



Data Interoperability Extension Tutorial



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Table of Contents

| | |
|----------------------------------------------------------------------------|----|
| About the Data Interoperability extension tutorial | 3 |
| Exercise 1: Using direct-read formats and connections | |
| Exercise 1a: Using direct-read formats | 4 |
| Exercise 1b: Adding interoperability connections | 6 |
| Exercise 2: Translating data with the quick conversion tools | |
| Exercise 2a: Importing data with the Quick Import tool | 12 |
| Exercise 2b: Exporting data with the Quick Export tool | 16 |
| Exercise 2c: Automating quick conversion tools with ModelBuilder | 20 |
| Exercise 3: Transforming data with spatial ETL tools | |
| Exercise 3a: Getting started with spatial ETL | 30 |
| Exercise 3b: Transforming data and using Visualizer | 40 |
| Exercise 3c: Using source attributes to separate data | 51 |

About the Data Interoperability extension tutorial

The Data Interoperability extension tutorial introduces you to the tools and functionality that are available in ArcGIS when the extension is enabled. It is divided into three sections that guide you through direct-read formats and interoperability connections, quick conversion tools, and the fundamentals of transforming data using FME Workbench.

The exercises within each section demonstrate concepts and methods sequentially and therefore should be completed in the order they are presented. They are designed to allow you to work at your own pace without additional assistance using ESRI ArcTutor sample data.

You will need about 30–40 minutes of focused time to complete all the exercises.

Tutorial data

This tutorial assumes you have installed the ESRI ArcTutor data at C:\arcgis\ArcTutor\Data Interoperability. If not, make the appropriate path changes throughout this tutorial. Ask your system administrator for the correct path to the tutorial data if you do not find it at the default installation path.

Using direct-read formats and connections

- In [Exercise 1a: Using direct-read formats](#), you work directly with a MapInfo TAB dataset in ArcMap.
- In [Exercise 1b: Adding interoperability connections](#), you create and work with an interoperability connection for Intergraph Modular GIS Environment (MGE) data.

Translating data with the quick conversion tools

- In [Exercise 2a: Importing data with the Quick Import tool](#), you import Geography Markup Language (GML) zoning data using the Quick Import tool.
- In [Exercise 2b: Exporting data with the Quick Export tool](#), you export geodatabase zoning data to a MapInfo TAB dataset using the Quick Export tool.
- In [Exercise 2c: Automating quick conversion tools with ModelBuilder](#), you create a model that imports GML zoning data, aggregates features based on specific attributes, and exports the results to GML and MapInfo TAB datasets.

Transforming data with spatial ETL tools

- In [Exercise 3a: Getting started with spatial ETL](#), you create a simple spatial ETL tool that reads Intergraph Modular GIS Environment (MGE) parcel data and loads it into a geodatabase.
- In [Exercise 3b: Transforming data and using Visualizer](#), you learn the fundamentals of using FME transformers by adding them to the spatial ETL tool you created in "Getting started with spatial ETL."
- In [Exercise 3c: Using source attributes to separate data](#), you learn how to use spatial ETL to categorize data and generate sets of features with common values.

Exercise 1a: Using direct-read formats

Direct-read formats are used directly from the Catalog tree as read-only datasets. When you add them to ArcMap, ArcScene, or ArcGlobe, all standard map functions are enabled, including attribute tables and labeling functions.

Using a direct-read feature class in ArcMap is similar to working with other geodatabase feature classes. You can snap to geometry, substitute symbology, query attributes, and use it with all geoprocessing tools that accept feature classes or layers as input.

This exercise introduces you to direct-read formats using MapInfo TAB data; other formats supported by the Data Interoperability extension can be used in the same way.

Complexity:
Beginner

Data Requirement:
ArcGIS Tutorial Data Setup

Data Path:
C:\arcgis\ArcTutor\Data Interoperability\


Goal:
Learn how to work with nonnative datasets in ArcMap when the Data Interoperability extension is enabled.

Add the data to ArcMap

Prerequisite:

The Data Interoperability extension must be enabled.

Steps:

1. Start ArcMap.
2. Click the **Catalog Window** button  on the **Standard** toolbar.
3. Type C:\arcgis\ArcTutor\Data Interoperability\ in the **Location** text box and press ENTER.
The location is added to the Catalog tree under the Folders Connections heading.
4. Click the subdivisions.tab dataset and drag it into your map.
ArcGIS uses spatial indexes to quickly locate features in feature classes. Notice that ArcGIS indexes the dataset the first time you add it to ArcMap and displays a status window. The display duration of the window depends on the size of the dataset; the window may be displayed only for a few seconds for small datasets.
5. Right-click the subdivisions Line feature layer and click **Open Attribute Table**.
The feature layer contains no data. Repeat this step for other feature layers and observe that only the Polygon feature layer contains data.
6. Right-click the folder in the table of contents and click **Remove**.
The dataset is removed from ArcMap.

Unlike a native ESRI dataset, when you connect to a MapInfo TAB dataset for the first time, it generates a feature class entry for all geometries supported by the format; other nonnative formats produce similar results. The next section will show you how to purge empty feature classes from the dataset.

Purge the empty feature classes

To purge empty feature classes from the dataset, refresh the dataset in the Catalog tree.

Steps:

1. Click the subdivisions.tab dataset in the Catalog window.
2. Press **F5** to refresh the data, or right-click the dataset and click **Refresh**.
3. Expand the dataset in the Catalog tree.
Only the subdivision Polygon feature layer is displayed.

Explore the dataset

Explore the dataset in ArcMap and the Catalog window to gain insight about working with nonnative data formats when the Data Interoperability extension is enabled.

Steps:

1. Right-click the subdivision Polygon feature class in the Catalog tree, and click **Item Properties** from the shortcut menu.
2. Click the **Description** tab and explore the metadata.
3. Drag the subdivision Polygon feature class into ArcMap.
4. Click the **Identify** button and select a feature to view the attributes.

This completes the exercise.

Continue to the next exercise: [Exercise 1b: Adding interoperability connections](#).

Exercise 1b: Adding interoperability connections

Interoperability connections can be used to aggregate files, perform translations on the fly, define a coordinate system, and store format-specific parameters such as database connections and passwords. All interoperability connections are saved in the Interoperability Connections folder.

In this exercise, you create an interoperability connection for Intergraph Modular GIS Environment (MGE) parcel data.

The MGE format uses standard MicroStation DGN files to store and edit the graphic elements of geographic data. The nongraphic elements, such as feature attributes, are stored in external database tables and linked to the graphic elements via pairs of entity and mslink numbers.

Using the **Add Interoperability Connection** dialog box, you perform the following tasks:

- Choose the FME reader and specify the data source.
- Specify the reader parameters for the external database.
- Define a coordinate system.
- Create the connection.

After creating the connection, you add the dataset to ArcMap, change symbology, and select features by attributes.

Complexity:
Beginner

Data Requirement:
ArcGIS Tutorial Data Setup

Data Path:
C:\arcgis\ArcTutor\Data Interoperability\

Goal:
Create an interoperability connection.

Create the interoperability connection

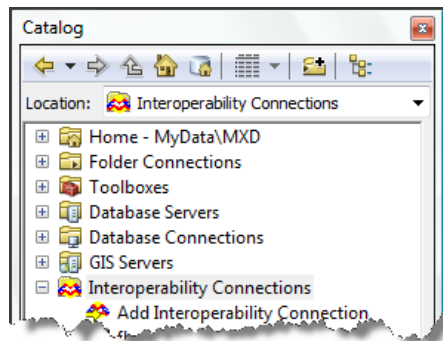
Opening the Interoperability Connection dialog box

Prerequisite:

The Data Interoperability extension must be enabled.

Steps:

1. Start ArcMap.
2. Click the **Catalog Window** button  on the **Standard** toolbar.
3. Expand the Interoperability Connections folder.

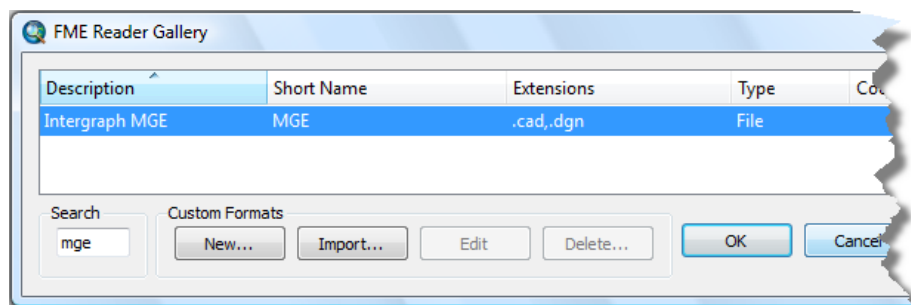


4. Double-click **Add Interoperability Connection**.
The **Interoperability Connection** dialog box opens.

Choosing the FME reader

Steps:

1. Click the **Format** browse button.
The **FME Reader Gallery** dialog box opens.




2. Type `mge` in the **Search** text box.
3. Click the row listing the Intergraph MGE format.
4. Click **OK**.
The **FME Reader Gallery** dialog box closes and the **Format** text box is populated with the format description.

Specifying the data source

Steps:

1. Click the **Dataset** browse button.
The **Select File** dialog box opens.
2. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\parcels folder.
3. Click the **File Type** arrow and choose **All Files (*.*)**.
The files with a .par file extension are displayed in the dialog box.

 **Note:** The MicroStation DGN format permits files to be saved without a file extension or with an extension of any length. As a result, it is not uncommon for DGN files to be saved with an extension that describes the contents. This tutorial uses the .par extension to identify them as parcel drawings.

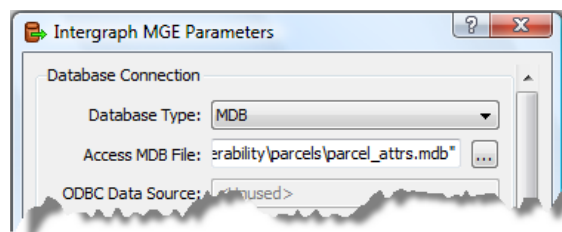
4. Click the parcel_K24.par file and click **Open**.
The **Dataset** text box is populated with the path and file name.

Specifying the reader parameters

Specify the external database that contains the attribute tables.

Steps:

1. Click the **Parameters** button.
The **Intergraph MGE Parameters** dialog box opens.



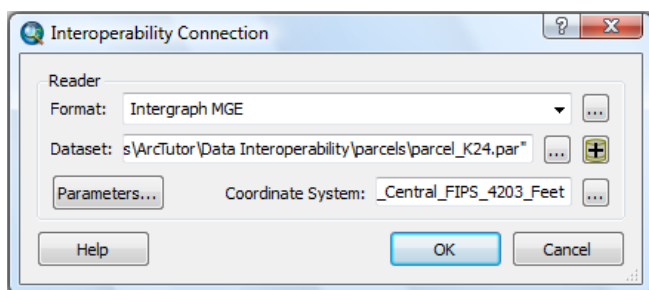
2. Click the **Database Type** arrow and choose **MDB**.
3. Click the **Access MDB File** browse button.
4. Navigate to C:\arcgis\ArcTutor\Data Interoperability\parcels\parcel_attr.mdb and click **Open**.
5. Click **OK**.
The **Intergraph MGE Parameters** dialog box closes.

Defining a coordinate system

Steps:

1. Click the **Coordinate System** browse button.
The **Spatial Reference Properties** dialog box opens.
2. Click **Select**.
3. Double-click the Projected Coordinate Systems folder, double-click the State Plane folder, double-click the NAD 1983 (US Feet) folder, choose NAD 1983 StatePlane Texas Central FIPS 4203 (Feet).prj, then click **Add**.
4. Click **OK**.
The **Spatial Reference Properties** dialog box closes.

Creating and preparing the connection



Steps:

1. Click **OK** in the **Interoperability Connection** dialog box.
The **Interoperability Connection** dialog box closes, and an interoperability connection named Connection (1)—parcel_K24 MGE is added to the Interoperability Connections folder.
2. Right-click the dataset, click **Rename**, then rename it to `parcel K24`.
3. Expand the parcel K24 dataset in the Catalog tree.
The dataset displays several feature classes that are potentially empty and not needed.
4. Click the parcel K24 dataset and press **F5** to purge any empty feature classes.
5. Expand the parcel K24 dataset and confirm your results.
The dataset contains only two feature classes.

Add data to ArcMap

Add the interoperability connection for the MGE parcel K24 dataset to ArcMap. Also add the MapInfo subdivisions.tab dataset, and the MapInfo flood_plains.mif dataset.

Steps:

1. Drag the parcel K24 dataset into ArcMap.
2. In the Catalog window, type `C:\arcgis\ArcTutor\Data Interoperability` in the **Location** text box and press **ENTER**.

The location is added to the Catalog tree under the Folders Connection heading.

3. Expand the flood_plains.mif dataset and drag the flood_plains Polygon feature class into ArcMap.
4. Expand the subdivisions.tab dataset and drag the subdivisions Polygon feature class into ArcMap.

Change the symbology

Assign a unique symbol for each date a subdivision was added to the survey. Use the ADD_DATE field. Also, set MapTips to display the contents of the SUBDIVISION field when pausing the pointer over a subdivision.

Steps:

1. Right-click the subdivisions Polygon layer and click **Properties**.
The **Layer Properties** dialog box opens.
2. Click the **Display** tab.
3. In the Display Expression box, click the **Fields** arrow and choose the SUBDIVISION field.
4. Check the box **Show MapTips using the display expression**.
5. Click the **Symbology** tab.
6. Click **Categories** and click **Unique values**.
7. Click the **Value Field** arrow and choose the ADD_DATE field.
8. Click the **Add all Values** button.
A unique symbol is generated for each unique value in the field.
9. Click **OK**.
The **Layer Properties** dialog box closes.
10. Right-click the subdivisions Polygon layer in the table of contents and click **Zoom to Layer**.
11. Pause the pointer over the subdivisions to see the names displayed as MapTips.

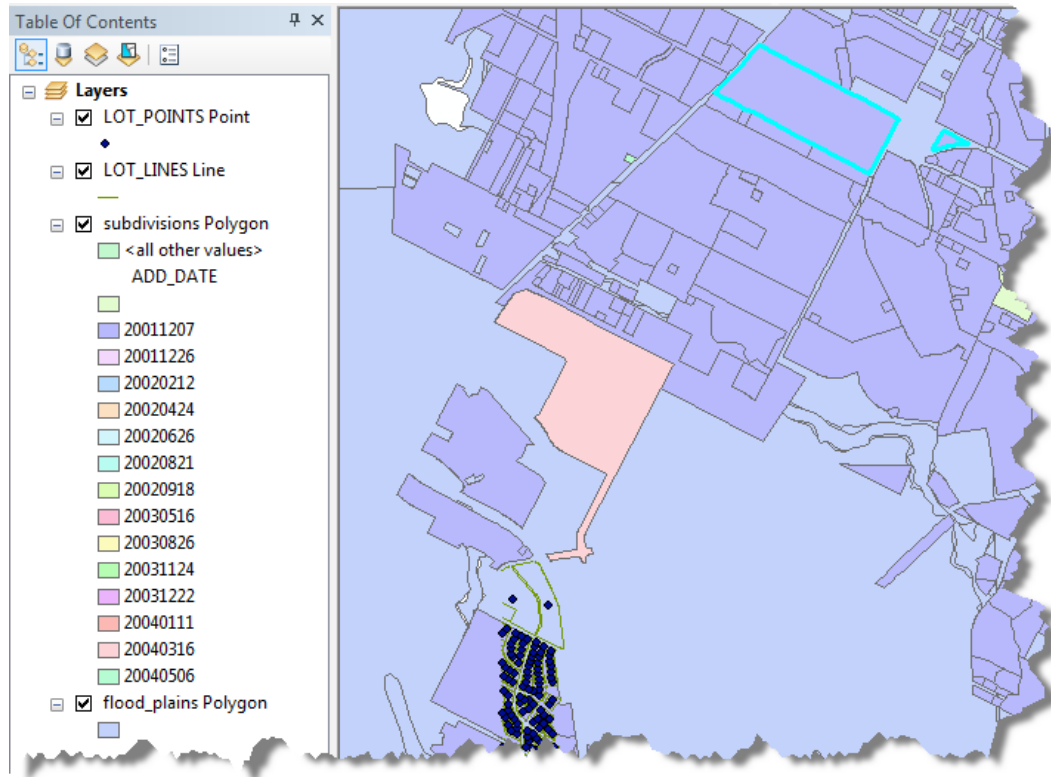
Select by attributes

Search for Gaston Park and zoom to it.

