

Autodesk MapGuide® Studio 2010

# User's Guide

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April 2009

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# Understanding Autodesk MapGuide® Studio

# 1

Use MapGuide Studio to assemble resources into a web layout that your users can view and interact with across a network. Resources include spatial and attribute data from files or databases, raster images, symbols, maps, and layers.

Before building a web layout, you need to understand the MapGuide Studio interface and its resources.

## What's New in Autodesk MapGuide Enterprise 2010?

Welcome to Autodesk MapGuide Enterprise 2010. The following list describes what's new in this release.

### **Support for SQL Server 2008**

Autodesk MapGuide Enterprise 2010 includes an FDO provider for Microsoft SQL Server 2008.

### **Enhance Server Error Reporting**

Autodesk MapGuide Enterprise 2010 enhances the Server error and trace logs to include more detailed information about server operations.

### Performance Improvements

Autodesk MapGuide Enterprise 2010 includes a number of performance enhancements:

- Improved connection time for Oracle feature sources and faster authoring in Studio
- Improved map generation time by enabling multiple open connections to raster feature sources
- Improved loading and selection times for flexible web layouts
- Improved rendering time by caching coordinate system transformation objects

### Raster Re-projection

Autodesk MapGuide Enterprise 2010 now includes an efficient raster re-projection algorithm that is based on tessellating an image into smaller triangles and re-projecting the triangles.

## Sample Data Available in Autodesk MapGuide Enterprise

Included with Autodesk MapGuide Enterprise are several kinds of sample data that you can use in different ways to learn and experiment with the product. The available sample data includes the following:

- Getting Started Guide Sample Data - This set of sample data is specifically for completing the exercises in chapter 3 of the Getting Started Guide. This data is installed with Autodesk MapGuide Studio in the Sample Data folder in your MapGuideStudio2010 install location.
- Sample Viewer Application Sample Data - This data is specifically for use with the Developer's Guide, API, and Viewer Sample Application. For installation instructions, refer to the document *Installing Sample Data and Viewer Sample Application*, available from the media browser on your Autodesk MapGuide Enterprise CD.
- Real World Data from Data Providers- This data is available for you to explore and experiment with before you create your own maps. For more information, see [Real World Data from Data Providers](#) (page 3).

## Real World Data from Data Providers

Autodesk MapGuide Enterprise comes with an extensive set of sample data that you can explore to get ideas, or experiment with before you create your own maps.

The sample data is available in a separate folder called "Autodesk MapGuide 2010 Sample Data". Depending on which version of the product you have, this folder is located on your product DVD, on a separate CD, or as a separate download.

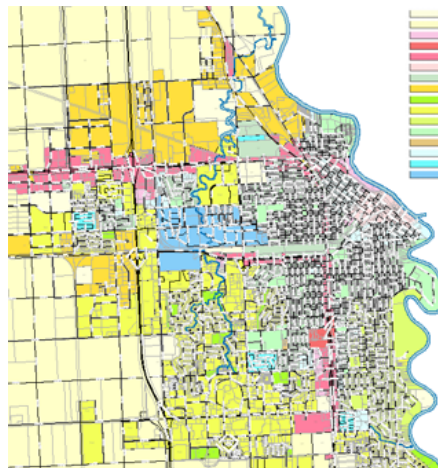
Because the sample data includes large files (aerial images, database, and so on), the sample data folder is not installed by default. To explore it, you must copy the folder of data to the root of your C: drive.

For all data connections to be correct and connected automatically, the final location of your sample data should be: *C:\Autodesk MapGuide 2010 Sample Data*. If you put it in a different location, you will need to fix data connections.

The sample data folder includes the data listed below. For more information about the data, see the documentation in the Autodesk MapGuide Sample Data 2010 folder.

### City of Grand Forks, North Dakota

This real-world municipal data set include feature data, aerial imagery, and sample maps.



## City of Redding, California

A real-world data set from the City of Redding, California, in the United States. Data includes real parcel data, soil drawings, water data, metadata, and more.



## Institut Geographique National, France

A comprehensive set of sample data from Institut Geographique National (IGN), the national mapping agency of France. The data covers "department 92" in France. Departments are administrative units of France, roughly analogous to English counties. Department 92 includes several cities just outside of Paris. The area is often called Haute-de-Seine.



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## NAVTEQ Data

NAVTEQ data sets for 3km x 3km areas of seven sample cities from around the world. NAVTEQ data is used in a broad range of location based applications and navigation products and mapping sites. They provide vector data, street centerline map data, and much more. You can use the sample data to get an idea of what NAVTEQ can provide and how you can use to enhance your maps in AutoCAD Map 3D.

## DigitalGlobe Imagery

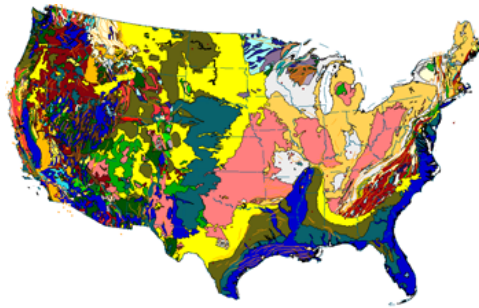
Samples of DigitalGlobe imagery for the seven sample cities. DigitalGlobe is a provider of high resolution aerial and satellite imagery.



Sample Map of London Using the Sample Data from NAVTEQ and DigitalGlobe

## Sample Maps

Sample maps highlighting sample data from NAVTEQ, DigitalGlobe, and other real-world maps from Redding, Grand Forks, Crater Lake, and more.



## Symbols

A copy of the bitmap symbols that are installed with Autodesk MapGuide Studio. Examples are shown below.



## Getting Additional Geospatial Data to Enhance Your Maps

As you create maps, you may want to add data to enhance them. For example, you may want to add raster 3D elevation data to help you create 3D maps, add new vector data such as land plots or points of interest, or add satellite imagery for your area.

So that you can get the high resolution precision geospatial data you need quickly, easily and at lower cost, Autodesk has partnered with leading geospatial data providers to provide a geodata portal that gives you access to all the geospatial data you need.

Visit the geodata portal at [www.autodesk.com/geodata](http://www.autodesk.com/geodata).

Examples of the types of data available on the portal:

- Aerial and satellite imagery from DigitalGlobe
- 3D raster elevation data from Intermap Technologies

- Vector data such as roads and land parcels from NAVTEQ
- Weather data from WeatherBug



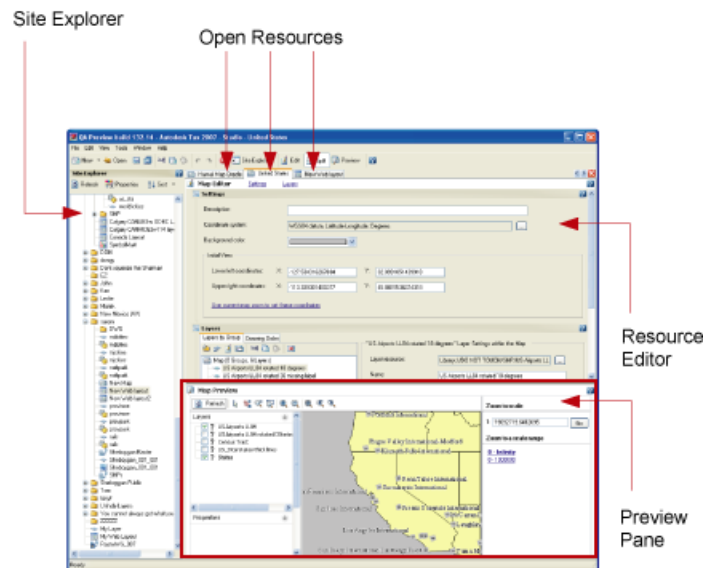
Data from: Intermap Technologies, NAVTEQ, and DigitalGlobe

## The MapGuide Studio Interface

The collection of servers that process MapGuide Studio and Viewer requests is called a site. The servers in each site share a single resource repository, which stores resources used to create web layouts.

In the MapGuide Studio application window, use the Site Explorer to access the resource repository and the editor pane to define and edit resources.

To work with MapGuide Studio you must connect to the site where your resources are stored. The resources on the site are displayed in the Site Explorer. When you double-click a resource, its properties are displayed in the editor, where you can make changes. The features of the editor vary depending on the type of resource you are editing.



The MapGuide Studio interface

You can open multiple resources in the editor pane. Each resource has its own editor. The resource name appears on a tab at the top of the editor. The toolbar at the upper left of the program window contains tools for both the Site Explorer and the various editors. Right-click a site, folder, or resource for additional options.

For more information about resources, see [Understanding Resources](#) (page 8).

## Understanding Resources

Resources are the data and other elements used to build a MapGuide Studio web layout, including the web layout itself. You can load files from a variety of formats and connect to databases to create data resources.

Resources are displayed in the Site Explorer as you load or create them.

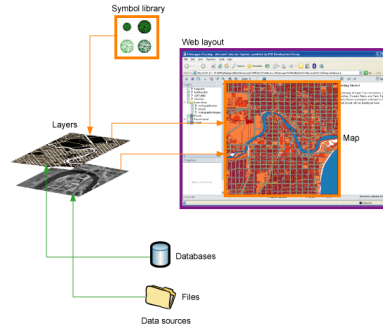
---

**NOTE** Resources have associated permissions that control who views and edits them. For more information about permissions, see [Setting Permissions](#) (page 62).

---

## Resource Diagram

The following diagram shows how you assemble MapGuide Studio resources to build a web layout.



## Web Layouts

The MapGuide Studio web layout is the highest-level resource in a hierarchy of resources. It is the end product of your work in MapGuide Studio. You can make the web layout available to users directly or embed it in your application.

For more information about creating web layouts, see [Displaying the Map in a Web Browser](#) (page 111).

## Maps

Web layouts reference a single map resource. The map resource references one or more layers. Each layer, in turn, references a data resource that provides the content for the layer. You can create new maps in MapGuide Studio, or load maps from Autodesk Map. When you create a new map, you must add layers and then specify the data to use with each layer.

For more information about creating a new map, see [Working with Maps](#) (page 67). For more information about loading a map, see [About DWG Files](#) (page 18).

## Layers

Maps reference one or more layer resources that contain links to data. Layers are independent MapGuide Studio elements that are displayed in the Site Explorer and can be shared among maps.

For more information about layers, see [Working with Layers](#) (page 77).

## Data Resources

You can display two types of data in a map: drawing source and feature source.

**Drawing sources** Preserve styles and themes created using the Display Manager in Autodesk Map or other Autodesk applications. The data is converted to Design Web Format (DWF) so the styles and themes are rendered accurately in the displayed map. You cannot modify these styles and themes.

To make styles and themes available for further analysis and editing, convert the data to SDF when loading. The data becomes feature source data in MapGuide Studio. Styles and themes are preserved and are available for further analysis and modification.

**Feature sources** Unstyled data that you can stylize and theme in MapGuide Studio. Feature sources are SDF, SHP, and raster files, as well as database connections, including Oracle, ArcSDE, and ODBC. MapGuide Studio also supports WMS and WFS sources.

## Load Procedures

These resources control how drawing and feature sources are loaded onto the site repository. For more information, see [Accessing Data](#) (page 15).

## Symbol Libraries

Symbol library resources contain one or many symbols that can be used when applying styles to points or labels. MapGuide Studio supports numerous file formats.

For more information about working with symbols, see [Working with Symbols](#) (page 143).

## Print Layouts

Print layouts define the elements to include in the DWF ePlot that is sent to the printer. You can include the following elements in a layout:

- Background color
- Title
- Legend
- Scale bar
- North arrow
- URL
- Date and time
- Custom logo
- Custom text

For more information about print layouts, see [Working with Print Layouts](#) (page 149).

## Starting the Application and Connecting to a Site

To work with MapGuide Studio you must connect to the site where your resources are stored.

### To start MapGuide Studio and connect to your site

- 1 Click Start menu ► Programs ► Autodesk ► Autodesk MapGuide Studio.
- 2 Click File menu ► Open Site or click File menu ► Recent Sites.
- 3 Select a site name.
- 4 In the Site Authentication dialog box, enter the URL for the site, your user name, and password.

Site, User ID, and Password entries are case-sensitive.

To obtain the site URL, see your administrator. Enter the site URL using the following syntax:

*http://MySiteAddress/mapguide*

The Site Explorer displays the site and all available resources. Note that resources have associated permissions that control who views and edits them. For more information about permissions, see [Setting Permissions](#) (page 62). For more information about resources, see [Understanding Resources](#) (page 8) and [Accessing Data](#) (page 15).

## Basic Steps for Building a Web Layout

The following steps summarize creating a web layout and provide links to more information.

### To build a web layout

- 1 Start MapGuide Studio and connect to a site.  
For more information, see [Starting the Application and Connecting to a Site](#) (page 11).
- 2 Determine the coordinate system to use for your web layout. For more information, see [Setting the Coordinate System for Your Map](#) (page 68).
- 3 Load or connect to data resources, making them available in the Site Explorer.  
For more information, see [Accessing Data](#) (page 15).
- 4 Load raster images, making them available in the Site Explorer.  
For more information, see [Loading Raster Files](#) (page 30).
- 5 Create symbol library resources to use in point layers.  
For more information about working with symbols, see [Working with Symbols](#) (page 143).
- 6 Define layers to organize your data and customize the display.  
For more information about working with layers to organize and present data, see [Working with Layers](#) (page 77).
- 7 Define a map by adding layers.  
For more information about building a map, see [Working with Maps](#) (page 67).  
You can also create a map with associated layers in one step by loading an Autodesk Map drawing with Display Manager elements defined.
- 8 Define print layouts.

For more information about print layouts, see [Working with Print Layouts](#) (page 149).

9 Create the web layout.

For more information about creating a web layout, see [Displaying the Map in a Web Browser](#) (page 111).

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# Accessing Data

# 2

Before you can build maps and web layouts in Autodesk MapGuide Studio, you must make your source data available. There are three ways to make source data available:

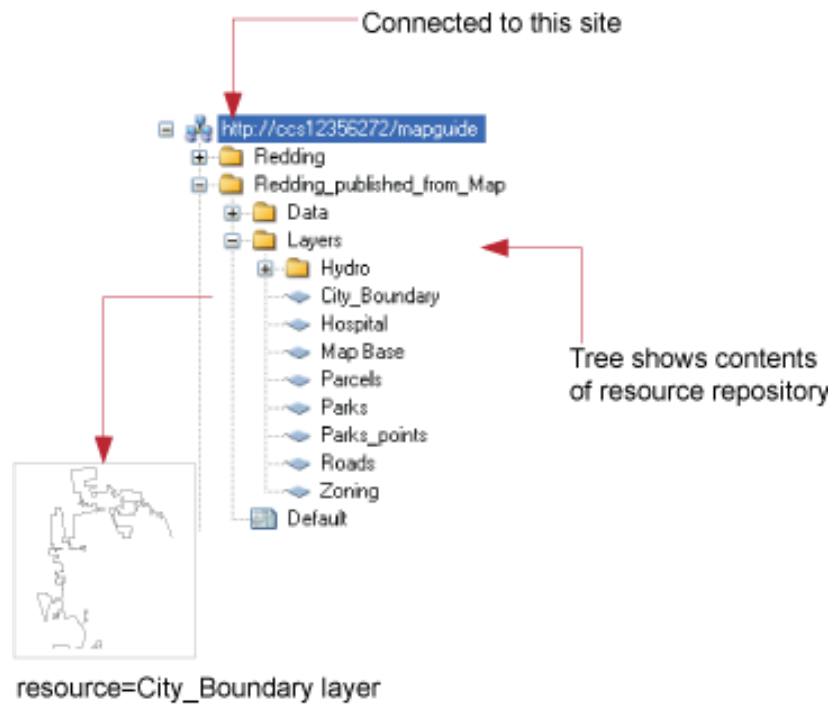
- Load any file-based data, such as DWG, SHP, or SDF. You can also load raster files.
- Configure connections to SDF, SHP, and raster files not loaded into the MapGuide resource repository.
- Configure connections to databases or web services, such as Oracle, ArcSDE, SQL Server, or WMS.

Load data by converting all, or part of, the source file into a format that MapGuide can use, and storing it as a resource. For example, you can load all the layers in a DWG file and create a separate resource for each one.

Connect to SDF, SHP, or raster files without loading them onto the MapGuide resource repository. The files can be located on the same server as MapGuide or on a different server.

Data stored in a database does not need to be loaded. You simply connect to it by configuring a data source for it. In this case, the information necessary to connect to the database is stored as the resource.

All resources are stored in the resource repository on the site server. When you open MapGuide Studio and connect to your site server, the contents of the resource repository are displayed in the Site Explorer.



The Site Explorer provides a view into the resource repository

Look up your source data format in the following table to find out how to make that data available in MapGuide Studio. Click the links below the table to go to step-by-step instructions.

Supported File Format	Method
Autodesk DWG, DXF	Load
Autodesk DWF	Load
Autodesk SDF	Load or Configure connection
SHP (ArcView shapefile)	Load or Configure connection
Raster formats (.Bil, .bmp, .cal, .ecw, .jpg/.jpeg, .png, .sid, .tif/.tiff, .tga)	Load or Configure connection
ArcSDE database	Configure connection
MySQL	Configure connection

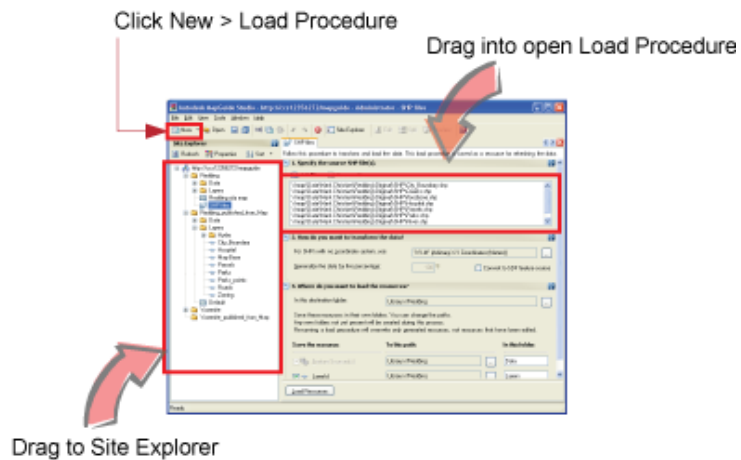
Supported File Format	Method
Microsoft SQL Server	Configure connection
ODBC databases (Microsoft Access, Excel etc.)	Configure connection
Oracle database	Configure connection
Web map service (WMS)	Configure connection
Web feature service (WFS)	Configure connection

## Loading Files

You load file-based data into the resource repository using load procedures. Load procedures specify the files you want to load and where you want to store the resources created from them.

In the case of DWG files, the load procedures also specify how you want to load each layer or element. For example, a procedure might specify that you want to load a layer called “Buildings” from a DWG file and store it as a resource called “Building outlines,” or another procedure might load all the layers as a single resource.

In MapGuide Studio, there are three ways to load your source files:



Load procedures are displayed in the Site Explorer as resources. You can reuse them, copy them, or modify them. Load procedures are essentially saved scripts for reloading data. You can use load procedures to automate the updating of resources on the server. They capture the location of the source files, the conversion rules, and where to put the resulting data on the server. You can execute these rules (either interactively in MapGuide Studio or through a script) to refresh file-based spatial data on your site. Scripts can be run overnight at regular intervals to keep the data up-to-date.

For more information about automation using scripts, see the *Developer's Guide*.

## About DWG Files

MapGuide Studio can load only CAD layers from a DWG file. These CAD layers are translated to individual SDF feature classes within a single SDF feature source. If you have xrefs in your DWG, the layers from the externally referenced files can also be loaded.

---

**NOTE** If you are using Autodesk Map 3D 2010, you can style and theme your maps in the DWG environment and then publish them directly to MapGuide. The Publish to MapGuide command loads the data into the resource repository, creates layers, applies styles, and creates maps, as appropriate. For more information, see your Autodesk Map 3D 2010 documentation.

---

### How DWG Files Are Transformed

DWG files are loaded one at a time. If you have more than one file in the load procedure, the different files are loaded sequentially. For example, if you have several DWG files in the procedure, you will get several resources, each one of which contains the layers of a single drawing, not one resource containing all the layers of all the drawings together.

## Loading A DWG

This procedure assumes that you have one or more DWG files that you want to load. To load a DWG file, you drag one or more source files to the Site Explorer.

Before you start loading files, you may want to create a folder in the Site Explorer to store the resources produced by the load. To find out how to create the recommended folder structure, see [Organizing and Sorting Resources](#) (page 55).

## To load a DWG

- 1 Drag a DWG file from Windows Explorer to the Site Explorer.  
The Load Procedure Editor is displayed to the right of the Site Explorer. The path to, and name of, the DWG source file is displayed at the top. The DWG, with its path information, is displayed under Specify The Source DWG File(s).
- 2 For Which Components Do You Want To Extract, click Select CAD Layers.
- 3 In the Select Individual Components dialog box, select the layers you want to load. Then click OK.
- 4 For How Do You Want To Transform The Data, select the coordinate system you want to use.  
MapGuide Studio cannot detect any coordinate system applied to the DWG. You must assign a coordinate system to apply to all DWGs in this load procedure.
- 5 Optional: for Generalize The Data By This Percentage, enter a percentage to reduce the number of vertices in the polylines or polygons in the source data.
- 6 Optional: select Transform Closed Polylines To Polygons to create polygon objects, for example, for parcels that have been drawn with polylines.
- 7 For Where Do You Want To Load The Resources, accept the defaults or specify a destination folder for the map resource that will be created by this load procedure. (You can also move the map resource later in the Site Explorer.)
- 8 Click Load Resources.  
MapGuide Studio converts each AutoCAD layer into a feature class within a single SDF. You can view the results by double-clicking the SDF or the map in the Site Explorer.

## About SDF Files

There are two types of SDF (Spatial Database Format) files:

- SDF 2—Compatible with Autodesk MapGuide 6.5 and earlier.
- SDF 3—Compatible with newer versions of MapGuide (Autodesk MapGuide Enterprise and MapGuide Open Source) and Autodesk Map 3D 2007.

SDF 2 files contain a single type of data (text, point, polyline, or polygon), and have only three attributes: Key, URL, and Name. Therefore, they are typically associated with external database files to provide table data for theming. SDF 3 files can store both geometry and any table data associated with it.

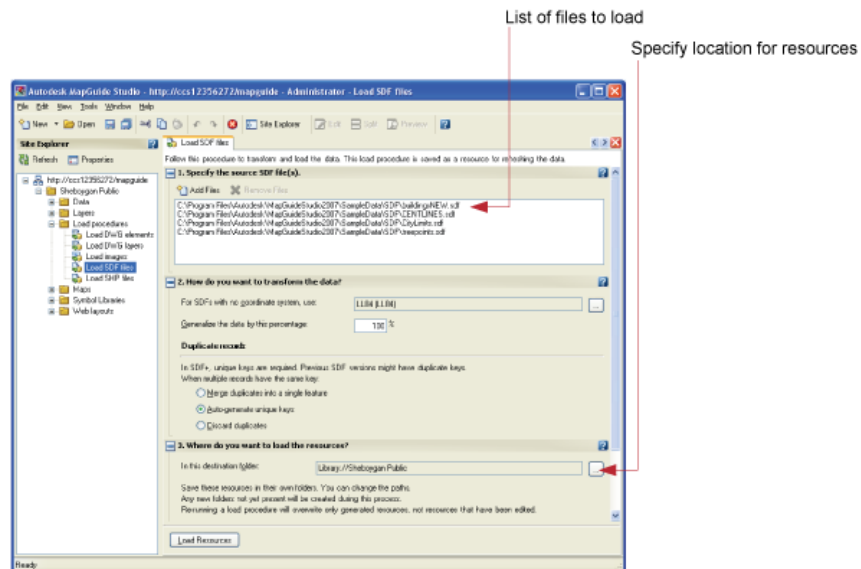
## Loading SDF Files

This procedure assumes that you have one or more SDF 2 or SDF 3 files that you want to load. To load an SDF file, you drag one or more source files to the Site Explorer. MapGuide Studio converts SDF 2 files to SDF 3 format and automatically creates a new layer for each file as well as a new feature source.

### To load an SDF file

- 1 Drag the SDF file or files you want to load into a folder in the Site Explorer.

A new load procedure is displayed to the right of the Site Explorer. It contains a list of the files to load. You can drag other files into this load procedure.



- 2 For How Do You Want To Transform The Data, select the coordinate system you want to use.

The coordinate system you select here will be used only if there is no coordinate system already defined for the source file or files.

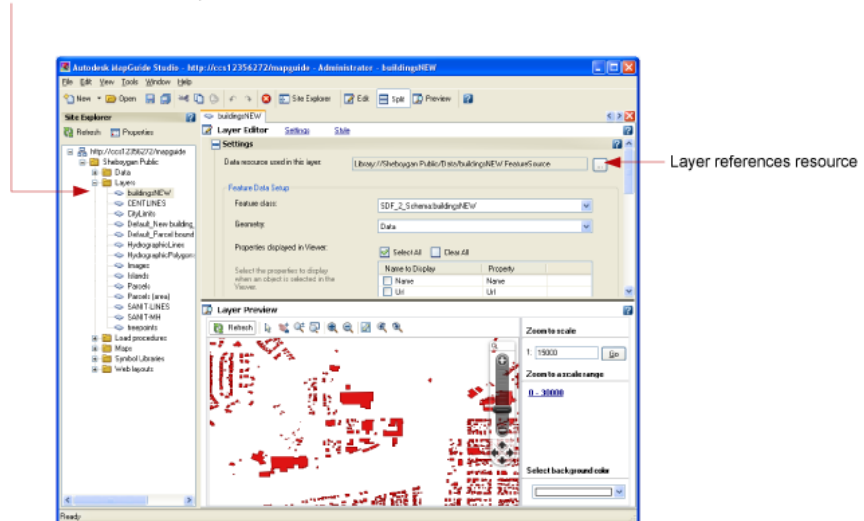
- Optional: for Generalize The Data By This Percentage, enter a percentage to reduce the number of vertices in the polylines or polygons in the source data.
- Under Duplicate Records, select Auto-Generate Unique Keys unless you know that the SDF 2 file already has links to an external database table that you want to preserve, in which case, select Merge Duplicates or Discard Duplicates.
- For Where Do You Want To Load The Resources, select the destination folder for the resources that will be created by this load. (You can also move the resources later in the Site Explorer.)
- Click Load Resources.

MapGuide Studio creates a new feature source and a new layer for each SDF file.

- Double-click one of the new layers to open it.

The Layer Editor is displayed to the right of the Site Explorer. (For more information about the Layer Editor, see [Working with Feature Source Layers](#) (page 78).)

New feature source and layer



- 8 On the MapGuide Studio toolbar, click Save to save the load procedure in the repository.  
You can rename the new feature sources and the layers in the Site Explorer.

## About SHP Files

The SHP format, also known as "shape format" or "shapefile," is published by ESRI and is widely used for data interchange in GIS. Shapefiles store both geometry and attribute data for features. A single shapefile consists of three physical files with the same file name, but different file extensions:

- **.shp**—Points, polylines, and polygon geometric data can be stored in a shp file. However a single shp file can contain only one type of geometry.
- **.shx**—Index to the geometric map features
- **.dbf**—Table data associated with the map features.

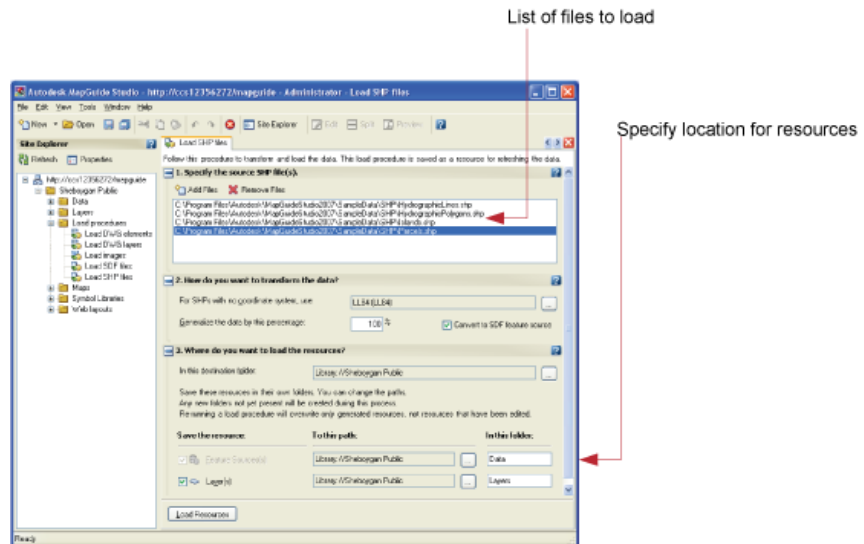
There may also be a **.prj** file, which defines the coordinate system for the shapefile.

