Using the Scanned Maps Template

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Using the Scanned Maps template

The Scanned Maps 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 Scanned Maps template and walk-through exercises in this document are designed to teach you how to add military scanned map data in CADRG/ECRG format to mosaic datasets, publish image services, and cache image services.

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 types of CADRG/ECRG data products to users through direct access or through image services.
- Mosaic datasets support loading data with the CADRG/ECRG 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 CADRG/ECRG data to ensure that only the latest data is stored.
- Mosaic datasets allow users to select and download rasters in their native CADRG/ECRG data format.

The walk-through exercise in this document, Populating mosaic datasets with CADRG/ECRG data, shows you how to use tools that come with the template to add sample CADRG 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 CADRG/ECRG data.

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

- In the "populating mosaic dataset" exercises, use tools that come with the template to add sample CADRG data 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 CADRG/ECRG data.
- In the "publishing" exercises you will learn how to publish the mosaic datasets populated in the previous exercise as ArcGIS Server cached and dynamic image services.

Populating mosaic datasets with "standard" CADRG/ECRG data

Complexity:
Beginner

Data Requirement:
ArcGIS.com

Data Path:
C:\ArcGISForDefense\Basemaps\ScannedMaps

Goal:
Create and populate mosaic datasets with sample "standard" CADRG data.

This section provides a walk-through exercise that shows you how to create and populate mosaic datasets with "standard" CADRG data to match the sample populated mosaic dataset provided in the Scanned Maps 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 Scanned Maps Template document.

Note: "Standard" CADRG/ECRG products are data products that are the most frequently used, serve the widest audience, have the greatest geographic coverage, generally cover the same geographic area across products, and have thematic content from global scale down to regional/city scales. These characteristics make "standard" CADRG/ECRG products a good source for creating a global basemap, which is why the exercises for "standard" products show you how to create a mosaic dataset that will be published as a cached image service.
"Standard" products include Global Navigation Chart, Jet Navigation Chart, Operational Navigation Chart, Tactical Pilotage Chart, Joint Operations Graphic, Topographic Line Map, and all City Graphics products.

In the exercise, you will use ArcGIS for Desktop geoprocessing tools, as well as geoprocessing tools and sample CADRG 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 CADRG/ECRG 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 Scanned Maps Template guide, C:\ArcGISForDefense\Basemaps\ScannedMaps, make note of the directory you extracted the zip file to and use it in place of C:\ArcGISForDefense\Basemaps\ScannedMaps 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 "CADRG/ECRG" are checked.

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 ScannedMaps located under the folder C:\ArcGISForDefense\Basemaps\ScannedMaps. See Creating a file geodatabase from the Catalog tree for more information.

Create a mosaic dataset

Create a mosaic dataset using the **Create CADRG/ECRG Mosaic Dataset** tool located in the **ScannedMapsTools** toolbox that is provided in this template. This tool executes the ArcGIS for Desktop **Create Mosaic Dataset** geoprocessing tool with the Number of Bands (3) and Pixel Type (8 bit unsigned) parameters set appropriately for storing CADRG and ECRG data. 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\ScannedMaps\Toolboxes and expand the ScannedMapsTools toolbox.
2. Open the **Create CADRG/ECRG Mosaic Dataset** tool.
3. Set the **Output Workspace** parameter to the `C:\ArcGISForDefense\Basemaps\ScannedMaps\ScannedMaps.gdb` file geodatabase.
4. Set the **Output Mosaic Dataset Name** parameter to `ScannedMaps`.
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 "standard" CADRG rasters to the mosaic dataset

Add CADRG data to the mosaic dataset using the **Add Standard CADRG/ECRG Rasters To Mosaic Dataset** geoprocessing tool located in the **ScannedMapsTools** toolbox that is provided in this template. This tool executes the ArcGIS for Desktop **Add Rasters To Mosaic Dataset** geoprocessing tool with certain parameters such as the Raster Type (CADRG/ECRG), Update Cell Size Ranges (unchecked), Update

Boundary (unchecked), File Filter (set to all "standard" CADRG/ECRG data product file extensions), and Add New Datasets Only (OVERWRITE_DUPLICATES) parameters set appropriately for adding CADRG/ECRG data.