Steps:

1. On the main menu, click **Selection > Select By Attributes**.
The **Select by Attributes** dialog box opens.
2. Click the **Layer** arrow and choose the subdivisions Polygon feature layer.
3. Double-click the SUBDIVISION field.
The field name is added to the expression box.
4. Click the **Like** button and press the SPACEBAR once to add a space after the word.
5. Type 'GAS%' to complete the SQL statement.
The completed expression should read "SUBDIVISION" LIKE 'GAS%'.

6. Click the **Apply** button.
The selected features are highlighted in the map.



7. Click the **OK** button.
The **Select by Attributes** dialog box closes.
8. On the main menu, click **Selection > Zoom To Select Features**.
9. Pause the pointer over the selected feature to display the name GASTON PARK as a MapTip.

This completes the exercise.

Continue to the next exercise: [Exercise 2a: Importing data with the Quick Import tool](#).

Exercise 2a: Importing data with the Quick Import tool

The Quick Import tool converts any data source supported by the Data Interoperability extension and loads it into a geodatabase using a simple one-to-one translation. This tool is ideal for importing nonnative data when your workflow does not require feature geometry or schema to be modified.

In this exercise, you import Geography Markup Language (GML) zoning data.

Complexity:
Beginner

Data Requirement:
ArcGIS Tutorial Data Setup

Data Path:
C:\arcgis\ArcTutor\Data Interoperability\

Goal:
Import GML data using the Quick Import tool.

Using the Quick Import dialog box, you perform the following tasks:

- Choose the FME reader and specify the data source.
- Accept the default reader parameters.
- Accept the coordinate system defined by the data source.
- Specify the destination staging geodatabase.
- Import the data.



After importing the data, you add the dataset to ArcMap to verify your results.

Open the tool and specify input

Prerequisite:

The Data Interoperability extension must be enabled.

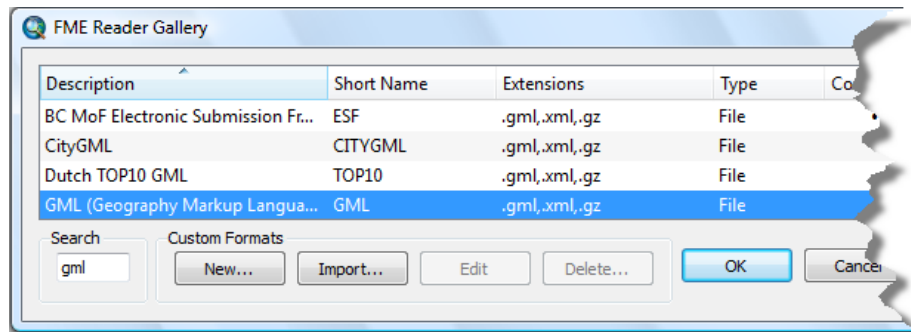
Steps:

1. Start ArcMap.
2. Click the **Catalog Window** button  on the **Standard** toolbar.
3. Find and open the **Quick Import tool** using the **Search** window .
4. Click the **Input Dataset** browse button.
The **Specify Data Source** dialog box opens.

Choosing the FME reader

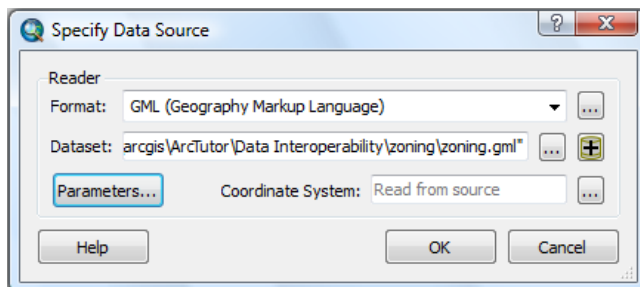
Steps:

1. Click the **Format** browse button.
The **FME Reader Gallery** dialog box opens.



2. Type `gml` in the **Search** text box.
3. Click the row listing **Geography Markup Language (GML)** and click **OK**.
The **FME Reader Gallery** dialog box closes.

Specifying the data source



Steps:

1. Click the **Dataset** browse button.
The **Select File** dialog box opens.
2. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\zoning folder.
3. Click the zoning.gml dataset and click **Open**.
The **Dataset** text box is populated with the path and file name.

Caution: Some file extensions can be associated with more than one format. It is good practice to visually confirm that the format and file extension are correctly matched before closing the dialog box.

4. Click **OK**.
The **Specify Data Source** dialog box closes.

Specify the output geodatabase and run the tool

The Quick Import tool creates a geodatabase as output. The output staging geodatabase can be used directly or for further processing.

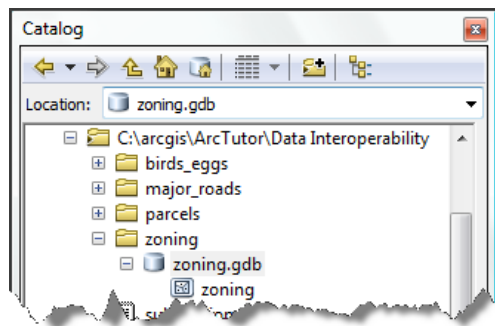
Steps:

1. Click the **Output Staging Geodatabase** browse button, navigate to the C:\arcgis\ArcTutor\Data Interoperability\zoning folder, type `zoning` in the **Name** text box, then click **Save**.
The **Output Staging Geodatabase** text box is populated with the path and name.
2. Click **OK**.
The tool executes the conversion in the background. A progress bar at the bottom of your map displays the name of the tool. When the tool is finished, a pop-up notification appears in the system tray. You can examine the details of the conversion in the **Results** window.

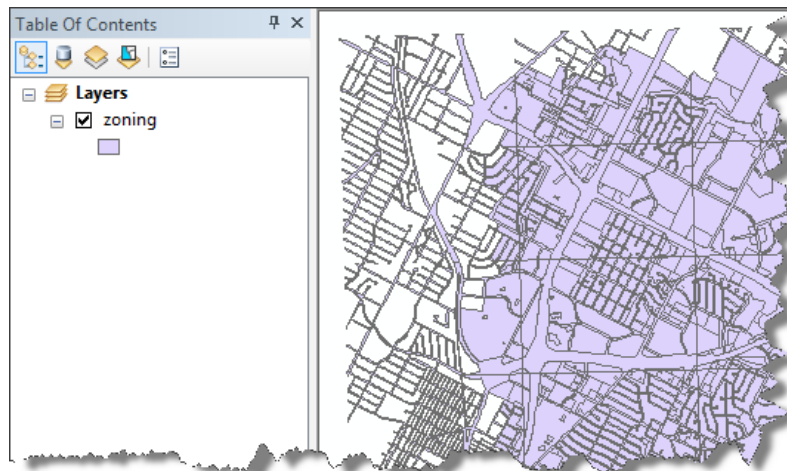
Add the data to ArcMap

Steps:

1. Type C:\arcgis\ArcTutor\Data Interoperability\zoning\zoning.gdb in the **Location** text box and press ENTER.
The location is added to the Catalog tree under the Folders Connection heading.



2. Drag the zoning feature class into ArcMap and verify your results.



This completes the exercise.

Continue to the next exercise: [Exercise 2b: Exporting data with the Quick Export tool](#).

Exercise 2b: Exporting data with the Quick Export tool

The Quick Export tool converts geodatabase feature classes or feature layers to any external dataset supported by the Data Interoperability extension using a simple one-to-one translation. This tool is ideal for exporting data to nonnative datasets when your workflow does not require feature geometry or schema to be modified.

In this exercise, you export geodatabase zoning data to a MapInfo TAB dataset.

Using the Quick Export dialog box, you perform the following tasks:

- Specify the geodatabase data source.
- Choose the FME writer and specify the data destination.
- Accept the default writer parameters.
- Accept the coordinate system defined by the data source.
- Export the data.

After exporting the data, you add the dataset to ArcMap to verify your results.



Open the tool and specify input

Prerequisite:

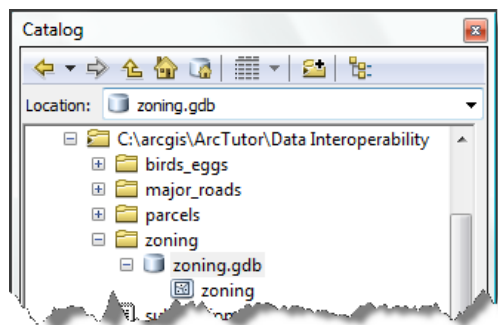
The Data Interoperability extension must be enabled.

Before starting this exercise, you must have completed the previous exercise, [Exercise 2a: Importing data with the Quick Import tool](#).

Steps:

1. Start ArcMap.
2. Click the **Catalog Window** button  on the **Standard** toolbar.
3. Find and open the **Quick Export** tool using the **Search** window .
4. Type `C:\arcgis\ArcTutor\Data Interoperability\zoning\zoning.gdb` in the **Location** text box and press ENTER.

The location is added to the Catalog tree under the Folders Connection heading.



5. Drag the zoning feature class into the **Input Features** text box.

Complexity:
Beginner

Data Requirement:
ArcGIS Tutorial Data Setup

Data Path:
C:\arcgis\ArcTutor\Data Interoperability\

Goal:
Export geodatabase data to a MapInfo TAB dataset using the Quick Export tool.

Specify the output and run the tool

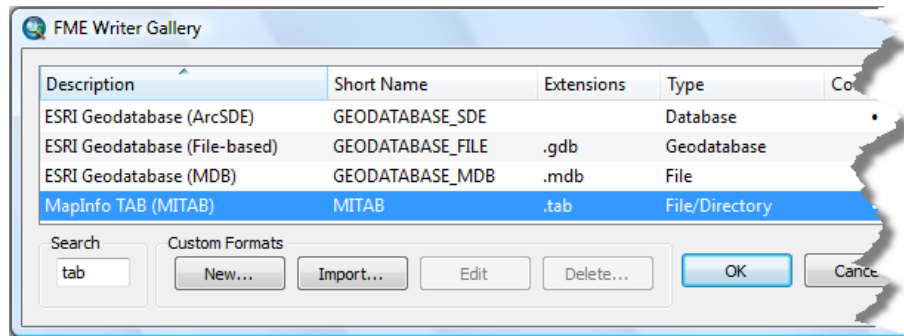
Steps:

1. Click the **Output Dataset** browse button.
The **Specify Data Destination** dialog box opens.

Choosing the FME writer

Steps:

1. Click the **Format** browse button.
The **FME Writer Gallery** dialog box opens.

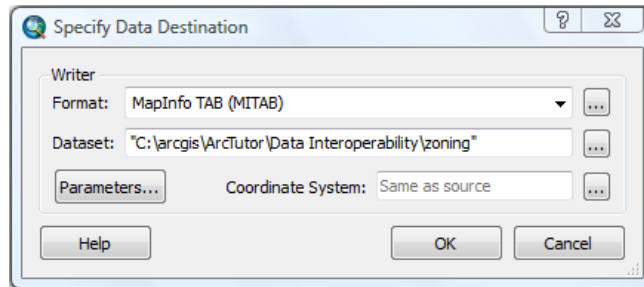


2. Type `tab` in the **Search** text box.
3. Click the row listing **MapInfo TAB (MITAB)** and click **OK**.
The **FME Writer Gallery** dialog box closes.

Specifying the data destination and running the tool

Steps:

1. Click the **Dataset** browse button.
The **Select Folder** dialog box opens.
2. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\zoning folder and click **Open**.
The **Select Folder** dialog box closes and the **Dataset** text box is populated with the path. By default, the MapInfo TAB writer uses the input feature class name.

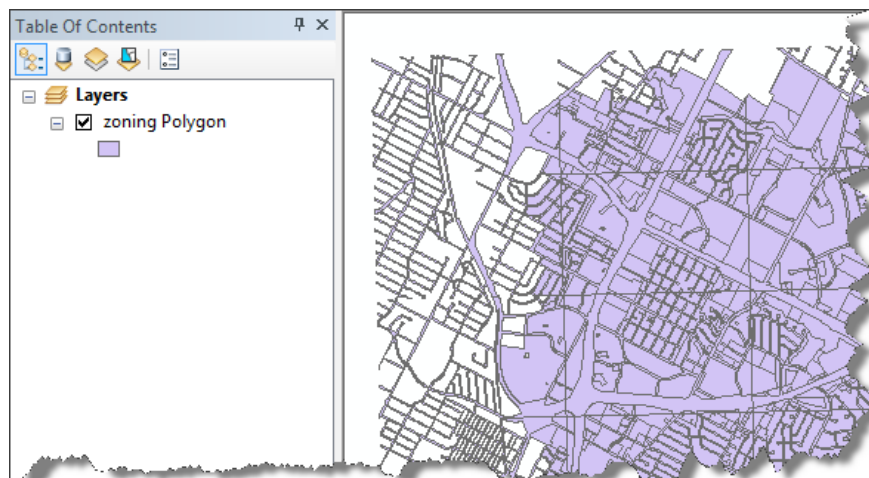


3. Click **OK**.
The **Specify Data Destination** dialog box closes.
4. Click **OK**.
The tool executes the conversion in the background. A progress bar at the bottom of your map displays the name of the tool. When the tool is finished, a pop-up notification appears in the system tray. You can examine the details of the conversion in the **Results** window.

Add the data to ArcMap

Steps:

1. Click the zoning folder and press **F5** to refresh the contents.
2. Expand the new zoning.tab dataset in the Catalog window.
3. Drag the zoning Polygon feature class into ArcMap and verify your results.



This completes the exercise.

Continue to the next exercise: [Exercise 2c: Automating quick conversion tools with ModelBuilder.](#)

Exercise 2c: Automating quick conversion tools with ModelBuilder

The Data Interoperability quick conversion tools can be used in ModelBuilder and connected to other geoprocessing tools to automate conversion workflows.

In this exercise, you build a model that performs the following tasks:

- Imports geodatabase zoning data
- Aggregates the polygons and removes grid tiles
- Exports the results to GML and MapInfo TAB formats

Complexity:
Intermediate

Data Requirement:
ArcGIS Tutorial Data Setup

Data Path:
C:\arcgis\ArcTutor\Data Interoperability\

Goal:
Automate the execution of quick conversion tools using ModelBuilder.

Create a toolbox and a model

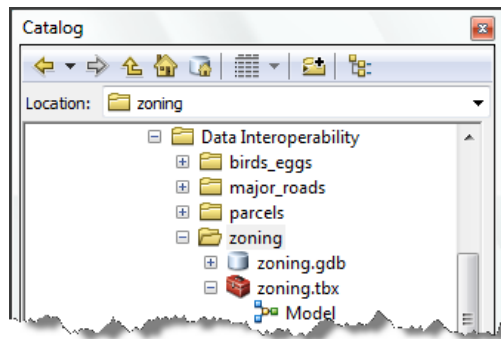
Prerequisite:

The Data Interoperability extension must be enabled.