## Loading SHP Files

This procedure assumes that the necessary **.shx** and **.dbf** files are in the same folder as the **.shp** files. To load a shapefile, you drag the source file to the Site Explorer. MapGuide Studio automatically creates a new layer as well as a new feature source.

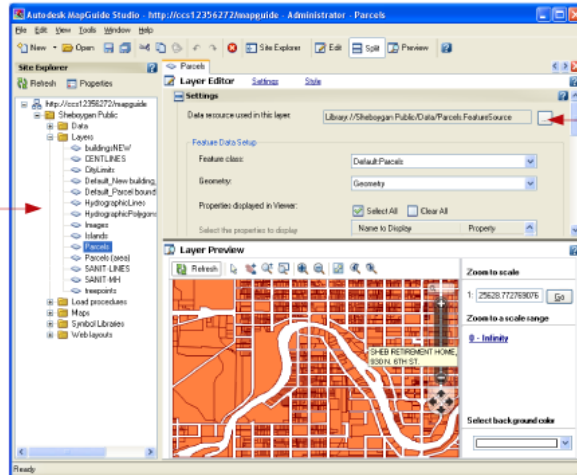
### To load an SHP file

- 1 Drag the SHP file or files you want to load into a folder in the Site Explorer.  
A new load procedure is displayed to the right of the Site Explorer. It contains a list of the files to load. You can drag other files into this load procedure.



- 2 For How Do You Want To Transform The Data, select the coordinate system you want to use.  
The coordinate system you select here will be used only if there is no coordinate system already defined for the source file or files.
- 3 Optional: For Generalize The Data By This Percentage, enter a percentage to reduce the number of vertices in the polylines or polygons in the source data (must convert to SDF).
- 4 Optional: Clear Convert To SDF Resource if you want to leave the resource in SHP format (generalization is ignored).
- 5 For Where Do You Want To Load The Resources, select the destination folder for the resources that will be created by this load. (You can also move the resources later in the Site Explorer.)
- 6 Click Load Resources.  
MapGuide Studio creates a new feature source and a new layer for each SHP file.
- 7 Double-click one of the new layers to open it.  
The Layer Editor is displayed to the right of the Site Explorer. (For more information about the Layer Editor, see [Working with Feature Source Layers](#) (page 78).)

New feature source and layer



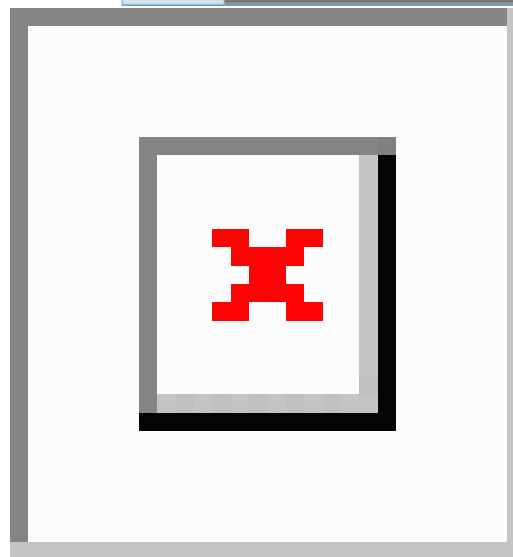
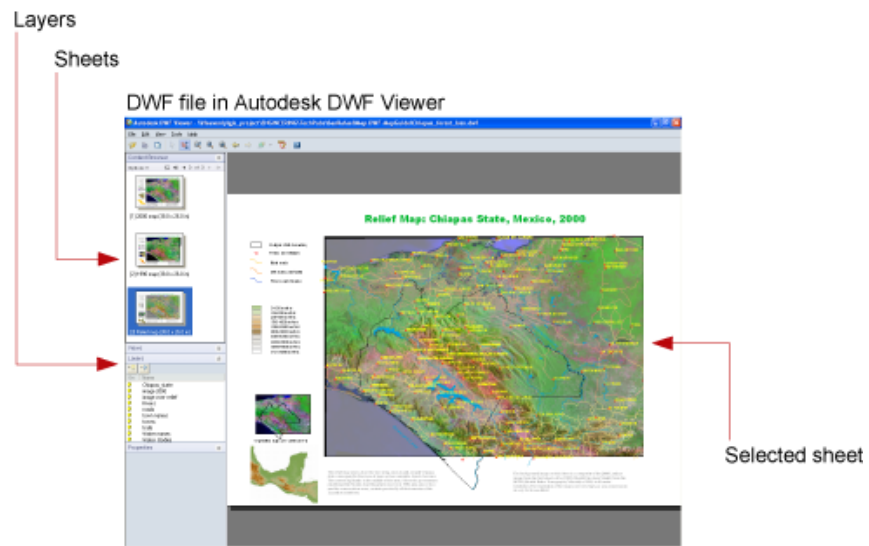
Layer references resource

- 8 On the MapGuide Studio toolbar, click Save to save the load procedure in the repository.

You can rename the new feature sources and the layers in the Site Explorer.

## About DWF Files

A DWF file is an electronic plot of a source file. It reproduces the appearance of the original drawing, including any stylization or theming. You can use a DWF to add a layer from styles, themes, or layouts which have been created in Autodesk Map or any other program that can write DWF files. This pre-styled data is loaded as a drawing source in MapGuide Studio. The following illustration shows the data sources in a typical DWF file:



Elements of DWF files (rollover)

A DWF file has two elements that you can select when you create a layer from the DWF drawing source in MapGuide Studio:

- Sheets—Different plot sheets containing views or layouts of the original data. You can select these in the Layer Editor.

- Layers—The layers from the original drawing, if the DWF was published from a DWG file. If layers were enabled when the DWF was published, you can turn layers on and off in the Layer Editor.

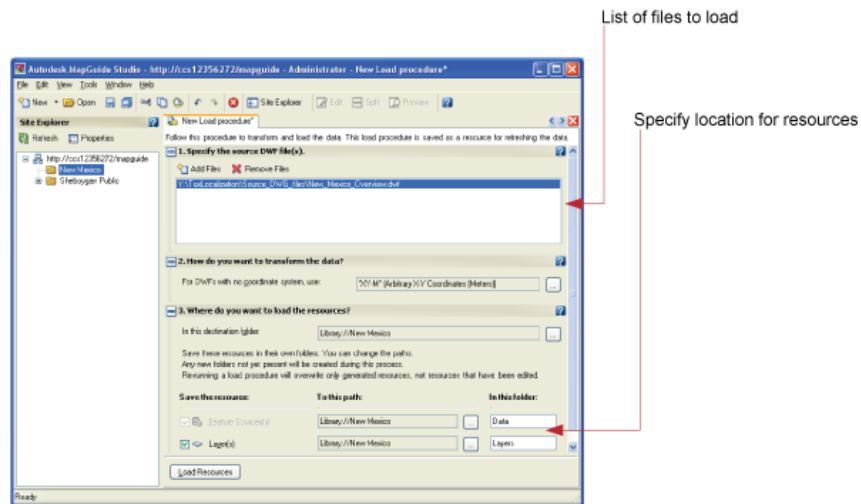
## Loading DWF Files

This procedure assumes that you have one or more DWF files that you want to load. To load a DWF file, you drag the source file to the Site Explorer. MapGuide Studio automatically creates a new layer as well as a new feature source.

### To load a DWF file

- 1 Drag the DWF file or files you want to load into a folder in the Site Explorer.

A new load procedure is displayed to the right of the Site Explorer. It contains a list of the files to load. You can drag other files into this load procedure.



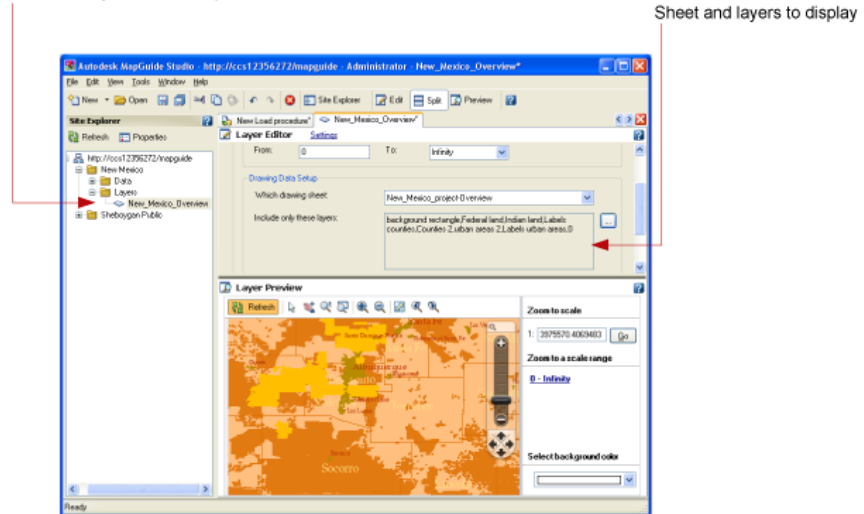
- 2 For How Do You Want To Transform The Data, select the coordinate system you want to use.

DWF files do not have a coordinate system assigned to them, so you always need to specify it.

- 3 For Where Do You Want To Load The Resources, select the destination folder for the resources that will be created by this load. (You can also move the resources later in the Site Explorer.)
- 4 Click Load Resources.  
MapGuide Studio creates a new drawing source and a new layer for each DWF file.
- 5 Double-click one of the new layers to open it.  
The Layer Editor is displayed to the right of the Site Explorer.
- 6 Select the drawing sheet and the layers that you want to use.

New drawing source and layer

Sheet and layers to display



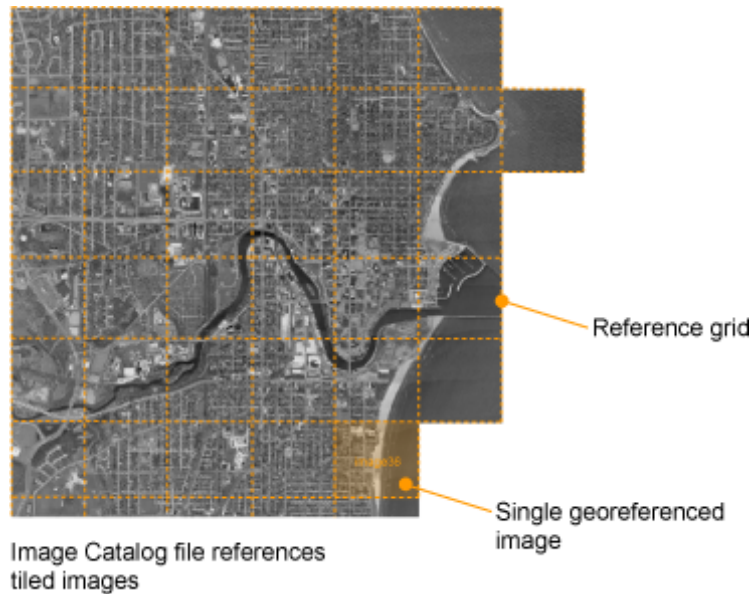
(For more information about the Layer Editor, see [Working with Feature Source Layers](#) (page 78).)

- 7 On the MapGuide Studio toolbar, click Save to save the load procedure in the repository.  
You can rename the new drawing sources and the layers in the Site Explorer.

## About Raster Files

Raster (or image) files are pixel-based data, such as digital photographs, that you can use as backgrounds for feature and drawing data. For example, you

can display an aerial photograph of a city under a layer of streets. Raster files are cataloged to optimize performance. You create a raster catalog as part of the load process.



- A raster catalog file contains a list of image files and their lower-left and upper-right coordinates. When you access a layer that references a raster catalog, the Server scans the catalog file to find the images that correspond to the area being viewed, and then sends only the data for that area.
- An individual image file must be georeferenced, that is, it must have an associated file (for example, TFW for TIFF files) that specifies the location of the image within the coordinate system used in the map.
- TIFF, ECW, and MrSID files are loaded without conversion. All other formats are converted to TIFF during the load process.

### Raster Image File Formats

The following table provides a brief description of the raster image file formats supported by Autodesk MapGuide Studio:

Format	File Extension	Description
BMP	.bmp	Microsoft Windows Bitmap

Format	File Extension	Description
CALS	.cal	CALS MIL-R-28002A Type 1 Format
ECW	.ecw	Enhanced Compression Wavelet
GeoSPOT	.bil	Band Interleaved (GeoSPOT, others) Note that GeoSPOT files need their associated color index files, which have a .clr file extension. The CLR file should be in the same directory as the BIL file.
JPEG	.jpg, .jpeg	Joint Photographic Experts Group
MrSID	.sid	Multi-Resolution Seamless Image Database
PNG	.png	Portable Network Graphic
TGA	.tga	TrueVision Targa 2.0 Format
TIFF	.tif, .tiff	Tagged Image File Format

### Georeference File Formats

The following table lists the raster file formats supported by MapGuide Studio and their associated georeference files.

Raster File Formats	Georeference file formats
.bmp	.bpw, .tab
.cal	.clw, .tab
.ecw	
.jpg/.jpeg	.jgw, .tab
.png	.pgw, .tab
.sid	
.tga	.taw, .tab
.tif/.tiff	.tfw, .tab

## Loading Raster Files

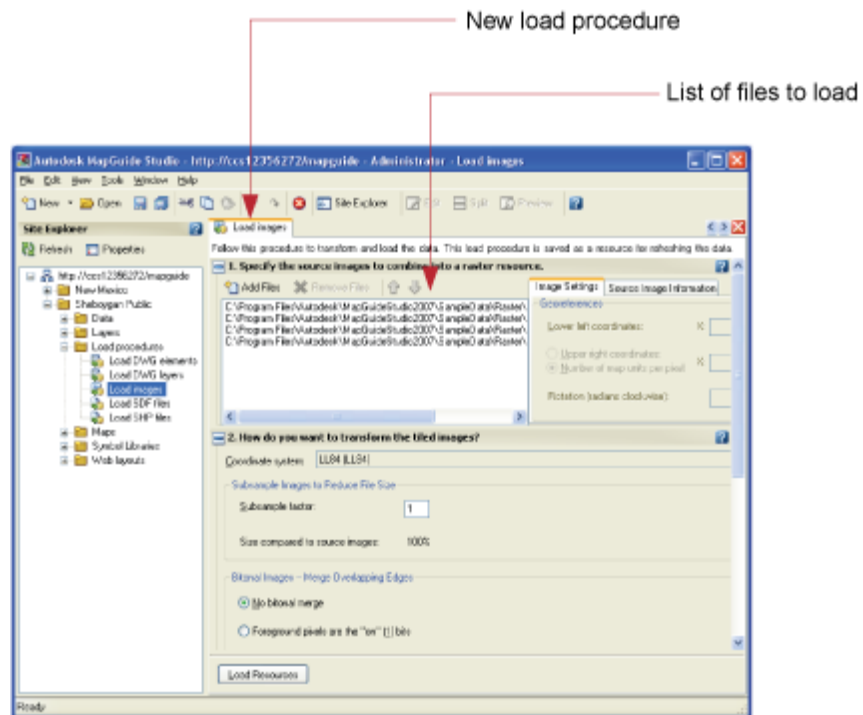
This procedure assumes that you have prepared your image source files and have them all in one folder, together with any georeferencing files. The simplest way to load images is to drag them into the Site Explorer. This automatically prepares a raster catalog for them. (The raster catalog is created when you click Load Resources.)

Before you start loading files, you may want to create a folder in the Site Explorer to store the resources produced by the load. To find out how to create the recommended folder structure, see [Organizing and Sorting Resources](#) (page 55).

### To load image files and create a catalog

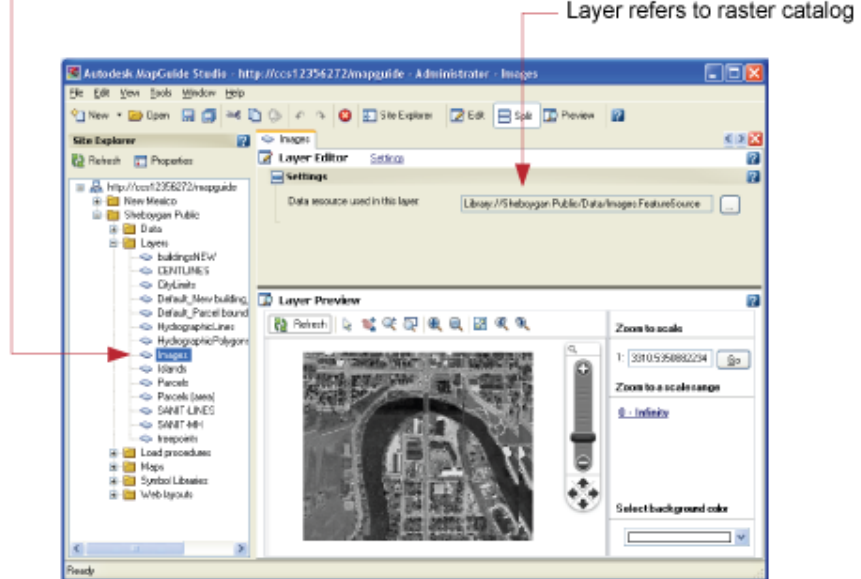
- 1 Drag one or more image files from the Windows Explorer to the Site Explorer.

A new load procedure is displayed to the right of the Site Explorer. MapGuide Studio prepares a catalog file for your images and names it after the first image file.



- 2 Optional: Use the up and down arrows to arrange the order of the images. Images higher in the list are displayed above any overlapping images that are lower in the list.
- 3 For How Do You Want To Transform The Tiled Images, select the coordinate system you want to use.
- 4 For Where Do You Want To Load The Resources, select the destination folder for the raster-catalog and layer resources that will be created by this load. (You can also move the resources later in the Site Explorer.)
- 5 Rename the raster catalog (the default is the name of the first raster file in the list).
- 6 Click Load Resources.  
MapGuide Studio converts the images into a single raster-catalog resource and creates a layer to reference it. The raster catalog and layer icons are displayed in the Site Explorer.
- 7 On the MapGuide Studio toolbar, click Save and save the load procedure in the Site Explorer.
- 8 Double-click the new layer to open it.  
The Layer Editor is displayed to the right of the Site Explorer. (For more information about the Layer Editor, see [Working with Feature Source Layers](#) (page 78).)

### Raster catalog and layer for the images



After you have a raster catalog, you can easily create another catalog, using the same image files. This is an easy way to build another set of image resources at a different resolution. You can then set the scale ranges for the layers so that the appropriate images appear at different zoom levels.

### To create another catalog with a different resolution

- 1 In the Site Explorer, select the load procedure for the images, right-click and click Copy.
- 2 Select the destination folder, right-click and click Paste.
- 3 Double-click the new load procedure to open it.
- 4 For How Do You Want To Transform The Tiled Images, select the coordinate system you want to use, if the source images do not have a coordinate system, or use a different one.
- 5 For Subsample Factor, enter a number. The higher the number, the lower the resolution. For example, a factor of 2 reduces the resolution of the images to 25% of the original.

- 6 For Where Do You Want To Load The Resources, select the destination folder for the raster-catalog and layer resources that will be created by this load. (You can also move the map resource later in the Site Explorer.)
- 7 Rename the raster catalog (the default is the name of the first raster file in the list).
- 8 Click Load Resources.  
MapGuide Studio converts the images into a single raster-catalog resource and creates a layer to reference it. The raster catalog and layer icons are displayed in the Site Explorer.
- 9 On the MapGuide Studio toolbar, click Save and save the load procedure in the Site Explorer.

#### **Other Controls in the Dialog Box**

**Bitonal Images--Merge Overlapping Edges** Any overlapping bitonal (black and white) images that are referenced by the raster catalog are merged. When images overlap, the foreground pixels are preserved and may overwrite the background pixels of an overlapping image. Specify whether you want the "on" bits (the drawing pixels) or the "off" bits (the pixels surrounding the drawings) to be the foreground pixels.

## **Connecting to Databases and Web Services**

You can create a live connection to an external database or a web service, and after the connection has been made, use the data in MapGuide Studio.

MapGuide uses Autodesk and OSGeo FDO providers. An FDO provider is an implementation of the FDO (Feature Data Objects) API that provides access to data in a particular data store or to specific kinds of files. (For more information about FDO, see the Open Source Geospatial website at <https://mapguide.osgeo.org/gettingstarted.html>.)

Connections to databases or web services are stored as resources in the resource repository and can be edited just like any other resource. Connection resources use one of the following providers:

- Autodesk FDO Provider for Oracle
- Autodesk FDO Provider for Raster
- Autodesk FDO Provider for SQL Server
- OSGeo FDO Provider for ArcSDE

- OSGeo FDO Provider for MySQL
- OSGeo FDO Provider for ODBC
- OSGeo FDO Provider for SDF
- OSGeo FDO Provider for SHP
- OSGeo FDO Provider for WFS
- OSGeo FDO Provider for WMS

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**NOTE** For information about configuring connections to SDF, SHP, and raster files, see [Connecting to SDF, SHP, and Raster Files](#) (page 44).

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## About ODBC Data Sources

The ODBC provider connects to databases such as Microsoft Access, Microsoft Excel, and DB2. An ODBC database contains points, which are typically specified either by Latitude and Longitude columns or by arbitrary XY coordinates. For example, a database “State” contains tables for “Cities” and “Villages,” each of which has columns LAT and LON to define the position of the point features.

ODBC databases do not store feature classification. However, you can define feature classes when you configure the data source. By default, the ODBC Provider maps each table in the database to a “feature class” while each column becomes a “property.”

If your data is in Microsoft Access or Excel format, you can upload the source files to the site server from any location in your file system. You can also download the files from the server to your file system for update and replacement.

## Connecting to an ODBC Database

To connect using the ODBC provider, you either make a direct connection to a database or upload a file for the resource. The resource created from an ODBC database is always a feature source.

### To connect to an ODBC database

- 1 Click File ► New ► Data Connection.

- 2 In the Connect To Data dialog box, select OSGeo FDO Provider for ODBC and click OK.

The Connection Editor is displayed to the right of the Site Explorer.

- 3 For Type Of Connection, select one of the following:
  - Connect To A File And Upload To The MapGuide Library: Click New and select the file to access (Microsoft Access or Excel). When you save the connection, the file is loaded into the resource repository, where it is stored as resource data.
  - Connect To An External File: Click File and enter a pathname or select an alias set up in Site Administration. A connection string is automatically generated after you select the file.
  - Connect To A Database: Make a selection from the Type Of Database list. A connection string template is automatically generated. You must replace the square brackets with the required parameters to make the connection.
  - Connect Via A Data Source Name (DSN) Set Up On This Server: The MapGuide server administrator must set up the DSN. The system DSN must be on all of the servers (if the site has multiple servers). Files are not loaded into the resource repository; they are left where they were originally set up.
- 4 Optionally, select Specify User Credentials. Then do one of the following:
  - If the database does not require a user ID and password, select Use MapGuide Credentials.
  - If the database requires them, select Use The Following Credentials and enter the user ID and password.
- 5 Click Test Connection.
  - You should see a Successful Connection message. If you receive an error, check the connection string carefully or verify that the DSN is set up correctly.
  - If necessary, modify the string in the Connection String field or enter your own.
  - Click Reset to restore the automatically generated connection string.
- 6 Optionally, under Define Geometry Properties To Create Spatial Feature Classes, select the tables and coordinate system to use to create geometry.

- 7 Optionally, under Joins With Other Feature Sources, you can set up feature joins after you have saved the connection. For more information, see [Using Feature Joins](#) (page 48).
- 8 On the MapGuide Studio toolbar, click Save to store this connection resource in the repository.

## About Oracle Data Sources

FDO Provider for Oracle provides access to an Oracle-based data store. FDO Provider for Oracle supports the following software:

- Oracle Client—Oracle 10g (10.1.0.2)
- Oracle Server—Oracle 9i R2 (9.2.0.6) or Oracle 10g

## Connecting to an Oracle Database

Make sure that the Oracle client is installed and that the services you want to connect to are available.

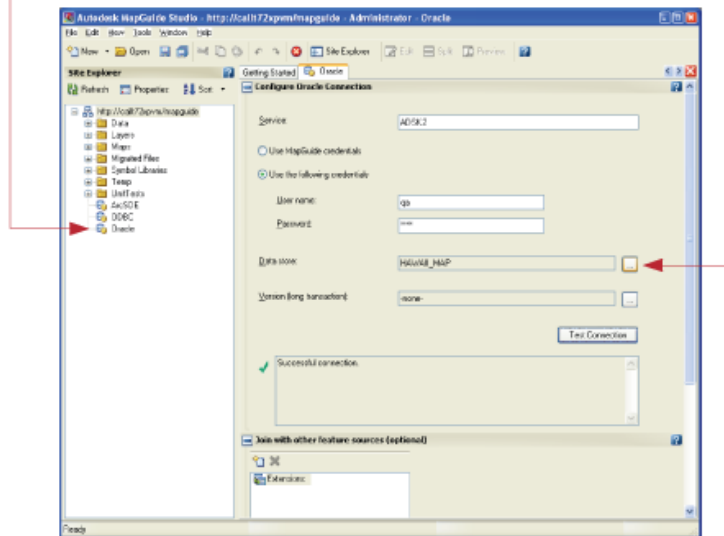
### To connect to an Oracle database

- 1 Click File ► New ► Data Connection.
- 2 In the Create Spatial Data Source dialog box, select Autodesk FDO Provider for Oracle and click OK.  
The Connection Editor is displayed to the right of the Site Explorer.
- 3 Enter the service to connect to.
- 4 Select Use MapGuide Credentials or Use The Following Credentials.
- 5 Do one of the following:
  - If the database is set up to recognize them, select Use MapGuide Credentials.
  - If the database requires them, select Use The Following Credentials and enter the userID and password.
- 6 Select the data store from the list.
- 7 Click Test Connection.

You should see a Successful Connection message.

New feature source

Click to select data store



- 8 On the MapGuide Studio toolbar, click Save to store this connection resource in the repository.

### Other Controls in this Dialog Box

**Version (Long Transaction)** If the provider provides this capability, select a long transaction name. A long transaction retains the context of an open transaction if it is interrupted and resumed.

## About ArcSDE Data Sources

ESRI ArcSDE (Spatial Database Engine) allows storage of GIS data (including feature geometry) in databases such as Microsoft SQL Server and Oracle. ArcSDE manages the storage of feature geometry using standard data types provided by the host database management system.

ArcSDE is part of the ArcGIS 9 system. ArcSDE manages the exchange of information between an (ArcGIS 9 Desktop) application and a relational database management system. FDO Provider for ArcSDE provides FDO with access to an ArcSDE 8.3-based data store, which, in this case, must be Oracle 9i.

## Connecting to an ArcSDE Database

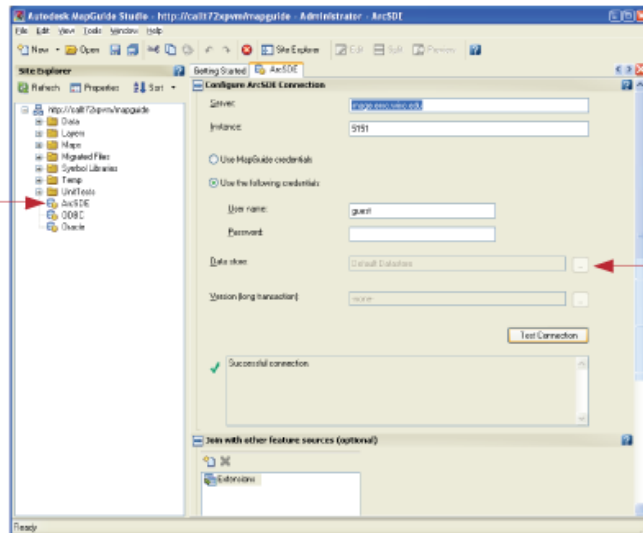
Make sure that the ArcSDE server is accessible and that the instances you want to connect to are available.

### To connect to an ArcSDE database

- 1 Click File ► New ► Data Connection.
- 2 In the Create Spatial Data Source dialog box, select OSGeo FDO Provider for ArcSDE and click OK.  
The Connection Editor is displayed to the right of the Site Explorer.
- 3 Enter the server and the instance to connect to.
- 4 Do one of the following:
  - If the database is set up to recognize them, select Use MapGuide Credentials.
  - If the database requires them, select Use The Following Credentials and enter the userID and password.
- 5 Select the data store from the list.
- 6 Click Test Connection.  
You should see a Successful Connection message.

New feature source

Click to select data store



- 7 On the MapGuide Studio toolbar, click Save to store this connection resource in the repository.

