Managing Imagery and Raster Data Using Mosaic Datasets

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Presentation Overview

- Introduction to mosaic datasets
- Build a mosaic dataset
- Design and serve mosaic datasets in your organization
- Maintain and update
- Q&A
Why Mosaic Dataset?

• A lot of images
  - Ortho images, DEM, scanned maps -> mosaic
  - Sensor images -> process
  - Manage and catalog-> search and retrieve

• Advantages
  - Store efficiently (reference images)
  - Process fast (on-the-fly)
  - Scalable
  - Search easily (selection and query)
  - Update easily
  - Multiple clients
Mosaic Dataset - Storage

- A model in geodatabase
- Stored as set of tables
  - Footprint table references source images
  - Boundary, Seamlines
  - Raster type, color correction
- Displayed as a composite layer in Map
  - Boundary
  - Footprint
  - Image
Mosaic Dataset – Mosaic Method

- Mosaic method to set the display order
  - North west (default)
  - Closest to center
  - By attribute
  - Closest to nadir
  - Seamline

- Mosaic operator to resolve the overlaps
  - First/Min/Max/Mean/Blend
Mosaic Dataset – Overviews and Visibility

- Overviews are resampled rasters added in the footprint table
- Increase visible range of mosaic dataset
- Fast image display at all levels of details
- MinPS and MaxPS define the visible range of items

<table>
<thead>
<tr>
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<th>Shape</th>
<th>Raster</th>
<th>Name</th>
<th>MinPS</th>
<th>MaxPS</th>
<th>LowPS</th>
<th>HighPS</th>
<th>Category</th>
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<td>Polygon</td>
<td>&lt;Raster&gt;</td>
<td>Filename3.tif</td>
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<td>400</td>
<td>400</td>
<td>Overviews</td>
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Use of Mosaic Dataset

- Produce orthorectified seamless mosaic product
  - Ortho quad products (7.5 or 3.75 minutes) using Split Raster tool

- Use as an input in raster analysis

- Manage and catalog images
  - Query and search
  - Time aware

- Publish as image service for web
  - Seamless mosaic and image catalog
Mosaic Dataset Basics
Build a Mosaic Dataset

- Getting data to mosaic dataset
  - Create a mosaic dataset
  - Adding rasters
- Editing rasters in mosaic dataset
- Making mosaic dataset look good
Creating a Mosaic Dataset
Create Mosaic Dataset tool - Create footprint table

- Define spatial reference
  - Spatial reference defined in your organization
  - Web Mercator

- Number of bands and pixel types

- Product definition
  - Used for automatic band matching
  - Examples: RGB, RGBA, Landsat, etc
Adding Rasters – Raster Type

Add Rasters to Mosaic Dataset tool - Populate field values

• Defines what data to add
  - Processing template
  - Construct a raster function
  - Fields for footprint table
    - Sensor, CloudCover, etc.

• Examples:
  - Raster Dataset, NITF, QuickBird etc

• Raster types for sensor images
  - Use DEM for orthorectification
  - Use Gram-Schmidt for pansharpen
Adding Rasters – Raster Function
Populate values for raster field

- Raster field contains processed raster
  - Created by applying raster function at run time
- Raster function
  - Defines a processing algorithm
  - Input images, parameters
- Process pixels on-the-fly
Statistics and Pyramids of Source Images

Build Pyramids and Statistics tool

- Pyramids
  - Speed up raster display
- Statistics
  - Used in raster function
- Calculate before adding data from a folder
- Tips
  - No need to calculate statistics on processed images
  - Pyramids speed up statistic calculation of large skip factor
  - Skip factor should be 2x2 for Gram-Schmidt pansharpen raster
Calculate Mosaic Dataset Item Visibility

Using Calculate Cell Size Ranges tool

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- MinPS and MaxPS define the visibility of these rasters
- Calculated based on resolutions and overlaps
  - Default cell size range factor is 10
- Can be set using field calculator

5m visible range 0-50 → 5-30
1m visible range 0-5
Build a Mosaic Dataset

- Adding data to mosaic dataset
- Editing rasters in mosaic dataset
  - Georeferencing
  - Footprint
  - Raster function
- Make mosaic dataset look good
Refine Mosaic Dataset Georeferencing
Using Register Raster tool

- Apples to certain data where georeferencing is not precise
- Automatic image registration
- Register Raster tool
  - Takes mosaic dataset as input
  - Matching each item to a given target
    - Use world imagery on ArcGIS Online as target
  - Matching MS to Pan of the pansharpen rasters
Handling the Image Background
Use Build Footprints and Set NoData tools

- **Build Footprints**
  - Optionally edit using Editor
  - Optionally import from an external file
  - Black pixels excluded

- **NoData tool**
  - Based on a value or a range
  - Nodata pixels included

- **ArcMap’s Editor to edit**
Build Boundary

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

Automatically generated based on footprints
  - Can be modified using Editor
  - Import Mosaic Dataset Geometry tool
Refine Radiometry

Insert, remove, edit raster function

- Edit mosaic dataset or one item
  - From function tab
- Edit multiple items
  - Make a selection
  - using raster function batch editor