Steps:

1. Start ArcMap.
2. Click the **Catalog Window** button  on the **Standard** toolbar.
3. Type `C:\arcgis\ArcTutor\Data Interoperability\zoning\` in the **Location** text box and press ENTER.

The location is added to the Catalog tree under the Folders Connection heading.



4. Right-click the zoning folder and click **New > Toolbox**.
5. Right-click the toolbox, click **Rename**, then name it `zoning`.
6. Right-click the zoning toolbox and click **New > Model**.


ModelBuilder opens.



Tip: By default, the model is named Model. You can rename it by right-clicking it in the Catalog window and clicking Rename from the shortcut menu.

Add the Quick Import tool

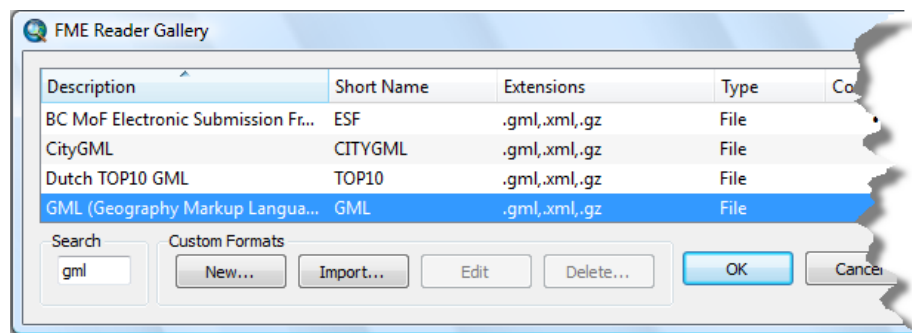
Steps:

1. Find the **Quick Import tool** using the **Search** window  and drag it onto the ModelBuilder canvas.
2. Double-click **Quick Import**.
3. Click the **Input Dataset** browse button.
The **Specify Data Source** dialog box opens.

Choosing the FME reader

Steps:

1. Click the **Format** browse button.
The **FME Reader Gallery** dialog box opens.




2. Type `gml` in the **Search** text box.
3. Click the row listing **Geography Markup Language (GML)** and click **OK**.
The **FME Reader Gallery** dialog box closes.

Specifying the data source

Steps:

1. Click the **Dataset** browse button.
The **Select File** dialog box opens.
2. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\zoning folder.
3. Click the zoning.gml dataset and click **Open**.
The **Dataset** text box is populated with the path and file name.

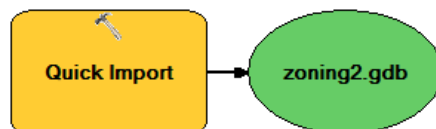
 **Caution:** Some file extensions can be associated with more than one format. It is good practice to visually confirm that the format and file extension are correctly matched before closing the dialog box.

4. Click **OK**.
The **Specify Data Source** dialog box closes.

Specifying the destination geodatabase

Steps:


1. Click the **Output Staging Geodatabase** browse button, navigate to the C:\arcgis\ArcTutor\Data Interoperability\zoning folder, type `zoning2` in the **Name** text box, then click **Save**.
The **Output Staging Geodatabase** text box is populated with the path and name. In the following section, you connect this output as input to the Select Data tool.
2. Click **OK**.
The **Quick Import** dialog box closes and displays the tool in a ready-to-run state.

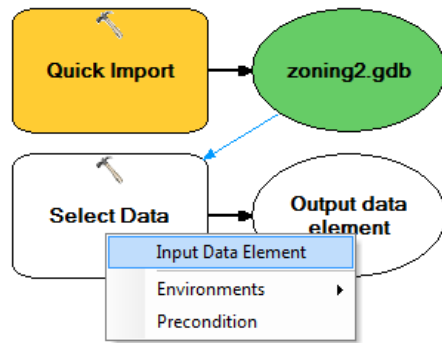


Add the Select Data tool

Use the Select Data tool to select the zoning feature class contained in the zoning2.gdb geodatabase.

Steps:


1. Find the [Select Data \(ModelBuilder\)](#) tool using the **Search** window  and drag it onto the ModelBuilder canvas.
2. Click the **Connect** button on the toolbar.
3. Click zoning2.gdb, click **Select Data**, then click **Input Data Element** on the shortcut menu.
The output geodatabase zoning2.gdb is connected as input to the Select Data tool.

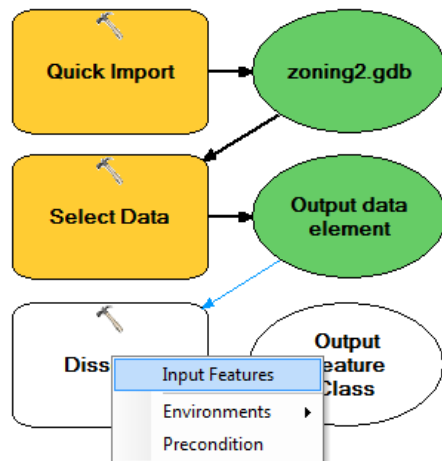


4. Double-click **Select Data** and confirm that the **Child Data Element** text box is set to `zoning`.
The child data element is the feature class contained in the `zoning2.gdb` output geodatabase that will be used as input to the Dissolve tool.
5. Click **OK**.
This closes the **Select Data** dialog box.

Add the Dissolve tool

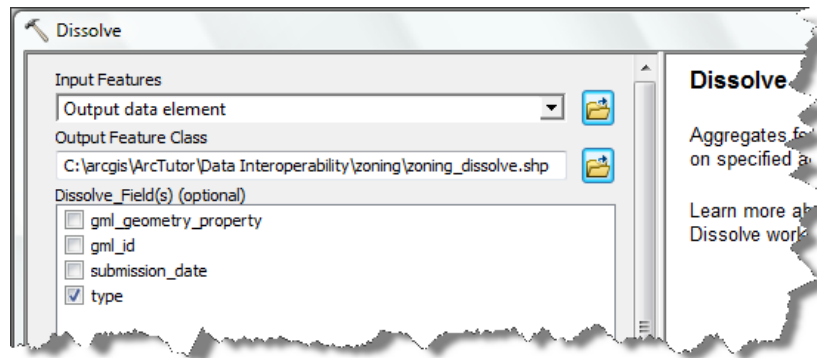
Steps:

1. Find the **Dissolve** tool using the **Search** window  and drag it onto the ModelBuilder canvas.
2. Click the **Connect** button on the toolbar.
3. Click **Output data element**, click **Dissolve**, then click **Input Features** from the shortcut menu.
The output data element is connected as input to the Dissolve tool.



4. Double-click **Dissolve** to open the dialog box.
5. Click the **Output Feature Class** browse button.
The **Output Feature Class** dialog box opens.
6. Navigate to the `C:\arcgis\ArcTutor\Data Interoperability\zoning` folder, type `zoning_dissolve` in the **Name** text box, then click **Save**.

The **Output Feature Class** dialog box closes and the **Output Feature Class** text box is populated with the path and file name. By default, the tool adds the (.shp) file extension.



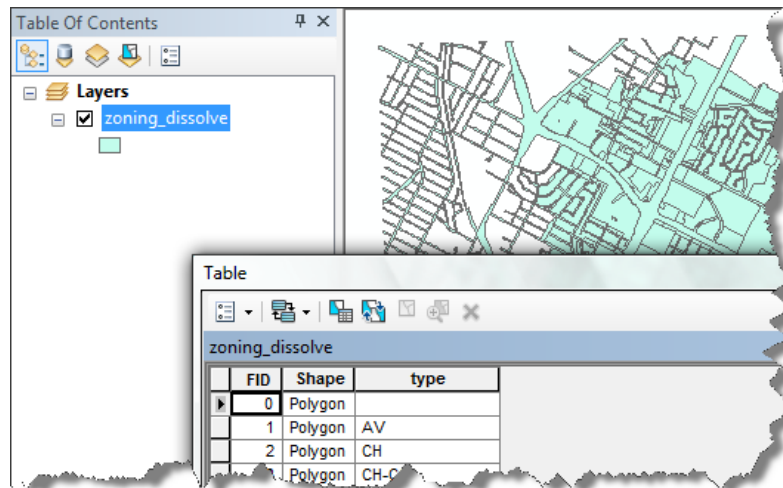
7. Check the **type** check box in the **Dissolve_Field(s)** list.
Features with the same values for checked fields are aggregated (dissolved) into a single feature. The dissolve fields are written to the output feature class.
8. Click **OK**.
The **Dissolve** dialog box closes.
9. Click **Model > Save**.

Run the model

The model generates a shapefile. During execution, the status window appears and displays a processing log.

Steps:

1. Click the **Run** button .
All the tools in a ready-to-run state are executed.
2. Click **Close** on the status message when the model finishes executing.
3. On the ModelBuilder canvas, right-click zoning_dissolve.shp and click **Add To Display** from the shortcut menu.
The results of the tool are displayed in ArcMap.




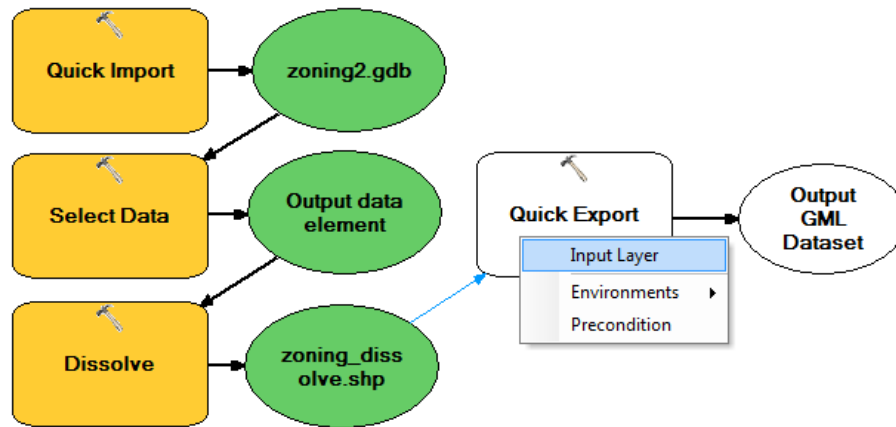
4. Right-click the zoning_dissolve feature layer in the table of contents and click **Open Attribute Table** on the shortcut menu.
The features with the same type field values are aggregated.
5. Close the attribute table.
6. Right-click the original zoning feature class in the **Catalog** window, click **Item Properties** on the shortcut menu, then click the **Preview** tab.
Compare your results and notice that the Dissolve tool removed the grid tiles.
7. On the canvas, right-click **zoning_dissolve.shp** and click **Add To Display** from the shortcut menu.
The results are removed from ArcMap.

Add the Quick Export tool

Add the Quick Export tool to generate a Geography Markup Language (GML) dataset.

Steps:

1. Find the **Quick Export** tool using the **Search** window  and drag it onto the ModelBuilder canvas.
2. Right-click Output Dataset, click **Rename** from the shortcut menu, then type `Output GML Dataset`.
3. Click the **Connect** button on the toolbar.
4. Click **zoning_dissolve.shp**, click **Quick Export**, then click **Input Layer** on the shortcut menu.
The output zoning_dissolve.shp file is connected to the Quick Export input.

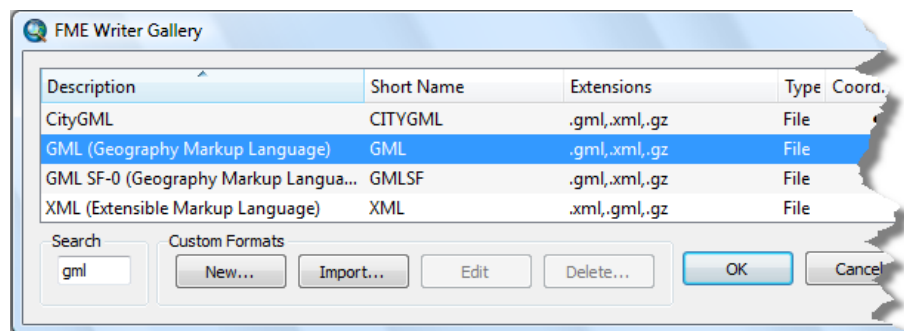


5. Double-click **Quick Export**.
6. Click the **Output Dataset** browse button.
The **Specify Data Destination** dialog box opens.

Choosing the FME writer

Steps:

1. Click the **Format** browse button.
The **FME Writer Gallery** dialog box opens.

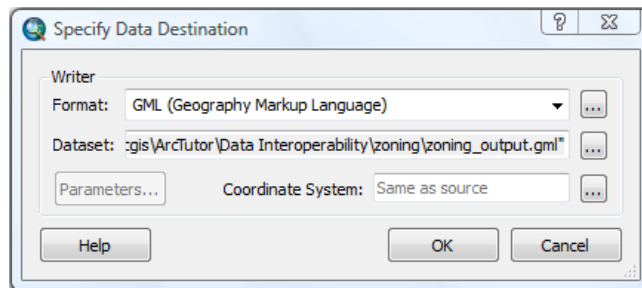


2. Type `gml` in the **Search** text box.
3. Click the row listing **Geography Markup Language (GML)** and click **OK**.
The **FME Writer Gallery** dialog box closes.

Specifying the data destination

Steps:

1. Click the **Dataset** browse button.
The **Select File** dialog box opens.
2. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\zoning folder, type `zoning_output` in the **File name** text box, then click **Save**.
The **Select File** dialog box closes and the **Dataset** text box is populated with the path and file name.



3. Click **OK**.
The **Specify Data Destination** dialog box closes.

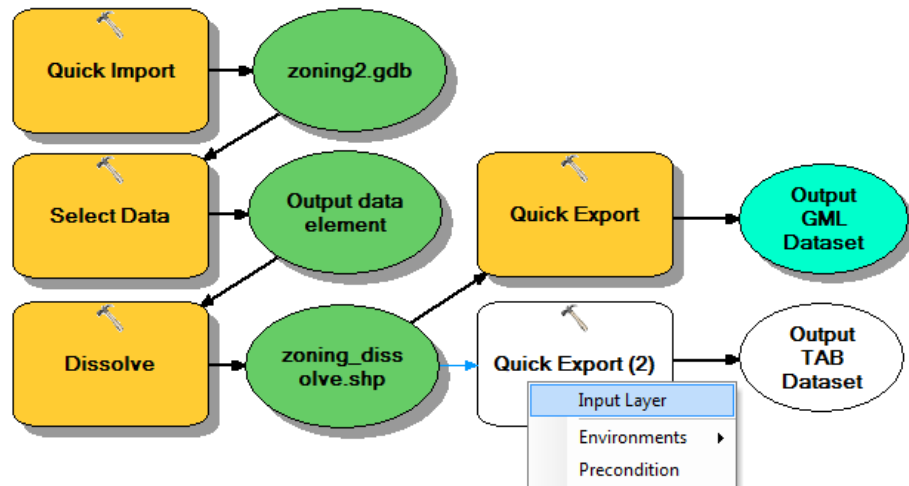
Add a second Quick Export tool

Add another instance of the Quick Export tool to generate a MapInfo TAB dataset.

Steps:

1. Find the **Quick Export** tool using the **Search** window and drag it onto the ModelBuilder canvas.
2. Right-click Output Dataset, click **Rename** from the shortcut menu, and type `Output TAB Dataset`.
3. Click the **Connect** button on the toolbar.
4. Click `zoning_dissolve.shp`, click **Quick Export (2)**, then click **Input Layer** on the shortcut menu.