### Other Controls in this Dialog Box

**Version (Long Transaction)** If the provider provides this capability, select a long transaction name. A long transaction retains the context of an open transaction if it is interrupted and resumed.

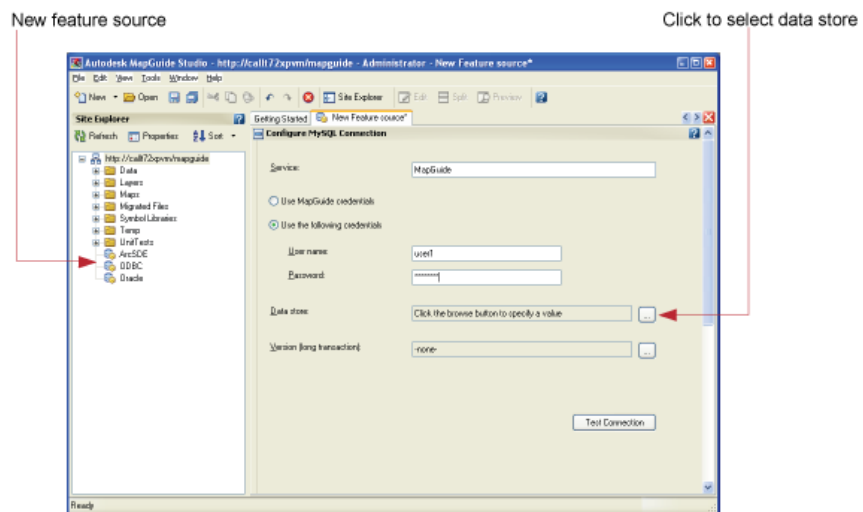
## Connecting to a MySQL Database

Make sure that the MySQL server is accessible and that the database you want to connect to is available.

### To connect to a MySQL database

- 1 Click File ► New ► Data Connection.
- 2 In the Create Spatial Data Source dialog box, select OSGeo FDO Provider for MySQL and click OK.  
The Connection Editor is displayed to the right of the Site Explorer.
- 3 Enter the server to connect to.

- 4 Do one of the following:
  - If the database is set up to recognize them, select Use MapGuide Credentials.
  - If the database requires them, select Use The Following Credentials and enter the userID and password.
- 5 Select the data store from the list.
- 6 Click Test Connection.  
You should see a Successful Connection message.



- 7 On the MapGuide Studio toolbar, click Save to store this connection resource in the repository.

### Other Controls in this Dialog Box

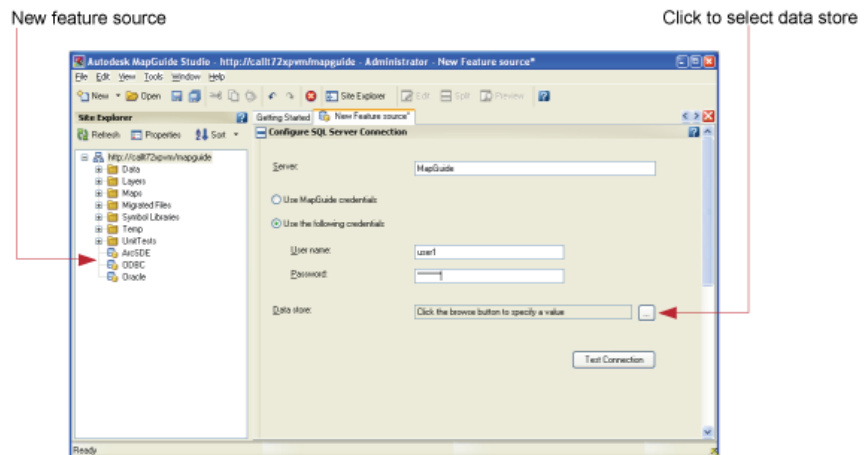
**Version (Long Transaction)** If the provider provides this capability, select a long transaction name. A long transaction retains the context of an open transaction if it is interrupted and resumed.

## Connecting to a SQL Server Database

Make sure that the computer running SQL Server is accessible and that the database you want to connect to is available.

### To connect to a SQL Server database

- 1 Click File ► New ► Data Connection.
- 2 In the Create Spatial Data Source dialog box, select Autodesk FDO Provider for SQL Server and click OK.  
The Connection Editor is displayed to the right of the Site Explorer.
- 3 Enter the server to connect to.
- 4 Do one of the following:
  - If the database is set up to recognize them, select Use MapGuide Credentials.
  - If the database requires them, select Use The Following Credentials and enter the userID and password.
- 5 Select the data store from the list.
- 6 Click Test Connection.  
You should see a Successful Connection message.



- 7 On the MapGuide Studio toolbar, click Save to store this connection resource in the repository.

## About Web Services

MapGuide has two FDO providers to connect to web services. Web services are becoming increasingly popular as a way of bringing commonly-used spatial data into a map. The two types of supported web services are WFS (Web Feature Service), and WMS (Web Map Service). Both of these are standards developed and maintained by the Open Geospatial Consortium (OGC).

The WFS provider allows you to connect to servers offering feature (vector-based) data, such as political boundaries or transportation networks.

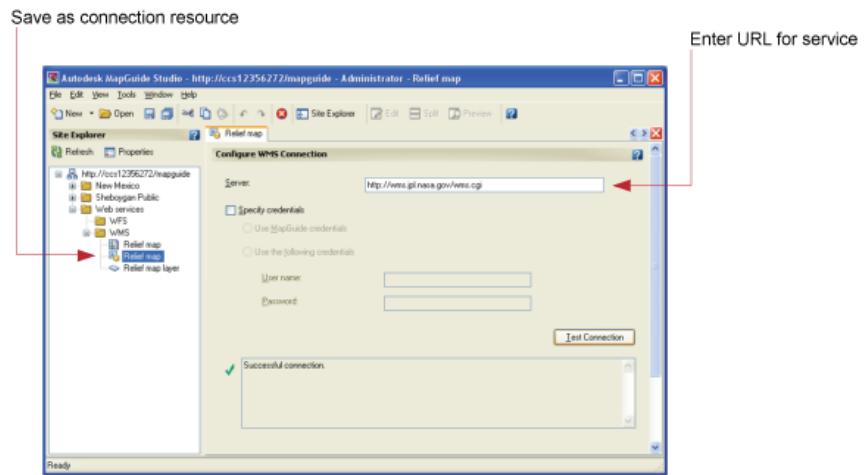
The WMS provider allows you to connect to servers or websites offering raster data, such as satellite photographs or scanned topo maps.

## Connecting to a Web Map Service (WMS)

Make sure that the service you want to connect to is available and that you have the correct URL.

### To connect to a web map service (WMS)

- 1 Click File ► New ► Data Connection.
- 2 In the Create Spatial Data Source dialog box, select OSGeo FDO Provider for WMS and click OK.  
The Connection Editor is displayed to the right of the Site Explorer.
- 3 Enter the URL to connect to.  
If you are connecting to layers that have been published on a MapGuide server, the connection string looks like this:
  - 4 `http://servername/mapguide/mapagent/mapagent.fcgi?`
- 5 If the server requires a password, do one of the following:
  - If the service is set up to recognize them, select Use MapGuide Credentials.
  - If the service requires them, select Use The Following Credentials and enter the userID and password.
- 6 Click Test Connection.  
You should see a Successful Connection message.



- 7 On the MapGuide Studio toolbar, click Save to store this connection resource in the repository.

## Connecting to a Web Feature Service (WFS)

Make sure that the service you want to connect to is available and that you have the correct URL.

### To connect to a web feature service (WFS)

- 1 Click File ► New ► Data Connection.
- 2 In the Create Spatial Data Source dialog box, select OSGeo FDO Provider for WFS and click OK.

The Connection Editor is displayed to the right of the Site Explorer.

- 3 Enter the URL to connect to.

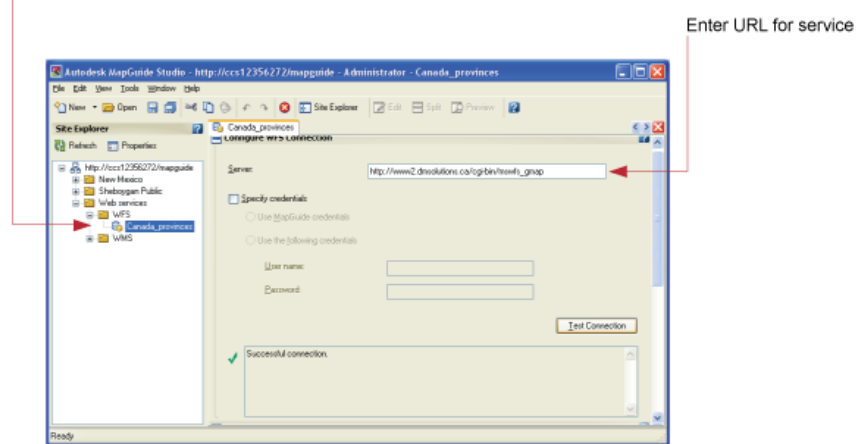
If you are connecting to feature sources that have been published on a MapGuide server, the connection string looks like this:

- 4 `http://servername/mapguide/mapagent/mapagent.fcgi?`

- 5 If the server requires a password, do one of the following:
  - If the service is set up to recognize them, select Use MapGuide Credentials.

- If the service requires them, select Use The Following Credentials and enter the userID and password.
- 6 Click Test Connection.  
You should see a Successful Connection message.

Save as connection resource



- 7 On the MapGuide Studio toolbar, click Save to store this connection resource in the repository.

## Connecting to SDF, SHP, and Raster Files

You can create a connection to external SDF, SHP, and raster files, without loading them into the resource repository.

MapGuide uses Autodesk and OSGeo FDO providers. An FDO provider is an implementation of the FDO (Feature Data Objects) API that provides access to data in a particular data store or to specific kinds of files. (For more information about FDO, see the Open Source Geospatial website at <https://mapguide.osgeo.org/gettingstarted.html>.)

You have the option of entering a pathname or selecting a file using the aliases set up in Site Administrator. If you enter a pathname, the file must be located either on the MapGuide Server, although not in the resource repository, or in a location directly accessible from the server. If you want to access resources on your local machine, you must set up an alias in Site Administrator; entering the pathname to a location on your local machine will not work.

## Connecting to SDF Files

You can configure a connection to SDF files. For information about SDF files, see [About SDF Files](#) (page 19).

### To connect to an SDF file

- 1 Click File ► New ► Data Connection.
- 2 In the Connect To Data dialog box, select OSGeo FDO Provider for SDF and click OK.  
The Connection Editor is displayed to the right of the Site Explorer.
- 3 Under File To Connect To, either enter a pathname or click File to select a file from aliases set up in Site Administrator.
- 4 Click Test Connection.  
The results are displayed in the field below.
- 5 Optionally, set coordinate system overrides.  
For more information about coordinate systems, see [Setting the Coordinate System for Your Map](#) (page 68).
- 6 On the MapGuide Studio toolbar, click Save to save the connection to the feature source.  
You can rename the new feature source in the Site Explorer.

---

**NOTE** After you have saved the connection, you can create joined feature classes. For more information, see [Using Feature Joins](#) (page 48).

---

## Connecting to SHP Files

You can configure a connection to SHP files. For information about SHP files, see [About SHP Files](#) (page 22).

### To connect to an SHP file

- 1 Click File ► New ► Data Connection.
- 2 In the Connect To Data dialog box, select OSGeo FDO Provider for SHP and click OK.  
The Connection Editor is displayed to the right of the Site Explorer.

- 3 Under File To Connect To, do one of the following:
  - Enter a pathname.
  - Click File or Folder to select a file or folder from aliases set up in Site Administrator.
- 4 Click Test Connection.  
The results are displayed in the field below.
- 5 Optionally, set coordinate system overrides.  
For more information about coordinate systems, see [Setting the Coordinate System for Your Map](#) (page 68).
- 6 On the MapGuide Studio toolbar, click Save to save the connection to the feature source.  
You can rename the new feature source in the Site Explorer.

---

**NOTE** After you have saved the connection, you can create joined feature classes. For more information, see [Using Feature Joins](#) (page 48).

---

## Connecting to Raster Files

You can configure a connection to individual raster images or to raster image catalog files. This procedure assumes that any georeference files are located in the folder with your image source files.

For more information about image files, see [About Raster Files](#) (page 27).

### To connect to a raster file

- 1 Click File ► New ► Data Connection.
- 2 In the Connect To Data dialog box, select Autodesk FDO Provider for Raster and click OK.  
The Connection Editor is displayed to the right of the Site Explorer.
- 3 Under File To Connect To, do one of the following:
  - Enter a pathname.
  - Click File or Folder to select a file or folder from aliases set up in Site Administrator.
- 4 Click Test Connection.

Results are displayed in the field below.

- 5 Optionally, set coordinate system overrides.  
For more information about coordinate systems, see [Setting the Coordinate System for Your Map](#) (page 68).
- 6 On the MapGuide Studio toolbar, click Save to save the connection to the feature source.  
You can rename the new feature source in the Site Explorer.

## Using Coordinate System Overrides

Autodesk MapGuide Studio must be able to detect the coordinate system of a feature source to be able to display the features in a map. You can see the coordinate system assigned to a feature source on the feature source editor pane. If MapGuide Studio cannot detect the coordinate system information, <unknown> will be displayed in the feature source editor. You can override the coordinate system of any feature source.

For more information about coordinate systems, see [Setting the Coordinate System for Your Map](#) (page 68).

## Setting Coordinate System Overrides

When you open a feature source, you can override the coordinate system assigned to that resource.

### To set coordinate system overrides

- 1 In the Set Coordinate System Overrides pane of the feature source Editor, click Refresh.  
The coordinate system for the feature source are displayed in the table, including any overrides created previously.
- 2 In the Set Coordinate System Overrides pane, click Edit.
- 3 In the Coordinate System dialog box, under Categories, select the category that contains the coordinate system for your map.  
To assign a coordinate system in which points are meaningful in relation to one another but do not represent single, absolute, fixed points on the Earth, select Arbitrary X-Y Coordinate Systems. For more information

about coordinate systems, see [Setting the Coordinate System for Your Map](#) (page 68).

- 4 In the Available Coordinate Systems list, click a coordinate system.
- 5 Click OK.

In the table under Set Coordinate System Overrides, the coordinate system you specified will be listed in the Override column.

---

**NOTE** To remove a coordinate system override, highlight the coordinate system in the table and click Remove. This will remove only the override, not the original coordinate system.

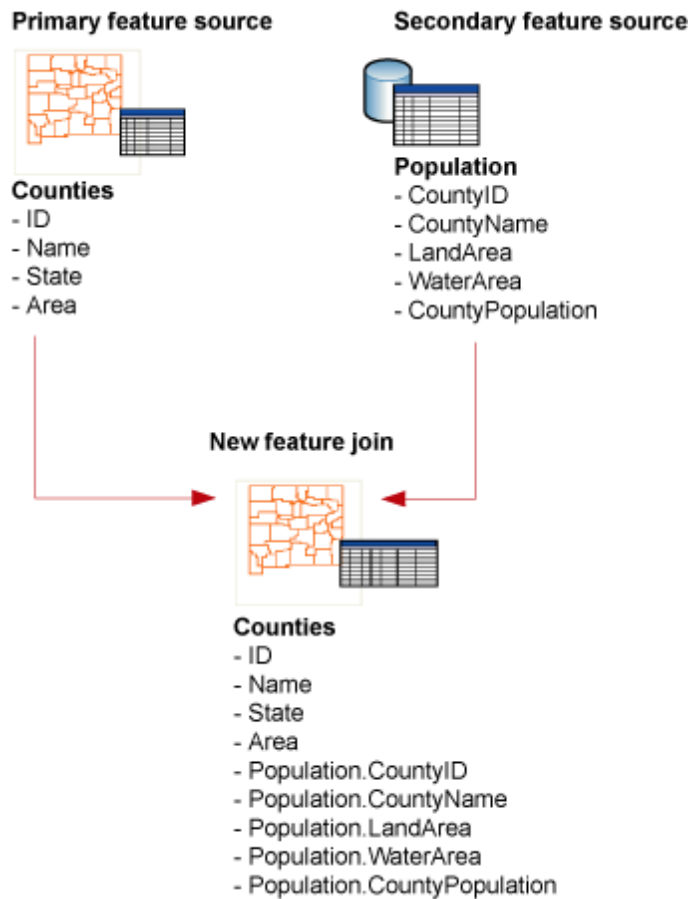
---

## Using Feature Joins

After you have loaded your data or connected to it, you can establish relationships between any two feature sources. These relationships are called feature joins. A feature join is similar to a relational join in a database. You are “extending” one feature resource to include another.

## About Feature Joins

The illustration below shows an example of relating a feature source containing state or county boundaries to another feature source containing census population data.



Joining one feature source with another

## Creating a New Feature Join

Creating a feature join involves the following general steps:

- Select the primary resource (for example, Counties).
- Select the secondary resource (for example, Population).
- Match the feature classes (a feature class is equivalent to a table, for example, Counties and Population).
- Enter a name for the joined feature class (appears in layer feature class list).

- Map the identifying properties (for example, ID and CountyID).

#### To create a feature join

- 1 In Site Explorer, double-click the feature source for which you want to create a feature join.  
This is the primary feature source.
- 2 In the Join With Other Feature Sources (optional) pane, click New Join.
- 3 Select a table from the Primary Feature Class (Table) list.
- 4 In the Name Of This Joined Feature Class field, enter the name that you want to be displayed in the layer feature class list.
- 5 In the Joins Within Feature Source “<name>” tree list, click the New Join node.
- 6 For the Secondary Source, click ... to select the feature source with which you want to create a join.
- 7 Select a table from the Secondary Class (Table) list.
- 8 In the Name Of This Secondary Join field, enter the name that you want to appear as a prefix in the property lists.
- 9 Under Match This Column From A Tabel On The Left, select a column from the primary feature source.
- 10 Under With This Column from Secondary Class, select a column from the secondary feature source.
- 11 Under Type Of Join, make a selection.
- 12 Under Releationship With Secondary Records (Cardinality), make a selection.
- 13 On the MapGuide Studio toolbar, click Save to store the updated resource definition in the repository.

---

**NOTE** To preview the new join, see [Previewing the Data](#) (page 52).

---

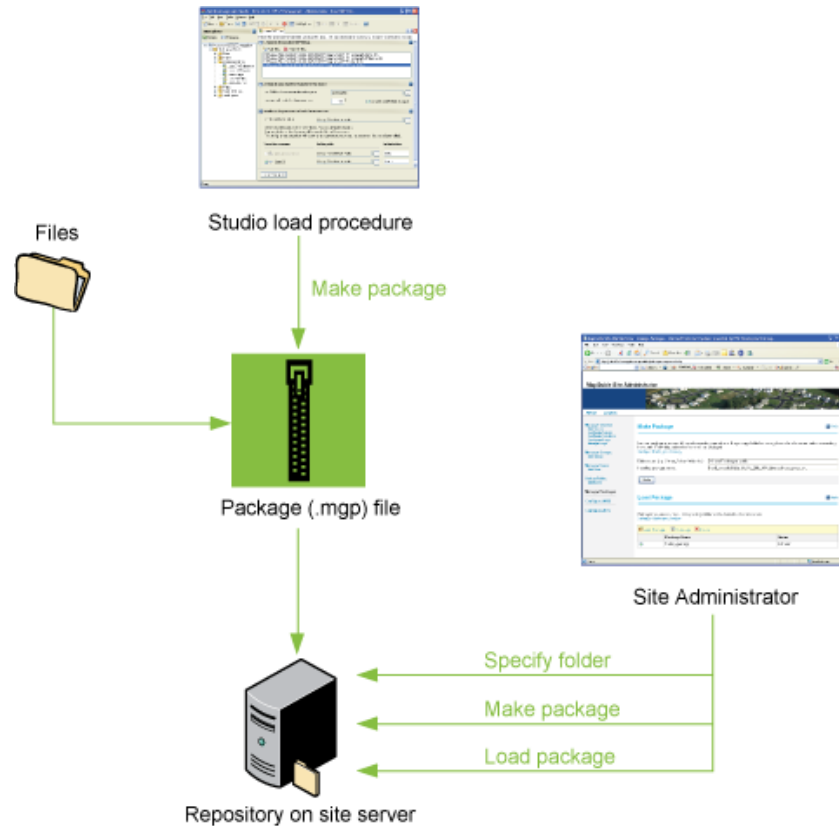
## Packaging Spatial Data

During the process of loading file-based data in MapGuide Studio, you can create data packages (.mgp files). Large collections of source-data files can be

zipped up in this file format and saved for easy transport. You can use packages to load data onto the site when a standard load procedure fails on very large files due to a timeout. The advantage of creating spatial data packages is that you can transfer large files to the server by CD-ROM/DVD rather than across a network.

You can save a package file anywhere. However, all data packages must be copied to a specific packages folder before they can be loaded into the repository. You specify the location of the package folder with the Site Administrator program (on the Configure Services page: Packages folder). You then use the Load Packages page to extract the data directly into the resource repository on the site server.

The process of creating and loading a package file looks like this:



## Creating a Spatial Data Package

In Autodesk MapGuide Studio, you can create a spatial data package after you define the settings for the load procedure and before you actually load the files.

---

**NOTE** You can also create a package using the Make Package command in the Site Administrator application.

---

### To create a spatial data package

- 1 Drag the files you want to load into a folder in the Site Explorer.
- 2 While displaying the Load Procedure Editor, click File menu ► Package Spatial Data.
- 3 In the Select Destination dialog box, specify a location in the resource repository to save the load procedure.  
If you have already saved the load procedure in the Site Explorer, this dialog box is not displayed.
- 4 In the Save Package As dialog box, enter a name for the package file.

## Loading a Spatial Data Package

After you create and save the spatial data package, you can copy it to the packages folder for uploading to the resource repository on the server. You load the package using the Site Administrator/Load Packages page. See the Site Administrator Help pages for the steps.

Once the package has been successfully loaded onto the server, the resources are available in the Site Explorer.

## Previewing the Data

As you style a layer, use the Layer Preview pane to view what it will look like when a user displays it in the Viewer.

**To preview the data**

- 1 If the Feature Source Preview pane is not displayed, click Preview.



- 2 Click Refresh.



The Feature Source Preview divides into two frames. The left frame displays the feature source schema, class, data properties, and geometric properties.

- 3 Do one of the following:

- Click View Data in the left frame to display the feature class data table in the right frame.
- Click View Feature in the left frame to display a preview of the feature class geometry in the right frame.

---

**NOTE** To display the Feature Source Preview pane below the Feature Source Editor

pane as you work, click Split.

---





# Working with the Site Explorer

# 3

The collection of servers that process Autodesk MapGuide® Studio and MapGuide Viewer requests is called a site. The servers in each site share a single resource repository, which stores resources used to create web layouts. The resources and folders in the repository are displayed in hierarchical order in the Site Explorer. You can use the Site Explorer to perform the operations described in this section.

## Organizing and Sorting Resources

You can use folders to organize resources in the Site Explorer. Sort resources by name or type.

Create a project folder that contains the following folders:

**Data:** Database connection resources, such as ODBC, Oracle, and ArcSDE.

**Load:** File-based data resources, such as DWG, SHP, and other files.

**Layer:** Layer resources that reference data resources.

**Map:** Map resources that reference layer resources.

**Symbol libraries:** Symbols libraries used to style elements on layers.

**Web layout:** Web layouts that reference maps.

### To create a folder

- 1 In the Site Explorer, click a site or folder.
- 2 Click File menu ► New ► Folder.  
You can also right-click a site name or folder and click New ► Folder.

- 3 Enter a name for the new folder and press Enter.  
The new folder is added to the selected folder or to the top of the tree if the site is selected.

#### To sort resources

- 1 Click the arrow next to Sort.
- 2 Click By Name or By Type.



Click Sort to toggle between By Name and By Type sorting methods.

## Creating New Resources

You can use the Site Explorer to create new data resources, layers, maps, symbol libraries, and web layouts. There are two ways to create new data resources: create new database connections and load files.

#### To create a new resource

- 1 Click File menu ► New.
- 2 Click the type of resource you want to create.  
The appropriate editor for the new resource is displayed in the resource editor. For more information, see the following Help topics:

For more information about creating...	See...
Data resources	<a href="#">Accessing Data</a> (page 15)
Layers	<a href="#">Working with Layers</a> (page 77)
Maps	<a href="#">Working with Maps</a> (page 67)
Web layouts	<a href="#">Displaying the Map in a Web Browser</a> (page 111).

For more information about creating...	See...
Symbol libraries	<a href="#">Working with Symbols</a> (page 143)
Print layouts	<a href="#">Working with Print Layouts</a> (page 149)

- 3 Click File menu ► Save or File menu ► Save As to save the new resource.

## Saving a Resource as XML

If you are developing web-tier applications, you can save most MapGuide Studio resources as XML. Use the XML versions as templates or use portions of the XML code as needed. The following resource types can be saved as XML: maps, layers, load procedures, feature source, drawing source, web layouts, and print layouts.

For more information about developing web-tier applications, see See the *Web Tier API Reference*.

### To save a resource as XML

- 1 Create or open the resource.
- 2 Click File menu ► Save As XML.

## Copying, Moving, Deleting, and Renaming Resources

After creating resources, you can move, delete, or rename them, including resources that are referenced by other resources.

---

**WARNING** Moving, deleting, and renaming a resource breaks references to that resource. You can have MapGuide Studio display a warning message when performing any of these operations. For more information see [Displaying Warning Messages](#) (page 63).

---

### Copying a resource

- 1 Click the resource to copy.

- 2 Click Edit menu ► Copy.  
You can also right-click and click Copy.
- 3 Click the destination folder and click Edit menu ► Paste.  
You can also right-click the destination folder and click Paste.

#### To move a resource

- Drag the resource to the destination folder.

#### To delete a resource

- 1 Click the resource to delete.
- 2 Click Edit menu ► Delete.  
You can also right-click and click Delete.

#### To rename a resource

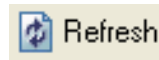
- 1 Click the resource to rename.
- 2 Do any of the following:
  - Click the resource again to edit the name.
  - Right-click and click Rename.
  - Press F2.
- 3 Enter a new name for the resource.

## Refreshing the Site Explorer

The contents of the site repository can change as other users add, move, rename, and delete resources. To view the most current content in the site repository, refresh the Site Explorer periodically.

#### To refresh the Site Explorer

- In the Site Explorer toolbar, click Refresh.

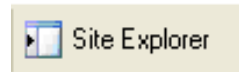


## Showing and Hiding the Site Explorer

You can hide the Site Explorer to increase your work area when you are using one of the resource editors.

### To show or hide the Site Explorer

- In the toolbar, click Site Explorer.



## Viewing Site Properties

View general properties and permission information about a site.

To change the owner of the site, see [Changing the Owner of a Resource or Site](#) (page 61). To set or change permissions on a site, see [Setting Permissions](#) (page 62).

### To view site properties

- 1 Right-click the site node in the Site Explorer and click Properties.

- 2 In the Properties dialog box, click General.

The General tab displays the site name if available, URL, version number, operating system, and owner.

Set the site name in the Site Administration program.

The site owner has complete control over permissions on all resources on the site. An owner or administrator can change the owner of a resource. To change the site owner, see [Changing the Owner of a Resource or Site](#) (page 61).

- 3 To view the level of access users have to the site, click Permissions.

To change permissions, see [Setting Permissions](#) (page 62).

## Viewing Resource Properties

For any resource in the Site Explorer, you can view general properties, permissions, and the resources that the selected resource references and is

referenced by. For example, select a map and view the layers this map references and the web layouts that reference this map.

To change the resource owner, see [Changing the Owner of a Resource or Site](#) (page 61). To set or change permissions on a resource, see [Setting Permissions](#) (page 62).

### To view resource properties

- 1 Right-click the resource or folder in the Site Explorer and click Properties.
- 2 In the Properties dialog box, click General.

The General tab displays the following properties for the selected resource:

**Resource Name:** Name of the currently selected resource in the Site Explorer.

**Type:** Type of resource, either folder, data, layer, map, web layout, print layout, symbol library, database connections, and load procedures. For more information about the different types of resources, see [Understanding Resources](#) (page 8).

**Location:** Location of the currently selected resource in the site repository. A resource can be referenced in multiple resources from one location in the site repository.

---

**WARNING** If you move a resource that is referenced in multiple resources, you will break these references.

---

**Owner:** Owner of the currently selected resource. By default, the owner is the user who created the resource. The owner has complete control over permissions on a resource, regardless of permission settings. Only an administrator can change the owner of a resource. To change the owner, see [Changing the Owner of a Resource or Site](#) (page 61).

