Using the Imagery Template

Copyright © 1995-2012 Esri All rights reserved.

Table of Contents

Copyright © 1995-2012 Esri. All rights reserved.

Using the Imagery template

The Imagery template is part of the basemap category of Esri defense and intelligence templates. Basemaps are designed to help you more quickly get your bearings in your map.

The Imagery template and walk-through exercises in this document are designed to teach you how to add military imagery data in CIB format to mosaic datasets, publish an image service, and cache the image service.

A few of the advantages of using mosaic datasets to store military raster data

- Mosaic datasets are designed to handle rasters of different resolutions, making it easy to store, manage, and distribute the various resolutions of CIB data to users through direct access or through image services.
- Mosaic datasets support loading data with the CIB raster type, which extracts NITF information from the raster metadata and stores it in the mosaic dataset attribute table. Loading data using this raster type also provides update logic that is appropriate for CIB data to ensure that only the latest data is stored.
- Mosaic datasets allow you or your users to select and download rasters in their native CIB data format.

The walk-through exercises in this document shows you how to:

- In the Populating mosaic datasets with CIB exercise, use tools that come with the template to add sample CIB data for Ft. Irwin, California to mosaic datasets. The same instructions and tools that you use in this exercise can be used to create and populate mosaic datasets with your own CIB data.
- In the Publishing a CIB mosaic dataset to ArcGIS Server exercise you will learn how to publish the mosaic dataset populated in the previous exercise as an ArcGIS Server cached image service.

Copyright © 1995-2012 Esri. All rights reserved.

Populating mosaic datasets with CIB data

Complexity:
Beginner

Data Requirement:
ArcGIS.com

Data Path:
C:\ArcGISForDefense\Basemaps\Imagery

Goal:
Create and populate mosaic datasets with sample CIB data.

This section provides a walk-through exercise that shows you how to create and populate mosaic datasets with CIB data to match the sample populated mosaic dataset provided in the Imagery template. The sample populated mosaic dataset is provided to let you see what the end result of the exercise should be before you begin the exercise. To view the populated mosaic dataset, open the .mxd file that came in the template .zip file. Details on the map, data, and tools provided in the template are in the "Template contents" section of Getting Started with the Imagery Template document.

In the exercise, you will use ArcGIS for Desktop geoprocessing tools, as well as geoprocessing tools and sample CIB, Landsat, and NASA Blue Marble Next Generation data provided in the template. Although the tools provided in the template execute ArcGIS for Desktop geoprocessing tools, which are available for you to use, the advantage to using the template tools is that certain tool parameters have already been set appropriately for adding CIB data to mosaic datasets.

⚠ **Caution:** If you extracted the template .zip file to a directory other than the one recommended in the Getting Started with the Imagery Template guide, C:\ArcGISForDefense\Basemaps\Imagery, make note of the directory you extracted the zip file to and use it in place of C:\ArcGISForDefense\Basemaps\Imagery in all the exercise steps that follow.

Start ArcMap

You can create and populate mosaic datasets either by running tools within ArcCatalog or ArcMap; for the purpose of this exercise you will use ArcMap. See Starting ArcMap for more information.

Disable background processing

Geoprocessing tools can run in the background so that you can continue to interact with ArcMap while the tools run. For this exercise, disable background processing so that you can more easily see the tool output as each tool runs. See Foreground and background processing for more information.

Set raster file format search mode to use file extensions

The template tools used to add data to mosaic datasets execute the **Add Rasters To Mosaic Dataset** tool that comes with ArcGIS. Just like other ArcGIS raster tools, this tool uses the search mode option set in the ***ArcMap Options*** dialog to determine what datasets in a workspace are rasters. The fastest search mode is to use the file extension, so set the Search Mode to **Search only files that match the following file extensions to find valid raster formats**.

For instructions on how to set this search mode, see Displaying specific raster formats. Within the **Raster Formats** list, ensure that all format name entries that start with "CIB" are checked as well as the "JP2" format entries.

Copyright © 1995-2012 Esri. All rights reserved.