The output `zoning_dissolve.shp` is connected to the Quick Export (2) input.

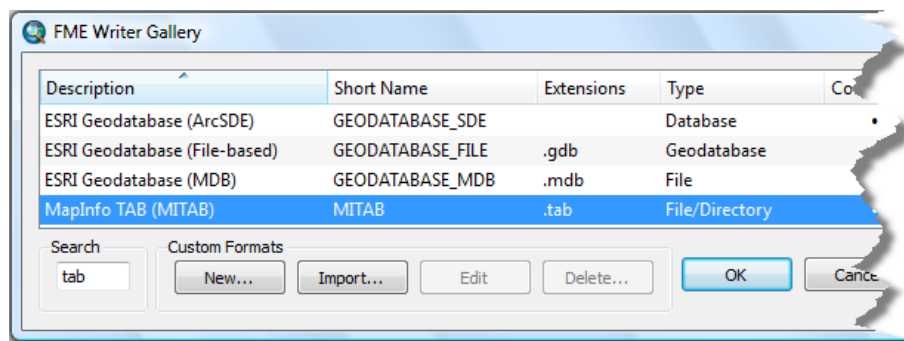


5. Double-click **Quick Export (2)**.
6. Click the **Output Dataset** browse button.
The **Specify Data Destination** dialog box opens.

Choosing the FME writer

Steps:

1. Click the **Format** browse button.
The **FME Writer Gallery** dialog box opens.

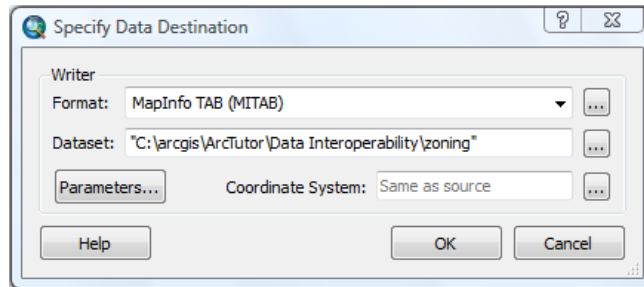


2. Type **tab** in the **Search** text box.
3. Click the row listing **MapInfo TAB (MITAB)** and click **OK**.
The **FME Writer Gallery** dialog box closes.

Specifying the data destination

Steps:

1. Click the **Dataset** browse button.
The **Select Folder** dialog box opens.
2. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\zoning folder and click **Open**.
The **Select Folder** dialog box closes and the **Dataset** text box is populated with the path. By default, the MapInfo TAB writer uses the input feature class name.



3. Click **OK**.
The **Specify Data Destination** dialog box closes.
4. Click **Model > Save**.

Run the model and explore the results

Steps:

1. On the main menu, click **Model > Run Entire Model**.
The model creates a zoning_dissolve.tab dataset and a zoning_output.gml dataset. During execution, the Model status window appears and displays a processing log.
2. Click **Close** on the status window when the model is finished.
3. In the Catalog window, navigate to the C:\arcgis\ArcTutor\Data Interoperability\zoning folder.
4. Expand the zoning_dissolve.tab dataset, right-click the zoning Polygon feature class, then click **Item Description** on the shortcut menu.
Preview the image and explore the metadata.
5. Expand the zoning_output.gml dataset, right-click the zoning_dissolve Polygon feature class, then click **Item Description** on the shortcut menu.
Preview the image and explore the metadata.

This completes the exercise.

Continue to the next exercise: [Exercise 3a: Getting started with spatial ETL](#).

Exercise 3a: Getting started with spatial ETL

Spatial ETL tools are capable of a wide range of processes and dataflows from simple format translations to complex transformations that restructure geometry and attributes.

In this exercise, you create a simple spatial ETL tool that extracts Intergraph Modular GIS Environment (MGE) parcel data and loads it into a geodatabase.

The MGE format uses standard MicroStation DGN files to store and edit the graphic elements of geographic data. The nongraphic elements, such as feature attributes, are stored in external database tables and linked to the graphic elements via pairs of entity and mslink numbers.

You begin by using the **Create Translation Workspace Wizard** to perform the following tasks:

- Choose the FME reader and specify multiple data sources.
- Specify the reader parameters for the external database.
- Choose the FME writer and start FME Workbench.

Using FME Workbench, you perform the following tasks:

- Prune the workspace so that it only processes the point and line features.
- Edit the destination parameter so that the path defaults to the tutorial folder.
- Save the workspace and close Workbench.
- Open and run the spatial ETL tool from the Catalog window.


After running the tool and generating the data, you add the dataset to ArcMap to verify your results.

Create a toolbox

Prerequisite:

The Data Interoperability extension must be enabled.

Steps:

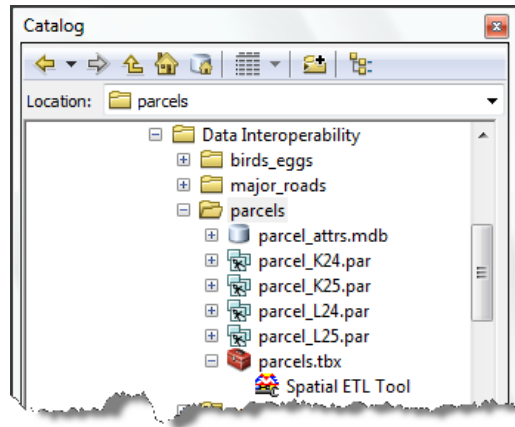
1. Start ArcMap.
2. Click the **Catalog Window** button  on the **Standard** toolbar.
3. Type `C:\arcgis\ArcTutor\Data Interoperability\parcels\` in the **Location** text box and press ENTER.
The location is added to the Catalog tree under the Folders Connection heading.

Complexity:
Intermediate

Data Requirement:
ArcGIS Tutorial Data Setup

Data Path:
C:\arcgis\ArcTutor\Data Interoperability\

Goal:
Create a simple spatial ETL tool that reads MGE parcel data and loads it into a geodatabase.



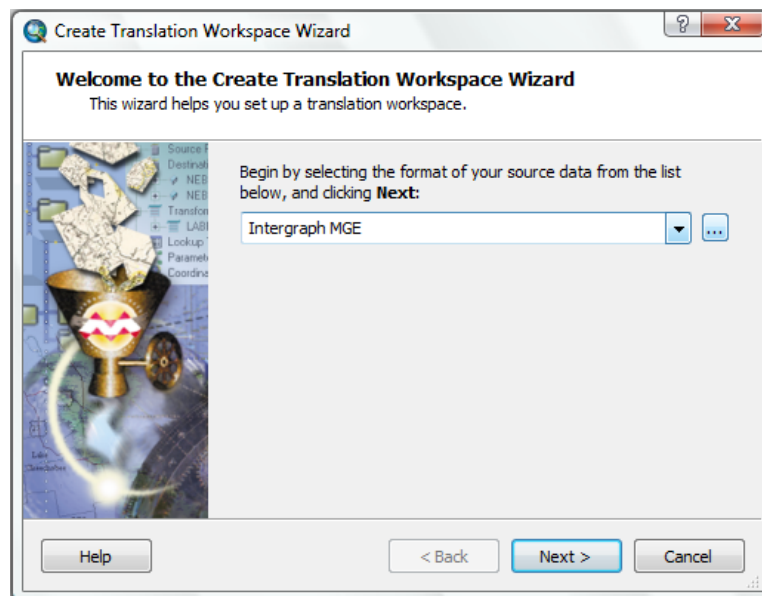
4. Right-click the parcels folder and click **New > Toolbox**.
5. Right-click the toolbox, click **Rename**, then name it `parcels`.

Create the translation workspace

Starting the Create Translation Workspace Wizard

Steps:

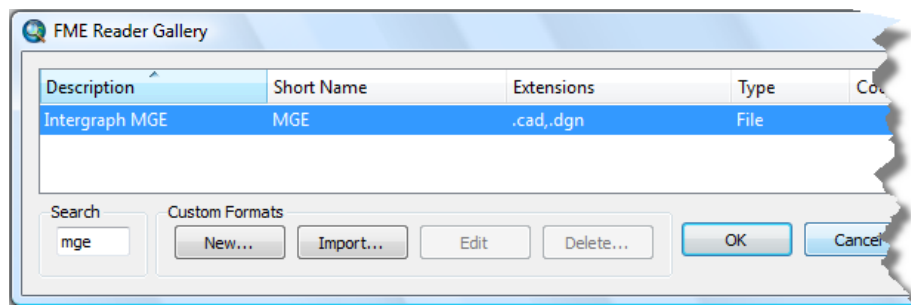
1. Right-click the parcels toolbox and click **New > Spatial ETL Tool**. The **Create Translation Workspace Wizard** opens.



Choosing the FME reader

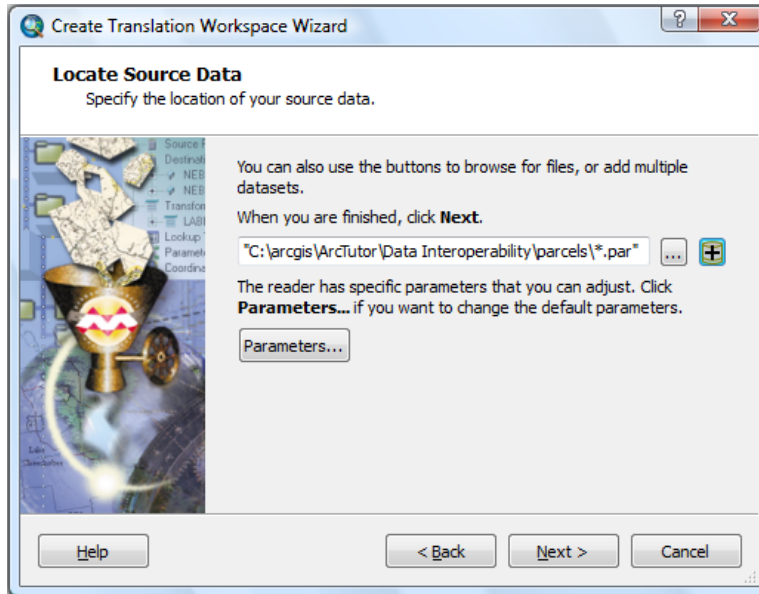
Steps:

1. Click the **Format** browse button.
The **FME Reader Gallery** dialog box opens.



2. Type `mge` in the **Search** text box.
3. Click the row listing the **Intergraph MGE** format and click **OK**.
The **FME Reader Gallery** dialog box closes.
4. Click **Next**.

Specifying the data source

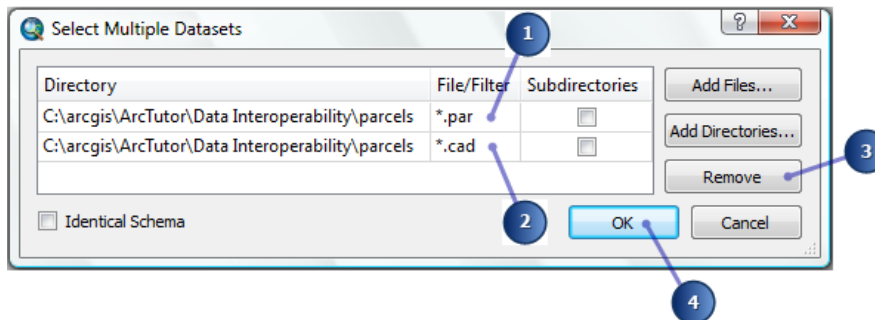


Steps:

1. Click the **Add (+)** button.
The **Select Multiple Datasets** dialog box opens.
2. Click the **Add Directories** button.
A second navigation window opens.
3. Navigate to `C:\arcgis\ArcTutor\Data Interoperability\parcels\` and click **Open**.
The **Select Multiple Datasets** dialog box is populated with the path and the standard (.dgn and .cad) file extensions defined for the Intergraph MGE format by FME Reader Gallery.

Specifying the file filter parameters

The next four steps edit the default **File/Filter** parameters to select the MicroStation DGN (.par) drawing files used in this exercise.



Steps:

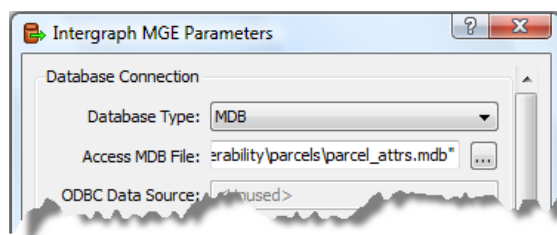
1. Double-click the **File/Filter** field containing *.dgn and replace the contents with *.par.
2. Click the row specifying *.cad and click **Remove**.
3. Click **OK**.
The **Select Multiple Datasets** dialog box closes.
4. Click **Next**.

Specifying the reader parameters

Specify the external database that contains the attribute tables.

Steps:

1. Click the **Parameters** button.
The **Intergraph MGE Parameters** dialog box opens.

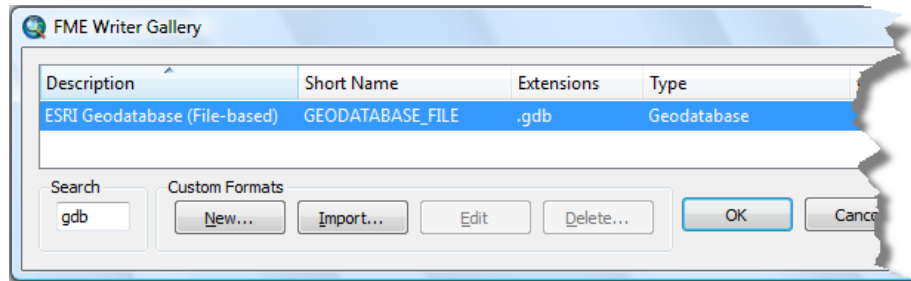


2. Click the **Database Type** arrow and choose **MDB**.
3. Click the **Access MDB File** browse button.
4. Navigate to C:\arcgis\ArcTutor\Data Interoperability\parcels\parcel_attr.mdb and click **Open**.
5. Click **OK**.
The **Intergraph MGE Parameters** dialog box closes.
6. Click **Next**.

Choosing the FME writer

Steps:

1. Click the **Format** browse button.
The **FME Writer Gallery** dialog box opens.



2. Type `gdb` in the **Search** text box.
3. Click the row listing **ESRI Geodatabase (File-based)** and click **OK**.
The **FME Writer Gallery** dialog box closes.
4. Click **Next**.

Specifying the writer parameters

Accept the default parameters for the geodatabase.

Steps:

1. Click **Next**.

Creating the workspace

Steps:

1. Click **Finish**.
The wizard processes the information and starts Workbench.

Prepare the tool

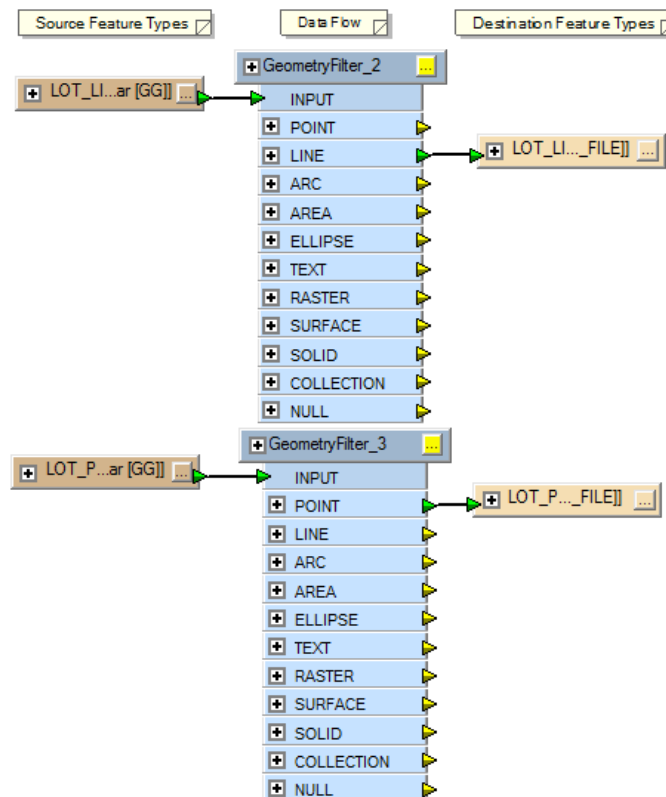
Workbench opens the workspace with an ETL model of the information you provided. Prune the workspace so that it only processes point and line features.