**Created:** Date and time that the resource or folder was created.

**Modified:** Date and time that the resource was last changed.

- 3 To view the level of access users have to the selected resource, click Permissions.  
To change permissions, see [Setting Permissions](#) (page 62).
- 4 To view the resources used by the selected resource, click References.  
For example, if the selected resource is a map, the References tab will list the layers used in the map.

- 5 To view the resources that use the selected resource, click Referenced By. For example, if the selected resource is data, Referenced By will list the layers that use the data resource.

## Changing the Owner of a Resource or Site

The owner of a resource is the user who creates, loads, or connects to the resource. The owner controls access to the resource by controlling permissions. A different user might work with the resource in Studio. For this reason, the owner or an administrator can assign a different owner to the resource.

---

**NOTE** A user who copies a resource becomes the owner of the copied resource.

---

### To change the owner of a resource

- 1 Right-click the resource or folder in the Site Explorer and click Properties.
- 2 In the Properties dialog box for the selected resource, on the General tab, click Change Owner.
- 3 In the Change Owner dialog box, click [...].
- 4 In the Users In Everyone dialog box, click a user. Then click Close.
- 5 In the Change Owner dialog box, click Ok.  
The owner is changed. The new owner is shown on the General tab in the Properties dialog box.

### To change the owner for a set of resources

- 1 Right-click the folder containing the resources for which to change ownership and click Properties.
- 2 In the Properties dialog box for the selected folder, on the General tab, click Change Owner.
- 3 In the Change Owner dialog box, click [...].
- 4 In the Users In Everyone dialog box, click a user. Then click Close.
- 5 In the Change Owner dialog box, click Change Owner On All My Child Resources (Administrator Changes All).

The owner is changed for all resources belonging to this particular user in the selected folder and all folders within that folder. The new owner is shown on the General tab in the Properties dialog box.

## Setting Permissions

Users with the proper permissions can view and edit resources in the Site Explorer. You can control permissions for individual resources, for the folders that contain them, or for the site. By default, resources inherit the permissions of the folder that contains them. Modify permissions as needed after you create them.

You must be an Administrator or the owner of the resource to modify permissions.

### To set permissions for a resource, folder, or site

- 1 Right-click the resource, folder, or site node in the Site Explorer and click Properties.
- 2 In the Properties dialog box, click the Permissions tab.
- 3 If setting permissions on a resource or folder, clear the Inherit Permissions From Parent *parentname* checkbox.  
The *parentname* variable represents the folder name.
- 4 Click Add.
- 5 In the Select Users And Groups dialog box, click either the Groups or the Users tab.
- 6 Click the checkbox next to the name of the group or user to add.  
To view the members of a group, select the group name and click Members.
- 7 Click OK.
- 8 In the Groups And Users list, select each group and user in turn and specify the type of access to allow: Read/Write, Read-Only, or No Access.
- 9 Click Apply to save permissions you specify as you work.

### To inherit permissions from the parent folder

- 1 Right-click a resource or folder and click Properties.

- 2 In the Properties dialog box, click the Permissions tab.
- 3 Click the Inherit Permissions From Parent *parentname* checkbox.  
The *parentname* variable represents the parent folder name.
- 4 Click OK.

## Displaying Warning Messages

You can have MapGuide Studio display warning messages when moving, renaming, or deleting resources. For more information, see [Setting Site Explorer Options](#) (page 147).

## Publishing WMS and WFS Data

You can choose to publish some or all of your data using either WMS (Web Mapping Service) or WFS (Web Feature Service) protocols in MapGuide. Publish layer resources using WMS. Publish feature data resources using WFS. Use the Properties dialog box in the Site Explorer to publish and add metadata to layer resources and feature data resources.

Publishing data to WMS or WFS are two separate operations. You can decide which of these protocols your site will support. The steps for each are similar.

### To publish using WMS or WFS

- 1 In the Site Explorer, right-click a layer resource to publish to WMS or a feature data resource to publish to WFS. Click Properties.
- 2 In the Properties dialog box, click the Service Properties tab.
- 3 Do one of the following:
  - If you are publishing a layer resource to WMS, select Publish Via Web Mapping Service.
  - If you are publishing a feature data resource to WFS, select Publish Via Web Feature Service.
- 4 Add metadata as follows:
  - Use Title to enter a title for the layer.  
This is the name that appears to the client user, for example *County Waterways*. This field is required.

- Use Abstract to provide a more detailed description of the data. For example, enter *Waterways of the county. 1972 base map with 1995 survey updates*. This field is optional.
- Use Keywords to enter a comma-separated list of words to help locate the data among a set of sources. For example, enter *Waterway,River,Lake,Stream,Canal,1995 survey*. This field is optional.
- Use Extended Metadata, to associate a web page with the data. This field is optional. For example, provide the client user a link for additional information. Use the following sample syntax:
 

```
<Link
href="http://myserver/wfs/meta.cgi?feature=Waterways&format=plain&type="TC211" format="text/plain" />

<Link
href="http://myserver/wfs/meta.cgi?feature=Waterways&format=xml&type="FGDC" format="text/xml" />
```
- Use Bounds to specify the area to display. This field is required. Define one or more <Bounds /> elements, each of which describes the same extent but uses units appropriate for the spatial reference system (SRS). The SRS attributes document which spatial reference systems the data is available in (based on server-side point transformation.) EPSG:4326 must be one of the spatial reference systems.

Attribute	Definition
SRS	Any valid spatial reference system as defined by the OGC specification. The west, south, east, and north attributes are expressed in terms of this value.
west	Western-most extent of the data.
south	Southern-most extent of the data.
east	Eastern-most extent of the data.
north	Northern-most extent of the data.
abstract	Optional attribute, assumed = <i>"false"</i> if omitted. This attribute is used specifically for <Bounds SRS= <i>"EPSG:4326"</i> .../> and

Attribute	Definition
default	must be =“true” only if EPSG:4326 is not one of the user-selected reference systems.
	Optional attribute, assumed =“false” if omitted. This attribute is used to identify the native reference system of the source data. If a client requested data in this SRS, no transformation would be necessary.

Use the following sample syntax:

```
<Bounds SRS="EPSG:4326" north="38" west="-123.5" south="36"
east="-121.5" abstract="true" />
```

- Use Other SRS to define any additional reference systems the underlying data can be transformed into. Create a comma-separated list. This field is optional.
- For WFS feature data resources, use Primary SRS to specify the spatial reference system native to the underlying data. This field is optional if the SRS is specified in the Bounds field.
- For WMS layer resources, select Opaque if this layer produces an image that is essentially opaque, such that any layer placed beneath it would be obscured.  
Clear the checkbox to indicate that the layer contains sparse data, for example points, lines, and polygons, that does not cover the entire bounds and can be rendered with transparency to expose layers behind it.  
This setting provides information to help the client user determine layer ordering. Opaque layers should be moved to the bottom of the viewing order.
- For WMS layer resources, select Queryable to indicate additional queryable metadata for individual features on the layer.



# Working with Maps

# 4

Use the Map Editor to specify basic map settings and add layers. Create a new map and drag layers into it from the Site Explorer or work with an existing map and make adjustments as needed.

## Creating a New Map

Use the Map Editor to specify general map settings and add layers. As you create new maps, each map is displayed on its own tab in the editor space.

### To create a new map

- 1 Do one of the following:
  - Click File menu ► New ► Map.
  - Double-click an existing map in the Site Explorer.
- 2 In the Settings pane, for Description, enter a description for the map.
- 3 For Coordinate System, specify a coordinate system for this map.  
For more information, see [Setting the Coordinate System for Your Map](#) (page 68).
- 4 Optionally, for Background Color, specify a background color for the map.  
For more information, see [Setting the Background Color](#) (page 69).
- 5 To specify the initial view of the map that is displayed when a user views it in a browser, do one of the following:
  - Enter values in the boxes in the Initial View area to specify the initial view of the map.
  - Click Use Current Map Zoom To Set These Coordinates.

If this option is not available, be sure the Map Editor is in Split mode so the Preview pane is showing. For more information, see [Previewing the Map](#) (page 75).

- 6 Click File menu ► Save As and specify a name and location for the map in the Site Explorer.

## Setting the Coordinate System for Your Map

A coordinate system is a description of the origin (datum) of your map, the projection system used, and the units you are using. It describes how the sphere of the Earth is projected onto a sheet of paper and converted to the Cartesian coordinate system.

Mapping applications use coordinate systems to determine where to display features on the map. In a latitude/longitude coordinate system, each coordinate pair corresponds to an exact fixed location on the Earth; in an arbitrary XY system, the coordinates have meaning in relation to each other but do not necessarily correspond to exact fixed locations on the Earth.

For example, a floor plan map might specify that the southwest corner is 0,0 and the northeast corner is 500,500, so that if the building were moved to another location, these coordinates would still be accurate because they are not tied to exact locations on the Earth. If you used latitude/longitude coordinates for that map, however, the coordinates would change if you moved the building, because each pair corresponds to one exact point on the Earth.

Some types of arbitrary XY systems, such as the state plane systems, make use of both of these concepts. Each system represents a specific area, usually a state or a section of a state. Within that area, the coordinates are meaningful and represent exact locations on the Earth. So a point with the coordinates 100000,100000 always represents a specific location in the New York state plane system. However, if you change the system to another state plane system, all of the data moves to that area, where 100000,100000 represents a specific location in that area. In this way, the data is arbitrary XY, because the numbers themselves do not represent exact locations except within the context of the fixed areas.

---

**NOTE** Arbitrary XY data is not converted to latitude/longitude. Use it only in maps that use arbitrary XY as the system and in which all data is in arbitrary XY.

---

### To set the coordinate system for your map

- 1 In the Settings pane of the Map Editor, for Coordinate System, click [...].
- 2 In the Coordinate System dialog box, under Categories, select the category that contains the coordinate system for your map.  
To assign a coordinate system in which points are meaningful in relation to one another but do not represent single, absolute, fixed points on the Earth, select Arbitrary X-Y Coordinate Systems.
- 3 In the Available Coordinate Systems list, click a coordinate system.
- 4 Click OK.

## Setting the Background Color

Set the background color for your map to a predefined color or a custom color that you define.

### To set the background color

- In the Settings pane of the Map Editor, for Background Color, select a color. Click More Colors to select a color from a larger set or define a custom color.

### To define a custom color

- 1 In the Settings pane of the Map Editor, for Background Color, click More Colors.
- 2 In the Color dialog box, click Define Custom Colors.
- 3 Enter values for Hue, Saturation, and Luminance or Red, Green, Blue settings to define a custom color.
- 4 Click Add To Custom Colors.
- 5 Click OK.

## Setting the Initial Map View

Specify the initial view of the map to display when the map is opened in the MapGuide Viewer. Users can zoom out from this initial view to see more of the map. When you reference the map in a web layout, you can override this

initial view. The unit of measurement varies depending on the selected coordinate system.

#### To define the initial view manually

- In the Settings pane of the Map Editor, in the Initial View area, use the coordinates boxes to define the lower left and upper right corners of the initial view.  
The left value should be less than the right and the bottom value should be less than the top.  
To avoid map distortion, make sure the numbers fit the current range of the coordinate system.

#### To set the initial view using the current map view

- 1 In the Map Preview pane, zoom in to the geographic area required for your new map.
- 2 Click Use Current Map Zoom To Set These Coordinates.  
The current view is used for the initial view of the new map.

## Setting Up Layers

You can use the Layers pane of the Map Editor to add layers to your map, create layer groups to organize layers, and control the draw order and other layer display options. Layers reside in the Site Explorer, and you add them to maps by creating a reference to them within a map. When you create a new layer reference in the Map Editor, you must specify the layer resource that you want to reference.

To control the data associated with a layer and how it is displayed in the map, use the Layer Editor. For more information, see [Working with Layers](#) (page 77).

## Adding Layers to Your Map

Create a reference to the layer by dragging the layer onto the Layers pane. The layer remains in the Site Explorer and can be used in other maps. A link to the layer is created in the Layers pane of the Map Editor. You can also create new layer references in the Map Editor and associate them with layers in the Site Explorer.

### To add layers to your map

- Drag a layer from the Site Explorer to the Layers pane of the Map Editor. You can change the layer resource and other settings as needed. For more information, see [Specifying Layer Settings](#) (page 72).

---

**WARNING** Users with write permission can modify, move, or delete layer resources used in your map.

---

## Creating Layer Groups and Adjusting Viewer Legend

Organize your layers in the Map Editor by creating one or more layer groups.

The legend displayed in the Viewer matches the Layers By Group tab on the Layers pane in the Map Editor.

### To create a layer group

- 1 In the Layers pane of the Map Editor, click the Layers By Group tab if it is not already displayed.
- 2 Click Create A New Group.
- 3 Name the new layer group.  
The new layer group name is selected by default when you create it. Enter a new name and press Enter.

### To control the order of groups

- 1 Click a group.
- 2 Click Move Up or Move Down to position the group as desired in the draw order.

### To rename a layer group

- 1 Click the group name.
- 2 In the Group Settings area, for Name, enter a new name and press Enter.

## Adjusting Layer Draw Order

The Drawing Order tab in the Layers pane controls the order in which layers are drawn when the map is displayed in the Viewer. The order of layers represents a stack of layers viewed from the top. Objects on layers higher in the list obscure objects on layers lower in the list.

### To arrange layer draw order

- 1 In the Layers pane, click the Drawing Order tab.
- 2 Click a layer.
- 3 Click Move Up or Move Down to position the layer as desired in the draw order.

---

**NOTE** The drawing order does not affect how the layers are listed in the Viewer legend.

---

## Specifying Layer Settings

You can change the layer resource referenced by the selected layer in the map as well as the layer name and group. Note that these changes affect the layer only within the current map, not in the Site Explorer. You can also set the default display status for the layer, whether features on the layer can be selected, and whether the layer is included in the legend. If the layer is to be included in the legend, you can assign a legend label and display status.

### To specify layer settings

- 1 In the Layers pane, click a layer on either the Layers By Group or Drawing Order tab.
- 2 To change the layer resource that this layer references, do the following:
  - For Layer Resource, click [...].
  - In the Select A Layer Resource dialog box, navigate to the layer you want to reference.
  - Click Open.
- 3 Optionally, enter a new name for the layer.

- 4 To change the group the layer belongs to, under Group, click a different group name or click None.  
You can also drag the layer into the desired group on the Layers By Group tab.
- 5 To specify that the layer is visible when first displayed in the Viewer, click Layer Is Initially Displayed In The Map.  
The actual visibility of the layer depends on the zoom position selected by the user.
- 6 To allow users to select features on this layer when they view the map, click Features On The Layer Can Be Selected.
- 7 Do any of the following:
  - To show the layer name in the legend when the map is displayed in the Viewer, click Layer Is Visible In The Legend.
  - Under Legend Label, enter a name for the layer.  
This name is used for the layer in the legend when the map is displayed in the Viewer.
  - To show layer themes in the legend when the map is first displayed in the Viewer, click Layer (If Themed) Is Initially Expanded In The Legend.

## Specifying Layer Group Settings

You can rename a group and add it to another group. You can also set the default display status for the group and whether the group is included in the legend. If the group is to be included in the legend, you can assign a legend label and display status.

### To specify layer group settings

- 1 In the Layers pane, click the Layers By Group tab. Then click a layer group.
- 2 Optionally, enter a new name for the layer group.
- 3 To add the layer group to another layer group, click the group name under Parent Group.  
You can also drag the layer group into the desired group on the Layers By Group tab.

- 4 To specify that the layer group is visible when first displayed in the Viewer, click Group Is Initially Displayed In The Map.  
The actual visibility of the layer group depends on the user's zoom position.
- 5 To adjust legend settings for the selected layer group, do the following:
  - To show the layer group name in the legend when the map is displayed in the Viewer, click Group Is Visible In The Legend.
  - Under Legend Label, enter a name for the layer group.  
This name is used for the layer group in the legend when the map is displayed in the Viewer.
  - To show the layers in the group when the map is first displayed in the Viewer, click Group Is Initially Expanded In The Legend.

## Setting Up Smooth Map Viewing

You can create a set of base map layers to enable smooth panning and zooming in the AJAX version of the MapGuide Viewer. These layers are cached and tiled on the server so they can be quickly displayed as users move around the map. Only specified scale ranges are cached and displayed. As users zoom in or out, the cached layers at the nearest scale range are displayed.

---

**NOTE** For consistency, the list of base layers is displayed in the DWF viewer as well but the layers are not cached and tiled.

---

### To setup smooth pan and zoom for the AJAX viewer

- 1 In the Base Layers For Smooth Navigation In AJAX Viewer pane, under Layers By Group And Drawing Order, click Base Layers (0 Groups, 0 Layers).
- 2 Click Create A New Group.  
Create as many base layer groups as you need. In the legend, users can turn the base layers groups on or off as needed. You must create at least one group and you cannot create nested groups.
- 3 Add layers to groups.  
These layers do not work as individual layers but rather as a group to provide a contextual experience for the user during pan and zoom operations.

Do not duplicate the layers in the Layers pane. If you want to use layers as base layers, remove them from the Layers pane.

- 4 Under Set Fixed Scales For Incremental Zooming, under Total Number Of Scales, enter the number of zoom scales you need.  
A set of evenly spaced scales is created. The zoom factor is indicated under Messages.
- 5 Specify Nearest Zoom In and Farthest Zoom Out.  
You can also adjust the map zoom in the Preview pane and click Use Current Map Zoom.

## Previewing the Map

As you build a map, use the Map Preview pane to view what it will look like when a user displays it in the Viewer.

### To preview the map

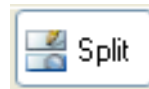
- 1 If the Map Preview pane is not displayed, click Preview.



- 2 Click Refresh.



To display the Map Preview pane below the Map Editor pane as you work, click Split.





# Working with Layers

# 5

You can use the Layer Editor to create a layer resource that can be shared and reused in many maps. A preview of the data resource using default styling is provided. Customize the styles or theme the data as needed.

---

**NOTE** As with any application accessing resources across a network it is advisable to save often after incremental changes are made to prevent the possible loss of work.

---

## Specifying the Data Resource for a Layer

Using the Layer Editor, you can specify the data resource for a new layer or change the data resource specified for an existing layer. For more information about the types of data Autodesk MapGuide Studio supports, see [Accessing Data](#) (page 15).

### To specify or change the data resource for a layer

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56).

- 2 In the Settings pane, click [...].
- 3 In the Open Resource dialog box, navigate to the data resource to associate with this layer.
- 4 Click the data resource name and click Open.

- 5 Click File menu ► Save.

## Working with Feature Source Layers

If the data resource for the layer is a feature source, you can do any of the following:

- Specify the feature class, geometry, and properties to display when a user views this layer in the MapGuide Viewer.
- Define a filter to further specify the data to include with this layer.
- Define a URL to display when a user clicks a feature on this layer.
- Define a tooltip to display when the pointer pauses on a feature on this layer.
- Define styles and themes to apply to the data on this layer. For more information about styles and themes, see [Creating Styles for Feature Source Layers](#) (page 83).

For more information about feature sources, see [Understanding Resources](#) (page 8).

## Specifying Feature Class and Geometry

For the feature source, specify the feature class and geometry to use if more than one are available. Also, you can specify the properties to display in the Properties section of the Viewer.

### To specify feature class and geometry

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Settings pane of the Layer Editor, in the Feature Data Setup area:
  - For Feature Class, select the feature class containing the features to display for this layer.
  - For Geometry, select the property that contains the geometry for the features in this layer.
- 3 Click File menu ► Save.

## Specifying the Properties to Display in the Viewer

When a user selects an object in the Viewer, its properties can be displayed in the Viewer's Properties section. Use the Layer Editor to define the properties to display.

### To specify object properties to display in the Viewer

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Settings pane of the Layer Editor, in the Feature Data Setup area, select properties to display from the Properties Displayed In The Viewer list.
  - To select all available properties, click Select All.
  - To clear selected properties, click Clear All.
- 3 To adjust the name of the property that is displayed in the Viewer, click the property name and enter a new name.

---

**NOTE** If you clear the checkbox for a property, the name reverts to the default.

---

- 4 To sort the properties list, do either of the following:
  - To display selected properties at the top of the list, click either column heading once.
  - To sort the list alphabetically, click either column heading twice.
- 5 Click File menu ► Save.

## Filtering Data

Use a filter to select a subset of features for a layer or for theming. For example, if you have a data resource containing all US cities with a property called STATE, you might create the following filter to display only cities in California:

```
STATE = 'CA'
```

The Filter dialog box has two modes: Builder and Advanced. In Builder mode you can only create filters that use valid syntax. In Advanced mode you can create filters using any syntax, even if it is not handled by the Builder. You cannot move from Advanced mode to Builder mode unless filter conditions are valid. Further, a filter with valid syntax is not allowed in the builder if it contains functions or property names that are not in the layer's data source.

All conditions must be in the following format:

```
<property> <operator> <constant>
```

### To filter data

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 Open the Filter dialog box by doing one of the following:
  - To select a subset of features for a layer, in the Settings pane of the Layer Editor, in the Feature Data Setup area, for Filter Applied To Data, click [...].

- To select a subset of features for theming, in the Style pane of the Layer Editor, under Scale Ranges, select the scale range to theme. In the style rule grid, click the Condition box.

For more information about scale ranges, see [Understanding Scale Ranges](#) (page 83).

- 3 In the Filter dialog box, do one of the following:
  - Select Property and then select a property from the list.
  - Select Expression and use the Number Expression dialog box to build an expression.  
For more information, see [Building Number Expressions](#) (page 108).
- 4 Under Conditions and Values, select a relational operator and a value from each list.  
To display available values for the selected property, click Get.
- 5 To add conditions, do the following:
  - Click New.
  - Under Operation, click And or Or.
  - To precede the selected condition with the Not boolean operator, under Operations, click Not.
  - Specify a property or expression, condition, and value.
- 6 To group and ungroup conditions, select the conditions and click Group Selected Conditions or Ungroup Selected Conditions as needed.
- 7 Click OK.
- 8 Click File menu ► Save.

## Setting Up Linked Documents and Tooltips

Enable your users to view documents and tooltips associated with map features. For more information, see [Building Text Expressions](#) (page 106).

### To specify a linked document

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.

- Double-click an existing layer.
- Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Settings pane of the Layer Editor, in the Feature Data Setup area, for URL Activated For Feature, click [...].
- 3 Use the Text Expression dialog box to specify the URL to use for the linked document.  
For more information, see [Building Text Expressions](#) (page 106).
- 4 Click File menu ► Save.

#### To specify a tooltip

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Settings pane of the Layer Editor, in the Feature Data Setup area, for Tooltip Displayed For Feature, click [...].
- 3 Use the Text Expression dialog box to specify the text to use for the tooltip.  
For more information, see [Building Text Expressions](#) (page 106).  
To display multi-line tooltips, insert the backslash character followed by the n character (\n) where you want line breaks. For example, *123 Main St\nParcel 2115*.
- 4 Click File menu ► Save.

## Creating Styles for Feature Source Layers

You can specify properties that control how feature source layers appear on a map. For example, you can specify the scale ranges at which a layer is visible, set the line color, and add labels to the map features. You can also create a theme, which displays the data in varying styles to indicate different values in the data. To specify styles for a layer, you define a style for a scale range. By default, 0 - Infinity is the only scale range. Add narrower scale ranges as you define styles to define how the data should appear at various scales. For example, you could create one scale range that displays roads with thick lines when you zoom in, and create a second scale range that displays roads with thin lines when you zoom out.

## Understanding Scale Ranges

A scale range specifies the zoom level at which a particular style is applied to the display of your data. When the zoom level of MapGuide Studio or the Viewer is within the specified scale range, MapGuide Studio redraws the layer as specified by the style associated with the scale range.

The style is applied when the zoom level is greater than or equal to the From value and less than the To value. When setting up adjacent scale ranges, use the same To value as the next range's From value. For example, if one range is 0 - 20,000 set the next range to 20,000 - 40,000.

## Defining Scale Ranges

The first step in creating styles is to define your scale ranges.

---

**NOTE** When setting up multiple scale ranges for a layer, make sure that they do not overlap. For example, the ranges 500,000 - 5,000,000 and 2,000,000 - 10,000,000 overlap. In such cases, when the zoom level is within the overlapping scale range, MapGuide Studio displays the features using the style of the first scale range.

---

### To define scale ranges

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.

- Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Style pane of the Layer Editor, in the Scale Ranges area, under From, enter the lower end of the scale range. Under To, enter the upper end of the scale range.

For example, to make a style visible when the map is zoomed anywhere between 1:250,000 and 1:5,000,000, enter 250000 for From and enter 5000000 for To.

- 3 To add a new scale range, click Add A Scale Range.

- 4 Specify From and To values.

- 5 When working with scale ranges:

- To copy a scale range, select the range and click Duplicate.
- To delete a scale range, select the range and click Delete.
- To change the position of a scale in the list, select the range and click Move Up or Move Down.

- 6 Click File menu ► Save.

## Styling Points

Use symbols to represent and display point features. MapGuide Studio provides six mark symbols: square, circle, triangle, star, cross, and X. You can also use font symbols and build MapGuide Studio symbol libraries.

In symbol libraries you can use Bitmap (BMP), Device Independent Bitmap (DIB), Enhanced Metafile (EMF), TrueType Fonts (TTF), Windows Metafile (WMF), Portable Network Graphics (PNG), and Joint Photographic Experts Group (JPG/JPEG). Create your own symbols in Autodesk Map 3D or other application and then import them into MapGuide Studio.

Symbols can contain four types of elements:

- Images
- Text
- Lines

## ■ Polygons

You cannot modify images. However, you can override the fill colors of polygon elements, the color of line elements, and the color of text elements. If a symbol element contains multiple colors (for example, a line element with three segments, each a different color), overriding applies the same color to all parts of the element.

If precise placement of labels is important, you can display labels instead of symbols at feature point locations. For more information, see [Displaying Fixed Labels at Point Locations](#) (page 95). You can also specify whether other labels should obscure symbols on this layer. For more information, see [Allowing Labels to Obscure Points \(Overposting\)](#) (page 95).

For more information about working with symbols, see [Working with Symbols](#) (page 143).

---

**NOTE** Set default size context and units in Options. For more information, see [Setting Layer Editor Options](#) (page 147).

---

### To apply styles to points

1 Open the layer to edit by doing one of the following:

- Create a new layer.
- Double-click an existing layer.
- Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

2 In the Style pane of the Layer Editor, under Scale Ranges, select the scale range to style.

For more information about scale ranges, see [Understanding Scale Ranges](#) (page 83).

3 In the Point Style area for the selected scale range, for Style Of The Geometry, click [...].

4 In the Style Point dialog box, select the Style A Point Symbol checkbox.

5 For Symbol, do one of the following:

- Select a mark symbol from the list.

- Select Font Symbol [...]. In the Font Symbol dialog box, from the Font list, select a font. Click a symbol. Click OK.
  - Select Symbol Library [...]. In the Select A Symbol dialog box, click [...]. Specify a symbol library. Click Open. Click a symbol. Click OK.
- 6 For Size Context, specify the type of units:
    - Select Device Space to specify symbol widths and heights in screen units. Available units are Points, Inches, Millimeters, or Centimeters.
    - Select Map Space to specify symbol widths and heights in Mapping Coordinate System (MCS) units. Available units are Inches, Feet, Yards, Miles, Millimeters, Centimeters, Meters, and Kilometers.
  - 7 For Units, select the type of units to use.
  - 8 For Width, enter the symbol width or specify the width using a number expression.  
For more information, see [Building Number Expressions](#) (page 108).
  - 9 For Height, enter the symbol height or specify the height using a number expression.  
For more information, see [Building Number Expressions](#) (page 108).
  - 10 To maintain width-to-height proportions when you change the width or height of the symbol, select the Maintain Aspect Ratio checkbox.
  - 11 For Reference, specify the reference point for the symbol.  
The reference point of a symbol controls the position of a symbol over a feature in a map. The default reference point is the center of the symbol. X specifies a value for the horizontal center of the symbol. Y specifies a value for the vertical center of the symbol. You can change the reference point position.
  - 12 For Rotation, do one of the following:
    - Enter the amount to rotate the symbol.
    - Click Any Angle. Specify the angle using the slider or enter an angle in the box. Click OK.
    - Click Expression. Specify the rotation using a number expression.  
For more information about creating a number expression, see [Building Number Expressions](#) (page 108).

- 13 For mark symbols, do either or both of the following:
  - To apply a fill to the symbol, select Apply Fill To The Symbol. For Fill Pattern, select a solid or pattern fill. Specify a foreground color and for patterned fills, a background color or transparency.
  - To apply a border to the symbol, select Apply A Border To The Area. Specify border pattern, thickness, and color.

---

**NOTE** Select 0 thickness to draw the border as thinly as possible.

---

- 14 For font symbols, specify a format and text color.
- 15 For symbols from a Symbol library, you can override the fill colors of polygon elements, the color of line elements, and the color of text elements, use the Fill Color, Line Color, and Text Color lists.

