Presentation Overview

- Imagery and raster data
- What is a mosaic dataset
- Use of mosaic datasets
- Build a mosaic dataset
- Migrate to mosaic datasets

- Q&A
Characteristics of Imagery and Raster Data

• Many sources
  - Aerial photographs
  - Satellite imagery from many sensors
  - DEM and scanned maps
  - Analytical data

• High resolution and large volume

• Requirements:
  - Store efficiently
  - Easy to search
  - Fast to process
  - Accessible
Evolution of Raster Data Models in ArcGIS

- **Raster dataset (8.0)**
  - A single image

- **Raster catalog (9.0)**
  - A collection of raster datasets
  - Managed/unmanaged

- **Image Server (9.2)**

  - **Mosaic dataset (10.0)**
    - Enhanced raster catalog with mosaic view and on the fly processing capability
    - Managing and serving a collection of images
Raster Datasets

• Formats
  - TIFF (bigTIFF), Mrsid, JP2000, NITF, CADRG, Geodatabase raster etc
  - Compress: JPEG/LZW/LZ77/PackBits/CCITT

• Pyramids
  - Reduced resolution copies of the source
  - Improve display performance
  - Support three resample methods
  - Can be compressed

• Statistics
  - Enhance visual display

• Build Pyramids and Statistics tool
  - Support mosaic dataset
Mosaic Dataset

• A GDB data model for managing and serving image collections
• Supported in FGDB/PGDB/SDE
  - Do NOT store pixels but reference them

• Advantages
  - Reduce processing time and storage
  - Catalog large image collection fast
  - Seamless display at all scales
  - Multiple sensors and metadata
  - Streamline update and maintain quality
Mosaic Datasets – Storage Schema

- A composite layer in ArcMap
  - Footprint/boundary/seamline
  - Image

- Stored as a set of internal geodatabase tables

<table>
<thead>
<tr>
<th>Name</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog</td>
<td>A raster catalog that stores function rasters and the footprints</td>
</tr>
<tr>
<td>Boundary</td>
<td>A feature class that defines the mosaic dataset boundary</td>
</tr>
<tr>
<td>Seamline</td>
<td>A feature class that maintains the seamlines for advanced mosaicking operations</td>
</tr>
<tr>
<td>Raster Type</td>
<td>A table holding each raster type instance</td>
</tr>
<tr>
<td>Log</td>
<td>A table that logs operations that have been performed</td>
</tr>
</tbody>
</table>
Mosaic Datasets – Catalog Table

<table>
<thead>
<tr>
<th>OID</th>
<th>Shape</th>
<th>Raster</th>
<th>Name</th>
<th>MinPS</th>
<th>MaxPS</th>
<th>LowPS</th>
<th>HighPS</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Polygon</td>
<td>&lt;Raster&gt;</td>
<td>P01.met</td>
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<td>90</td>
<td>10</td>
<td>30</td>
<td>Primary</td>
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<td>Polygon</td>
<td>&lt;Raster&gt;</td>
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<td>90</td>
<td>10</td>
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<td>Primary</td>
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<tr>
<td>5</td>
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<td>filename1.tif</td>
<td>90</td>
<td>270</td>
<td>90</td>
<td>90</td>
<td>Overviews</td>
</tr>
</tbody>
</table>

- **A special raster catalog**
  - Shape field stores the footprints
  - Raster field stores function raster datasets

- **Function raster datasets**
  - Store references to the image along with processing
  - Process on the fly during access

- **MinPS and MaxPS define the visibility ranges of the rasters**
Mosaic Dataset – Overviews

- Fast and seamless display
- Overview vs. Pyramids
  - Overviews for mosaic dataset
  - Pyramids for raster dataset
- A set of resampled rasters
  - Multiple levels
  - Each level has multiple tiles
  - Each tile is a tiff file

Overview: 180m (range: 180-1800)
Overviews: 60m (range: 60-180)
Sources: 20m (range: 0-60)
PS=100
Mosaic Dataset – Mosaic Rules

• Control which raster/pixels to display

• Mosaic method to sort the rasters
  - Closest to center (default)
  - By attribute
  - Closest to nadir
  - North west
  - Seamline