Modifying the model

Steps:

1. Right-click the source feature type named `unlinked` and click **Delete** from the shortcut menu.
2. Right-click its orphaned geometry filter and click **Delete** from the shortcut menu.
You may need to drag GeometryFilter_3 out of your way.
3. Click and drag to create a selection box around the remaining orphaned destination feature types, right-click the selection, then click **Delete** from the shortcut menu.
4. Delete all destination feature types except for source feature types `LOT_LINES` and `LOT_POINTS`.

The `LOT_LINES` source feature type `LINE` attribute is mapped to the `LOT_LINES_line` destination feature type, and the `LOT_POINTS` source feature type `POINT` attribute is mapped to the `LOT_POINTS_point` destination feature type.



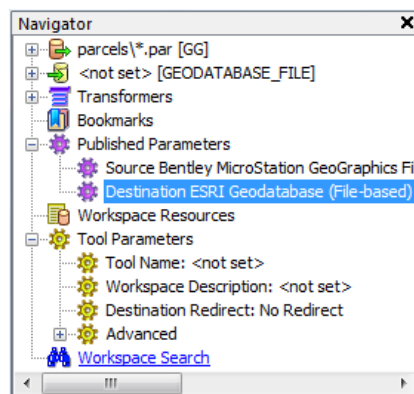
Editing the destination parameter

Specify the default output geodatabase path and file.

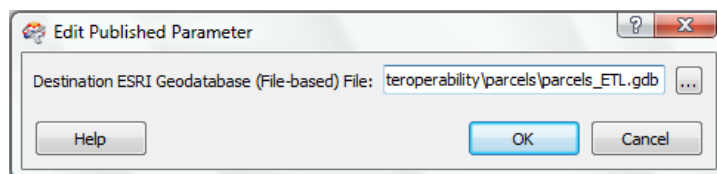
Steps:

1. Confirm that Navigator is available.

To open the Navigator window from the main menu, click **View > Windows > Navigator**.



2. Expand **Published Parameters**.
3. Double-click **Destination ESRI Geodatabase (File-based)**.
The **Edit Published Parameter** dialog box opens.



4. Click the browse button.
The **Select Destination ESRI Geodatabase (File-based) File** dialog box opens.
5. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\parcels folder.
6. Type `parcels_ETL.gdb` in the **Geodatabase** text box to complete the path and click **Open**.
7. Click **OK**.
The **Edit Published Parameter** dialog box closes.

Save and rename the tool

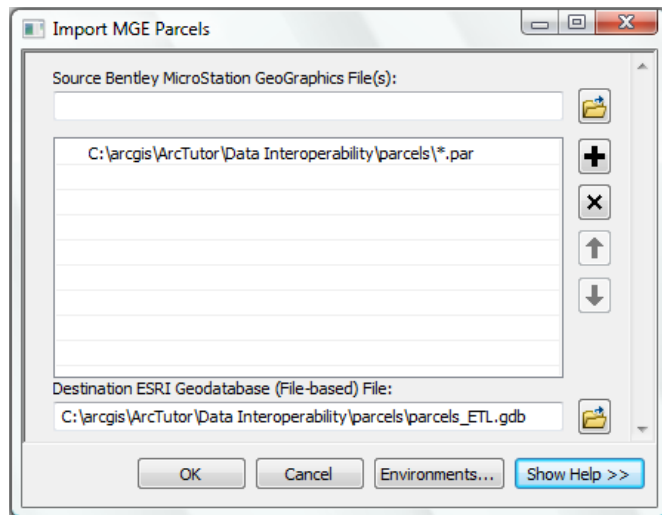
Steps:

1. Click **File > Save** to save the tool.
2. Click **File > Exit** to exit Workbench.
3. Right-click the new spatial ETL tool in the Catalog window, click **Rename**, then type `Import MGE Parcels`.

Open and run the tool

Steps:

1. In the Catalog window, expand the Parcels toolbox .
2. Double-click the **Import MGE Parcels** tool.
The spatial ETL tool **Import MGE Parcels** dialog box opens.

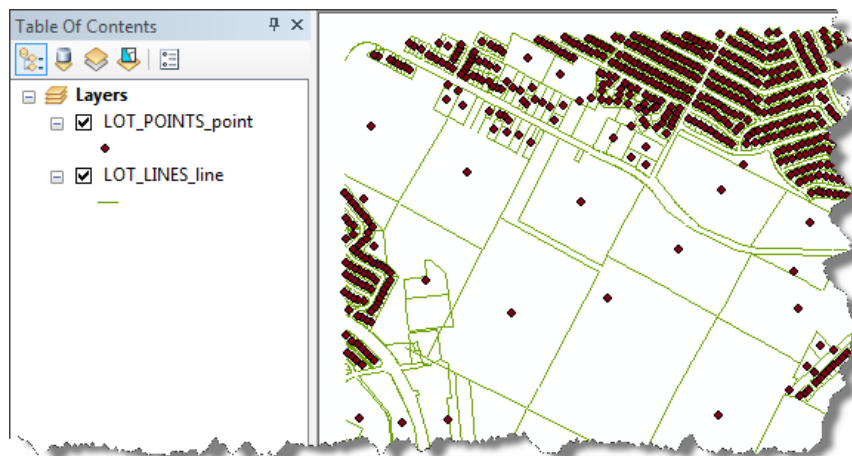


3. Click **OK**.
The tool executes the conversion in the background. A progress bar at the bottom of your map displays the name of the tool. When the tool is finished, a pop-up notification appears in the system tray. You can examine the details of the conversion in the **Results** window.

Add the data to ArcMap

Steps:

1. In the Catalog window, expand the **parcels_ETL** geodatabase and drag the feature classes **LOT_POINTS_point** and **LOT_LINES_line** into ArcMap and verify your results.



This completes the exercise.

Continue to the next exercise: [Exercise 3b: Transforming data and verifying output.](#)

Exercise 3b: Transforming data and using Visualizer

A transformer is an FME Workbench object that performs a particular restructuring of features or schema. It is a visual object that you add to your workspace canvas and connect between the source and destination features, or to other transformers.

This exercise introduces you to the fundamentals of using FME transformers. You create a spatial ETL tool that transforms MGE parcel data, evaluates the new features with a test clause, and generates output as failed or passed features. Finally, you inspect the output of your workspace without generating data using **Visualizer**. You complete the exercise by exporting the workspace as a custom format.

Complexity:
Advanced

Data Requirement:
ArcGIS Tutorial Data Setup

Data Path:
C:\arcgis\ArcTutor\Data Interoperability\

Goal:
Learn the fundamentals of transforming features and attributes in FME Workbench and using Visualizer to verify output.

Using FME Workbench, you perform the following tasks:

- Add an **AreaBuilder** transformer to create polygons from the LOT_LINES source feature type.
- Add a **PointOnAreaOverlayer** transformer to overlay the LOT_POINTS features onto the polygon features and merge their attributes.
- Add a **Tester** transformer to evaluate and count the point features inside each polygon feature.
- Redirect the output of the workspace to **Visualizer** and inspect the output of your workspace.
- Export the workspace as a custom format.

Start ArcMap

Prerequisite:

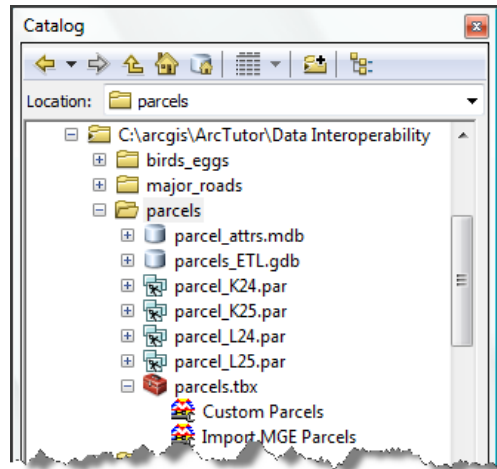
The Data Interoperability extension must be enabled.

Before starting this exercise, you must have completed the previous exercise, [Exercise 3a: Getting started with spatial ETL](#).

Steps:

1. Start ArcMap.
2. Click the **Catalog Window** button  on the **Standard** toolbar.
3. Type C:\arcgis\ArcTutor\Data Interoperability\parcels\ in the **Location** text box and press ENTER.

The location is added to the Catalog tree under the Folders Connection heading.



Copy and rename the spatial ETL tool

Steps:

1. Right-click the **Import MGE Parcel** tool and click **Copy** on the shortcut menu.
2. Right-click the Parcels toolbox and click **Paste** on the shortcut menu.
3. Right-click the **Import MGE Parcel (2)** tool, click **Rename** on the shortcut menu, then type Custom Parcels.
4. Right-click the **Custom Parcels** tool and click **Edit**.
Workbench starts.

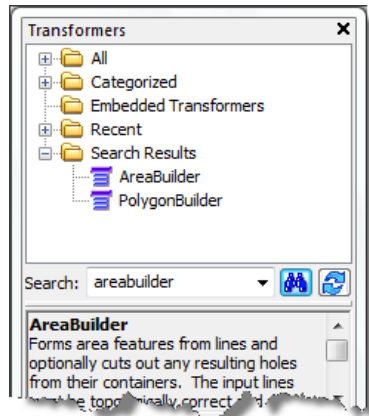
Add an AreaBuilder transformer

The AreaBuilder transformer creates topologically correct polygon features from lines that form closed shapes.

Connect an AreaBuilder transformer to the LOT_LINES GeometryFilter.

Steps:

1. Confirm that **Transformer Gallery** is available.
To open the Transformer window from the main menu, click **View > Windows > Transformer Gallery**.



2. In the **Transformers** window, type `areabuilder` in the search text box and press ENTER.
3. Double-click **AreaBuilder**.
An AreaBuilder transformer is added to the canvas.
4. Click the line connecting the LOT_LINES GeometryFilter and the LOT_LINES destination feature and press DELETE.
The GeometryFilter is disconnected from the destination feature type.
5. On the LOT_LINES GeometryFilter, click the yellow arrow beside the LINE attribute output and drag the arrow to the red arrow beside the AreaBuilder input.
The GeometryFilter output is connected to the AreaBuilder input, and the arrow turns green.

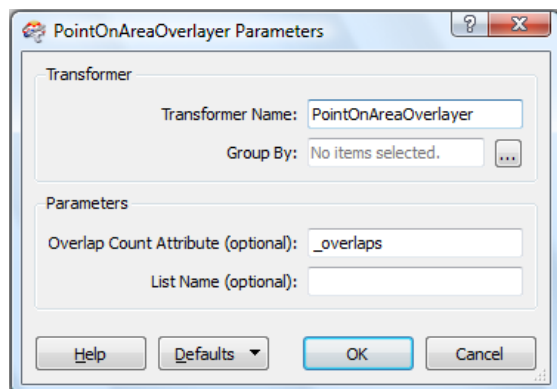
Add a PointOnAreaOverlayer transformer

The PointOnAreaOverlayer transformer overlays point features onto area features and merges their attributes. As a result, each polygon feature acquires attributes from the point feature contained within its boundary. Attributes with the same name are not replaced.

Connect a PointOnAreaOverlayer transformer to the LOT_LINES AreaBuilder transformer and the LOT_POINTS GeometryFilter.

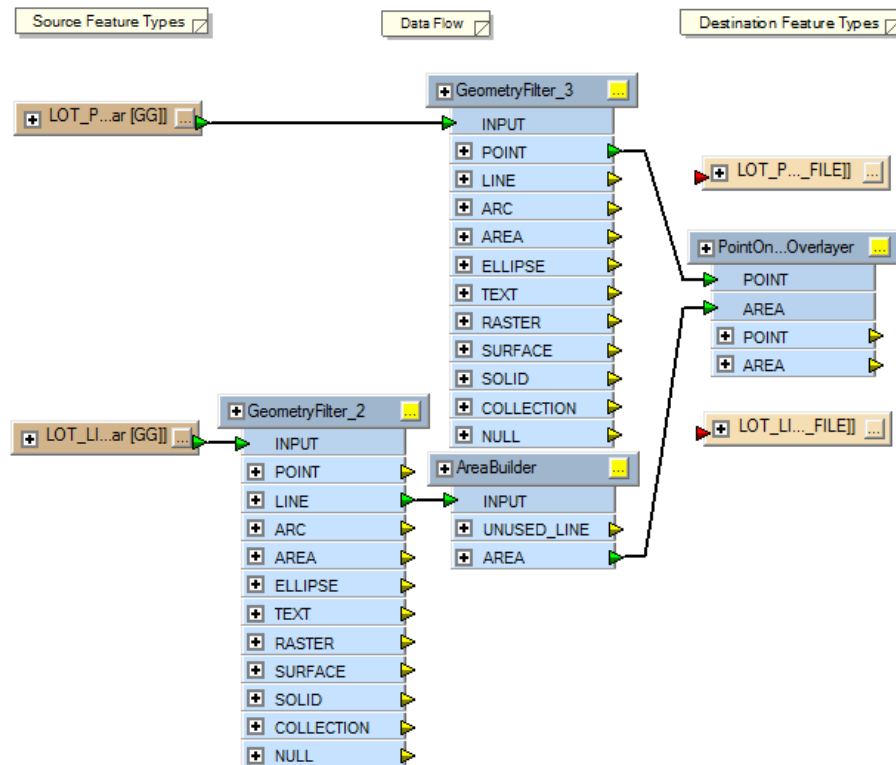
Steps:

1. In the **Transformers** window, type `PointOnArea` in the search text box and press ENTER.
2. Double-click **PointOnAreaOverlayer**.
A PointOnAreaOverlayer transformer is added to the canvas.
3. Click the **Properties** button and view the parameters.
The **PointOnAreaOverlayer Parameters** dialog box opens.



Overlap Count Attribute counts the number of point features contained in each polygon. This is useful for validating data and sending features to separate outputs for further processing. In the next section, you will connect a Tester transformer to evaluate this number and direct output accordingly.

4. Click **OK**.
The **PointOnAreaOverlayer Parameters** dialog box closes.
5. Click the line connecting the **LOT_POINTS** GeometryFilter and the **LOT_POINTS** destination feature type and press DELETE.
The GeometryFilter is disconnected from the destination feature type.
6. On the **LOT_POINTS** GeometryFilter, click the yellow arrow beside the POINT output and drag the line to the red arrow beside the PointOnAreaOverlayer POINT input.
The GeometryFilter POINT output is connected to the PointOnAreaOverlayer POINT input, and the arrow turns green.



Organizing the canvas layout

At this time, the connectors may begin to cross over each other and appear confusing. There are several ways to organize the canvas layout:

- Click **Tools > Auto Layout**, then drag the objects on the canvas.
- Right-click a connector line, click **Insert Vertex on link** on the shortcut menu to add one more vertex, then drag each vertex to route the connector around other transformers.