The CADRG/ECRG **Raster Type** is used to load CADRG/ECRG 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 CADRG/ECRG data is added to the mosaic dataset.

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 CADRG or ECRG 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\ScannedMaps\Toolboxes and expand the ScannedMapsTools toolbox.
2. Open the **Add Standard CADRG/ECRG Rasters To Mosaic Dataset** tool.
3. Set the **Input Mosaic Dataset** parameter to the `ScannedMaps` layer.
4. Set the **Input** parameter to the `C:\ArcGISForDefense\Basemaps\ScannedMaps\Data\Sample\SourceData\RPF` workspace.
5. Run the tool.
   53 CADRG 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 ScannedMaps mosaic dataset you have loaded various CADRG data products, such as Global Navigation Chart, Jet Navigation Chart, and Operational Navigation Chart, 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\ScannedMaps\Toolboxes and expand the ScannedMapsTools toolbox.
2. Open the **Calculate Raster Visibility** tool.
3. Set the **Input Mosaic Dataset** parameter to the `ScannedMaps` 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. 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\ScannedMaps\ScannedMaps.gdb.
2. Right-click the ScannedMaps 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 CADRG/ECRG 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 CADRG/ECRG 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 CADRG/ECRG 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\ScannedMaps\ScannedMaps.gdb.
2. Right-click the ScannedMaps 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`.
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 Global Navigation Chart (GNC) data. For more information about overviews, see Mosaic dataset overviews.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\ScannedMaps\ScannedMaps.gdb.
2. Right-click the ScannedMaps mosaic dataset and click **Optimize > Define Overviews**.
3. Set the **Pixel Size** parameter to `3020`.
   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 GNC data you need to use a pixel size value that is between the MaxPS and the HighPS value of the GNC data (7526.11 and 752.61 respectively). For this exercise, a value of 3020 works well.
4. Run the tool.
   Two overview records are 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\ScannedMaps\ScannedMaps.gdb.
2. Right-click the ScannedMaps mosaic dataset and click **Optimize > Build Overviews**.
3. Run the tool using all the default parameter values.

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

Publishing mosaic datasets with "standard" CADRG/ECRG data to ArcGIS Server

Complexity:
Beginner

Data Requirement:
ArcGIS.com

Data Path:
C:\ArcGISForDefense\Basemaps\ScannedMaps

Goal:
Create a cached image service from a "standard" CADRG/ECRG mosaic dataset.

The instructions below show you how to create a cached image service from the mosaic dataset you populated with "standard" CADRG 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 Scanned Maps Template guide, C:\ArcGISForDefense\Basemaps\ScannedMaps, make note of the directory you extracted the zip file to and use it in place of C:\ArcGISForDefense\Basemaps\ScannedMaps 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 "standard" CADRG mosaic dataset as an image service

You will now publish the "standard" CADRG mosaic dataset you populated in the previous exercise (C:\ArcGISForDefense\Basemaps\ScannedMaps\ScannedMaps.gdb\ScannedMaps), 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 approximately 7.5 meters (TLM 1:50,000), so a maximum scale level of 15 (cell size 4.78) is appropriate, as this cell size is 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 CADRG/ECRG 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.
- 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 15 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 "standard" CADRG 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 ScannedMaps 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 all data products (i.e., see area centered on 116.67W, 35.42N).

5. Run the tool.

Note: 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 "standard" CADRG 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.

Populating mosaic datasets with "miscellaneous" CADRG/ECRG data

Complexity:
Beginner

Data Requirement:
ArcGIS.com

Data Path:
C:\ArcGISForDefense\Basemaps\ScannedMaps

Goal:
Create and populate mosaic datasets with sample "miscellaneous" CADRG data.