If you do not specify overrides, the default colors from the symbol are used.
- 16 Click OK.
- 17 Click File menu ► Save.

---

**NOTE** To add labels to features, see [Adding Labels to Features](#) (page 92).

---

## Changing a Symbol's Reference Point

The reference point of a symbol controls the position of a symbol over a feature in a map. The default reference point is the center of the symbol. In the Style Point dialog box, for Reference Point, X specifies a value for the horizontal center of the symbol. Y specifies a value for the vertical center of the symbol.

### To change the reference point of a symbol

- 1 In the Style Point dialog box, select Style A Point Symbol.
- 2 For Symbol, specify the symbol to edit.
- 3 For Reference Point, click [...].
- 4 In the Symbol Editor, use any of the following methods to define the reference point:
  - Click the new reference point.

A red box indicates the new position of the reference point. The X and Y values are updated.

- Click Center.  
The reference point is positioned at the center of the symbol.
- Enter values for X and Y.

Use In, Out, and Extents to adjust your view of the symbol as needed. To view the edges of the symbol, click Outline.

- 5 If necessary, click Reset to restore the reference point to its original position.
- 6 Click OK.
- 7 Click File menu Save.

## Styling Lines

Specify the thickness, color, and pattern of polyline features. Style a single line or build a composite line with several components and then style each component. For example, to illustrate a highway, create a thick black line and add a thinner, dashed, yellow line.

---

**NOTE** Set default units in Options. For more information, see [Setting Layer Editor Options](#) (page 147).

---

### To apply styles to lines

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Style pane of the Layer Editor, under Scale Ranges, select the scale range to style.  
For more information about scale ranges, see [Understanding Scale Ranges](#) (page 83).

- 3 In the Line Style area for the selected scale range, for Style Of The Geometry, click [...].
- 4 In the Style Line dialog box, select the Apply Styles To The Line checkbox.
- 5 To style a single line, do the following:
  - For Size Context, select Map Space to specify the size in standard real-world units (inches, feet, yards, miles, millimeters, centimeters, meters, kilometers) or Device Space to specify the size in screen units (points, inches, millimeters, centimeters).
  - For Units, select the type of units to measure line thickness.
  - Use the lists to specify polyline thickness, color, and pattern.

---

**NOTE** Select 0 thickness to draw the line as thin as possible.

---

- 6 To build a composite line, do the following:
  - Click Create Composite Lines to expand the Style Line dialog box.
  - Style the first line in the composite.
  - Click New to add a new component to the line.
  - Style the new component as desired.
  - Control the position of the selected component in the overall composite line by clicking the up and down arrows.
- 7 Click OK.
- 8 Click File menu ► Save.

---

**NOTE** To add labels to features, see [Adding Labels to Features](#) (page 92).

---

## Styling Areas

Specify the fill style and color, background color, edge style and color, and line thickness used to draw polygon features.

---

**NOTE** Set default size context and units in Options. For more information, see [Setting Layer Editor Options](#) (page 147).

---

### To apply styles to areas

1 Open the layer to edit by doing one of the following:

- Create a new layer.
- Double-click an existing layer.
- Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

2 In the Style pane of the Layer Editor, under Scale Ranges, select the scale range to style.

For more information about scale ranges, see [Understanding Scale Ranges](#) (page 83).

3 In the Area Style area for the selected scale range, for Style Of The Geometry, click [...].

4 To fill polygons, in the Style Area dialog box, select the Apply Fill To The Area check box.

5 For Fill Pattern, select Solid or a pattern.

- If you specified Solid fill, specify Foreground Transparency and Foreground Color.
- If you specified a pattern fill, specify colors for Foreground Color and Background Color. If you do not want a background color for the pattern, click Transparent for Background Color.

---

**NOTE** In polygons with transparent backgrounds, the colors you see on the map may differ from the colors displayed in the preview frame because the preview frame always uses a white background, which may differ from the color beneath the transparent objects in your map.

---

6 To add borders to polygons, select the Apply A Border To The Area checkbox and then do the following:

- For Line Pattern, specify the pattern for the area border.
- For Size Context, select Map Space to specify the size in standard real-world units (inches, feet, yards, miles, millimeters, centimeters, meters, kilometers) or Device Space to specify the size in screen units (points, inches, millimeters, centimeters).

- For Units, select the type of units to use to measure border thickness.
- For Line Thickness, specify a thickness for the area border.

---

**NOTE** Select 0 thickness to draw the border as thin as possible.

---

- For Line Color, specify a color for the area border.
- 7 Click OK.
  - 8 Click File menu ► Save.

---

**NOTE** To add labels to features, see [Adding Labels to Features](#) (page 92).

---

## Styling an Annotation Layer

If you are working with data that was created using the Publish to MapGuide feature in AutoCAD Map 3D, the data may include annotation layers. You cannot create or edit annotation layers in MapGuide Studio, but you can style them.

### To style an annotation layer

- 1 In the Site Explorer, double-click the annotation layer.
- 2 At the top of the Layer Editor, click Style (blue text, not a button) to bring the Style panel of the editor to the top.
- 3 In the Style panel, next to Style of the geometry, click ....
- 4 In the Style Text Layer dialog box specify the Size Context.
  - Select Device Space to specify symbol widths and heights in screen units. Available units are Points, Inches, Millimeters, or Centimeters.
  - Select Map Space to specify symbol widths and heights in Mapping Coordinate System (MCS) units. Available units are Inches, Feet, Yards, Miles, Millimeters, Centimeters, Meters, and Kilometers.
- 5 Specify the Units.
- 6 For Text Type, select one of the following:
  - Plain—Formats annotation text uniformly using the settings specified for the layer in the Style Text Layer dialog box. The text has no formatting information itself.

- **Mtext**—Formats annotation text as multiline. The settings specified for the layer in the Style Text Layer dialog box define the base formatting style. You can override this formatting when you insert individual Annotative text features.

The Edit Expression button lets you specify an expression for this setting for advanced use cases. We recommend that you do not use expressions for Text Type.

- 7 For Text, leave the "Label\_Text" value unchanged.  
This is the name of a property in the feature source.
- 8 For Font Name, specify the font to use on the annotation layer.
- 9 For Font Size, leave the "NullValue(SIZE,number)" expression.  
The initial setting for font height is in mapping units and is based on the existing view. We recommend that you try the suggested height and adjust the number as needed. If individual instances require a different height, adjust the value in the SIZE column in the Data Table after you insert the annotation instances.
- 10 Specify other font styling using the drop downs.
- 11 For Horizontal Alignment, Vertical Alignment, and Rotation, leave the "HORIZONTAL\_ALIGNMENT", "VERTICAL\_ALIGNMENT", and "ORIENTATION" expression values unchanged. These are the names of properties in the feature source.
- 12 Click OK.

## Adding Labels to Features

Add labels to features on feature source layers. The label is placed near the line, point symbol, or polygon. For point layers, if precise placement is important, display the label at a point location. For more information, see [Displaying Fixed Labels at Point Locations](#) (page 95). If a feature label obscures another label, it is not displayed. Feature labels are drawn on top of point symbols, lines, and polygons. By default, feature labels will not obscure point symbols. You can allow feature labels to obscure point symbols. For more information, see [Allowing Labels to Obscure Points \(Overposting\)](#) (page 95).

Specify the label text, font, size, format, color, background style and color, alignment, and rotation of the label.

---

**NOTE** Set default size context and units in Options. For more information, see [Setting Layer Editor Options](#) (page 147).

---

### To label features

1 Open the layer to edit by doing one of the following:

- Create a new layer.
- Double-click an existing layer.
- Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

2 In the Style pane of the Layer Editor, under Scale Ranges, select the scale range to style.

For more information about scale ranges, see [Understanding Scale Ranges](#) (page 83).

3 In the style area for the selected scale range, for Feature Label, click [...].

4 In the Style Label dialog box, select the Create A Label checkbox.

5 For Property To Display, do one of the following:

- Select a property.
- Select Expression to use Text Expression dialog box to specify label text.

For more information, see [Building Text Expressions](#) (page 106).

6 For Font, select a font from the list.

7 For Size Context, specify the type of units:

- Select Device Space to specify symbol widths and heights in screen units. Available units are Points, Inches, Millimeters, or Centimeters.
- Select Map Space to specify symbol widths and heights in Mapping Coordinate System (MCS) units. Available units are Inches, Feet, Yards, Miles, Millimeters, Centimeters, Meters, and Kilometers.

8 For Units, select the type of units to use.

9 For Size, enter the text size or specify the size using a number expression.

For more information, see [Building Number Expressions](#) (page 108).

- 10 To apply bold, italic, or underlining, click one or more of the Format options.
- 11 For Text Color, click a color.
- 12 To specify a background style, from the Background Style list click one of the following:
  - Ghosted: Draws an opaque border around each character. Use Background Color to specify a color for the outline.
  - Opaque: Draws a background behind the labels. They are displayed as rectangles with text inside. Use Background Color to specify a color for the rectangles.
  - Transparent: No background is applied to the labels, which are displayed only as text on the map.
- 13 For Ghosted and Opaque background styles, click a color in the Background Color list.
- 14 If you are adding labels to a polyline layer, use Vertical Alignment to specify the label position.

You can select one of the available positions or select a layer property that contains alignment information for each feature.

---

**NOTE** Horizontal and vertical alignment settings are not available for area layers. Only the vertical alignment setting is available for line layers. Horizontal and vertical alignment settings are available for point layers that display fixed labels instead of symbols. For more information, see [Displaying Fixed Labels at Point Locations](#) (page 95).

---

- 15 For Rotation, do one of the following:
  - Enter the amount to rotate the text.
  - Click Any Angle. Specify the angle using the slider or enter an angle in the box. Click OK.
  - Click Expression. Specify the rotation using a number expression. For more information about creating a number expression, see [Building Number Expressions](#) (page 108).
- 16 Click OK.
- 17 Click File menu ► Save.

## Allowing Labels to Obscure Points (Overposting)

Feature labels are drawn on top of point symbols, lines, and polygons. This can be a problem on point layers where the point symbol can be completely obscured by a label. This is called overposting. To minimize overposting, a default setting prevents a label from being drawn at a specific zoom level if it obscures other labels or point features on the map. However, overposting is always allowed for line and polygon features. MapGuide Studio displays the label when you zoom in far enough to allow sufficient space to display it.

### To allow overposting

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Style pane of the Layer Editor, under Scale Ranges, select the scale range to style.  
For more information about scale ranges, see [Understanding Scale Ranges](#) (page 83).
- 3 Click Allow Other Labels To Obscure Feature Symbols On This Layer.
- 4 Click File menu ► Save.

## Displaying Fixed Labels at Point Locations

If exact placement of labels is important, disable the point style and place fixed labels at feature locations.

---

**NOTE** Fixed labels are always displayed, even if they obscure other labels or features. While feature labels are drawn after all layer features have been drawn, fixed labels are drawn according to the draw order of their layer within a map, and may be obscured by features from other layers.

---

### To place labels at points

1 Open the layer to edit by doing one of the following:

- Create a new layer.
- Double-click an existing layer.
- Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

2 In the Style pane of the Layer Editor, under Scale Ranges, select the scale range to style.

For more information about scale ranges, see [Understanding Scale Ranges](#) (page 83).

3 In the Point Style area for the selected scale range, select the Labels Are Fixed (Not Dynamic) checkbox.

4 In the Point Style area for the selected scale range, for Style Of The Geometry, click [...].

5 To remove the point symbol, in the Style Point dialog box, clear the Style a Point Symbol checkbox.

6 In the Point Style area for the selected scale range, for Feature Label, click [...].

7 To turn on and style the label, in the Style Label dialog box, select the Style checkbox.

8 Specify label text and style.

For more information about feature labels, see [Adding Labels to Features](#) (page 92).

9 Use the Horizontal Alignment and Vertical Alignment lists to specify the position of the label relative to the feature.

You can select one of the available positions or select a layer property that contains alignment information for each feature. The alignment values in the property must be specified as follows:

- Horizontal: Left, Center, or Right.
- Vertical: Baseline, Bottom, Capline, Halfline, or Top.

10 Click File menu ► Save.

## Creating Themes

Themes are styles based on the data associated with features in your map. Themes provide a visual representation of the data. For example, a typical theme for a point layer might display retail store locations with a different symbol for each type of store, or a polygon layer theme might display each land use classification with a different color or shading.

A theme consists of a collection of rules. Each rule specifies a style and feature label for the features that meet the specified condition. You can add a legend label to provide a description of a rule's condition. As a layer is drawn, each feature is compared to the rules in the order that they are listed. The first rule for which the feature meets the condition is used to specify the style and feature label for that feature. A default or empty condition applies to all features and defines the style for features that do not meet any of the preceding rules. A well-constructed theme contains only one default rule and it is last in the list.

Create rules manually or use the MapGuide Studio theming tool to automate theming based on a range of conditions. For more information, see [Creating Themes Automatically](#) (page 98).

### To create a theme manually

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Style pane of the Layer Editor, under Scale Ranges, select the scale range to theme.  
For more information about scale ranges, see [Understanding Scale Ranges](#) (page 83).
- 3 In the geometry style area, click Theme>> if the style rule grid is not displayed.

- 4 In the style rule grid, click the Condition grid cell.
- 5 Use the Filter dialog box to specify the subset of features to theme. Click OK.  
For more information about using the Filter dialog box, see [Filtering Data](#) (page 80).
- 6 In the style rule grid, click the Style grid cell.  
The Style Point, Style Line, or Style Area dialog box is displayed depending on the type of data associated with the layer.
- 7 Create point, line, and area styles for the theme.  
For more information about defining styles, see [Styling Points](#) (page 84), [Styling Lines](#) (page 88), and [Styling Areas](#) (page 89).
- 8 To add labels to features in the theme, in the style rule grid, click the Feature Label grid cell.  
For more information about creating feature labels, see [Adding Labels to Features](#) (page 92).
- 9 To label the theme in the legend, enter the text in the Legend Label grid cell.
- 10 Optionally, do one or more of the following:
  - To add a new rule to an existing theme, click Add A Rule. Define the rule as described in the preceding steps.
  - To copy and modify a selected rule, click Duplicate. Modify the new rule as described in the preceding steps.
  - To delete the selected rule, click Delete.
  - To adjust the position of the selected rule in the list, click Move Up and Move Down as needed.  
After a rule applies to a feature, none of the rules that come after it in the list are applied to the feature.
- 11 Click File menu ► Save.

## Creating Themes Automatically

The MapGuide Studio theming tool creates a theme automatically based on a range of conditions.

### To create a theme automatically

1 Open the layer to edit by doing one of the following:

- Create a new layer.
- Double-click an existing layer.
- Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

2 In the Style pane of the Layer Editor, under Scale Ranges, select the scale range to theme.

For more information about scale ranges, see [Understanding Scale Ranges](#) (page 83).

3 In the style rule grid, click Theme>> to display the advanced editor.

4 Click Theme [...] to display the Theme dialog box.

5 In the Rules area, specify the number of ranges to create and whether new ranges replace existing ranges or are added before or after existing ranges.

You can specify the number of ranges to create if Distribution method is Equal, Quantile, or Jenks (Natural Breaks). Properties containing strings use an Individual Values distribution that does not allow the number of rules to be edited. Adjust the number of rules to control the coarseness of the theme.

For more information about distribution methods, see [Understanding Distribution Methods](#) (page 101).

6 To analyze features based on values that fall into various numerical ranges, do the following:

- Select the Create A Range Of Conditions checkbox.
- For Property, select the property on which to base the theme.
- Specify the Minimum Value and Maximum Value for the range. The first rule includes the Minimum Value and the last rule includes the Maximum Value. Styles are interpolated across the range.
- For Distribution, select a method. For more information about distribution methods, see [Understanding Distribution Methods](#) (page 101).

If you clear the Create A Range Of Conditions checkbox, the theming tool creates a set of ranges with interpolated styles and labels, but with empty conditions. You can then fill in the conditions manually.

- 7 To interpolate styles across the range of conditions, do the following:
  - Select the Interpolate Styles Across The Range Of Conditions checkbox.
  - For Style Ramp, click [...].  
The Style Point, Style Line, or Style Area dialog box is displayed depending on the type of data associated with the layer. An additional column of controls is provided for defining the end-of-range style.
  - Use the From column to define the start of the range.
  - Use the To column to define the end of the range.

The first rule uses the From style and the last rule uses the To style. Styles are interpolated across the range.

For more information about defining styles, see [Styling Points](#) (page 84), [Styling Lines](#) (page 88), and [Styling Areas](#) (page 89).

If you clear the Interpolate Styles Across The Range Of Conditions checkbox, the theming tool creates a range of conditions with blank styles. Then, you can fill in the styles manually.

- 8 To add labels to features in the theme, do the following:
  - Select the Create Feature Labels For The Range Of Conditions checkbox.
  - Click Label Ramp.  
You can interpolate label size, text color, and rotation across the range of conditions.
  - In the Style Label dialog box, use the From column to define the start of the ramp. Use the To column to define the end of the ramp. The first rule uses the From label style and the last rule uses the To label style. Label styles are interpolated across the range.  
For more information about creating feature labels, see [Adding Labels to Features](#) (page 92).
- 9 To create legend labels for the theme, do the following:
  - Select the Create Legend Labels For The Range Of Conditions checkbox.
  - For Legend Text, enter the text to appear within each rule in the legend.

- For Label Format, specify how to display the legend label. If you theme a layer on a property that contained area information and you used the label text *Area*, the label formats might look like the following examples:

<Label Text> <Min> to <Max>  
Area: 100 to 200

<Label Text> <Min> - <Max>  
Area: 100 - 200

<Min> <= <Label Text> <<Max>  
100 <= Area < 200

10 Click File menu ► Save.

## Understanding Distribution Methods

When you create a range of conditions for a theme, you must specify the distribution method. The following methods are available:

Distribution method	Description
Equal	The difference between the high and low values is the same for every range. This method is easy to interpret and is useful for showing continuous data such as rainfall.
Standard Deviation	Features are placed in ranges based on how much their values vary from the mean. MapGuide Studio calculates the mean and then adds or subtracts the standard deviation to or from the mean to create the ranges.
Quantile	Each range contains an equal number of features. This method is useful for showing data in which values are evenly distributed.
Jenks (Natural Breaks)	Ranges are based on natural groupings of data values. Features with similar values

Distribution method	Description
	are grouped together. This method shows the natural groupings in the data.
Individual Values	Features are not grouped. This distribution is useful if values are not continuous, there is a fixed number of values, and many features have the same value.

## Working with Drawing Source Layers

If the data resource associated with the layer is a drawing source (DWF file), you can specify a scale range and the sheet and layers to display in the Viewer.

For more information about drawing sources, see [Understanding Resources](#) (page 8).

## Setting the Scale Range

Specify the range at which the DWF data is visible.

### To specify or change the scale range for a layer

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Settings pane of the Layer Editor, under Scale Range, for From enter the lower range value.
- 3 For To, enter the upper range value.
- 4 Click File menu ► Save.

## Specifying the Drawing Sheet and Layers

When you work with a drawing source (DWF) layer, you can specify which sheet and layers to use. Sheets are individual plot sheets containing views or layouts of the original data. You must specify a single sheet to display in the layer. If the DWF was published from a DWG file, and layers were enabled, you can turn layers on and off.

### To specify the sheet and layers

1 Open the layer to edit by doing one of the following:

- Create a new layer.
- Double-click an existing layer.
- Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

2 In the Settings pane of the Layer Editor, under Drawing Data Setup, for Which Drawing Sheet, select the sheet to use for the layer.

3 For Include Only These Layers, click [...].

4 In the Select Layers dialog box, do one of the following:

- In the Layers list, select the layers to display.
- Click Select All to select all available layers.

Click Clear All to clear selected layers.

5 Click OK.

6 Click File menu ► Save.

## Working with Raster Layers

When the data resource associated with the layer is a raster catalog, the layer settings are slightly different from other files and database connections. You can specify a scale range, how often to redraw the image during zooming, and how to display bitonal images.

For more information about creating raster catalogs, see [About Raster Files](#) (page 27).

## Setting the Scale Range for a Raster Image

Specify the range at which the raster image is visible.

### To specify a scale range for the raster image

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.
  - Double-click an existing layer.
  - Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Style pane of the Layer Editor, under Scale Range, for From enter the lower range value.
- 3 For To, enter the upper range value.
- 4 Click File menu ► Save.

## Specifying the Zoom Rebuild Factor

Specify how often MapGuide Studio should re-sample the raster image data after zooming in. To understand how the zoom rebuild factor works, suppose the value is set to 3 and the Viewer is displaying a map that is 300x200 pixels. Assume that the source of the raster image layer is 3000x2000 pixels in size. The first time the Viewer displays the map, the application makes a request to the server to resample the entire raster image to a resolution of 300x200 pixels. MapGuide Viewer displays and scales this resampled image locally until the user has zoomed in by a magnification factor of 3. At that time, the application issues another request to the server to re-sample a smaller subset of the original raster image to a resolution of 300x200 pixels. Again, the Viewer displays and scales this re-sampled image locally as zooming continues, until the user zooms in another 3 times.

### To specify the zoom rebuild factor

- 1 Open the layer to edit by doing one of the following:
  - Create a new layer.

- Double-click an existing layer.
- Click the layer's tab if the layer is already open.

For information about creating a new layer, see [Creating New Resources](#) (page 56). For information about associating a data resource with a new layer, see [Specifying the Data Resource for a Layer](#) (page 77).

- 2 In the Rebuild Layer After Zooming By A Factor Of box, enter a magnification factor.  
This number must be an integer.
- 3 Click File menu ► Save.

## Setting Foreground and Background Color for Bitonal Images

For bitonal raster images, Foreground Color (1 Or “On” Pixels) is black by default and Background Color (0 Or “Off” Pixels) is white. You can specify the following settings for the foreground and background colors:

- Specify any color.
- Set foreground or background to transparent. Features from other layers will show through the raster image.
- Use the foreground or background color in the map that references this layer and raster data.

### To set foreground and background colors

- 1 From the Foreground color (1 or “on” pixels) list, select one of the following:
  - A color
  - Map Window Background
  - Transparent
- 2 From the Background color (0 or “off” pixels) list, select one of the following:
  - A color

- Map Window Background
  - Transparent
- 3 Click File menu ► Save.

## Building Text Expressions

The Text Expression dialog box is available in several places in MapGuide Studio. Use it to specify URL, tooltip, and feature label values. For example, you might create a text expression that specifies the following label text:

```
<State_Name>: <Population>
```

Where `<State_Name>` and `<Population>` are the values of these properties for each feature. For example, California: 33,871,648.

The Text Expression dialog box has two modes: Builder and Advanced. In Builder mode you can only create expressions that use valid syntax. In Advanced mode you can create expressions using any syntax, even if it is not handled by the Builder. You cannot move from Advanced mode to Builder mode unless conditions are valid. Further, an expression with valid syntax is not allowed in the builder if it contains functions or property names that are not in the layer's data source.

### To build a text expression

- 1 In the Text Expression dialog box, under Text Value, do any of the following:
  - Click Property and select a property from the list.
  - Click Constant and enter the text to use.
  - Click Number Expression and click [...]. Use the Number Expression dialog box to create a number expression.  
For more information, see [Building Number Expressions](#) (page 108).
- 2 To add components to the expression, click New and define the next component.

To join multiple components in Advanced mode, use `concat`. For example:

```
concat(State_Name, concat(':', Population))
```

Spaces are ignored in Advanced mode except within the single quotes that specify a constant.

- 3 Click OK.
- 4 Click File menu ► Save.

### Building URL Expressions

The following functions are designed to help build URL expressions that include identifying information with each feature. For example, when you click on a feature, the link opens a browser window that displays the feature's properties.

Function	Description
MAPNAME()	Name of the runtime map for the current session
SESSION()	Current session ID
LAYERID()	Layer ID of the feature associated with the URL
FEATURECLASS()	Class name of the feature associated with the URL
FEATUREID()	ID of the feature associated with the URL
URLENCODE(string)	URL-encodes the supplied string

To create this type of expression, you must use the Text Expression dialog box in Advanced Mode. For the above mentioned use case, the following expression is an example of a feature URL that includes the necessary identifying information:

```
concat (concat (
concat ('Hyperlink.php?FeatureID=', URLENCODE (FEATUREID ())),
concat ('&FeatureClass=', URLENCODE (FEATURECLASS ())),
concat ('&LayerID=', URLENCODE (LAYERID ())))
```

**NOTE** When using these functions in feature URL expressions, remember to use URLENCODE to ensure that all URL parameter values are properly encoded.

## Building Number Expressions

Use number expressions to specify values in many places in MapGuide Studio. You can generate a new numerical value based on existing values. You can also include a number expression within a text expression by placing it within parentheses. For example, you might create a text expression that specifies a state name and population for a label. To express the population in millions, you can apply a number expression that divides the population value by 1,000,000.

For example, you might create a text and number expression that specifies the following label text:

```
concat (State_Name, concat (': ', (Population/1000000)))
```

Where `<State_Name>` and `<Population>` are the values of these properties for each feature. The label would display California: 33.

The Number Expression dialog box has two modes: Builder and Advanced. In Builder mode you can only create expressions that use valid syntax. In Advanced mode you can create expressions using any syntax, even if it is not handled by the Builder. You cannot move from Advanced mode to Builder mode unless conditions are valid. Further, an expression with valid syntax is not allowed in the builder if it contains functions or property names that are not in the layer's data source.

Spaces are ignored in Advanced mode except within the single quotes that specify a constant.

### To build a number expression

- 1 In the Number Expression dialog box, under Property Or Constant, do either of the following:
  - Click Property and select a property from the list.
  - Click Constant and enter the value to use.
- 2 Click New to add additional elements to the expression.
- 3 Under Operation, click an arithmetic operator.
- 4 Under Property Or Constant, specify a property or constant value.
- 5 To group and ungroup conditions, select the conditions and click Group Selected Conditions or Ungroup Selected Conditions as needed.
- 6 Click OK.

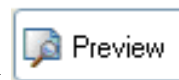
7 Click File menu ► Save.

## Previewing the Layer

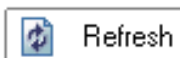
As you style a layer, use the Layer Preview pane to view what it will look like when a user displays it in the Viewer.

To preview the layer

1 If the Layer Preview pane is not displayed, click Preview.

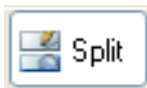


2 Click Refresh.



To display the Layer Preview pane below the Layer Editor pane as you

work, click Split.





# Displaying the Map in a Web Browser

# 6

After you create a map, you can build a flexible or basic web layout so that users can view and interact with the map on the Internet or an intranet. The flexible web layout is a CSS-based web layout, which allows you to modify the templates provided with MapGuide Studio and add third party templates. The basic web layout supports the table-based DWF and AJAX viewers and maintains backward compatibility with your basic web layouts from previous versions of MapGuide Studio. Test your flexible or basic web layout using either the Preview pane in the Web Layout Editor or by viewing it in your default browser.

When you build a new flexible or basic web layout you only need to specify the map to display. All other settings have default values. Use the Web Layout Editor to perform the following tasks:

- Create a new web layout and specify the map to display.
- Modify default web layout settings.
- Design Viewer toolbars, right-click menus, and a task pane.
- Create custom components.

## Flexible Layout Viewer

### Setting Up the Web Layout

You can create a new flexible web layout, specify general settings, select a template, and specify the Viewer components to display.

## Creating a New Flexible Web Layout

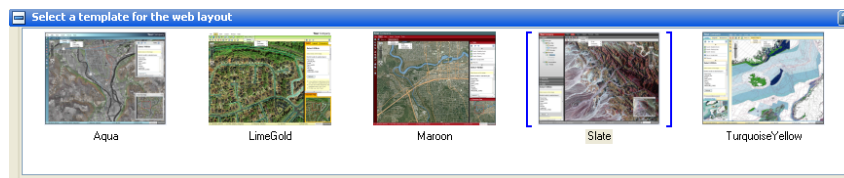
MapGuide Studio provides default web layout settings so that you only need to specify a map to display when you create a new flexible web layout.

### To create a new flexible web layout

- 1 Click File menu ► New ► Web Layout ► Flexible Layout.
- 2 For Map Resource Used In This Layout click [...], locate and select the map to reference in the web layout and click Open.
- 3 Click File menu ► Save As. In the Save Resource As dialog box, specify a name for the web layout and a location in the Site Explorer and click Save.

## Selecting a Template

You can choose any 1 of the 5 templates to create your web layout. If you select the Aqua, LimeGold, or TurquoiseYellow templates, the containers are displayed in a tab format. If you select the Maroon or Slate templates, the containers are displayed in a pane format.