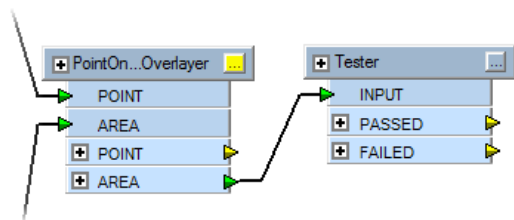
Add a Tester transformer

The Tester transformer evaluates one or more tests on a feature and routes the feature according to the outcome of the test(s).

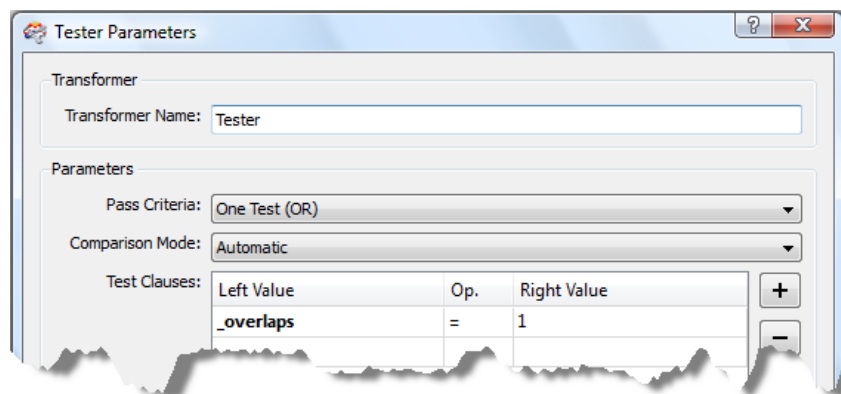
Connect a Tester transformer to the PointOnAreaOverlayer transformer. Add a test clause that evaluates the Overlap Count attribute generated by the PointOnAreaOverlayer transformer. Send polygon features containing one point feature to the PASSED output and all others to the FAILED output.

Steps:

1. In the **Transformers** window, type `Tester` in the search text box and click **Find**.
2. Double-click **Tester**.
A Tester transformer is added to the canvas.
3. Connect the PointOnAreaOverlayer **AREA** output to the Test **INPUT**.



- Click the **Properties** button on the Tester transformer.
The **Tester Parameters** dialog box opens.



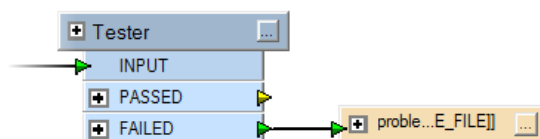
- Double-click the first cell in the **Left Value** field, click the down arrow, then choose **_overlaps**.
- Double-click the first cell in the **Op.** field, click the arrow, then choose **=**.
- Click the first cell in the **Right Value** field and type 1.
- Click **OK**.
The **Tester Parameters** dialog box closes.

Redefine the LOT_LINES destination feature

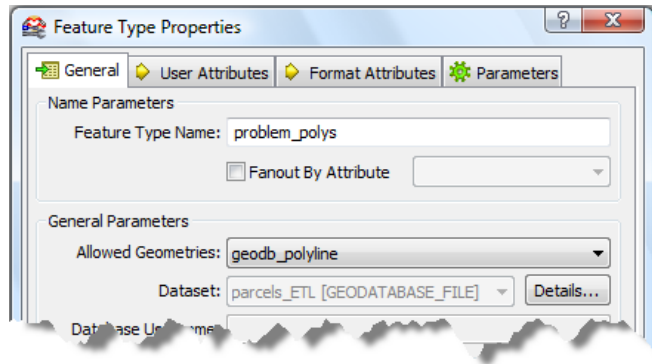
Redefine the LOT_LINES destination feature to generate the polygon features that failed the test clause specified in the Tester transformer. Also, add a user attribute to capture the _overlay value.

Steps:

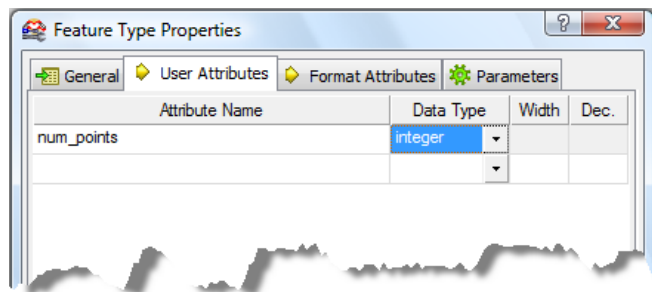
- Connect the FAILED output on the Tester transformer to the INPUT on the **LOT_LINES** destination feature.



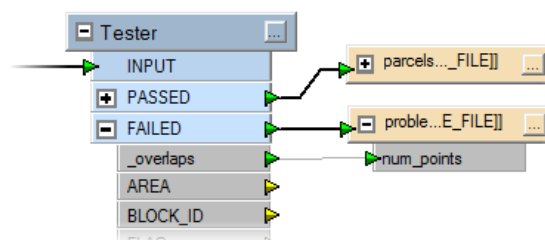
- Click the **Properties** button on the LOT_LINES destination feature.
The **Feature Type Properties** dialog box opens.



3. Click the **General** tab.
4. In the **Feature Type Name** text box, type `problem_polys`.
5. Click the **Allowed Geometries** arrow and choose **geodb_polyline**.
6. Click the **User Attributes** tab.



7. Select all attributes and press **DELETE**.
The `LOT_LINES` attributes are not needed.
8. Click the first empty cell in the **Attribute Name** field and type `num_points`.
The `num_points` attribute is used to capture the `_overlay` attribute value generated by the Tester transformer. This value represents the quantity of overlapping points for each failed feature.
9. Click the **Data Type** arrow and choose **integer**.
10. Click **OK**.
The **Feature Type Properties** dialog box closes.
11. Expand the Tester transformer and connect the `_overlay` output to `num_points` on the `LOT_LINES` destination feature.

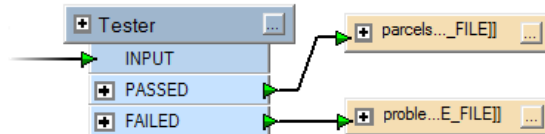


Redefine the LOT_POINTS destination feature

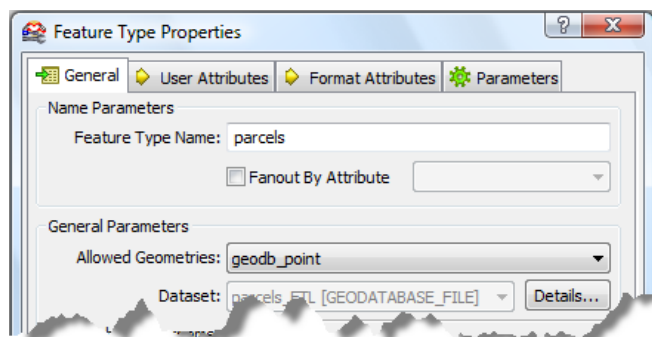
Redefine the LOT_POINTS destination feature to generate the polygon features that passed the test clause specified in the Tester transformer.

Steps:

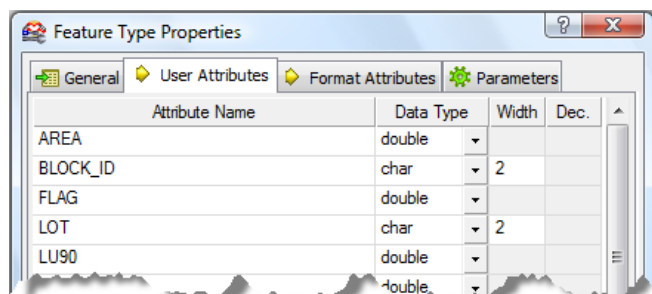
1. Connect the PASSED output on the Tester transformer to the INPUT on the LOT_POINTS destination feature.



2. Click the **Properties** button on the LOT_POINTS destination feature. The **Feature Type Properties** dialog box opens.



3. Click the **General** tab.
4. In the **Feature Type Name** text box, type `parcels`.
5. Click the **Allowed Geometries** arrow and choose `geodb_polyline`.
6. Click the **User Attributes** tab.



7. Select only the attributes with names that start with `igds_` and press **DELETE**.

The `igds_` attributes are symbolic names created by the FME reader to simplify the translation of the IGDS source element types to FME feature types. There is no need to include them with the destination features.

8. Click **OK**.

The **Feature Type Properties** dialog box closes.

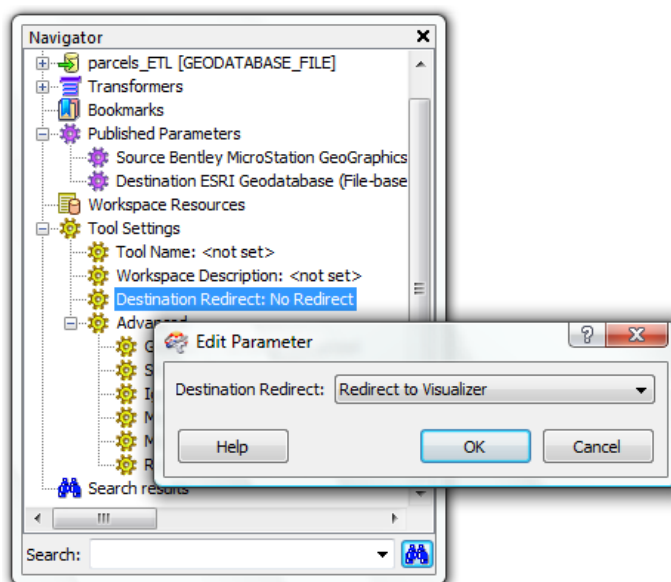
Verify the output of your workspace with Visualizer

Visualizer is an in-memory viewer that enables you to inspect the output of your workspace without generating data or possibly overwriting existing data.

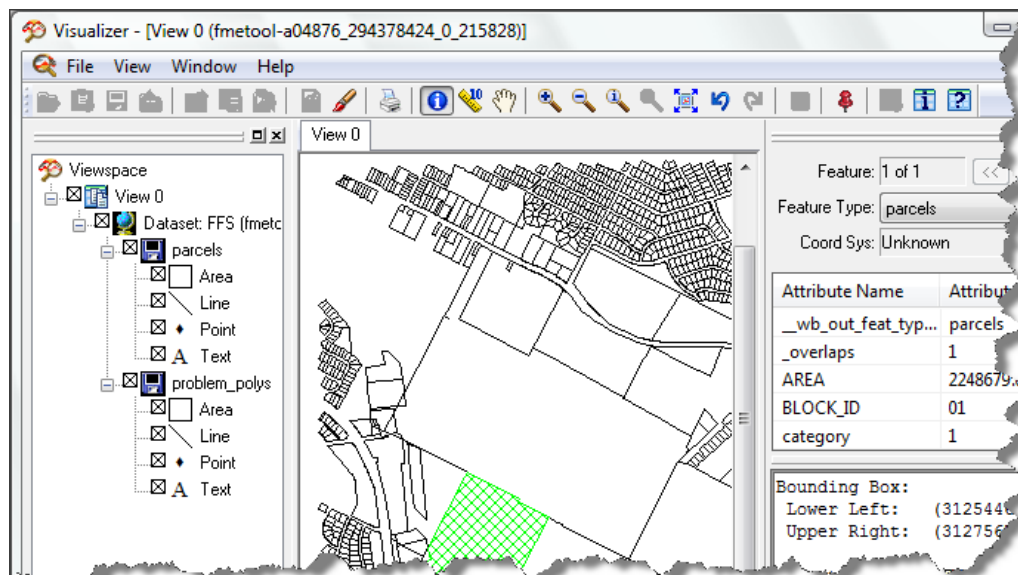
Redirect the output of your workspace to Visualizer and verify your results.

Steps:

1. In the **Navigator** window, expand **Tool Settings**, right-click **Destination Redirect**, then click **Edit Parameter** from the shortcut menu.
The **Edit Parameter** dialog box opens.



2. Click the **Destination Redirect** arrow and choose **Redirect to Visualizer**.
3. Click **OK**.
The **Edit Parameter** dialog box closes.
4. On the main menu, click **File > Run Translation**.
Visualizer starts.



- Expand the datasets in **Viewspace**.
- Click the **Identify** tool on the toolbar, select features, then explore their attribute values displayed in the **Information** window.

Observe that the workspace creates polygons from line elements stored in the MicroStation DGN (.par) files and acquires the point feature attributes stored in the parcels_attr.mdb database. Also observe that the Tester transformer routed features that did not pass the test clause to the problem_polys destination features.

- Exit **Visualizer**.
- On the Workbench menu, click **File > Save**.

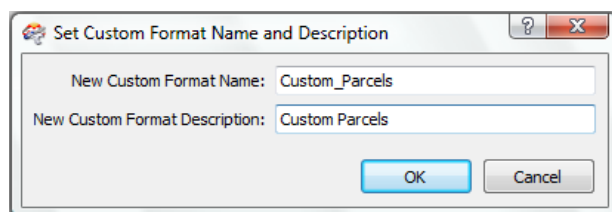
Save the spatial ETL tool as a custom format

A custom format is a translation workspace that is exported as a format and utilized in the FME reader gallery. It is saved to an external (.fds) file and can be imported to reader galleries on other desktops.

Creating a custom format adds the format to the FME reader gallery. Once created, subsequent uses of the gallery allow you to edit the format in FME Workbench or delete it from the list and remove the (.fds) file from the default folder location.

Steps:

- On the **Workbench** menu, click **File > Export as Custom Format**.
The **Set Custom Format Name and Description** dialog box opens.



2. Type `Custom_Parcel`s in the **New Custom Format Name** text box.
3. Type `Custom Parcel`s in the **New Custom Format Description** text box.
4. Click **OK**.
A second Workbench session starts as a custom format (.fds) workspace.
5. Click **File > Exit** to close the custom format workspace.
6. Click **File > Exit** to close the transformation workspace.

This completes the exercise.

Continue to the next exercise: [Exercise 3c: Using attribute values to control output](#).

Exercise 3c: Using source attributes to separate data

This exercise introduces two methods for separating data based on attribute values. They can be used to create spatial ETL tools that categorize source data and generate sets of features with common values.

The first method separates the data within the workspace using the ValueMapper transformer as a lookup table and routes the data to specific AutoCAD block definitions. The second method separates the data at the time of writing using the Fanout By Attribute writer parameter for a GML dataset and generates unique feature types on the fly.

Complexity:
Advanced

Data Requirement:
ArcGIS Tutorial Data Setup

Data Path:
C:\arcgis\ArcTutor\Data Interoperability\

Goal:
Learn how to use source attribute values in FME Workbench to separate data and generate new features.

Using Workbench, you perform the following tasks:


- Add a **ValueMapper** transformer and map specific attribute values in the COVER field to AutoCAD block definitions stored in the AutoCAD template (.dwg) file.
- Expose the AutoCAD properties for the block name, block rotation, and the block reference (insert) entity.
- Specify the AutoCAD template file that is included with the tutorial data.
- Add a second data destination for a GML dataset and set the **Fanout By Attribute** parameter for each unique value in the COVER field.

Create a toolbox and a spatial ETL tool

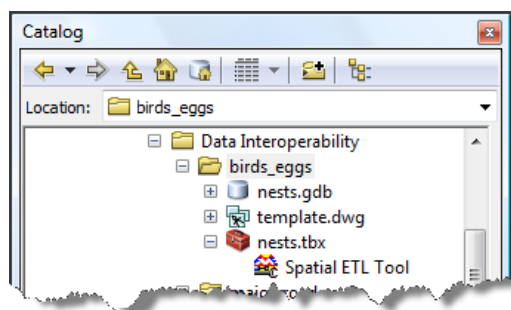
Prerequisite:

The Data Interoperability extension must be enabled.