This section provides a walk-through exercise that shows you how to create and populate mosaic datasets with "miscellaneous" CADRG data to match the sample populated mosaic dataset provided in the Scanned Maps 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 Scanned Maps Template document.

Note: "Miscellaneous" CADRG/ECRG products are data products that have more specialized uses and typically cover smaller geographic areas than the "standard" products. Some less frequently used products, which do cover large geographic areas, are included in this category because they have the same map scale as one of the "standard" products and are easier to work with when stored in a separate mosaic dataset. These characteristics do not make "miscellaneous" CADRG/ECRG products a good source for creating a global basemap, but rather serve as a supplement to the cached image service created from the "standard" CADRG/ECRG products. This is why the exercises for "miscellaneous" products show you how to create a mosaic dataset that will be published as a dynamic image service (i.e. non-cached).
The products in this category include, but are not limited to Riverine Maps, Combat Charts, Miscellaneous Maps and Charts, and Military Installation Maps.

In the exercise, you will use ArcGIS for Desktop geoprocessing tools, as well as geoprocessing tools and sample CADRG 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 CADRG/ECRG 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 Scanned Maps Template guide, C:\ArcGISForDefense\Basemaps\ScannedMaps, make note of the directory you extracted the zip file to and use it in place of C:\ArcGISForDefense\Basemaps\ScannedMaps 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 "CADRG/ECRG" are checked.

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 ScannedMaps located under the folder C:\ArcGISForDefense\Basemaps\ScannedMaps. See Creating a file geodatabase from the Catalog tree for more information.

Note: The ScannedMaps file geodatabase will already exist if you completed the exercise in Populating mosaic datasets with "standard" CADRG/ECRG data topic.

Create a mosaic dataset

Create a mosaic dataset using the **Create CADRG/ECRG Mosaic Dataset** tool located in the **ScannedMapsTools** toolbox that is provided in this template. This tool executes the ArcGIS for Desktop **Create Mosaic Dataset** geoprocessing tool with the Number of Bands (3) and Pixel Type (8 bit unsigned) parameters set appropriately for storing CADRG and ECRG data. 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\ScannedMaps\Toolboxes and expand the ScannedMapsTools toolbox.
2. Open the **Create CADRG/ECRG Mosaic Dataset** tool.
3. Set the **Output Workspace** parameter to the `C:\ArcGISForDefense\Basemaps\ScannedMaps\ScannedMaps.gdb` file geodatabase.
4. Set the **Output Mosaic Dataset Name** parameter to `ScannedMapsMisc`.
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 "miscellaneous" CADRG rasters to the mosaic dataset

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

The CADRG/ECRG **Raster Type** is used to load CADRG/ECRG 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 CADRG/ECRG data is added to the mosaic dataset.

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 CADRG or ECRG 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\ScannedMaps\Toolboxes and expand the ScannedMapsTools toolbox.
2. Open the **Add Miscellaneous CADRG/ECRG Rasters To Mosaic Dataset** tool.
3. Set the **Input Mosaic Dataset** parameter to the `ScannedMapsMisc` layer.
4. Set the **Input** parameter to the `C:\ArcGISForDefense\Basemaps\ScannedMaps\Data\Sample\SourceData\RPF` workspace.
5. Run the tool.
   12 CADRG 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. Typically, the mosaic dataset will have various data

products, 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).

For mosaic datasets containing "miscellaneous" CADRG/ECRG data, use the ArcGIS for Desktop Calculate Cell Size Ranges geoprocessing tool to calculate the pixel size values instead of the **Calculate Raster Visibility** geoprocessing tool included in this template, which you used in the Populating mosaic datasets with "standard" CADRG/ECRG data exercise, because "miscellaneous" CADRG/ECRG data products typically don't have consistent spatial coverage between products so it is important to take the spatial relationship between rasters into account, which the **Calculate Cell Size Ranges** geoprocessing tool will do.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\ScannedMaps\ScannedMaps.gdb.
2. Right-click the ScannedMapsMisc mosaic dataset and click **Modify > Calculate Item Visibility** .
   The **Calculate Cell Size Ranges** geoprocessing tool is displayed.
3. Run the tool using all the default parameter values.