Create a file geodatabase

Mosaic datasets can be created in file, and enterprise geodatabases. To replicate the geodatabase in the template, create a file geodatabase named Imagery located under the folder C:\ArcGISForDefense\Basemaps\Imagery. See Creating a file geodatabase from the Catalog tree for more information.

Create a mosaic dataset

Create a mosaic dataset in the geodatabase you created using the **Create CIB Mosaic Dataset** tool located in the **ImageryTools** toolbox that is provided in this template. This tool executes the ArcGIS for Desktop **Create Mosaic Dataset** tool with the Number of Bands (3) and Pixel Type (8 bit unsigned) parameters set appropriately for storing CIB data and RGB imagery typically used in an imagery basemap. See Creating and adding military data to mosaic datasets for more information.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\Imagery\Toolboxes and expand the ImageryTools toolbox.
2. Open the **Create CIB Mosaic Dataset** tool.
3. Set the **Output Workspace** parameter to the `C:\ArcGISForDefense\Basemaps\Imagery\Imagery.gdb` file geodatabase.
4. Set the **Output Mosaic Dataset Name** parameter to `Imagery`.
5. Set the **Coordinate System** parameter to `WGS_1984_Web_Mercator_Auxiliary_Sphere` (navigate to Projected Coordinate Systems\World\WGS 1984 Web Mercator (auxiliary sphere)). This coordinate system is used because it is the same coordinate system used by Esri ArcGIS Online services.
6. Run the tool.

Add CIB rasters to the mosaic dataset

Add CIB data to the mosaic dataset using the **Add CIB Rasters To Mosaic Dataset** geoprocessing tool located in the **ImageryTools** toolbox that is provided in this template. This tool executes the ArcGIS for Desktop **Add Rasters To Mosaic Dataset** tool with certain parameters such as the Raster Type (CIB), Update Cell Size Ranges (unchecked), Update Boundary (unchecked), File Filter (set to all CIB file extensions), and Add New Datasets Only (OVERWRITE_DUPLICATES) parameters set appropriately for adding CIB data.

The CIB **Raster Type** is used to load CIB data, as this raster type extracts metadata information from the image and adds it to the mosaic dataset attribute table, as well as defining the appropriate update logic used to determine which data is overwritten.

The **Update Cell Size Ranges** and **Update Boundary** check boxes are left unchecked while loading data because it is more efficient to perform these operations after all data has been added to the mosaic dataset. These operations are explained in more detail later in this exercise.

The **Add New Datasets Only** parameter is set to **OVERWRITE_DUPLICATES** to ensure that only the most current CIB data is added to the mosaic dataset.

Copyright © 1995-2012 Esri. All rights reserved.

Note: When a mosaic dataset is created it is placed in "load-only" mode, which only allows insert operations. For the "Overwrite Duplicates" option on the **Add Rasters To Mosaic Dataset** tool to work properly it must be in "normal" mode, which allows both insert and update operations. To place the mosaic dataset in "normal" mode, load a single CIB dataset into the mosaic dataset. The sample data does not contain any duplicate datasets so it is not necessary to "seed" the dataset prior to loading the complete set of sample data.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\Imagery\Toolboxes and expand the ImageryTools toolbox.
2. Open the **Add CIB Rasters To Mosaic Dataset** tool.
3. Set the **Input Mosaic Dataset** parameter to the `Imagery` layer.
4. Set the **Input** parameter to the `C:\ArcGISForDefense\Basemaps\Imagery\Data\Sample\SourceData\RPF` workspace.
5. Run the tool.
   204 CIB raster datasets are added to the mosaic dataset.

Add lower resolution imagery to the mosaic dataset

When you work with world-wide data is it very useful to orient yourself on the map when zoomed out to continental and global scales. CIB 10 data, the lowest resolution CIB data loaded in the mosaic dataset, stops displaying at approximately 1:472,872, so it won't display at these smaller scales. You could build overviews, which are lower resolution rasters, on the CIB data but it does not display well because the data has to be highly resampled to get them to display at these smaller scales. A much better approach is to add imagery that was designed for these smaller scales into the mosaic dataset, after which you can build overviews on the smallest scale data that was added.