Steps:

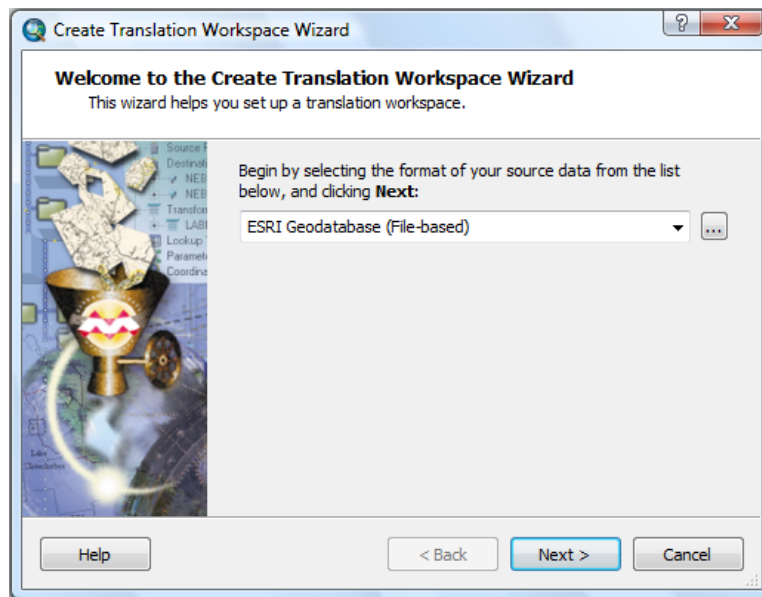
1. Start ArcMap.
2. Click the **Catalog Window** button  on the **Standard** toolbar.
3. Type C:\arcgis\ArcTutor\Data Interoperability\birds_eggs\ in the **Location** text box and press ENTER.

The location is added to the Catalog tree under the Folders Connection heading.



4. Right-click the birds_eggs folder and click **New > Toolbox**.
5. Right-click the toolbox, click **Rename**, then type nests.
6. Right-click the nests toolbox and click **New > Spatial ETL Tool**.

Create Translation Workspace Wizard opens.

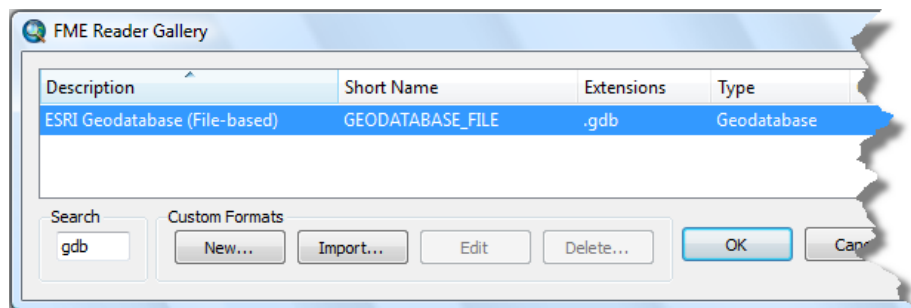


Create the translation workspace

Choosing the FME reader

Steps:

1. Click the **Format** button.
The **FME Reader Gallery** dialog box opens.

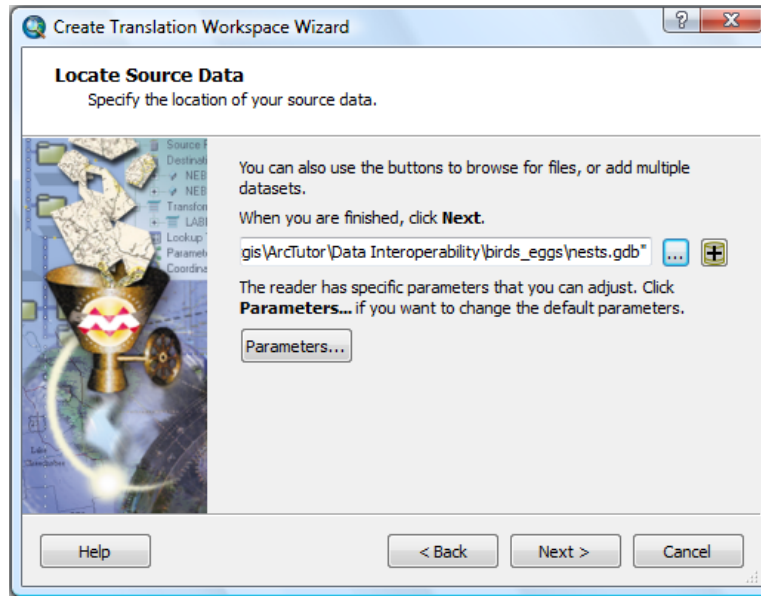


2. Type `gdb` in the **Search** text box.
3. Click the row listing the **ESRI Geodatabase (File-based)** format and click **OK**.
The **FME Reader Gallery** dialog box closes.
4. Click **Next**.

Specifying the data source

Steps:

1. Click the **Locate Source Data** browse button.
The **Select Geodatabase** dialog box opens.



2. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\birds_eggs\ folder.
3. Click the nests.gdb folder and click **Open**.
The **Select Geodatabase** dialog box closes.
4. Click **Next**.

Specifying the reader parameters

Accept the default parameters for the geodatabase.

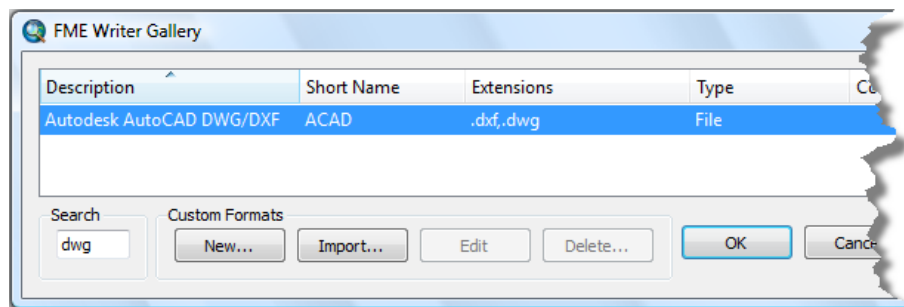
Steps:

1. Click **Next**.

Choosing the FME writer

Steps:

1. Click the **Format** browse button.
The **FME Writer Gallery** dialog box opens.



2. Type `dwg` in the **Search** text box.
3. Click the row listing **ESRI Geodatabase (File-based)** and click **OK**.
The **FME Writer Gallery** dialog box closes.
4. Click **Next**.

Specifying the writer parameters

Accept the default parameters for the AutoCAD DWG format.

Steps:

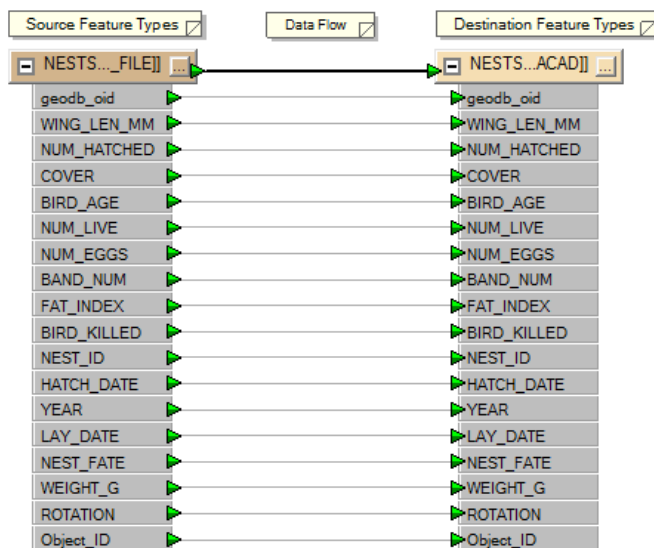
1. Click **Next**.

Creating the workspace

Steps:

1. Click **Finish**.

The wizard processes the information and starts **Workbench**.



2. Expand the source dataset NESTS and the destination feature NESTS. Observe that the source feature attributes are mapped directly to the destination AutoCAD dataset.

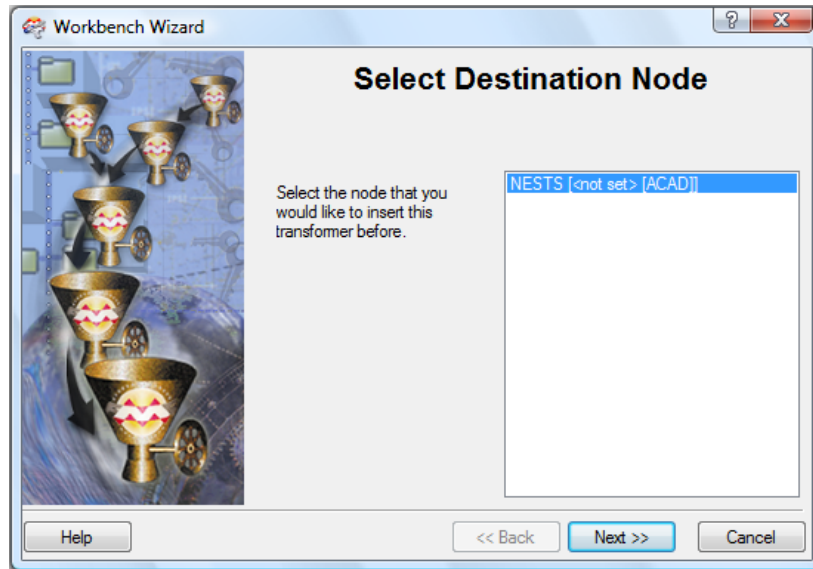
Add a ValueMapper transformer

The ValueMapper transformer acts as a lookup table for input values and stores the output values in a user-defined attribute.

Map the unique values in the COVER feature attribute field to specific AutoCAD block names stored in the block_name attribute field.

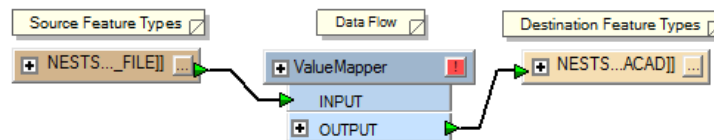
Steps:

1. In the **Transformers** window, type `valuem` in the search text box and press ENTER.
2. Double-click **ValueMapper**.
A ValueMapper transformer is added to the canvas.
3. Right-click the ValueMapper transformer and click **Insert Before** from the shortcut menu.
Workbench Wizard starts.

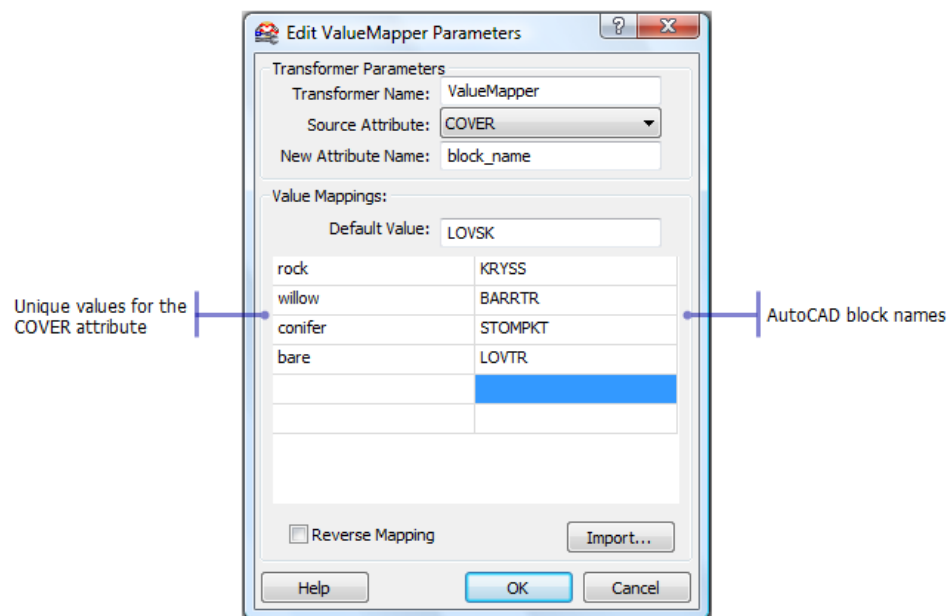


4. Click **Next**.

The transformer is connected to the source and destination datasets.



5. Click the **Properties** button on the **ValueMapper** transformer window. The **Edit ValueMapper Parameters** dialog box opens.



6. Click the **Source Attribute** arrow and choose the **Cover** attribute.

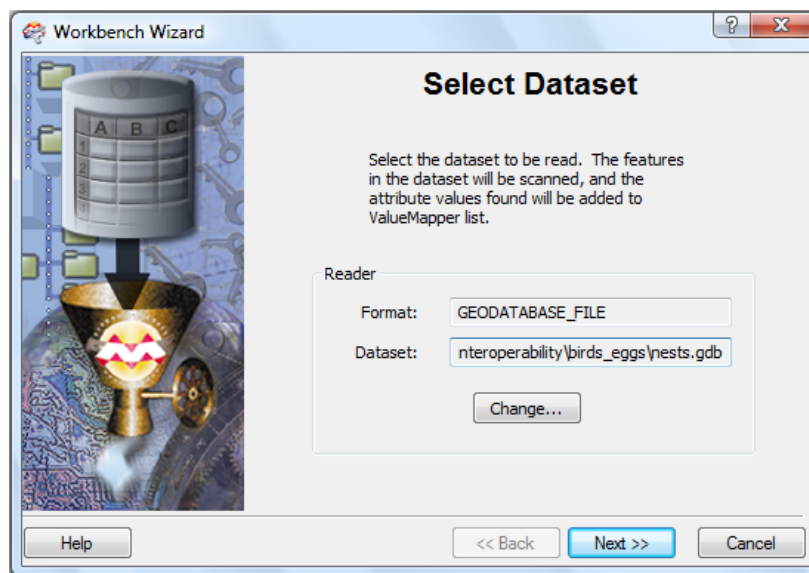
7. In the **New Attribute Name** text box, type `block_name`.

Importing unique values

You can type the source input values manually or use the import wizard. You can use the import wizard even when the destination values are unavailable. In this case, select the same source attributes for both sides of the equation to generate a basic 1:1 mapping, then edit the destination values to match the corresponding AutoCAD block names stored in the template (.dwg) file.