• Mosaic operator to resolve the overlaps
  - First/Min/Max/Mean/Blend

Closest to the center

By attribute: cloud cover
Use of Mosaic Dataset

- Use as a catalog
  - Selection/query
  - Add selected images to Map
  - View raster and metadata
  - Time aware

- Use as a raster dataset
  - Seamless display
  - Export a raster dataset
  - Use as an input to geoprocessing tool
Use of Mosaic Dataset (Continue)

• Serve as an image service
  - Similar functionality as local mosaic dataset
  - Access as a catalog
    - Select/download selected images
    - Time aware
  - Access seamless mosaic
  - REST
  - WCS/WMS

• Image Extension license
Demo: Using Mosaic Datasets
Build a Mosaic Dataset

- Mosaic dataset toolset
- Automate with model and python

Typical workflow
- Create a mosaic dataset
- Add rasters
  - Calculate cell size range
  - Build boundary
- Build overviews (optional)
- Edit properties (optional)
Build a Mosaic Dataset - Create

- Create table schema and define pixel properties

- Spatial reference (required)
  - Used in footprints and overviews
  - Can be different from input
  - Datum consideration

- Number of bands
  - Taken from the first added raster

- Pixel type
  - Taken from the first added raster
Build a Mosaic Dataset – Add Rasters

- Specify a raster type
  - Define the format to crawl
  - Metadata to read and fields to create
  - Processes to apply

- Support many raster types
  - Raster Dataset/NITF/CADRG/etc.
  - QB/IKONOS/Landsat/WVI/WVII/etc
  - Web Services
  - Table/Image Service Definition
Build a Mosaic Dataset – Cell Size Ranges

- MinPS and MaxPS define the visibility of the rasters
- Use Calculate Cell Size Ranges tool
- Based on source and overlaps
- Default cell size range factor is 10

<table>
<thead>
<tr>
<th>OBJECTID *</th>
<th>Raster</th>
<th>Name</th>
<th>MinPS</th>
<th>MaxPS</th>
<th>LowPS</th>
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<tbody>
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<td>11.338233</td>
<td>0.566912</td>
<td>1.133823</td>
<td>1</td>
<td>Dataset</td>
</tr>
</tbody>
</table>

- 30m visible range 30-300
- 5m visible range 0-50 → 5-30
- 1m visible range 0-5
Building a Mosaic Dataset – Background

• Footprint
  - Build Footprint tool
  - Edit using Editor
  - Import Mosaic Dataset Geometry tool

• Define NoData
  - Based on a value
  - Based on a range
Build a Mosaic Dataset - Boundary

- Define the boundary of the mosaic dataset
  - Pixels outside the boundary will be clipped

- Build using Build Boundary tool
  - Calculated based on footprints

- Can be modified using Editor
  - Import Mosaic Dataset Geometry tool
Build a Mosaic Dataset – Overviews

- **Build Overviews tool**
  - Generate overview images

- **Define Overviews tool**
  - Redefine the default parameters

- Optionally add an external raster as overview

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<td>30</td>
<td>Primary</td>
</tr>
<tr>
<td>3</td>
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<td>filename1.tif</td>
<td>90</td>
<td>900</td>
<td>90</td>
<td>90</td>
<td>Overviews</td>
</tr>
<tr>
<td>4</td>
<td>Polygon</td>
<td>&lt;Raster&gt;</td>
<td>filename2.tif</td>
<td>90</td>
<td>900</td>
<td>90</td>
<td>90</td>
<td>Overviews</td>
</tr>
</tbody>
</table>

Default overview parameters:
- TIFF format with JPEG
- Size is 5120x5120
- Factor of 3
- Overview location
Build Mosaic Dataset – Advanced Processing

• **Color Correction**
  - Based on a calculated color surface
  - Based on an existing target raster
  - Support excluded area

![Before](image1.png) ![After](image2.png)

• **Seamlines**
  - Used for seamline mosaicking
  - Build Seamlines GP tool
  - Edit and Import seamlines
Demo: Build Mosaic Datasets
Mosaic Dataset – Update

- Add new rasters from a folder
  - Synchronize Mosaic Dataset tool
    - Identify new data in the folder
    - Add Raster tool

- Source rasters are changed
  - Changes in geometric/metadata/etc.
  - Run Synchronize Mosaic Dataset tool