Use the ArcGIS for Desktop **Add Rasters To Mosaic Dataset** tool to add the Landsat (~30-meter) and NASA Blue Marble Next Generation (~500-meter) data to the mosaic dataset that is included in the template. See Adding raster data to a mosaic dataset and Add Rasters To Mosaic Dataset tool help for more information on how to use this tool.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\Imagery\Imagery.gdb.
2. Right-click the Imagery mosaic dataset and click **Add Rasters** .
3. Set the **Raster Type** parameter to **Raster Dataset**.
4. Set the **Input** parameter to the following workspaces: `C:\ArcGISForDefense\Basemaps\Imagery\Data\Sample\SourceData\BlueMarble`, and `C:\ArcGISForDefense\Basemaps\Imagery\Data\Sample\SourceData\Landsat`.

Copyright © 1995-2012 Esri. All rights reserved.

5. Uncheck the **Update Cell Size Ranges** and the **Update Boundary** check boxes, as these will be updated in a later step.
6. Run the tool.
   One Blue Marble Next Generation and 20 Landsat raster datasets are added to the mosaic dataset.

Calculate mosaic dataset cell size ranges

Cell size ranges are used to control which rasters in a mosaic dataset are processed to create the dynamically mosaicked image that is displayed. For example, in the Imagery mosaic dataset you have loaded Blue Marble, Landsat, and CIB imagery each with differing resolutions and the intended behavior is that imagery of increasingly higher resolution is displayed as the user zooms closer in. This behavior is controlled by the cell size range, which is defined by the minimum and maximum pixel size values on each record in the mosaic dataset (MinPS and MaxPS fields respectively).

You could use the Calculate Cell Size Ranges geoprocessing tool, which examines the spatial relationship between rasters to determine the MinPS and MaxPS values; however, in the case where you need to calculate these values on large volumes of datasets it can be more efficient to calculate these values based on a multiplier of the pixel size. While not necessary to use this alternate approach due to the small number of datasets included in this template, a tool named **Calculate Raster Visibility** has been included in this template to calculate these values based on this alternate approach.

⚠ **Caution:** Because the **Calculate Raster Visibility** tool does not examine the spatial relationships between rasters of differing resolutions to determine the Min/MaxPS values, you should only use this tool if your data is fairly consistent in spatial coverage between data products.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\Imagery\Toolboxes and expand the ImageryTools toolbox.
2. Open the **Calculate Raster Visibility** tool.
3. Set the **Input Mosaic Dataset** parameter to the`Imagery` layer.
4. Leave the default **High Pixel Size Multiplier** parameter value as is. For most cases, a value of 10 is sufficient.
5. Run the tool.
   The MinPS field will be set to 0 and the MaxPS will be set to High Pixel Size Multiplier multiplied by the HighPS value.

Build mosaic dataset boundary

The boundary determines the spatial extent of the mosaic dataset and can be used to clip the mosaicked image, i.e. only raster data that is contained within the boundary will be visible. The boundary is created using the Build Boundary geoprocessing tool or as an option when using the Add Rasters to Mosaic Dataset geoprocessing tool. By default, the boundary is created by merging all raster footprints into a single or multipart polygon, that can result in a boundary with a large number of vertices affecting draw performance.

Copyright © 1995-2012 Esri. All rights reserved.

When creating mosaic datasets containing rasters covering the world's extent or when boundaries have large numbers of vertices (such as greater than 5000), it is recommended to use the **Build Boundary** tool with the ENVELOPE **Simplification Method** to build the boundary.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\Imagery\Imagery.gdb.
2. Right-click the Imagery mosaic dataset and click **Modify > Build Boundary**.
3. Set the **Simplification Method** parameter to **ENVELOPE**.
4. Run the tool.

Modify the mosaic dataset default properties

Properties can be set on the mosaic dataset that affect how the mosaicked image will be presented to the user and how they might interact with it. These properties can also impact the performance of the server or image service if the mosaic dataset is served. See Mosaic dataset properties for more information.

In these next steps, you will change the following default property values:

- The maximum number of rasters per mosaic
- The maximum number of items downloadable per request

Because of the characteristics of CIB data, the default value of 20 for the maximum number of rasters that are dynamically mosaicked is not always sufficient to provide total screen coverage for any one particular CIB product; increasing the **Maximum Number of Raster per Mosaic** property value to 50 is generally sufficient.