Steps:

1. Click **Import**.
Workbench Wizard starts.



2. Confirm the path is set to C:\arcgis\ArcTutor\Data Interoperability\birds_eggs\ nests.gdb.
3. Click **Next**.
4. Click the feature type **NEST** and click **Next**.
5. Click the key attribute **COVER** and click **Next**.
6. Click the value attribute **COVER** and click **Next**.
7. Click **Finish**.
8. In the **Default Value** text box, type LOVSK.
During execution, the default value is used if the tool encounters an attribute value not listed in the ValueMapper lookup table. In this exercise, you are providing a default AutoCAD block name.
9. Double-click each value in the right-hand column and replace it with the corresponding AutoCAD block name listed in the following table.

| COVER attribute value | block_name attribute value |
|-----------------------|----------------------------|
| rock | KRYSS |
| willow | BARRTR |
| conifer | STOMPKT |

| | |
|------|-------|
| bare | LOVTR |
|------|-------|

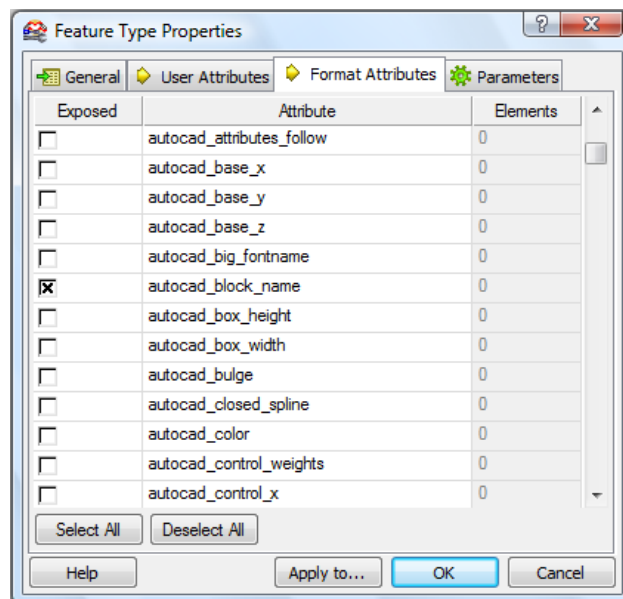
- Click **OK**.
The **Edit ValueMapper Parameters** dialog box closes.

Expose the AutoCAD block properties

Exposing the AutoCAD block properties in the destination feature type enables you to control how the block references are inserted in the destination AutoCAD (.dwg) file.

Steps:

- Click the **Properties** button on the destination feature type NESTS.
The **Feature Type Properties** dialog box opens.

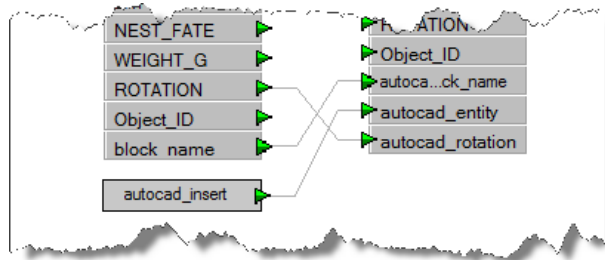


- Click the **Format Attributes** tab.
- Check the boxes for **autocad_block_name**, **autocad_entity**, and **autocad_rotation**.
- Click **OK**.
The **Feature Type Properties** dialog box closes.

Connect input for the exposed format attributes

Steps:

- Expand the attributes list for the ValueMapper transformer and the NESTS destination feature.



Pan to the bottom of the lists and make the following connections:

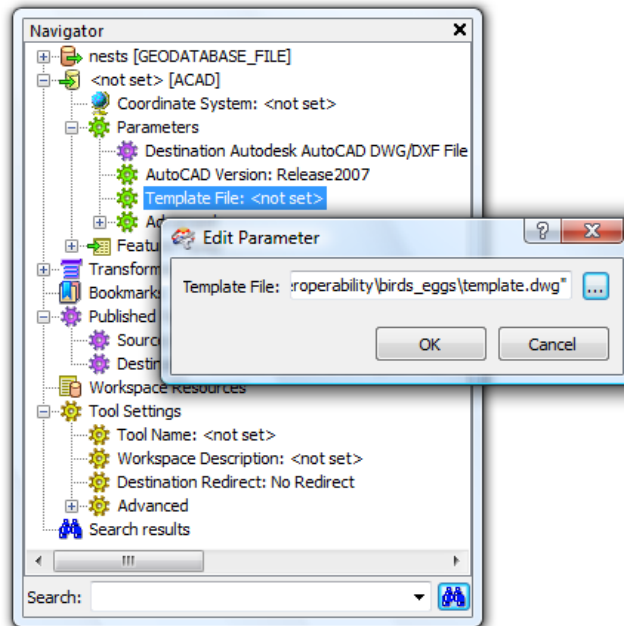
2. Connect the **ROTATION** attribute to the **autocad_rotation** format attribute.
The rotation values are passed from the source data.
3. Connect the **block_name** attribute to the **autocad_block_name** format attribute.
The block_name values are generated by the ValueMapper lookup table.
4. Double-click the **autocad_entity** input (red) arrow.
New Constant appears as input.
5. Double-click **New Constant** and type `autocad_insert`.
The autocad_insert constant instructs FME Writer to insert a block reference for each output entity. In addition to the graphic elements defined in the AutoCAD template (.dwg) file, the user attributes specified for the destination dataset are written as block attributes to each block reference.

Specify the AutoCAD template file

The AutoCAD template file contains the block definitions you specified in the ValueMapper lookup table.

Steps:

1. In the **Navigator** window, expand the destination format **Parameters**, right-click **Template File**, then click **Edit Parameter** from the shortcut menu.
The **Edit Parameter** dialog box opens.



2. Click the **browse (...)** button.
The **Select Template File** dialog box opens.
3. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\birds_eggs folder, click **template.dwg**, then click **Open**.
4. Click **OK**.
5. Save your work and exit Workbench.

Save and rename the tool

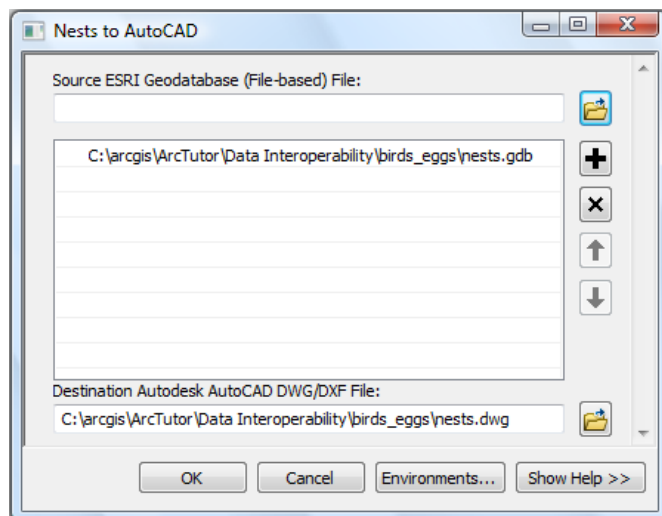
Steps:

1. Click **File > Save** to save the tool.
2. Click **File > Exit** to exit Workbench.
3. Right-click the new spatial ETL tool in the Catalog window, click **Rename**, then type **Nests** to **AutoCAD**.

Open and run the tool

Steps:

1. In the **Catalog** window, expand the **Nests** toolbox .
2. Double-click the **Nests to AutoCAD** tool.
The **Nests to AutoCAD** dialog box opens.



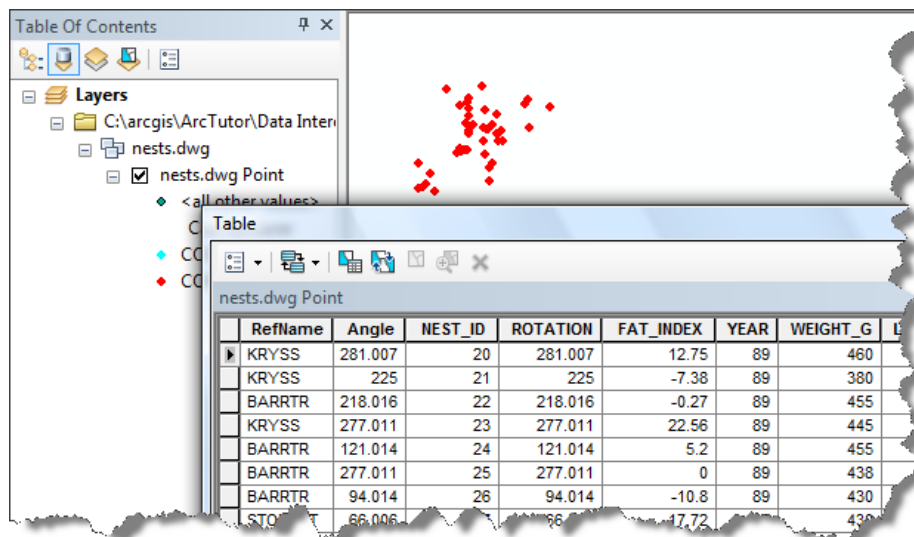
3. Click **OK**.

The tool executes the conversion in the background. A progress bar at the bottom of your map displays the name of the tool. When the tool is finished, a pop-up notification appears in the system tray. You can examine the details of the conversion in the **Results** window.

Add the data to ArcMap

Steps:

1. In the **Catalog** window, expand the **nests** DWG dataset and drag the point feature class into ArcMap to confirm your results.



Copy and rename the tool

Steps:

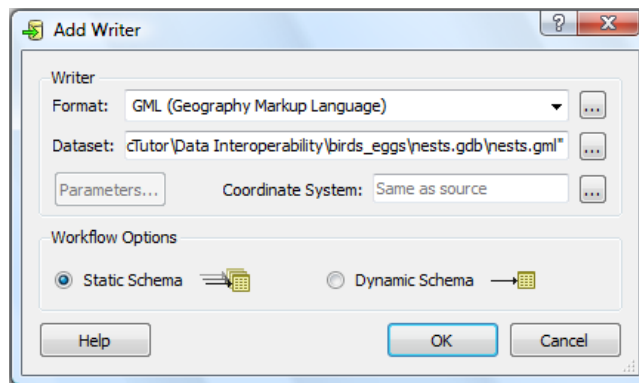
1. In the **Catalog** window, right-click the **Nests to AutoCAD** tool and click **Copy** on the shortcut menu.
2. Right-click the Nests toolbox and click **Paste** on the shortcut menu.
3. Right-click the **Nests to AutoCAD (2)** tool, click **Rename** on the shortcut menu, then type **Nests to AutoCAD and GML**.
4. Right-click the **Nests to AutoCAD and GML** tool and click **Edit**.
Workbench starts.

Add a writer for GML

Add a writer and connect a second destination dataset for GML to the ValueMapper transformer OUTPUT.

Steps:

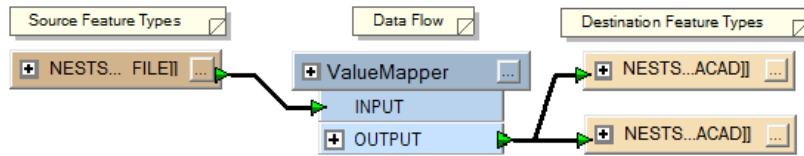
1. On the main menu, click **Writers > Add Writer**.
The **Add Writer** dialog box opens.



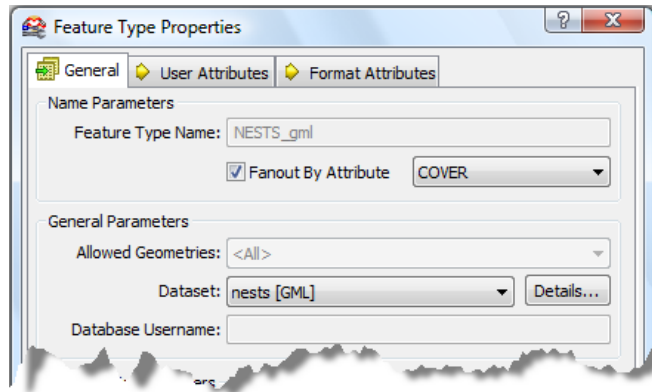
2. Click the **Format** browse button and choose **Geography Markup Language (GML)** from **FME Writer Gallery**.
3. Click the **Dataset** browse button.
The **Select File** dialog box opens.
4. Navigate to the C:\arcgis\ArcTutor\Data Interoperability\birds_eggs\ folder, type `nests` in the **File name** text box, then click **Save**.
5. Click **OK**.
Workbench prompts you to create a new feature type.
6. Click **No**.

Instead of creating a feature type from scratch, copy the AutoCAD feature type and edit the settings.

7. Right-click the AutoCAD output feature type **NESTS** and click **Duplicate** from the shortcut menu.
8. Connect the ValueMapper OUTPUT to the INPUT of the new destination feature type.



9. Click the **Properties** button on the destination feature type NESTS. The **Feature Type Properties** dialog box opens.

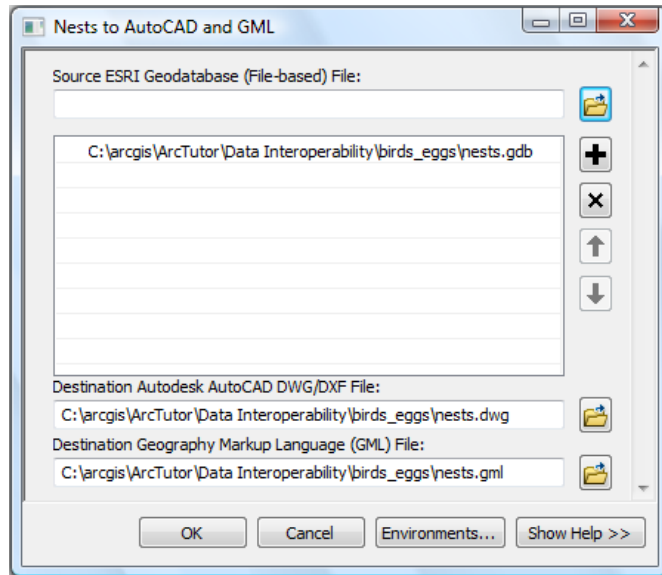


10. In the **Feature Type Name** text box, type NESTS_gml.
11. Check the **Fanout By Attribute** check box, click the arrow, then choose **COVER**. The Fanout setting generates a new output feature type on the fly for each unique value in the COVER attribute field.
12. Click the **Dataset** arrow and choose **nests [GML]**.
13. Click **OK**. The **Feature Type Properties** dialog box closes.

Save and run the tool

Steps:

1. Click **File > Save** to save the tool.
2. Click **File > Exit** to exit Workbench.
3. In the **Catalog** window, expand the Nests toolbox .
4. Double-click the **Nests to AutoCAD** tool. The **Nests to AutoCAD** dialog box opens.



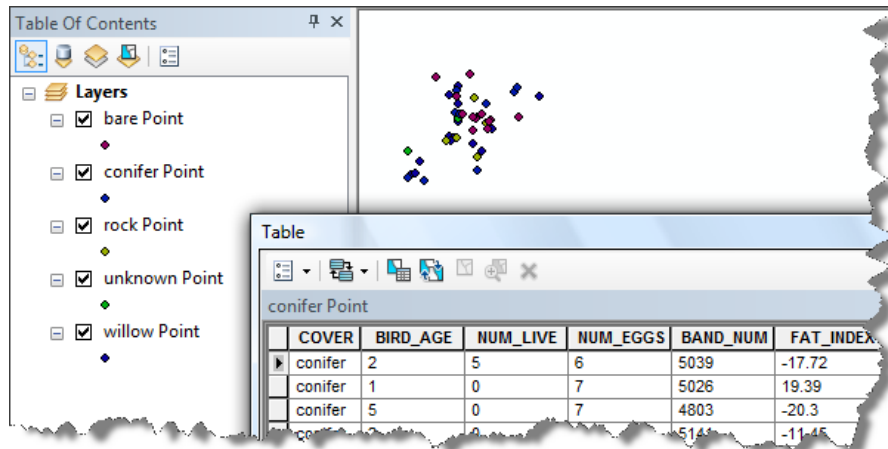
5. Click **OK**.

The tool executes the conversion in the background. A progress bar at the bottom of your map displays the name of the tool. When the tool is finished, a pop-up notification appears in the system tray. You can examine the details of the conversion in the **Results** window.

Add the data to ArcMap

Steps:

1. In the Catalog window, drag the **nests** GML dataset into ArcMap to verify your results.



This completes the exercise.