---

**NOTE** Each template has a separate URL, which launches it in a separate browser. To preview your web layout in a browser, see [Previewing the Web Layout in a Browser](#) (page 125).

---

### To select a template

- 1 Open the web layout to edit by doing one of the following:
  - Create a new web layout.
  - Double-click an existing web layout.
  - Click the web layout's tab if it is already open.

- 2 In the Select A Template For The Web Layout pane, click a template thumbnail.
- 3 For Web Page Title enter a title to appear in the title bar of the browser.
- 4 Use the Configure Components of the Selected Template to specify the settings for your web layout.  
If you choose to use a different template, you can reuse the settings that you selected for the previous template.

## Specifying General Web Layout Settings

Use the Web Layout Editor to specify the following settings for your web layout:

- The template to display
- Web page title
- Map resource to reference in the web layout
- Initial view of the map when displayed in a browser
- URL for the initial task to display in the task pane of the Viewer
- The Viewer components to display

### To set general web layout settings

- 1 Open the web layout to edit.  
For information about creating a new web layout, see [Creating a New Basic Web Layout](#) (page 126).
- 2 On the MapGuide Studio toolbar, click Edit to hide the preview panel.
- 3 Select a template by clicking on a thumbnail.  
For information about selecting a template, see [Selecting a Template](#) (page 112).
- 4 For Web Page Title enter a title to appear in the title bar of the browser.
- 5 In the Configure Components Of The Selected Template, for Map Resource Used In This Layout click [...], locate and select the map to reference in the web layout and click Open.

- 6 For Initial View Of The Map do the one of the following:
  - Click Use Map's Initial View.  
The initial view in the layout matches the initial view you specified in the Map Editor. For more information, see [Setting the Initial Map View](#) (page 69).
  - Click Use Custom View. For Center, enter the XY values of the point to use as the initial center point of the map.  
The XY values correspond to the units used in the referenced map resource. For example, if the map uses a Lat/Lon coordinate system, X is Lon and Y is Lat in degrees. If the map uses the Miller Cylindrical Projection, X and Y values are in Meters.  
To adjust the zoom level, for Zoom To enter the zoom factor for the initial zoom scale of the map.  
Leave the Zoom To field clear to display the entire map.  
Click Set To Current Map Zoom to use the center and zoom level you have defined in the Web Preview pane of the Web Layout Editor.
- 7 Click the Task Pane tab. For Inital Task URL specify the location of the initial HTML content to display in the task pane to assist your users.
- 8 Click File menu ► Save.

## Displaying Viewer Containers

All templates display the following containers in your web layout browser:

**Legend** Controls the display of the Legend pane. The Legend pane displays a list of layers.

**Map** Controls the display of the referenced map.

**Overview Map** Controls the display of the Overview Map pane.

To display the overview map, click View ► Show Overview Map in the browser of your completed web layout.

**Right-Click Menu** Controls the display of the components in the Right-Click Menu. The Right-Click Menu contains the following default components: Refresh, Pan, Zoom Rectangle, Zoom In, Zoom Out, Zoom, Select, Clear Selection, Select More, Buffer, Measure, Help, and About.

To customize this menu, see [Customizing the Right-Click Menu](#) (page 117).

**Selection** Displays properties for a selected feature. The pane is blank if multiple features are selected. To define the properties to display in the Selection pane, see [Specifying the Properties to Display in the Viewer](#) (page 79).

**Status Bar** Controls the display of the cursor position, layer name, number of features selected, current map scale, current map window height and width, and command descriptions.

**Task Pane** Controls the display of the Task pane. The Task pane displays the Task List menu, which contains the Buffer and Measure default components, task bar buttons, interactive prompts, and the results of searches and interactive commands.

To customize this pane, see [Customizing the Task List Menu](#) (page 118).

**Main Menu Toolbar** Controls the display of the components in the Main Menu toolbar. The Main Menu toolbar contains the following default components: Maps and View.

To customize this toolbar, see [Customizing the Viewer Toolbars](#) (page 116).

**Primary Toolbar** Controls the display of the components in the Primary toolbar. The Primary toolbar contains the following default components: Refresh, Select Radius, Select Polygon, Clear Selection, Buffer, Measure, Print, Options, About, and Help.

To customize this toolbar, see [Customizing the Viewer Toolbars](#) (page 116).

**Vertical (or Secondary) Toolbar** Controls the display of the Vertical toolbar and Secondary toolbar. These toolbars contain the following default components: Select, Pan, Zoom Rectangle, Zoom In, Zoom Out, Zoom Extents, Zoom Selection, Previous, and Next.

To customize these toolbars, see [Customizing the Viewer Toolbars](#) (page 116).

If you detach the default components from the Legend, Selection, Task, or Overview Map panes, the panes will appear blank in your web layout.

## Specifying Additional Maps to Display

You can specify additional maps to display in the Maps menu item of the main menu toolbar in the browser of your completed web layout.

### To specify additional maps to display

- 1 In the Configure Components Of The Selected Template pane, click the Map tab.

- 2 For Map Resource Used In This Layout click [...], locate and select the map to reference in the web layout and click Open.
- 3 Click File menu ► Save.

---

**NOTE** To delete maps from the map group, click Edit Map Groups in the Map tab to access the Map Set Editor window, in which you can edit the XML code.

---

## Defining the Viewer Toolbars, Right-Click Menu, and Task Pane Menu

Use the toolbar, right-click menu, and task pane menu tabs of the Web Layout Editor to set up the components to make available to your users. You can provide different sets of components in the Viewer toolbars, the right-click menu, and task list menu. The set of available components is defined by MapGuide Studio.

A set of built-in basic components with few or no settings is available for immediate use. Three additional components require configuration and have additional parameters. These are: Search, Invoke Script, and Invoke URL. For more information about working with these components, see [Customizing Components](#) (page 120).

### Customizing the Viewer Toolbars

MapGuide Studio provides the following toolbars: the Main Menu toolbar, the Primary toolbar, and the Vertical (or Secondary) toolbar. You can customize all toolbars by specifying additional components to include. If you have customized the right-click menu or task list menu, you can use those settings for the toolbars. For more information, see [Duplicating the Toolbar, Right-Click Menu, and Task List Menu](#) (page 119).

---

**NOTE** The position of the toolbars in the browser depends on which template you select. When you select the LimeGold or Slate templates, the Secondary Toolbar appears below the Primary Toolbar in the browser. The Vertical Toolbar appears if you select the Aqua, Maroon, or TurquoiseYellow templates.

---

#### To customize the Viewer toolbars

- 1 In the Configure Components Of The Selected Template pane of the Web Layout Editor, select the toolbar to customize by clicking a tab.

- 2 Do any or all of the following:
  - Drag component icons from the Components Available in This Layout pane to the Items Displayed In Container pane.
  - To add a separator between items in the toolbar, click the item that will appear to the right of the separator and click Add ► New Separator.
  - To change the position of an item, click the item and click Move Item Up or Move Item Down.
  - To delete an item, click the item and click Remove Item.
  - To add a flyout menu, see [Creating Flyouts](#) (page 133).
- 3 View the toolbar in the Web Preview pane.
- 4 Click File menu ► Save.

## Customizing the Right-Click Menu

You can specify additional components to include in the Right-Click menu. If you have customized the toolbars or task list menu, you can use those settings for the right-click menu. For more information, see [Duplicating the Toolbar, Right-Click Menu, and Task List Menu](#) (page 119).

### To customize the right-click menu

- 1 In the Configure Components Of The Selected Template pane, click the Map:Right-Click Menu tab.
- 2 Do any or all of the following:
  - Drag component icons from the Components Available In This Layout pane to the Items Displayed In Container pane.
  - To add a separator between items in the right-click menu, select the item that will appear below the separator and click Add ► New Separator.
  - To change the position of an item, click the item. Then click Move Item Up and Move Item Down.
  - To delete an item, click the item. Then click Remove Item.
  - To add a flyout menu, see [Creating Flyouts](#) (page 133).

- 3 To preview the right-click menu, right-click the map in the Web Preview pane.
- 4 Click File menu ► Save.

## Customizing the Task List Menu

You can specify additional components to include in the Task List menu. If you have customized the toolbars or right-click menu, you can use the same settings for the task list menu. For more information, see [Duplicating the Toolbar, Right-Click Menu, and Task List Menu](#) (page 119).

### To customize the task list menu

- 1 In the Configure Components Of The Selected Template pane, click the Task Pane: Task Menu tab.
- 2 Do any or all of the following:
  - Drag component icons from the Components Available In This Layout pane to the Items Displayed In Container pane.
  - To add a separator between items in the task list menu, click the item that will appear below the separator. Then click Add ► New Separator.
  - To change the position of an item, click the item. Then click Move Item Up and Move Item Down.
  - To delete an item, click the item. Then click Remove Item.
- 3 To view the task list menu, click Task List in the Task pane displayed in the Web Preview pane.
- 4 Click File menu ► Save.

## Creating Flyouts

Add a flyout menu to any container in the toolbar, task pane menu, and right-click menu.

### To create a flyout

- 1 Click the Toolbar or Map:Right-Click Menu tab.

- 2 Click Add ► New Flyout.
- 3 Click the new flyout and do the following:
  - Position the flyout menu using Move Item Up and Move Item Down.
  - In the Flyout Parameters panel, specify the label, tooltip, and images to use for this control.  
For more information about these properties, see [Basic Command Settings](#) (page 135).
  - Add components and separators to the flyout the same way you add them to the toolbar, task list menu, and right-click menu.
- 4 Click File menu ► Save.

## Restoring Toolbar, Right-Click Menu, and Task List Menu Defaults

You can restore the toolbar, right-click menu, and task list menu to the default state before customization.

### To restore defaults

- 1 In the Configure Components Of The Selected Template pane of the Web Layout Editor, click the Toolbar, Map:Right-Click Menu, or Task Pane:Task Menu tab.
- 2 In the Items Displayed In Container click Reset ► To Defaults For and click the menu to restore its defaults.

## Duplicating the Toolbar, Right-Click Menu, and Task List Menu

After you customize the toolbar, right-click menu, or task list menu, you can apply the same settings to each of the other two tabs making the contents match.

### To duplicate settings

- 1 Click the tab you want to make match the customized tab.

- 2 Click **Reset** ► **To Match** and select the customized menu or toolbar that you want to match.

## Customizing Components

MapGuide Studio provides a set of built-in basic components and three advanced components: Invoke Script, Invoke URL, and Search.

You cannot modify or delete the components that are provided with MapGuide Studio. However, you can customize the built-in components by creating new components based on each action type and modifying the settings of the new components.

To create new basic components, see [Creating New Basic Components](#) (page 121). To create new advanced components, see [Creating New Advanced Components](#) (page 122).

### Basic Component Settings

Many components share the following settings:

**ID** Internal name for the component.

**Label To Display In The Interface** Name to display for this component.

**Tool Tip To Appear On Hover** Short text description that is displayed when the cursor is placed over the button that activates the component.

**Description To Appear On The Status Bar** Additional description that is displayed in the status bar when the cursor is placed over the button, menu item, or task that activates this component.

**URL To Image For This Control** Location for the button image to use when the component is available.

**Image Class** Controls how the image is displayed in the web application when a CSS class is specified.

In addition to the basic component settings, a component may have additional settings, which you can adjust as necessary.

The following components generate results:

- Buffer Panel
- Measure

- **Select Within**

You must specify a location (target) to display results. Target options are:

**Task Pane** Displays results in the Task pane.

**New Window** Opens a new browser window to display results.

**Specified Frame** Displays results in the named frame that you specify.

## Creating New Basic Components

Customize a basic component by creating a new component with the same action type, and then modifying its settings. For more information about basic component settings, see [Basic Command Settings](#) (page 135).

### To create a new basic component

- 1 In the **Configure Components Of The Selected Template** pane, select the tab where you want to place the customized component.
- 2 In the **Components Available In This Layout**, click **New...**
- 3 In the list of components, click the new component and click **OK**.
- 4 Use the **Parameters For Selected Item** panel to specify basic component settings.  
For more information, see [Basic Command Settings](#) (page 135).
- 5 If you are creating a new component based on **Buffer Panel**, **Measure**, or **Select Within** do the following:
  - In the **Parameters For Selected Item** pane, for **Target**, click either **Task Pane**, **New Window**, or **Specified Frame**.
  - If you select **Specify Frame**, enter the frame name.  
For more information about target options, see [Basic Command Settings](#) (page 135).
- 6 To create a new print component, see [Creating a Print Command](#) (page 139).
- 7 Click **File menu** ► **Save**.

## Creating New Advanced Components

Customize an advanced component by creating a new component with the same action type, and then modifying its settings.

Advanced commands are:

- Invoke Script
- Invoke URL
- Search

### To create a new advanced component

- 1 In the **Configure Components Of The Selected Template**, do one of the following:
  - Select a toolbar
  - Click **Map:Right-Click Menu**
  - Click **Task Pane:Task menu**
- 2 In the **Components Available In This Layout** panel, click **New** and select a new component.
- 3 Use the **Parameters For Selected Item** panel to specify basic component settings.  
For more information, see [Basic Command Settings](#) (page 135).
- 4 Do one of the following:
  - To create a new **Invoke Script** component, see [Creating an Invoke Script Command](#) (page 138).
  - To create a new **Invoke URL** component, see [Creating an Invoke URL Command](#) (page 138).
  - To create a new **Search** component, see [Creating a Search Command](#) (page 139).
- 5 Click **File menu** ► **Save**.

## Creating an Invoke Script Component

Use an Invoke Script component to call a JavaScript function inside your web layout.

### To create an Invoke Script component

- 1 Follow steps 1 - 4 in [Creating New Advanced Components](#) (page 122).
- 2 In the Parameters For Selected Item panel, under Script To Invoke, enter the name of the script file to associate with this component.
- 3 Click File menu ► Save.

## Creating an Invoke URL Component

Use an Invoke URL component to call a URL from your web layout.

### To create an Invoke URL component

- 1 Follow steps 1 - 4 in [Creating New Advanced Components](#) (page 122).
- 2 In the Parameters For Selected Item panel, under URL To Invoke, enter the URL to call when this component is executed.
- 3 Under Pass In These Additional Parameters With The URL, specify one or more key/value parameters to include with the URL.
- 4 Under Use Only These Layers, specify the layers to which the component applies.
- 5 To specify that the component is only available if features are selected, click Disable Command If Nothing Is Selected.
- 6 Under Target, specify whether the results should display in the task pane, a new window, or a specific frame.  
For more information about target options, see [Basic Component Settings](#) (page 120).
- 7 Click File menu ► Save.

## Creating a Search Component

Use a Search component to build a search tool for your users.

### To create a search component

- 1 Follow steps 1 - 4 in [Creating New Advanced Components](#) (page 122).
- 2 In the Parameters For Selected Item panel, for Display This Prompt For Users To Enter A Search specify the prompt to display to your users.
- 3 For Search This Layer, specify the layer to which the search applies.
- 4 For Pass The Search Term Into This Filter, click [...] and define a filter to select a subset of features.  
For more information about defining a filter, see [Filtering Data](#) (page 80).
- 5 For Use These Columns To Display The Results Returned By This Search Component, click Add and do the following:
  - Enter a title for the column.
  - Select the property to display in the column.
  - Use the Move Up and Move Down buttons to adjust the order of the columns in the results table.
- 6 Specify a maximum number of results under Return A List Of Results No Larger Than.
- 7 For Target, click either Task Pane, New Window, or Specified Frame.  
If you select Specify Frame, enter the frame name.  
For more information about target options, see [Basic Component Settings](#) (page 120).
- 8 Click File menu ► Save.

## Creating a Print Component

Create a custom print component by modifying a built-in basic component.

### To create a print component

- 1 Follow the instructions for creating a basic component.  
For more information, see [Creating New Basic Components](#) (page 121).
- 2 In the Parameters For Selected Item, select any or all of the following checkboxes: Show Title, Show Legend, Show North Arrow.
- 3 Enter a title to be printed on the page.

- 4 Click File menu ► Save.

## Previewing the Web Layout

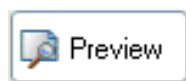
Use the Web Preview pane of the Web Layout Editor to preview your flexible layout as you work.

### Previewing the Web Layout in MapGuide Studio

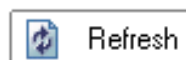
Preview your web layout as you work using the Web Preview pane of the Web Layout Editor. When you preview your web layout in the Web Layout Editor, you are not required to save your changes.

#### To preview your web layout within MapGuide Studio

- 1 If the Web Preview pane is not displayed, click Preview.



- 2 In the Web Preview pane, click Refresh.



### Previewing the Web Layout in a Browser

Your default browser displays the last saved version of your web layout.

#### To preview your web layout in a browser

- 1 In the Select a Template For The Web Layout pane, click View in Browser.
- 2 Enter your MapGuide Studio User Name and Password when prompted and click OK.

You can also copy and paste the URL into the location bar of your browser.

---

**NOTE** The URLs displayed are the locations of your web layouts in the MapGuide Studio virtual directory structure. For newly created web layouts, the Web Address Of This Layout field is blank and you will be prompted to save when you click View in Browser.

---

## Basic Layout Viewer

### Setting Up the Web Layout

You can create a new web layout, specify general settings, and specify the Viewer components to display.

#### Creating a New Basic Web Layout

To create a new basic web layout

- 1 Click File menu ► New ► Web Layout ► Basic Layout.
- 2 For Map Resource Used In This Layout click [...], locate and select the map to reference in the web layout and click Open.
- 3 Click File menu ► Save As. In the Save Resource As dialog box, specify a name for the web layout and a location in the Site Explorer and click Save.

#### Specifying General Web Layout Settings

Use the Settings pane of the Web Layout Editor to specify the following settings for your web layout:

- Browser title bar text
- Map resource to reference in the web layout
- Initial view of the map when displayed in a browser
- The Viewer components to display
- URL for the initial task to display in the task pane of the Viewer

- The target location to display hyperlinks associated with features

#### To set general web layout settings

- 1 Open the web layout to edit by doing one of the following:

- Create a new web layout.
- Double-click an existing web layout.
- Click the web layout's tab if the web layout is already open.

For information about creating a new basic web layout, see [Creating a New Basic Web Layout](#) (page 126).

- 2 Expand the Settings pane if it is not already displayed.
- 3 For Viewer Title enter a title to appear in the title bar of the browser.
- 4 For Map Resource Used In This Layout click [...], locate and select the map to reference in the web layout and click Open.
- 5 For Initial View Of The Map do the one of the following:
  - Click Use Map's Initial View.  
The initial view in the layout matches the initial view you specified in the Map Editor. For more information, see [Setting the Initial Map View](#) (page 69).
  - Click Use Custom View. For Center, enter the XY values of the point to use as the initial center point of the map.  
The XY values correspond to the units used in the referenced map resource. For example, if the map uses a Lat/Lon coordinate system, X is Lon and Y is Lat in degrees. If the map uses the Miller Cylindrical Projection, X and Y values are in Meters.  
  
To adjust the zoom level, for Zoom To enter the zoom factor for the initial zoom scale of the map.  
  
Leave the Zoom To field clear to display the entire map.  
  
Click Set To Current Map Zoom to use the center and zoom level you have defined in the Web Preview pane of the Web Layout Editor.
- 6 For Display These Components In The Viewer, specify which components of the Viewer to display.  
For more information, see [Specifying Viewer Components to Display](#) (page 128).

- 7 For URL For Home Task Displayed In The Task Pane specify the location of the initial HTML content to display in the task pane to assist your users.  
The Home button in the task pane displays this initial page. Various commands can also use the task pane as the frame in which to display their output. For more information, see [Customizing the Task Bar Menu](#) (page 132).
- 8 For Open Feature URL Hyperlinks In This Target Interface specify how to display hyperlinks associated with features.  
You can open hyperlinks in the Task pane, a new browser window, or a named frame that you specify.
- 9 Click File menu ► Save.

## Specifying Viewer Components to Display

Specify which components of the Viewer are displayed when your users view the web layout in a browser. The Viewer can display the following sets of components:

**Left Pane** Controls the display of the Layers Pane and the Properties Pane. The Layers Pane displays a list of layers. The Properties Pane displays properties for a selected feature. The pane is blank if multiple features are selected. To define the properties to display in the Properties Pane, see [Specifying the Properties to Display in the Viewer](#) (page 79).

If you display the left pane you can specify the width in pixels.

**Middle Pane** Controls the display of the Toolbar, Context Menu, Status Bar, and the Zoom Control for the AJAX viewer.

**Right Pane** Controls the display of the Task pane. The Task pane can display a Task bar, interactive prompts, and the results of searches and interactive commands.

If you display the right pane you can specify the width in pixels.

### To specify Viewer components

- 1 In the Settings pane of the Web Layout Editor, locate the Display These Components In The Viewer section.
- 2 For Left Pane, do the following:
  - Select Layers Pane, Properties Pane, or both.

- For Width (Pixels), specify a width for the left pane.
- 3 For Middle Pane, select any or all of the following checkboxes: Toolbar, Context Menu, Status Bar, Zoom Control (AJAX Viewer Only).
- The status bar displays the cursor position, layer name, number of features selected, current map scale, current map window height and width, and command descriptions.
- To customize the contents of the Viewer toolbar and context menu, see [Customizing the Viewer Toolbar](#) (page 131) and [Customizing the Context Menu](#) (page 132).
- If you set up base layers with a set of defined scales for smooth zooming in the AJAX viewer, the zoom control snaps to the specified scales. For more information, see [Setting Up Smooth Map Viewing](#) (page 74).
- 4 For Right Pane, do the following:
- To include a task pane, select the Task Pane checkbox.  
To specify the location of HTML content to display in the task pane, see [Specifying General Web Layout Settings](#) (page 126).  
The task pane contains Home, Back, and Forward buttons and a Tasks menu button.
  - To include a task bar, select the Task Bar checkbox.  
To define the contents in the task bar menu, see [Customizing the Task Bar Menu](#) (page 132).
  - To customize the buttons on the bar, click Edit Navigation Buttons.  
You can change the name of each button, the tooltip text to display when the cursor is placed over the button, the text that displays in the Viewer status bar (if turned on), and the images to use when the button is enabled or disabled. For more information, see [Customizing Task Bar Buttons](#) (page 130).
  - For Width (Pixels), specify a width for the right pane.  
The Width and the Task Bar checkbox are unavailable when Task Pane is turned off.
- 5 To define a toolbar, context menu, and task pane in the Viewer, follow the instructions in [Defining the Viewer Toolbar, Context Menu, and Task Pane Menu](#) (page 131).
- 6 Click File menu ► Save.

## Customizing Task Bar Buttons

The Task Bar in the Task Pane contains the Home, Back, Forward, and Tasks menu buttons.

- Home—Navigates to the home task URL specified when you set general web layout properties.  
For more information, see [Specifying General Web Layout Settings](#) (page 126).
- Back and Forward—Provide navigation in the task pane.
- Tasks—Provides access to the commands in the Task menu.  
For more information about customizing the Tasks menu, see [Customizing the Task Bar Menu](#) (page 132).

You can change the name of each button, the text to display when the cursor is placed over the button, the text that displays in the Viewer status bar, and the images to use when the button is enabled and disabled.

### To customize task bar buttons

- 1 In the Settings pane of the Web Layout Editor, locate the Display These Components In The Viewer section.
- 2 In the Right Pane area, click Edit Navigation Buttons.
- 3 In the Customize Navigation Buttons dialog box, select the button you want to customize.
- 4 Do any of the following tasks:
  - For Name To Display In The Interface, enter a new name for the button.
  - For Tool Tip To Appear Upon Hover, enter the text to display when a user positions the cursor over the icon.
  - For Description To Appear On The Status Bar, enter additional descriptive text to display in the status bar when the cursor is placed over the button.
  - For URL To An Image For Enabled State, enter a location for the button image to use when the command is available.
  - For URL To An Image For Disabled State, enter a location for the button image to use when the command is not available.

## Defining the Viewer Toolbar, Context Menu, and Task Pane Menu

Use the Toolbar And Menus pane of the Web Layout Editor to set up the commands to make available to your users. You can provide different sets of commands in the Viewer toolbar, the context menu, and task pane menu. The set of available commands is defined by Autodesk MapGuide Studio.

A set of built-in basic commands with few or no parameters is available for immediate use. Three additional commands require configuration and have additional parameters. These are: Search, Invoke Script, and Invoke URL. For more information about working with these commands, see [Customizing Commands](#) (page 135).

### Customizing the Viewer Toolbar

When you make a Viewer toolbar available to your users, specify the commands to include. If you have customized the context menu or task bar menu, you can use those settings for the toolbar. For more information, see [Duplicating the Toolbar, Context Menu, and Task Bar Menu](#) (page 134).

#### To customize the Viewer toolbar

- 1 In the Settings pane of the Web Layout Editor, under Middle Pane, select the Toolbar checkbox to enable a Viewer toolbar.
- 2 Display the Toolbar And Menus pane.
- 3 Click the Toolbar tab.
- 4 Do any or all of the following:
  - Drag command icons from the Command List tab to the Toolbar tab.
  - To add a separator between items in the toolbar, click the item that will appear to the right of the separator and click Add ► Add Separator.
  - To change the position of an item, click the item and click Move Up or Move Down.
  - To delete an item, click the item and click Remove Item.
  - To add a flyout menu, see [Creating Flyouts](#) (page 133).
- 5 View the toolbar in the Web Preview pane.

- 6 Click File menu ► Save.

## Customizing the Context Menu

When you make a Viewer context menu available to your users, specify the commands to include. If you have customized the toolbar or task bar menu, you can use those settings for the context menu. For more information, see [Duplicating the Toolbar, Context Menu, and Task Bar Menu](#) (page 134).

### To customize the context menu

- 1 In the Settings pane of the Web Layout Editor, under Middle Pane, select the Context Menu checkbox to enable a Viewer context menu.
- 2 Display the Toolbar And Menus pane.
- 3 Click the Context Menu tab.
- 4 Do any or all of the following:
  - Drag command icons from the Command List tab to the Context Menu tab.
  - To add a separator between items in the context menu, select the item that will appear below the separator and click Add ► Add Separator.
  - To change the position of an item, click the item. Then click Move Up and Move Down.
  - To delete an item, click the item. Then click Remove Item.
  - To add a flyout menu, see [Creating Flyouts](#) (page 133).
- 5 To preview the context menu, right-click the map in the Web Preview pane.
- 6 Click File menu ► Save.

## Customizing the Task Bar Menu

When you make a Viewer Task Pane and Task Bar menu available to your users, specify the commands to include. If you have customized the toolbar or context menu, you can use the same settings for the task bar menu. For

more information, see [Duplicating the Toolbar, Context Menu, and Task Bar Menu](#) (page 134).

#### To customize the task bar menu

- 1 In the Settings pane of the Web Layout Editor, under Right Pane, select the Task Pane and Task Bar checkboxes.
- 2 Display the Toolbar And Menus pane.
- 3 Click the Task Bar Menu tab.
- 4 Do any or all of the following:
  - Drag command icons from the Command List tab to the Task Bar Menu tab.
  - To add a separator between items in the task bar menu, click the item that will appear below the separator. Then click Add ► Add Separator.
  - To change the position of an item, click the item. Then click Move Up and Move Down.
  - To delete an item, click the item. Then click Remove Item.
- 5 To view the task bar menu, click Tasks in the Task Pane displayed in the Web Preview pane.
- 6 Click File menu ► Save.

## Creating Flyouts

Add a flyout menu to any command in the toolbar and context menu.

#### To create a flyout

- 1 Click the Toolbar or Context Menu tab.
- 2 Click Add ► Add Flyout Menu.
- 3 Click the flyout and do the following:
  - Position the flyout menu using Move Up and Move Down.
  - Click Item Properties.
  - On the Item Properties tab, specify the name, tooltip, description, and images to use for enabled and disabled states.

For more information about these properties, see [Basic Command Settings](#) (page 135).

- Add commands and separators to the flyout the same way you add them to the toolbar and context menu.
- 4 Click File menu ► Save.

## Restoring Toolbar, Context Menu, and Task Bar Menu Defaults

You can restore the toolbar, context menu, and task bar menu to the default state before customization.

### To restore defaults

- 1 Display the Toolbar And Menus pane of the Web Layout Editor.
- 2 Click the Toolbar, Context Menu, or Task Bar Menu tab.
- 3 Click Reset ► To Defaults.

## Duplicating the Toolbar, Context Menu, and Task Bar Menu

After you customize the toolbar, context menu, or task bar menu, you can apply the same settings to each of the other two tabs making the contents match.

### To duplicate settings

- 1 Click the tab you want to make match the customized tab.
- 2 Click one of the following as needed:
  - Reset ► To Match Toolbar
  - Reset ► To Match Context Menu
  - Reset ► To Match Task Bar Menu

## Customizing Commands

MapGuide Studio provides a set of built-in basic commands and three advanced commands: Invoke Script, Invoke URL, and Search.