The maximum number of items downloadable per request has a default property value of 20, but because it is recommended to store multiple CIB products within a single mosaic dataset, changes are good users will typically exceed this value even when selecting seemingly small areas. The mosaic datasets distributed with the template have this property, **Maximum Number of Items Downloadable per Request** set to 200. For production mosaic datasets, modify this property to best balance the needs of your users and the performance load on your servers. Used in conjunction with this property, is the **Maximum Download Size per Request (MB)** property. This defines the maximum size limit that a user can download. The default value of 2048 MB is sufficient when the **Maximum Number of Items Downloadable per Request** is set to 200. Modify this property as required.

Note: If you do not want users to download rasters from your mosaic dataset/image service, set the **Maximum Number of Items Downloadable per Request** to 0.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\Imagery\Imagery.gdb.
2. Right-click the Imagery mosaic dataset in the ***Catalog*** window and click **Properties**.
3. Click the **Defaults** tab.
4. Set the **Maximum Number of Rasters per Mosaic** property value to `50`.

Copyright © 1995-2012 Esri. All rights reserved.

5. Set the **Maximum Number of Items Downloadable per Request** property value box to `200`.
6. Click **OK** to apply the changes and close the ***Mosaic Dataset Properties*** dialog box.

Define overviews

In the next exercise, you will be creating a cached image service from this mosaic dataset. Cached image services do not require overviews to be generated. However, since cached image services can be accessed dynamically, which means that the cache tiles will not be displayed, you will build overviews so that data will display at smaller scales when the service is accessed dynamically. See How applications access and use the image service cache for more information.

Before building overviews, you will use the Define Overviews tool to set the overview base pixel size so that overviews are only generated on the Blue Marble data. For more information about overviews, see Mosaic dataset overviews.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\Imagery\Imagery.gdb.
2. Right-click the Imagery mosaic dataset and click **Optimize > Define Overviews**.
3. Set the **Pixel Size** parameter to `2000`.
   The pixel size parameter defines the raster pixel size of the first overview level and is in the same spatial reference units as the mosaic dataset, which is meters. To generate overviews just on the Blue Marble data you need to use a pixel size value that is between the MaxPS and the HighPS value of the Blue Marble dataset (4638.68 and 463.87 respectively). For this exercise, a value of 2000 works well.
4. Run the tool.
   One overview record is created in the mosaic dataset attribute table.

Build Overviews

Now that the overviews have been defined using a specific pixel size, you will build the overviews using the Build Overviews geoprocessing tool.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\Imagery\Imagery.gdb.
2. Right-click the Imagery mosaic dataset and click **Optimize > Build Overviews**.
3. Run the tool.

A mosaic dataset has been created, populated, and is ready to use or publish as a cached image service to ArcGIS Server.

Copyright © 1995-2012 Esri. All rights reserved.

Publishing a CIB mosaic dataset to ArcGIS Server

Complexity:
Beginner

Data Requirement:
ArcGIS.com

Data Path:
C:\ArcGISForDefense\Basemaps\Imagery

Goal:
Create a cached image service from a CIB mosaic dataset.

The instructions below show you how to create a cached image service from the mosaic dataset you populated with CIB data in the previous exercise.

The reason to create a cached image service is that it is the best way to create fast image services. When you cache an image service, the server draws the image at a set of scale levels and pixel sizes that you define and saves the preprocessed (cached) images. So, when the server receives a request for an image, it's much quicker to return one of these cached images than to draw the original image again.

Caching is appropriate for image services that don't change often, such as those used as basemaps. If they do change, there are tools available to update the cache. For more information, see What is image service caching?, Map cache updates, and Common caching questions.

⚠ **Caution:** If you extracted the template .zip file to a directory other than the one recommended in the Getting Started with the Imagery Template guide, C:\ArcGISForDefense\Basemaps\Imagery, make note of the directory you extracted the zip file to and use it in place of C:\ArcGISForDefense\Basemaps\Imagery in all the exercise steps that follow.