The Edit Raster Function tool
- For editing item(s) or mosaic dataset
Mosaic Dataset – Merge Items

Merge Mosaic Dataset Items tool

• Merge multiple mosaic dataset items into one
• Applies to certain cases
  - Merge images of same metadata
    - IKONOS case
  - Option in the raster type
  - Reduce table size/ Remove slivers
    - Avoid merging large number of terms
Adding data
Build a Mosaic Dataset

- Adding data to mosaic dataset
- Editing rasters in mosaic dataset
- Make mosaic dataset look good
  - Color correction
  - Seamlines
  - Overviews
Calculate Statistics for the Items

Use Build Pyramids and Statistics tool

- Statistics in multiple places
  - Source raster dataset
  - Mosaic dataset item (processed raster)
  - Mosaic dataset

- Use Build Pyramids and Statistics tool
  - Input is a mosaic dataset
  - Required by color correction operation
Color Correcting Mosaic Dataset
Use Color Balance Mosaic Dataset tool or Color Correction window

- Based on a calculated color surface
  - Single color, color grid
  - First, second, third polynomial
- Based on an existing target raster
  - World imagery service
- Support excluded area

Before

After

Use Color Balance Mosaic Dataset tool or Color Correction window

Color Correction
- None
- 1
- Dodging
- Color grid
- Enable Color Correction
- Correct Color

Building Seamlines

Use Build Seamlines tool

- A feature class stored in the seamline table
- Generate seamlines automatically
- Edit and import seamlines

Used by Seamline mosaic method
  - Blend along the seamlines with a default width

Define Seamline as default method from mosaic dataset property page
Building Overviews

Using Build Overviews tool

• Build Overviews tool create images with default
  - TIFF with JPEG compression
  - Size of 5120x5120
  - Factor of 3

• Use Define Overview tool to refine the parameters

• Add a raster dataset as an overview
  - Create a tile cache using Manage Tile Cache tool and as an overview
Analyzing Mosaic Datasets
Using Analyze Mosaic Dataset tool

• Identify errors and provide performance tips
  - Check raster
  - Check footprint geometry
  - Check function chain
  - Check broken path
  - Performance
  - etc.

• Recommended for publishing as image services
Make mosaic look good
Updating and Synchronizing Mosaic Dataset

Using Synchronize Mosaic Dataset GP tool

- Update existing items
  - Any change in source images
  - Any change in rasters
  - Option to maintain the existing fields
- Add new rasters
- Remove items of broken source
- Data must be added from folder mosaic datasets
Moving Mosaic Dataset

- **Copy from OS**
  - Copy the file mosaic dataset (.gdb)
  - Copy the source and overview images
  - Repair path using Repair dialog
    - Or Repair Mosaic Dataset Paths GP tool
  - Auto repair capability

- **Use Distributed Geodatabase toolbar**
  - Extract all or a portion to a designated folder and .gdb
  - Source files and overview copied
  - Path repaired
Publish Image Services

- **Capabilities**
  - Mosaicking, catalog
  - Mensuration, editing

- **Parameters**
  - Transmission format (JPEG, LZ77/LERC)
  - Mosaic methods
  - etc

- **Server raster functions**
  - Register using function template
  - response to client’s request
  - server side on-the-fly image processing
Reference and Derived Mosaic Datasets

Create Reference Mosaic Dataset tool

- Source mosaic dataset
  - References source images
- Reference mosaic dataset
  - References an external mosaic
  - Read only
  - Multiple views of source mosaic
- Derived mosaic dataset
  - Table type to copy rows
  - Raster Dataset type add as one row
- Support update mechanism
Designing Mosaic Datasets

- Source mosaic dataset contains similar type
  - Elevation
  - Ortho images of same date
  - QuickBird, IKONOS
  - Landsat 5 or 7
- Derived mosaic datasets
  - Centralize your data
- Referenced mosaic datasets
  - Multiple products
  - Protect your data
- Use server raster function
  - Reduce the number of services
  - Build server side processing Applications
Publish Mosaic Dataset as an Image Service
What is New for Mosaic Dataset in 10.2

• Support more raster types
  - Landsat 8, SPOT 6, DMCii, Pleiades-1, Socet Set (.sup file)
  - Raster Types for Chinese Satellite Imagery
    - ZY-3, ZY-1 02C, HJ 1A/1B
    - free plug-in

• Local function
  - Logical, conditional, mathematical operations

• New tools
  - Merger Mosaic Dataset Items
  - Split Mosaic Dataset Items
  - Compute Pan-sharpening Weights

• Search Imagery
  - Based on key properties (sensor name, cloud cover, etc.)
Summary

- Mosaic dataset is an effective model to manage large image collections
- Workflows and tips of building mosaic datasets
- Using source mosaic dataset, derived mosaic dataset, reference mosaic dataset, and server raster functions to manage and publish data in your organization
- Additional resources:
    - Imagery tutorial
    - Image management workflows (topics and scripts)
    - Image blogs

Thank you...

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