You cannot modify or delete the commands that are provided with MapGuide Studio. However, you can customize the built-in commands by creating new commands based on each action type and modifying the settings of the new commands.

To create new basic commands, see [Creating New Basic Commands](#) (page 136). To create new advanced commands, see [Creating New Advanced Commands](#) (page 137).

### Basic Command Settings

All commands share the following settings:

**Action To Be Performed By This Command** Action to perform when the command is executed by a user.

**Command Name** Internal name for the command.

**Name To Display In The Interface** Name to display for this command.

**Tool Tip To Appear On Hover** Short text description that is displayed when the cursor is placed over the button that activates the command.

**Description To Appear On The Status Bar** Additional description that is displayed in the status bar when the cursor is placed over the button, menu item, or task that activates this command.

**URL To An Image For Enabled State** Location for the button image to use when the command is available.

**URL To An Image For Disabled State** Location for the button image to use when the command is not available.

**Viewers That Support This Command** The type of Viewer that supports this command: All, AJAX, or DWF. This property is determined by the action type and cannot be modified.

The following commands generate results:

- Buffer
- Get Printable Page

- Measure
- Select Within
- View Options

You must specify a location (target) to display results. Target options are:

**Task Pane** Displays results in the Task pane.

**New Window** Opens a new browser window to display results.

**Specified Frame** Displays results in the named frame that you specify.

The Print command requires you to specify the print layouts to make available to your users. For more information about setting up print layouts, see [Working with Print Layouts](#) (page 149).

## Creating New Basic Commands

Customize a basic command by creating a new command with the same action type and then modifying its settings. For more information about basic command settings, see [Basic Command Settings](#) (page 135).

### To create a new basic command

- 1 In the Web Layout Editor, expand the New Commands pane.
- 2 Click Add ► Built-In Commands and click the type of command to add.
- 3 In the list of commands, click the new command.
- 4 Use the Settings tab to specify basic command settings.  
For more information, see [Basic Command Settings](#) (page 135).
- 5 If you are creating a new command based on Buffer, Get Printable Page, Measure, Select Within, or View Options do the following:
  - Click the Additional Parameters tab.
  - For Display Results In This Target Interface, click either Task Pane, New Window, or Specified Frame.
  - If you select Specify Frame, enter the frame name.  
For more information about target options, see [Basic Command Settings](#) (page 135).

- 6 To create a new print command, see [Creating a Print Command](#) (page 139).
- 7 Click File menu ► Save.

## Creating New Advanced Commands

Customize an advanced command by creating a new command with the same action type and then modifying its settings.

Advanced commands are:

- Invoke Script
- Invoke URL
- Search

### To create a new advanced command

- 1 In the Web Layout Editor, expand the New Commands pane.
- 2 Do one of the following:
  - Click Add ► Invoke Script
  - Click Add ► Invoke URL
  - Click Add ► Search
- 3 In the list of commands, click the new command.
- 4 Use the Settings tab to specify basic command settings.  
For more information, see [Basic Command Settings](#) (page 135).
- 5 Do one of the following:
  - To create a new Invoke Script command, see [Creating an Invoke Script Command](#) (page 138).
  - To create a new Invoke URL command, see [Creating an Invoke URL Command](#) (page 138).
  - To create a new Search command, see [Creating a Search Command](#) (page 139).
- 6 Click File menu ► Save.

## Creating an Invoke Script Command

Use an Invoke Script command to call a JavaScript function inside your web layout.

### To create an Invoke Script command

- 1 Follow steps 1 - 4 in [Creating New Advanced Commands](#) (page 137).
- 2 Click the Additional Parameters tab.
- 3 On the Additional Parameters tab, under Script To Invoke, enter the name of the script file to associate with this command.
- 4 Click File menu ► Save.

## Creating an Invoke URL Command

Use an Invoke URL command to call a URL from your web layout.

### To create an Invoke URL command

- 1 Follow steps 1 - 4 in [Creating New Advanced Commands](#) (page 137).
- 2 Click the Additional Parameters tab.
- 3 Under URL To Invoke, enter the URL to call when this command is executed.
- 4 Under Pass In These Additional Parameters With The URL, specify one or more key/value parameters to include with the URL.
- 5 Under Use Only These Layers, specify the layers to which the command applies.
- 6 To specify that the command is only available if features are selected, click Disable Command If Nothing Is Selected.
- 7 Under Display Results In This Target Interface, specify whether the results should display in the task pane, a new window, or a specific frame.  
For more information about target options, see [Basic Command Settings](#) (page 135).
- 8 Click File menu ► Save.

## Creating a Search Command

Use a Search command to build a search tool for your users.

### To create a search command

- 1 Follow steps 1 - 4 in [Creating New Advanced Commands](#) (page 137).
- 2 Click the Additional Parameters tab.
- 3 For Display This Prompt For Users To Enter A Search Term, specify the prompt to display to your users.
- 4 For Search This Layer, specify the layer to which the search applies.
- 5 For Pass The Search Term Into This Filter, click [...] and define a filter to select a subset of features.  
For more information about defining a filter, see [Filtering Data](#) (page 80).
- 6 For Use These Columns To Display The Results Returned By This Search Command, click Add and do the following:
  - Enter a title for the column.
  - Select the property to display in the column.
  - Use the Move Up and Move Down buttons to adjust the order of the columns in the results table.
- 7 Specify a maximum number of results under To Return A List Of Results No Larger Than.
- 8 For Display Results In This Target Interface, click either Task Pane, New Window, or Specified Frame.  
If you select Specify Frame, enter the frame name.  
For more information about target options, see [Basic Command Settings](#) (page 135).
- 9 Click File menu ► Save.

## Creating a Print Command

Create a custom print command by modifying a built-in basic command. You must specify the print layouts to make available to users when they print from the Viewer.

For information about setting up print layouts, see [Working with Print Layouts](#) (page 149).

#### To create a print command

- 1 Follow the instructions for creating a basic command.  
For more information, see [Creating New Basic Commands](#) (page 136).
- 2 Click the Additional Parameters tab.
- 3 Under Print Layouts Options To Be Displayed To End Users, click [...].
- 4 In the Select Print Layouts dialog box, do one of the following:
  - In the Print Layouts list, select the layouts to make available.
  - Click Select All to select all available layers.  
Click Clear All to clear selected layers.
- 5 Click OK.
- 6 Click File menu ► Save.

## Previewing the Web Layout

Use the Web Preview pane of the Web Layout Editor to preview your layout as you work. Preview your web layout using either the DWF Viewer or the AJAX Viewer.

### Previewing the Web Layout in MapGuide Studio

Preview your web layout as you work using the Web Preview pane of the Web Layout Editor.

#### To preview your web layout within MapGuide Studio

- 1 If the Web Preview pane is not displayed, click Preview.



- 2 In the Web Preview pane, click Refresh.



## Previewing the Web Layout in a Browser

Preview your web layout in a browser using either the AJAX or DWF option of the Autodesk MapGuide Viewer. The AJAX option is for users who do not use Microsoft Internet Explorer.

### To preview your web layout in a browser

- Click either of the following options:
  - For Preview In Browser Using DWF Viewer, click Go. Internet Explorer displays the last saved version of your layout using the Autodesk DWF Viewer. You can also copy and paste the URL into the location bar of your browser.
  - For Preview In Browser Using AJAX Viewer, click Go. Your default browser displays the last saved version of your layout using the AJAX Viewer. You can also copy and paste the URL into the location bar of your browser.

---

**NOTE** The URLs displayed are the locations of your web layouts in the MapGuide Studio virtual directory structure. For newly created web layouts, the URL field is blank and the Go button is disabled until the resource has been saved.

---



# Working with Symbols

# 7

Autodesk MapGuide® Studio provides six mark symbols: square, circle, triangle, star, cross, and X. In addition you can use font symbols and build MapGuide Studio symbol libraries.

Insert symbols in point layers using the Style Point dialog box. For more information, see [Styling Points](#) (page 84).

Organize symbols into symbol libraries based on themes or on the frequency with which you use certain symbols. A symbol library is a resource in the Site Explorer.

Symbol Libraries support the following file formats:

- Bitmap (BMP)
- Device Independent Bitmap (DIB)
- Enhanced Metafile (EMF)
- TrueType Fonts (TTF)
- Windows Metafile (WMF)
- Portable Network Graphics (PNG)
- Joint Photographic Experts Group (JPG/JPEG)

Symbol Libraries support vector as well as bitmap images and complex symbols that combine both formats.

## Creating a New Symbol Library

You can create symbol libraries to group symbols, making them easier to locate and use.

---

**NOTE** When you load an Autodesk Map drawing into Autodesk MapGuide Studio, blocks are converted into a symbol library.

---

### To create a new symbol library

- 1 Click File menu ► New ► Symbol Library.
- 2 For Description, enter a description of the library.
- 3 Do any or all of the following:
  - Import images into a library. For more information, see [Importing Images into a Symbol Library](#) (page 144).
  - Import fonts as symbols. For more information, see [Importing Font Characters as Symbols](#) (page 144).
- 4 Click File menu ► Save.

## Importing Images into a Symbol Library

You can import images of a variety of file types to use as symbols.

### To import images

- 1 On the Symbol Library toolbar, click New.
- 2 In the Load Symbols dialog box, navigate to and select the file to import.
- 3 Click Open.

The name of the symbol is displayed in the list and the selected symbol is displayed in the Preview area.
- 4 Click File menu ► Save.

---

**NOTE** Alternatively, drag images from your file system into the symbol list area.

---

## Importing Font Characters as Symbols

Import True Type font characters to use as symbols. You can also insert a font symbol directly in the Style Point dialog box. For more information, see [Styling Points](#) (page 84).

### To import font characters

- 1 On the Symbol Library toolbar, click Fonts.

- 2 In the Load Fonts dialog box, for Font, select the font family from which to import characters.
- 3 Optionally, for Format, click Bold and/or Italic.  
For some fonts, Bold and/or Italic are not available or are enabled by default.
- 4 For Symbol Color, select a color.
- 5 For Background Style, specify either Opaque or Transparent.
- 6 If you specify an opaque background for a symbol, for Background Color, select a color.
- 7 Click OK.
- 8 Click File menu ► Save.

## Deleting Symbols

You can customize symbol libraries to include only symbols based on one theme or to include only symbols you frequently use. If you have a symbol in multiple symbol libraries, deleting it from one will not delete it from the others.

### To delete a symbol

- 1 Open the symbol library containing the symbol to delete by doing one of the following:
  - Double-click the symbol library in the Site Explorer.
  - Click the symbol library's tab if the symbol library is already open.
- 2 Click the symbol in the symbol list area.
- 3 Click Delete.

## Copying Symbols

You can duplicate a symbol to create a new symbol with many of the same properties of an existing symbol. Customize the new symbol by modifying the reference point, zoom level, and outline.

### To copy a symbol

- 1 Open the symbol library containing the symbol to copy by doing one of the following:
  - Double-click the symbol library in the Site Explorer.
  - Click the symbol library's tab if the symbol library is already open.
- 2 Click the symbol in the symbol list area.
- 3 Click Duplicate.

A new symbol is created. A number is appended to the name to indicate that one or more copies of the symbol exist.
- 4 Customize and rename the symbol as desired.

# Setting Options

# 8

Use Options to control the default settings for the Site Explorer and Layer Editor. Also use options to specify whether to use the DWF Viewer or AJAX Viewer for previews in the Layer, Map, and Web Layout editors.

## Setting Site Explorer Options

Control the display of a warning message when moving, renaming, or deleting resources.

### To set Site Explorer options

- 1 Click Tools menu ► Options.
- 2 In the Options dialog box, click the Site Explorer tab.
- 3 Select or clear the checkbox, Show Confirmation Dialog Before Moving, Renaming, Or Deleting A Resource.
- 4 Click OK.

## Setting Layer Editor Options

Control the default settings for size context and units used in the Layer Editor.

### To set Layer editor options

- 1 Click Tools menu ► Options.
- 2 In the Options dialog box, click the Layer Editor tab.
- 3 Specify default size context for labels, points, and lines and borders.

Device Space sets widths and heights in screen units. Map Space sets widths and heights in Mapping Coordinate System (MCS) units.

- 4 Specify default units for labels, points, and lines and borders.

## Setting Viewer Options

MapGuide Studio can use either of the viewers to display layer, map, and web layout previews. If both viewers are installed, you can specify the default to use. If the DWF Viewer is not installed, the AJAX Viewer is used.

### To specify the default viewer

- 1 Click Tools menu ► Options.
- 2 In the Options dialog box, click the Viewer tab.
- 3 Specify the default viewer.

If the DWF Viewer is not installed, the DWF Viewer option is not available. To install the free DWF Viewer, visit the Autodesk web site, <http://www.autodesk.com>.

# Working with Print Layouts

# 9

Define any number of print layouts to include with a web layout. When your users view the web layout in a browser, they can print using a layout from the set you provide. The layout describes the elements to include in the DWF ePlot that is sent to the printer. You can include the following elements in a layout:

- Background color
- Title
- Legend
- Scale bar
- North arrow
- URL
- Date and time
- Custom logo
- Custom text

---

**NOTE** Print layouts are XML files. The Print Layout Editor requires a basic understanding of XML.

---

## Creating Print Layouts

When you create a new print layout, all the elements are provide by default. Edit them as necessary. All page elements except custom symbols and text are placed at a predetermined location on the page which cannot be modified. You can specify the placement of custom logos and text.

### To create a new print layout

- 1 Click File menu ► New ► Print Layout.

The Print Layout Editor displays an XML template that includes all possible print layout elements.

- 2 Edit the XML template as necessary.

- When specifying a background color, enter color values for red, green, and blue using RGB color values. There are 256 possible values for each of the red, green, and blue components of a color pixel on a computer screen. Each color value ranges from 0 (no color) to 255 (full color). A full color value combines a red, a green, and a blue value. The following table provides sample color values (red, green, blue):

RGB values	Color
0, 0, 0	black
255, 0, 0	bright red
255, 255, 0	bright yellow
0, 0, 255	bright blue
255, 255, 255	white

- Custom logos are stored in a Symbol Library resource. If you are adding a logo to a layout, locate the `CustomLogos` section and specify the logo position, Symbol Library resource, name, size, and rotation. Valid units for `Logo Position` are percent, meters, and inches. If the `Position Units` value is not specified, the default is percent. Valid units for `Logo Size` are meters and inches. Default `Logo Size` units are inches.
- If you are adding text to a layout, locate the `CustomText` section and specify the text position, font and size, and the text to print. Valid units for `Text Position` are percent, meters, and inches. If the `Position Units` value is not specified, the default is percent. Valid units for `Font Height` are inches, meters, and points. Default `Font Height` units are points.

- 3 Click Validate to check for syntax errors.

Syntax errors are displayed at the bottom of the Print Layout Editor.

- 4 If errors are detected, click on each error in turn to locate the problem in the XML code.

When you have addressed each error, a message indicates that the layout is valid.

- 5 Click File menu ► Save As to save the layout.

When you create a new print command in the Web Layout Editor, the print layouts you have saved are available under Additional Parameters. For more information, see [Customizing Commands](#) (page 135).

## Print Layout Schema

The following schema describes the print layouts you can create using the Print Layout editor. The schema file is named *PrintLayout-1.0.0.xsd*. It can be found in the MapGuide Studio installation folder.

```

<?xml version="1.0" encoding="UTF-8" ?>
<xs:schema
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">
  <xs:element name="PrintLayout">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="PageProperties">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="BackgroundColor" minOccurs="0">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="Red" type="xs:integer" minOccurs="0" />
                    <xs:element name="Blue" type="xs:integer" minOccurs="0" />
                    <xs:element name="Green" type="xs:integer" minOccurs="0" />
                  </xs:sequence>
                </xs:complexType>
              </xs:element>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="LayoutProperties">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="ShowTitle" type="xs:boolean" minOccurs="0" />
              <xs:element name="ShowLegend" type="xs:boolean" minOccurs="0" />
              <xs:element name="ShowScaleBar" type="xs:boolean" minOccurs="0" />
              <xs:element name="ShowNorthArrow" type="xs:boolean" minOccurs="0" />
              <xs:element name="ShowURL" type="xs:boolean" minOccurs="0" />
              <xs:element name="ShowDateTime" type="xs:boolean" minOccurs="0" />
              <xs:element name="ShowCustomLogos" type="xs:boolean" minOccurs="0" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>

```

```

        <xs:element name="ShowCustomText" type="xs:boolean" minOccurs="0" />
    </xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="CustomLogos">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="Logo" minOccurs="0" maxOccurs="unbounded">
                <xs:complexType>
                    <xs:sequence>
                        <xs:element name="Position" minOccurs="0">
                            <xs:complexType>
                                <xs:sequence>
                                    <xs:element name="Left" type="xs:float" />
                                    <xs:element name="Bottom" type="xs:float" />
                                    <xs:element name="Units" type="xs:string" />
                                </xs:sequence>
                            </xs:complexType>
                        </xs:element>
                        <xs:element name="ResourceId" type="xs:string" minOccurs="0" />
                        <xs:element name="Name" type="xs:string" minOccurs="0" />
                        <xs:element name="Size" minOccurs="0">
                            <xs:complexType>
                                <xs:sequence>
                                    <xs:element name="Width" type="xs:float" />
                                    <xs:element name="Height" type="xs:float" />
                                    <xs:element name="Units" type="xs:string" />
                                </xs:sequence>
                            </xs:complexType>
                        </xs:element>
                        <xs:element name="Rotation" type="xs:float" minOccurs="0" />
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="CustomText">
    <xs:complexType>
        <xs:sequence>

```



```

<?xml version="1.0" encoding="utf-8"?>
<PrintLayout
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  xsi:noNamespaceSchemaLocation="PrintLayout-1.0.0.xsd"
  <PageProperties>
    <BackgroundColor>
      <Red>255</Red>
      <Blue>255</Blue>
      <Green>255</Green>
    </BackgroundColor>
  </PageProperties>
  <LayoutProperties>
    <ShowTitle>true</ShowTitle>
    <ShowLegend>true</ShowLegend>
    <ShowScaleBar>true</ShowScaleBar>
    <ShowNorthArrow>true</ShowNorthArrow>
    <ShowURL>true</ShowURL>
    <ShowDateTime>true</ShowDateTime>
    <ShowCustomLogos>>false</ShowCustomLogos>
    <ShowCustomText>true</ShowCustomText>
  </LayoutProperties>
  <CustomLogos>
    <!-- To add a custom logo, import the image into a Symbol Library
    and reference the image. This logo section has been commented
    out. When you've set up your custom logo, please remove this com
    ment tag.
    <Logo>
      <Position>
        <Left>10</Left>
        <Bottom>90</Bottom>
        <Units></Units>
      </Position>
      <ResourceId>Library://FolderName/SymbolMart.SymbolLibrary</Re
sourceId>
      <Name>Name</Name>
      <Size>
        <Width>0.02</Width>
        <Height>0.02</Height>
        <Units>meters</Units>
      </Size>
      <Rotation>0</Rotation>
    </Logo>
  </CustomLogos>
  </PrintLayout>

```

When you've set up your custom logo, please remove this comment tag. -->

```
</CustomLogos>
<CustomText>
  <Text>
    <Position>
      <Left>1.5</Left>
      <Bottom>1.5</Bottom>
      <Units>inches</Units>
    </Position>
    <Font>
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      <Height>0.005</Height>
      <Units>meters</Units>
    </Font>
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  </Text>
  <Text>
    <Position>
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      <Bottom>0.05</Bottom>
      <Units>meters</Units>
    </Position>
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      <Units>points</Units>
    </Font>
    <Value>Custom Text #2</Value>
  </Text>
</CustomText>
</PrintLayout>
```

# Expression Builder

# 10

## Using the Expression Builder

Use [expressions](#) (page 157) to filter the geospatial information displayed in your map, to create calculated fields, and to change the styles used for a feature layer based on certain conditions.

The [Expression Builder](#) (page 157) is displayed when you are doing the following:

- [Filtering the Layers You Add to a Map](#) (page 191)
- [Filtering Feature Layers](#) (page 191)
- [Filtering by Location](#) (page 179)
- [Searching to Select Feature Layers](#) (page 193)
- [Creating a Calculation](#) (page 172)
- [Using Expressions to Label Features](#) (page 182)
- [Using Expressions In Split/Merge Rules](#) (page 183)

Expressions you build with the Expression Builder affect geospatial data only and cannot be used for drawing objects.

## Overview of Expressions for Geospatial Features

An expression is the part of a query that specifies its conditions. A query evaluates data and returns only the subset of data that meets the conditions of the query.

For example, you can create an expression that specifies all parcels whose area is larger than 4000 square feet. A query containing this expression displays or selects only parcels that meet those criteria.

A complete query also specifies the following:

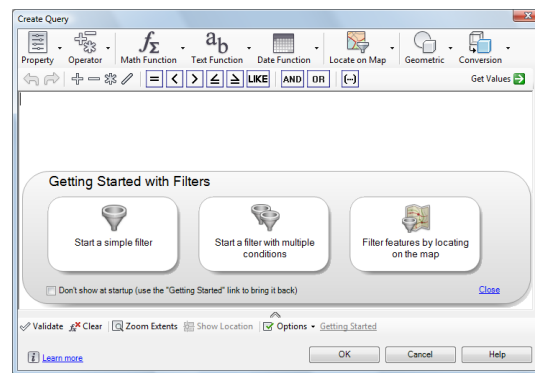
- The set of data to which the conditions are applied
- The action to apply to the data that meets the conditions

For example, you can query a feature layer in a map and display or hide its data based on whether it meets the query conditions.

In practice, you specify the data set by selecting the feature class or layer to query before you build the expression. You specify the action to apply when you select the command that lets you build the expression. For example, in AutoCAD Map 3D, select Add To Map With Query or Search To Select.

The title bar for the dialog box in which you create expressions is different, depending on the command you choose. The contents of the dialog box are much the same, no matter what it is called.

Use expressions to filter geospatial data, select a subset of data, calculate values, or convert data from one data type to another. Use text expressions to format text strings for display, for example, as labels. Use numeric expressions to apply math functions to properties with numeric values.



The text in the title bar changes, depending on which command you select.

## Basic Steps for Creating Expressions

To create an expression, follow these basic steps:

- Specify the data to which the expression applies. For example, select the layer to filter.
- Select a command that can use an expression. For example, right-click a layer and select Query To Filter Data.
- Use an expression to specify the conditions for the command. For example, create an expression to specify the subset of features on the layer to select.

Ways to Use Expressions	Description
<a href="#">Evaluating Properties</a> (page 167)	<p>You can filter or select data based on the value of one or more properties. A simple expression evaluates a single property, but you can create complex expressions that use multiple properties or multiple values. For example, you could create an expression that shows counties with a population over 50,000 but under 100,000.</p> <p>The result of a filter expression must be a Boolean value.</p>
<a href="#">Creating a Calculation</a> (page 172)	<p>You can calculate a new value based on existing values. For example, you can do the following:</p> <ul style="list-style-type: none"><li>■ Calculate the area of a polygon or the length of a linear feature.</li><li>■ Convert a text string to a date format and add days or months to the resulting date.</li></ul>
<a href="#">Performing a Conversion</a> (page 175)	<p>Conversions change data values from one data type to another. For example, if a data store keeps date values as text, you can convert these values to date strings. Then you can use <a href="#">Date Functions</a> (page 221) on them.</p>

Ways to Use Expressions	Description
	<p>You can also convert numeric or text strings to a particular numeric format, for example to a single- or double-precision number. You can convert numeric values into text strings, for example, to extract a substring or find the number of characters in the string.</p>
<a href="#">Creating Text Expressions</a> (page 176)	<p>With text expressions, you can analyze and manipulate strings. For example, you can do the following:</p> <ul style="list-style-type: none"> <li>■ Format multiline labels.</li> <li>■ Concatenate multiple properties into a single entry. For example, concatenate <code>First_Name</code> and <code>Last_Name</code> to get <code>Full_Name</code>.</li> <li>■ Find the length of a text string, or the position of one text string within another.</li> <li>■ Convert a text string to all uppercase or lowercase characters.</li> <li>■ Trim or add to the beginning or end of a text string.</li> <li>■ Replace one set of characters with another.</li> </ul>
<a href="#">Creating Numeric Expressions</a> (page 178)	<p>Numeric expressions operate only on numeric values. They use math functions, with which you can analyze and manipulate numeric strings. For example, with numeric expressions, you can do the following:</p> <ul style="list-style-type: none"> <li>■ Round a value up or down.</li> <li>■ Find the square root of a value, use trigonometric functions, or determine the remainder of a number after it is divided by another number.</li> </ul>

Ways to Use Expressions	Description
	<ul style="list-style-type: none"> <li>■ Find the average, mean, or median of a set of values.</li> </ul>
<a href="#">Using Expressions to Filter Feature Data</a> (page 190)	<p>With filters, you can work with a subset of your data. For example, if your map includes all the counties in California, you can create a filter to show only counties with a population over 50,000. Use expressions to do the following:</p> <ul style="list-style-type: none"> <li>■ <a href="#">Filter data as you add it to an AutoCAD Map 3D map</a> (page 191).</li> <li>■ <a href="#">Filter the display of data in a map</a> (page 191).</li> <li>■ <a href="#">Select only features that meet a set of conditions</a> (page 193).</li> </ul>
<a href="#">Using Expressions to Label Features</a> (page 182)	<p>Use a <a href="#">text expression</a> (page 176) or a <a href="#">numeric expression</a> (page 178) to determine the content of labels when you style your map.</p>
<a href="#">Using Expressions In Split/Merge Rules</a> (page 183)	<p>Use expressions in AutoCAD Map 3D to determine how property values are specified after merging or splitting features.</p>

## Creating Expressions

### Overview of Creating Expressions

An expression is the part of a query that specifies the conditions. For example, you can create an expression to specify all parcels whose area is larger than 4000 square feet. A query containing that expression displays or selects only parcels that meet those criteria.

A complete query also specifies the set of data to which the conditions are applied and the action to apply. For example, you can query a feature layer in a map and display or hide its data based on whether it meets the query conditions.


In practice, you specify the data set by selecting the feature class or layer to query before you build the expression. You specify the action to apply when you select the command or option for building the expression. For example, in AutoCAD Map 3D, select Add To Map With Query or Search To Select.

The title bar for the dialog box in which you create expressions is different, depending on the command you choose. The contents of the dialog box are much the same, no matter what it is called. In AutoCAD Map 3D, you can create expressions for geospatial features from the following locations:

Command	Title Bar Contents
Home tab ► Data panel ► Search	Search For Features Across Multiple Layers
Right-click Display Manager layers ► Query To Filter Data.	Create Query
Data Table ► Search To Select	Search To Select
Data Connect ► Add To Map With Query	Create Query
Data Table ► Options ► Create A Calculation	Create A Calculation
Data Table ► Set Split And Merge Rules	Split or Merge Rule Expression
Style Editor ► Style Label ► Property To Display	Create/Modify Expressions

### Tell me more

 **Procedures** ■ [To create an expression](#) (page 163)

 **Related topics** ■ [Evaluating Properties](#) (page 167)  
 ■ [Creating a Calculation](#) (page 172)  
 ■ [Performing a Conversion](#) (page 175)  
 ■ [Creating Text Expressions](#) (page 176)  
 ■ [Creating Numeric Expressions](#) (page 178)

- [Filtering by Location](#) (page 179)
- [Using Dates in Expressions](#) (page 166)
- [Expression Builder - Reference](#) (page 199)

---

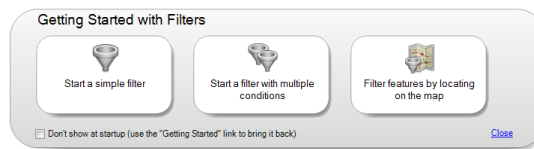
### To create an expression

- 1 Select the feature classes or feature layers to apply the expression to and the action the query will affect.

For example, in the AutoCAD Map 3D Display Manager, right-click the layer and click Query To Filter Data. The layer you right-clicked is the data source for the expression. When you filter the data, AutoCAD Map 3D displays only the data in that layer that matches the conditions of the expression.

- 2 In the window that displays, insert the elements that comprise the expression.

If the expression startup page is turned on, buttons representing different expression types are displayed. You can click one of these buttons to insert an expression template.

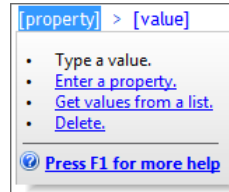


Click one of these buttons to start with a sample expression.

To prevent these startup buttons from displaying each time you create an expression, select the Don't Show At Startup check box. You can redisplay them later by clicking Getting Started.