Start ArcMap

You can publish mosaic datasets as image services within ArcCatalog or ArcMap; for the purpose of this exercise you will use ArcMap. See Starting ArcMap for more information.

Make a publisher connection to ArcGIS Server

Before you can publish a service you need to create a publisher connection to an existing ArcGIS Server site. See Making a publisher connection to ArcGIS Server in ArcGIS for Desktop for more information.

Publish CIB mosaic dataset as an image service

You will now publish the CIB mosaic dataset you populated in the previous exercise (C:\ArcGISForDefense\Basemaps\Imagery\Imagery.gdb\Imagery), using the steps described in the **Publishing an image service** section of the help topic Tutorial: Creating a cached image service.

Follow the steps in the tutorial with the following modifications/suggestions:

- In step #14, set the **Minimum scale level** to `0`, and the **Maximum scale level** to `15`. The minimum and maximum scale levels define the levels at which the image service will be cached. The highest resolution data in the included sample data is 5 meter, so a maximum scale level of 15 (cell size 4.78) is appropriate, as this cell size is slightly smaller then the highest resolution data. When using your own data, adjust the scale levels appropriately.
- In step #15, choose to **Build cache manually after the service is published**. By default, the service is configured so that the cache is built automatically when the service is published. However, when building caches on image services that contain your larger CIB holdings, you will probably want to cache manually at a different time, such as overnight or during the weekend. This is the approach that will be described later in this exercise.

Copyright © 1995-2012 Esri. All rights reserved.

- When you analyze the mosaic dataset in step #23, the following two warnings will appear in the **Prepare** window:
  - Code 24011: **Data source is not registered with the server and data will be copied to the server**. When you publish without registering the data source, the dataset and all associated data is copied to the ArcGIS Server, which in this case, is not really an issue because the data size is small (approximately 85 MB). However, if you were publishing a mosaic dataset that referenced gigabytes or terabytes of data then you would want to register the data source so that the data is not copied during publishing. For more information, see About registering your data with the server, and Making your data accessible to ArcGIS Server.
  - Code 24022: **Mosaic dataset items have not been analyzed**. If a mosaic dataset isn't behaving as you expect, you can analyze it using the Analyze Mosaic Dataset tool, which examines it for commonly known anomalies. For the purposes of this exercise, it is not necessary to analyze the mosaic dataset. For more information, see Analyzing a mosaic dataset.

Build image service cache

Now that the CIB mosaic dataset has been successfully published as a cached image service, you will build the cache using the Manage Map Server Cache Tiles tool.

Steps:

1. Within the ***Catalog*** window under GIS Servers, navigate to your publisher connection, right-click the Imagery image service, and click **Manage Cache > Manage Tiles**.
   The **Manage Map Server Cache Tiles** tool dialog is displayed. Note that the **Scales** parameter only contains the scales you selected to build cache for when you configured the service during publishing.
2. Set the **Update Mode** parameter to **RECREATE_ALL_TILES**.
3. Because you won't be caching a large area, set the **Number of caching service instances** parameter to `2`. ArcGIS Server creates cache files using a geoprocessing service named CachingTools. The number of instances you allow for the CachingTools service determines how much power your machine can dedicate toward caching jobs. For more information, see Allocation of server resources to caching
4. For the purposes of this exercise, you don't need to generate cache for the full extent of the image service. Use the **Area of Interest (Polygon)** parameter to define a smaller area to cache. The area of interest can be defined by a polygon feature class, or by a feature you interactively define in ArcMap. For this exercise, define the area of interest using the interactive method. Click on the **area_of_interest** interactive feature input control on the tool dialog and click on the map display to define a small polygon feature located in an area containing Blue Marble, Landsat, CIB 10, and CIB 5 data.
5. Run the tool.

Note:

Copyright © 1995-2012 Esri. All rights reserved.

During cache creation you can check the completion status using ArcGIS for Desktop or in ArcGIS Server Manager. For more information, see Viewing cache completion status.

The CIB mosaic dataset has been published as a cached image service and cache tiles have been created. The cached image service is now ready to use.

Copyright © 1995-2012 Esri. All rights reserved.