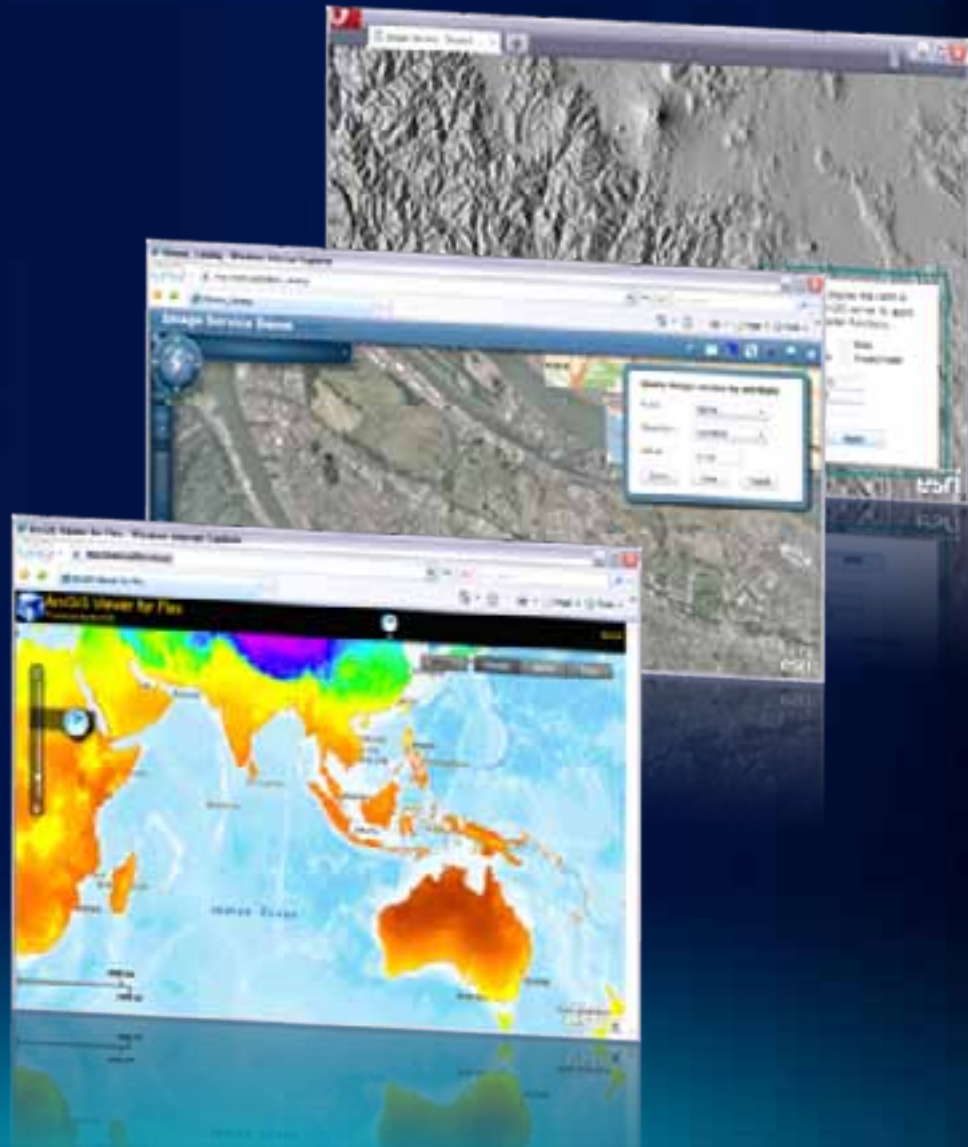


Web applications using APIs



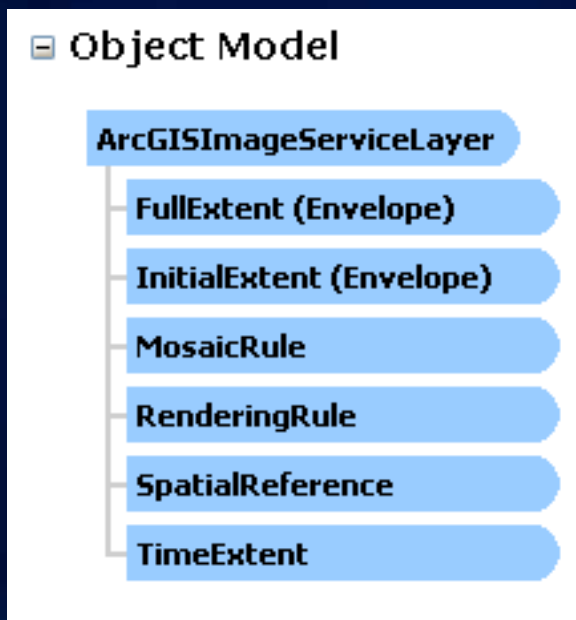
Building web applications

- JavaScript
- Flex
- Silverlight/WPF



ArcGISImageServiceLayer class

- Allows you to work with an Image Service resource exposed by the ArcGIS Server REST API



Dynamic imaging and mosaicking



Accessing image service catalog items



Interrogating image services



Summary

- **Introduction to mosaic datasets**
- **Options for sharing image and raster data**
 - **Packages**
 - **Services**
- **Image services capabilities**
- **How to use image services**
 - **Desktop applications**
 - **In ArcGIS.com**
 - **In Web applications**

Questions?



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