- Remove Rasters
  - Use Remove Rasters from Mosaic Dataset tool
Mosaic Dataset – On-the-fly Processing

- Process image on-the-fly
  - Image enhancement
  - Orthorectification, Pan-sharpen
  - Shaded relief, hillshade, etc

- Add at mosaic dataset level
- Add at raster level
  - Apply to the raster
Reference Mosaic Dataset

- References an external mosaic dataset or raster catalog
  - Supported in GDB and file (.amd)
  - Catalog table is read-only

- Created by specifying
  - Definition query
  - Area of interest

- Provides multiple views of the source mosaic dataset
- Prevents editing of the source mosaic dataset

Boundary = My County
Where Sensor = Landsat and Cloud <10%
Add NDVI processing
Mosaic Dataset - Derived

• Adding mosaic datasets to a mosaic dataset
  - Using Table raster type
  - Copy all records and the raster type to the master mosaic dataset

• Adding selected items of a mosaic dataset
  - Save as a mosaic layer
  - Add mosaic layer use Table type
  - Selected records will be added to mosaic dataset
Image Management Patterns

- Create mosaic datasets with data of similar type
  - Elevation
  - Ortho images of same date
  - QuickBird/IKONOS
  - Landsat 5 or 7

- Create derived mosaic datasets if needed

- Create referenced mosaic datasets
Demo: Reference Mosaic Dataset
Moving a Mosaic Dataset

• Move all
  - Copy the FGDB where the mosaic dataset resides
  - Copy the source and overview images
  - Use Repair dialog to repair the paths

• Extract a portion
  - Create a new folder
  - Create a target File geodatabase
  - Use Distributed Geodatabase toolbar
  - Copy/move the whole folder
Migrating to Mosaic Datasets

• From Image Server Service Definition
  - Create a mosaic dataset
  - Use Image Service Definition raster type
  - Add the ISDef file

• Raster Process Definition raster type

<table>
<thead>
<tr>
<th>Image service Definitions</th>
<th>Mosaic dataset</th>
</tr>
</thead>
<tbody>
<tr>
<td>.\Amberg.ISDef</td>
<td>Mosaic dataset</td>
</tr>
<tr>
<td>ImageService.ISDef</td>
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</tr>
<tr>
<td>Footprint.dbf</td>
<td>Footprint feature class</td>
</tr>
<tr>
<td>Boundary.dbf</td>
<td>Boundary feature class</td>
</tr>
<tr>
<td>Seaml ine.dbf</td>
<td>Seaml ine feature class</td>
</tr>
<tr>
<td>.\RPDefs\rasteris.RPDef s</td>
<td>Function raster datasets</td>
</tr>
</tbody>
</table>
Migrating to Mosaic Datasets (Continue)

- From a raster catalog
  - Create a mosaic dataset
  - Use Table type to add
  - Raster datasets are re-added as function raster datasets

- Find the source data and re-create mosaic dataset
Demo: Migrate to Mosaic Dataset
Summary

- Mosaic dataset advantages
- Usage of mosaic datasets
- How to build a mosaic dataset
- Reference and derived mosaic datasets
- Update and deploy mosaic datasets
- Migrate to mosaic dataset
What is New for Mosaic Dataset in 10.1

• Support more raster types
  - LAS, LASDataset, Terrain
  - Radarsat2, Kompsat, Formosat

• Many New tools
  - Analyze Mosaic Dataset
  - Edit Raster Function
  - Set Mosaic Dataset Properties
  - Alter Mosaic Dataset Schema

• New raster functions
  - Remap Function/Band Arithmetic Function/Attribute Table Function

• Enhancements
  - Automatic seamline generation
  - Calculate footprint by geometry
  - Create good looking mosaic dataset easily
Additional Information

Technical workshops:
- Introduction to Imagery and Raster Data in ArcGIS (Tue: 1:30, Wed: 3:15)
- Sharing Imagery and Raster Data in ArcGIS (Weds: 1:30)
- Satellite and Aerial Imagery Support in ArcGIS (Thursday 10:15)

Additional resources:
- Desktop/Online Help
- Imagery section at resources.arcgis.com

Fill evaluations online
Questions?
Evaluations

Fill evaluations online

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THANK YOU VERY MUCH FOR ATTENDING!