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. 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\ScannedMaps\ScannedMaps.gdb.
2. Right-click the ScannedMapsMisc 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 CADRG/ECRG 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 CADRG/ECRG 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 CADRG/ECRG 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\ScannedMaps\ScannedMaps.gdb.
2. Right-click the ScannedMapsMisc 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`.
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.

Calculate raster statistics on mosaic dataset

Calculating statistics on the mosaic dataset allow ArcGIS applications to properly stretch and symbolize raster data for display. Use the ArcGIS for Desktop Calculate Statistics geoprocessing tool to calculate statistics on the ScannedMapsMisc mosaic dataset. For more information about how raster statistics are used in ArcGIS, and options for calculating or setting statistic values, see Raster data statistics.

Note: In the Populating mosaic datasets with "standard" CADRG/ECRG data exercise you didn't have to explicitly calculate statistics on the ScannedMaps mosaic dataset because overviews were generated on this mosaic dataset. During the process of building overviews, raster statistics are automatically calculated on the mosaic dataset.

Steps:

1. Within the ***Catalog*** window under Folder Connections, navigate to C:\ArcGISForDefense\Basemaps\ScannedMaps\ScannedMaps.gdb.
2. Right-click the ScannedMapsMisc mosaic dataset in the ***Catalog*** window and click **Enhance > Calculate Statistics**.
3. For this exercise, you can leave the **Number of Columns to Skip** and the **Number of Rows to Skip** parameters set to one, since this mosaic dataset has a small number of columns and rows (6098 and 7540 respectively).
   If you're working with a mosaic dataset that has hundreds of thousands or millions of columns or rows, use a value larger than one to decrease the time it takes to calculate raster statistics; however, be aware that the larger the skip factor the less accurate the statistics will be. A generally rule of thumb for determining what skip factors to use for very large mosaic datasets is: Number of columns/rows to skip = Number of columns/rows in mosaic dataset divided by 1,000.

A mosaic dataset containing "miscellaneous" CADRG data has been created, populated, and is ready to use or publish as an image service to ArcGIS Server.

Publishing mosaic datasets with "miscellaneous" CADRG/ECRG data to ArcGIS Server

The instructions below show you how to create an image service from the mosaic dataset you populated with "miscellaneous" CADRG data in the previous exercise.

Complexity:
Beginner

Data Requirement:
ArcGIS.com

Data Path:
C:\ArcGISForDefense\Basemaps\ScannedMaps

Goal:
Create an image service from a "miscellaneous" CADRG/ECRG mosaic dataset.

Caution: If you extracted the template .zip file to a directory other than the one recommended in the Getting Started with the Scanned Maps Template guide, C:\ArcGISForDefense\Basemaps\ScannedMaps, make note of the directory you extracted the zip file to and use it in place of C:\ArcGISForDefense\Basemaps\ScannedMaps 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 "miscellaneous" CADRG mosaic dataset as an image service

You will now publish the "miscellaneous" CADRG mosaic dataset you populated in the previous exercise (C:\ArcGISForDefense\Basemaps\ScannedMaps\ScannedMaps.gdb\ScannedMapsMisc), using the steps described in the help topic Publishing raster data as an image service.

Follow the steps in the help topic with the following modifications/suggestions:

- When you analyze the mosaic dataset in step #12, the following three 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**. This warning can be ignored for this exercise. 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 15 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**. This warning can be ignored for this exercise. 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.

The "miscellaneous" CADRG mosaic dataset has been published as an image service and is now ready to use.