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

- Imagery is processed as it is accessed
- Can create multiple products from one source
- Processing
  - Image enhancement
  - Combine bands
  - Color correction
  - Orthorectification
  - Pan-sharpen
  - Shaded relief, hillshade
- Define processing functions
  - On each raster dataset
  - On a mosaic dataset
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 .lpk 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

<table>
<thead>
<tr>
<th>Image service</th>
<th>Map service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serves imagery (raster data) directly</td>
<td>Serves a map document containing imagery or vector data</td>
</tr>
</tbody>
</table>
| Layer properties can be altered by client  
  - Compression  
  - Rendering  
  - Band combinations | Client views map service as it was designed |
| Can be saved as a layer and used as a data source | Client cannot change layer properties |
|               | 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?

Capabilities

- WCS
- WMS
- KML

SOAP

REST

Desktop, Web, & Mobile Applications

Imaging

Applications: Desktop, Web, & Mobile
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
Image service capabilities

- Limits what users can do with your Web service

<table>
<thead>
<tr>
<th>Capability</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td>Allows the image to be displayed (Absorbed the Mosaic operation in 9.3x)</td>
</tr>
<tr>
<td>Metadata</td>
<td>Allows the client to see metadata for the image service and for each raster in a mosaic dataset</td>
</tr>
<tr>
<td>Catalog</td>
<td>Allows the client to open the table of a mosaic dataset when it is served</td>
</tr>
<tr>
<td>Download</td>
<td>Allows rasters to be downloaded when serving a mosaic dataset</td>
</tr>
<tr>
<td>Pixels</td>
<td>Allows the API developer to access the pixel blocks of the individual rasters in a mosaic dataset</td>
</tr>
</tbody>
</table>
Image service parameters: Image

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>RD</th>
<th>MD</th>
<th>Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max image size per request</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Default resampling method</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Compression methods and quality</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Max # of rasters per mosaic</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowed mosaic methods</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>MD</th>
<th>Max # of records returned per request</th>
<th>✔</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raster metadata level</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>Allowed fields</td>
<td>✔</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Sources</th>
<th>Operations</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mosaic dataset</td>
<td>ExportImage</td>
<td>An image in a supported format</td>
</tr>
<tr>
<td>Raster dataset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mosaic dataset</td>
<td>Query\textsuperscript{new}</td>
<td>A list of catalog items</td>
</tr>
<tr>
<td>Mosaic dataset</td>
<td>Download\textsuperscript{new}</td>
<td>A list of file IDs for download</td>
</tr>
<tr>
<td>Mosaic dataset</td>
<td>Identify\textsuperscript{new}</td>
<td>Pixel values and lists of catalog items</td>
</tr>
<tr>
<td>Raster dataset</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ExportImage enhancements

- Specifies how and what to get from the server
- `bbox`, `size`, `SR`, `pixel type`, `compression`, `format`, etc.
- MosaicRule
  ```json
  { "mosaicMethod" : "esriMosaicLockRaster", "lockRasterIds" : [32, 454, 14] }
  ```
- RenderRule
  ```json
  { "rasterFunction" : "Slope",
    "rasterFunctionArguments" : {
      "ZFactor" : 0.3
    },
    "variableName" : "DEM"
  }
  ```

Supported raster functions:
- Aspect
- ShadedRelief
- Colormap
- Hillshade
- NDVI
- Statistic
- Slope
- Stretch
ExportImage enhancements: Time

- Time
  
  Syntax: \(<\text{timeInstant}>\)
  
  Example: \(\text{time}=1199145600000\)
  
  (1 Jan 2008 00:00:00 GMT)

  Syntax: \(\text{time}=<\text{startTime}>, <\text{endTime}>\)
  
  Example: \(\text{time}=1199145600000, 1230768000000\)
  
  (1 Jan 2008 00:00:00 GMT to 1 Jan 2009 00:00:00 GMT)
ExportImage enhancements: Image format

- `jpeg` | `png` | `png8` | `png24` | `jpg` | `bmp` | `gif` | `tiff`
- **JPG/PNG** 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?

REST address example

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

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?