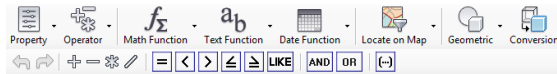
To close the startup page, click Close.

- 3 In the expression area, do any of the following to build your expression:
  - Click an element in the expression to replace it with a property, value, or operator. See [Selecting Property Values from a List](#) (page 171) for information on viewing and selecting properties.



Click an element to see a menu of options for replacing or deleting it.

- Use commands and icons to add elements.



Use the menus and buttons at the top of the window to insert elements.

- If you know the names of the properties, values, and operators you want, enter them directly.  
All expressions consist of text you can type.

An expression can combine operations in many ways. For example, you can calculate the area of all parcels and then find features that have the StreetName “Elm” and are larger than 20,000 square feet.

- In building your expression, you can do any of the following:
  - [Evaluate the value of a property](#) (page 167). For example, find features on a Parcels layer whose StreetName property is “Elm.” That expression would look like this one:  
`ST_NAME = 'ELM St'`

- [Perform a calculation](#) (page 172), and then evaluate the result of the calculation. For example, first determine the area of parcels, and then find parcels with an area smaller than a value you specify. That expression would look like this one:  
`Area2D (Geometry) < 12000`

---

**NOTE** The `Geometry` property may have a different name in your data store. It is always listed under Geometry Properties in the Property list. Insert the property from the list. Do not change it manually or substitute a value for this property.

---

- [Perform a conversion](#) (page 175), and then evaluate the result of the conversion. For example, convert a parcel property called `Purchase_Date` from a text string to a date string, and then find parcels purchased before a date you specify. That expression would look like this one:

```
ToDate (PURCHASE_DATE, MM/DD/YYYY) AND PURCHASE_DATE < 01/01/2005
```

---

**NOTE** See [Using Dates in Expressions](#) (page 166) for information about date formatting.

---

- [Create a text expression](#) (page 176). For example, you can label a layer representing roads with the street name and suffix (for example, “Portobello Road” or “Fifth Avenue”). That expression would look like this one:

```
Concat (ST_NAME, SUFFIX)
```

- [Create a numeric expression](#) (page 178). For example, you can round off repair costs to the next highest dollar. That expression would look like this one:

```
Ceil (REPAIR_COST)
```

- [Filter by location](#) (page 179). For example, you can find all parcels within or touching a circle that you draw on the map.

For help with any expression element, see [Expression Builder - Reference](#) (page 199).

- 5 Validate the expression by clicking **Validate** (at the bottom of the window).  
Validation checks the syntax of the expression only. It does not check whether the values you specified are valid for the data, or whether the results are as expected. If there are validation problems, [an error message helps direct you to their solutions](#) (page 186).
- 6 To reuse your expression later, [save it](#) (page 188) using the **Options** menu (at the bottom of the window).
- 7 To apply your expression, click **OK**.
- 8 [To set expression options](#) (page 189), use the **Options** menu.

## Using Dates in Expressions

You can use the following date options in your expressions:

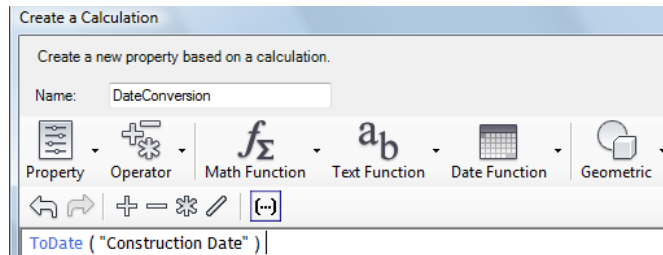
- To convert a text property that contains date or time information into a date value, use the `ToDate` or `ToString` conversion options. See [Conversion Options](#) (page 226). These options support a [variety of formats](#) (page 228) for the resulting date strings.
- To use standard date and time formats, use the [Date-Time Operators](#) (page 205).  
When you insert a date-time property from the Get Values panel into your expression, that value uses a Date-Time operator. If you are an advanced user, you can also add one of these operators to an expression if you know its FDO syntax.

The Date-Time operators are parsed using the standard SQL literal strings:

- `DATE 'YYYY-MM-DD'`
- `TIME 'HH:MM:SS[.sss]'`
- `TIMESTAMP 'YYYY-MM-DD HH:MM:SS[.sss]'`

### To convert a text string to a date string and change its format

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 Select `ToDate` from Conversion.
- 3 In the `ToDate` function, do one of the following:
  - Within the parentheses, type a property name.
  - Click Property. In the Property list, select the property to convert. Select a text property that represents a date value.



Convert a text string to a date string.

- 4 Optionally, specify the [date format](#) (page 228).
- 5 Specify any further conditions for the expression.  
For information about formulating an expression, see [Overview of Creating Expressions](#) (page 161).  
For help with any expression element, see [Expression Builder - Reference](#) (page 199).
- 6 Click OK to apply the expression.

## Evaluating Properties

You can use expressions to evaluate properties. Here are some examples:

- Find all features on a layer that have a property equal to, greater than, or less than a particular value. For example, find all parcels with an assessed value greater than \$250,000.
- Display all the features on a layer with a property that matches a pattern you specify. For example, display all roads whose names begin with “Mt.”
- Label features with the value of a particular property, rounded in a particular way. For example, label roads with their length, rounded up to the nearest whole number.

You can enter property names directly into an expression, or you can select them from the Property list. If you selected multiple feature layers, the properties for all those layers are available.

If you enter a property name that is not in the Property list, the Validate operation may issue a warning. However, if that property exists in your data store, the expression may still be valid when it is run.

You can also [view and insert the valid values](#) (page 171) for any listed property.

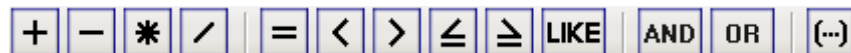
The syntax for an expression that evaluates a property is slightly different, depending on whether you use an operator, a function, or an option. For an operator, the basic syntax is `Property OPERATOR Value`. For functions and options, the basic syntax is `Function (PROPERTY)`.

**See also:**

- [Using Expressions to Filter Feature Data](#) (page 190)
- [Overview of Creating Expressions](#) (page 161)
- [Expression Builder - Reference](#) (page 199)

**To evaluate properties in an expression using an operator**

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 In the expression area, do one of the following:
  - Enter a property name manually.
  - Click Property. In the Property list, select a property.
- 3 Enter an operator using one of these methods:
  - Enter an operator manually.
  - Click an operator button.



Use the Operator buttons.

- Select an operator from a menu.
- 4 You can use the following types of operators:
    - [Math Operators](#) (page 202)  
For example, this expression could be used to label repair locations with the total amount spent on parts and labor for a pipe repair project:  
`PIPE_PARTS_COST + PIPE_LABOR_COST`
    - [Comparison Operators](#) (page 203)

For example, to find parcels whose assessed value is \$100,000 or more, use this expression:

```
PARCEL_VALUE >= 100000
```

■ [Logical Operators](#) (page 204)

For example, to find only parcels that have a value for the `PARCEL_OWNER` property, use this expression:

```
NOT PARCEL_OWNER NULL
```

5 [Select or type the value to evaluate](#) (page 171).

6 To create a complex property evaluation, insert an AND or OR operator, and then insert another property, operator, and value combination.

Precede every operator with a property. For example, to find parcels whose last purchase date is after 1990 and before 2005, the expression must look like this one:

```
PURCHASE_DATE > 1990 AND PURCHASE_DATE < 2005
```

7 Click OK to apply the expression.

**To evaluate properties in an expression using a function or option**

1 [Select the command for which you want to create an expression.](#) (page 163)

2 In the expression area, do one of the following:

■ Type a function or option for this property.

■ Select a function or option from a menu.

You can use the following types of functions:

■ [Math Functions](#) (page 207)

For example, to find the square root of the value representing parcel area, use this expression:

```
Sqrt(PARCEL_AREA)
```

■ [Numeric Functions](#) (page 213)

Numeric functions are available from the Math Functions menu. For example, to round the assessed value of parcels down to the nearest lower whole dollar, use this expression:

```
Floor(PARCEL_VALUE)
```

■ [Text Functions](#) (page 215)

For example, to convert pipe names to all uppercase letters, use this expression:

```
Upper (PIPE_NAME)
```

- [Date Functions](#) (page 221)

For example, to add one month to the start date for a project, use this expression:

```
AddMonths (START_DATE, 1)
```

You can use the following types of options:

- [Geometric Options](#) (page 225)

For example, to find the perimeter value for parcels, use this expression (when `Parcels` is the current feature or layer):

```
Length2D (Geometry)
```

---

**NOTE** The `Geometry` property may have a different name in your data store. It is always listed under `Geometry Properties` in the `Property list`. Insert the property from the list. Do not change it manually or substitute a value for this property.

---

- [Conversion Options](#) (page 226)

For example, to create label text that displays “Unoccupied” if the property `Occupied` is null, use this expression:

```
NullValue (OCCUPIED, 'Unoccupied')
```

- [Aggregate Options](#) (page 230)

Aggregate functions are not available from a menu, but you can type them in. For example, to find the median value of all parcels, use this expression:

```
Median (PARCEL_VALUE)
```

- 3 In your expression, do one of the following:
  - Enter a property name manually.
  - Click `Property`. In the `Property list`, select a property.
- 4 [Select or type the value to evaluate](#) (page 171).
- 5 To create a complex property evaluation, insert an AND or OR operator, and then insert another operator, property, and value combination.
- 6 Click `OK` to apply the expression.

## Selecting Property Values from a List

You can see the valid values for any property in the current data set. For example, suppose a parcel has the property `IS_OWNER_OCCUPIED`. If you are unfamiliar with the data, you would not know the valid values for this property. They could be Yes and No, True and False, Y and N, or T and F. You can view and insert the possible values for this property from the Properties pane.

Some properties have many values, which can take a long time to retrieve. In some cases, a warning is displayed. You can retrieve the values anyway, or cancel the retrieval.

---

**NOTE** You cannot view or insert values when you are creating a calculation or an expression for a label.

---

**See also:**

- [Evaluating Properties](#) (page 167)
- [Expression Builder - Reference](#) (page 199)

**To select property values from a list**

---

**NOTE** You cannot view or insert values when you are creating a calculation or an expression for a label.

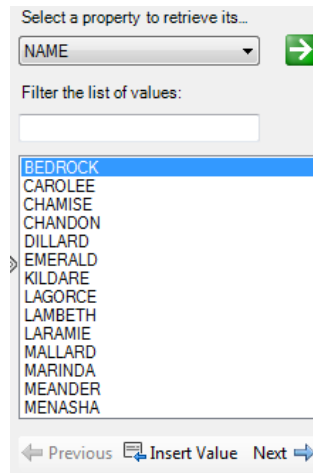
---

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 To see the possible values for a property, do one of the following:
  - Click the green arrow next to Get Values and select the property whose values you want to see.
  - Click a property in your expression. In the list that displays, click Get Values From A List.

The Properties panel is displayed on the right side of the window.

- 3 In the Properties panel, click the green arrow next to the property name to see the values for this property.

The list of values is sorted in ascending order or in the order used in the data source.



Use the Properties panel to insert values from a list.

- 4 To filter the list, under Filter The List Of Values, enter the characters to filter by. For example, enter ill to find Dillard and Fillmore. Click the green arrow. The list shows all values that contain those characters.

---

**NOTE** Wildcards are not supported.

---

- 5 Double-click a value to insert it in your expression, or select the value and click Insert Value.

For help with any expression element, see [Expression Builder - Reference](#) (page 199).

## Creating a Calculation

You can use operators and functions to calculate a new value based on existing property values. You can use the resulting value to filter or select data. For example, you can calculate the area of parcels and then select parcels whose areas are above a certain area value.

---

**NOTE** In AutoCAD Map 3D, you can store the resulting calculation as a new property in the Data Table. The calculated property is stored with the map, but is not written back to the original data store. To save the property to a data store, export the layer to an SDF file or Bulk Copy the feature class to another data store.

---

The syntax for calculations varies, depending on whether you use operators or functions.

There are two special calculations you can perform: finding the area of a polygon and finding the length of a linear feature.

---

**NOTE** Connect to the data store that contains the data for the calculation to create or manage calculations.

---

**NOTE** For some calculations, values do not update automatically because the data providers do not support their underlying functions. Instead, the values display as read-only properties. If you do not see a new calculated value immediately, refresh the layer manually. Right-click the layer in Display Manager and click Refresh Layer.

---

### Tell me more

---



#### Procedures

- [To perform a calculation using an operator](#) (page 173)
- [To perform a calculation using a function](#) (page 174)
- [To find area or length](#) (page 175)
- To create a calculated property



#### Related topics

- [Creating Calculated Properties](#)
- [Using Expressions to Filter Feature Data](#) (page 190)
- [Geometric Options](#) (page 225)
- [Overview of Creating Expressions](#) (page 161)
- [Expression Builder - Reference](#) (page 199)

---

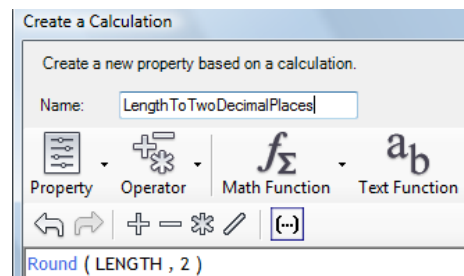
### To perform a calculation using an operator

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 In the expression area, do one of the following:
  - Enter a property name manually.
  - Click Property. Select the property you want.
- 3 To insert an operator, do one of the following:
  - Enter an operator for this property manually.

- Click an operator button.
  - Click [Operators](#) (page 202). Select the operator you want.
- 4 **Select or enter the value to evaluate** (page 171).  
For example, if you are multiplying the value of the property, enter the number or insert a property to multiply by.
  - 5 Specify any further conditions for the expression.  
To create a complex property evaluation, insert an AND or OR operator, and then insert another operator/property combination.  
For help with any expression element, see [Expression Builder - Reference](#) (page 199).
  - 6 Click OK to apply the expression.

**To perform a calculation using a function**

- 1 **Select the command for which you want to create an expression.** (page 163)
- 2 In the expression area, click one of the following and select a function:
  - [Math Function](#) (page 207)
  - [Text Functions](#) (page 215)
  - [Date Functions](#) (page 221)
- 3 Click Property and select the property to apply the function to.



**This expression is the definition of a calculated property.**

For help with any expression element, see [Expression Builder - Reference](#) (page 199).

- 4 Click OK to apply the expression.

#### To find area or length

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 In the expression area, enter or insert the geometric function (`Area2D` or `Length2D`).
- 3 Insert the property `Geometry` in parentheses after the function.

---

**NOTE** The `Geometry` property may have a different name in your data store. It is always listed under Geometry Properties in the Property list. Insert the property from the list. Do not change it manually or substitute a value for this property.

---

For help with any expression element, see [Expression Builder - Reference](#) (page 199).

- 4 Click OK to apply the expression.

## Performing a Conversion

Conversions change data values from one data type to another. For example, an assessor database can store the last date that a parcel was sold as a simple text string. You can convert these text strings to date strings so you can use [Date Functions](#) (page 221) on them.

You can also convert numeric or text strings to a particular numeric format. For example, if your data source stores a numeric value as a single-precision floating-point value, you can convert it to double-precision.

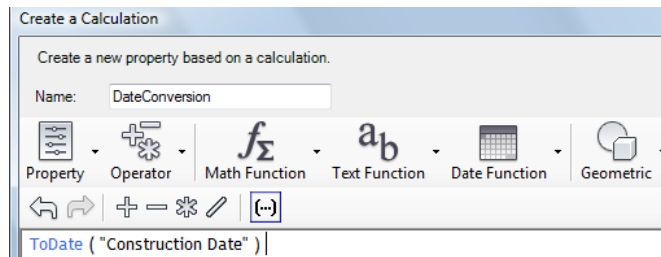
You can convert numeric values into text strings, for example, to extract a substring or find the number of characters in the string.

#### See also:

- [Conversion Options](#) (page 226)
- [Creating Expressions](#) (page 161)
- [Expression Builder - Reference](#) (page 199)

### To convert a data value to a different format

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 In the expression area, select the conversion type you want from Conversion.  
For a complete list, see [Conversion Options](#) (page 226)
- 3 Click Property and select the property to convert.
- 4 Specify any further arguments or values required by the conversion.  
Some conversions let you specify the format of the converted string. For example, if you convert a text string to a date format, you can specify how the date value appears. For more information, see [Date Formatting Options](#) (page 228).



Use conversions to change the format or type of a string property.

For help with any expression element, see [Expression Builder - Reference](#) (page 199).

- 5 Click OK to apply the expression.

## Creating Text Expressions

Text expressions are useful for formatting the results of text-related queries. You can use text expressions when you create labels for features.

### See also:

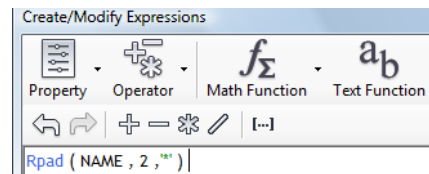
- [Text Functions](#) (page 215)
- [Creating Expressions](#) (page 161)
- [Using Expressions to Label Features](#) (page 182)

- [Adding Labels to Features](#) (page 92)
- [Expression Builder - Reference](#) (page 199)

**To create a text expression**

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 In the expression area, do one of the following:
  - Enter a [text function](#) (page 215) manually.
  - Click Text Function and select the function you want.
- 3 Click Property. In the Property list, select the property for the function.
- 4 Specify any arguments required by the function, enclosed in single quotation marks.

For example, if you are padding the right side of a text string with three asterisks, the expression looks like this one:



**For text expressions, the property is within parentheses, followed by any arguments within single quotation marks.**

If you are translating a text string from mixed case to lowercase, the expression looks like this one:

`Lower (PRODUCT_NAME)`

- 5 Specify any further conditions for the expression.
 

To create a complex property evaluation, insert an AND or OR operator, and then insert another operator, property, and value combination.

For help with any expression element, see [Expression Builder - Reference](#) (page 199).
- 6 Click OK to apply the expression.


## Creating Numeric Expressions

Numeric expressions operate on numeric properties and are useful for performing calculations within expressions.

### Tell me more

---

 Procedures ■ [To create a numeric expression](#) (page 178)

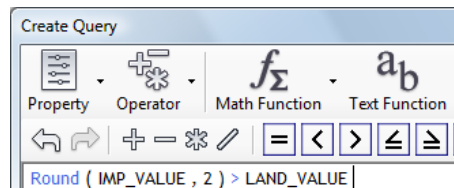
 Related topics ■ [Numeric Functions](#) (page 213)  
■ [Creating Expressions](#) (page 161)  
■ [Expression Builder - Reference](#) (page 199)

---

### To create a numeric expression

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 In the expression area, do one of the following:
  - Enter a [numeric function](#) (page 213) manually.
  - Click Math Function and select the function you want.
- 3 Click Property. In the Property list, select the property for the function.
- 4 Specify any arguments required by the function.

For example, if you are rounding off the length of an item to two decimal places, the expression looks like this one:



**Numeric expressions operate on numeric properties or values.**

If you are truncating the value for population estimates to a specified number of digits, the expression looks like this one:

```
Trunc (POPULATION, 5)
```

If you are checking the sign of a profit/loss value, the expression looks like this one:

```
Sign (PROFIT_LOSS)
```

For help with any expression element, see [Expression Builder - Reference](#) (page 199).

- 5 Click OK to apply the expression.

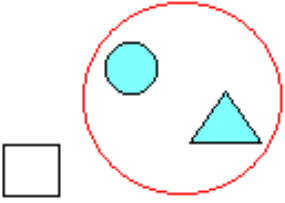
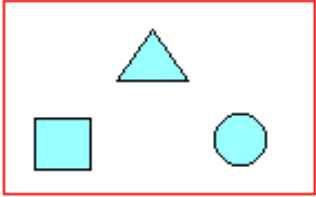
## Filtering by Location

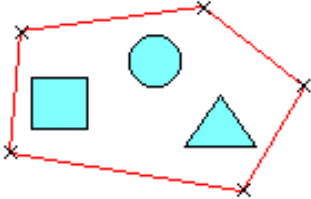
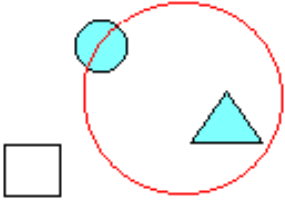
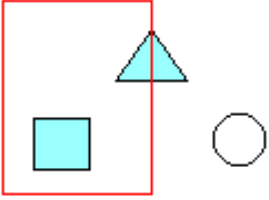
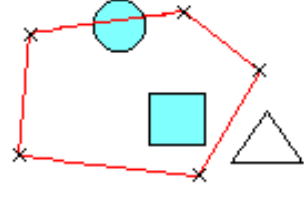
You can filter or select data by specifying a location in your map. For example, you can find all roads within 100 meters of a power line, or all parcels within a specific section of the drawing.

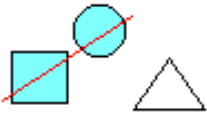

When you specify a location condition in an expression, you switch to your map and draw the location manually. For example, if you want to find all parcels within a circular area, you draw the circle on your map. As soon as your designation is complete, you return to the expression.

You cannot use location filters for labels or calculations.

In the following illustrations, the objects that are retrieved are highlighted.

Location Type	Items retrieved
Inside Circle	
Inside Rectangle	

Location Type	Items retrieved
Inside Polygon	
Touching any part of a circle	
Touching any part of a rectangle	
Touching any part of a polygon	

Location Type	Items retrieved
Touching any part of a fence (line)	
Touching a point	

**See also:**

- [Expression Builder - Reference](#) (page 199)

**To specify a location condition**

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 Click Location and select a location condition.  
The dialog box is hidden while you specify the area for the condition.
- 3 In the map, indicate whether to create a boundary or use an existing feature as the boundary.
- 4 Do one of the following:
  - If you chose Create, draw the area to include.
  - If you chose Select, click the feature to use as a boundary.
 Once you specify the area, the dialog box appears again.  
For help with any expression element, see [Expression Builder - Reference](#) (page 199).
- 5 Click OK to apply the expression.

## Using Expressions to Label Features

You can create text or numeric expressions that determine the content of labels when you style features.

**See also:**

- [Adding Labels to Features](#) (page 92)
- [Expression Builder - Reference](#) (page 199)

**To use expressions in labels**

- 1 Display the Style Editor for the feature or layer you are labeling.

- 2 Under Feature Label, click  for the appropriate entry.

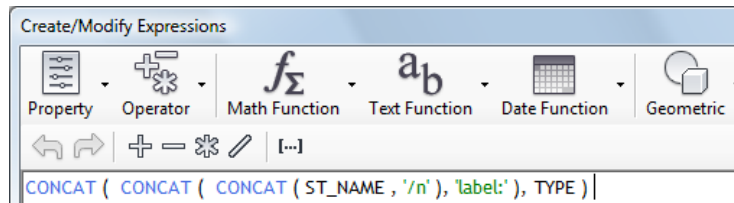
If you are theming this feature, there is one entry for each theme rule. Click the entry for a rule that displays labels.

- 3 In the Style Label dialog box, do one of the following:
  - To create a label with multiple lines, select Multiline.
  - To create single-line labels, select Advanced Placement. Text follows the outline of a linear feature and displays a single label, even if there are multiple line segments. The text shrinks to fit the length of the line.

In either case, you can specify an expression for the content of the label.

- 4 To create an expression for the label content, click Property To Display and scroll to the bottom of the list. Click Expression.
- 5 In the Create/Modify Expressions dialog box, enter the [expression](#) (page 177).

If you selected Multiline, use `'/n'` to insert a line break. For example, you could place the street name on one line and the street type on another:



To create multiline labels, use ' /n ' to insert a line break.

**NOTE** The syntax for the `CONCAT` operator is complex. It takes only two parameters, and you must nest the functions you use with it when there are multiple parameters. For more information, see [Text Functions](#) (page 215).

For help with any expression element, see [Expression Builder - Reference](#) (page 199).

- 6 Click OK to apply the expression to the labels.

## Using Expressions In Split/Merge Rules

In AutoCAD Map 3D, you can set rules for the assignment of properties when you split and merge geospatial features. You can use expressions to define these rules.

For example, when splitting a parcel, you can base the land value of the resulting parcels on a calculation that you define. There are also choices for automatic calculations. You can assign the average value of all merged features to the resulting feature. You can divide the value of a feature evenly among its split features.

This table lists the options for split and merge rules and describes how to use them.

Split Rules	Merge Rules
Calculation divides the value of the property for each resulting feature based on an expression you specify. For example, suppose the average parcel value for a neighborhood is 2000 times the value of the property <code>Parcel_Acres</code> . You can specify that <code>Land_Value</code> for each resulting parcel use	Average gives the new feature a value that is an average of the original features. This option is for numeric values only.

Split Rules	Merge Rules
that formula. This option is for numeric values only.	
Copy gives each new feature an exact copy of the original property value. The original is unchanged.	Calculation determines the value of the property for the resulting feature based on an expression you specify. For example, you can specify that Net_Value for each resulting parcel equal Imp_Value minus Land_Value. (This option is available for numeric properties only.)
Divide gives each resulting feature an equal fraction of the original value. This option is for numeric values only.	Concatenation appends the values for each merged feature to create the value for the new feature.
Empty leaves the new property value empty for each new feature. The original is unchanged.	Count gives the new feature the value of the total number of features merged to produce it. This option is for numeric values only.
Expression Specifies an expression for string properties.	Empty leaves the new property value empty for the new feature. The original features are unchanged.
Proportional divides the value of the property for each resulting feature proportionally, based on a value you specify. For example, you can assign a proportional value for Parcel_Acres based on the value of the area of the resulting parcels. This option is for numeric values only.	Expression Specifies an expression for string properties.
	First Selected gives the new feature the value of the first feature you select for the merge. This option is meaningful only if you select the objects for the merge sequentially. (First Selected is the default for all properties except numeric ones.)
	Last Selected gives the new feature the value of the last feature you select for the merge. This option is meaningful only if

Split Rules	Merge Rules
	you select the objects for the merge sequentially.
	Maximum gives the new feature the maximum value available in all features in the merge. (This option is available for numeric properties only.)
	Median gives the new feature the median value calculated from all features in the merge. (This option is available for numeric properties only.)
	Minimum gives the new feature the minimum value available in all features in the merge. (This option is available for numeric properties only.)
	Standard Deviation gives the new feature the standard deviation value calculated from all features in the merge. (This option is available for numeric properties only.)
	Sum gives the new feature the total value of all features in the merge. (This option is available for numeric properties only.)

**See also:**

- Splitting Features
- Merging Features
- Tutorial 5: Styling, Splitting, and Editing Polygon Features
- [Expression Builder - Reference](#) (page 199)

**To create split/merge rules using expressions**

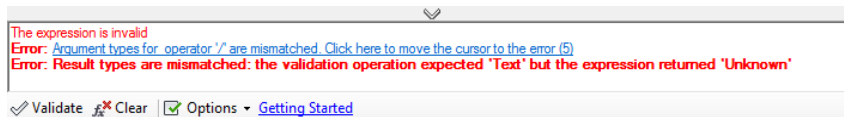
- 1 In Display Manager, select the layer containing the feature to split or merge.
- 2 In the Task Pane, click Table.

- 3 In the Data Table, click Options (at the bottom of the window) and select Set Split And Merge Rules.
- 4 Under Feature Properties, select a property whose rules you want to set. For example, if you are splitting or merging parcels, select LAND\_VALUE to specify how to determine the land value of the resulting parcels. For help with any expression element, see [Expression Builder - Reference](#) (page 199).
- 5 Click Split Rule and select a value.
- 6 Click Merge Rule and select a value. For a description of the possible values, see the Concept tab of this topic.
- 7 Click OK.

## Troubleshooting Validation Errors

When you save an expression, it is always checked to be sure it is valid. You can also check whether your expression is valid before you save it.

The validation checks the syntax of the expression, whether the specified properties are present in the current data store, and whether the property values are valid.



When possible, the validation operation displays a message describing the errors it finds. Often, you can click this error message to place the cursor at the problem spot so you can correct it.

Validation can fail for one of the following reasons:

- A separator character is missing or invalid. For example, for some functions, commas must separate each argument. Perhaps one of the commas is missing, or you entered a semicolon instead of a comma.
- An operator or property is missing. This problem is common in expressions with multiple conditions. For example, the expression `PARCEL_VALUE > 100000 AND <200000` is invalid. The correct syntax is `PARCEL_VALUE > 100000 AND PARCEL_VALUE < 200000`. Notice that in the second example,

PARCEL\_VALUE appears twice, while in the first example it appears only once.

- A character or property is the wrong type. This problem can occur if you use an operator that requires a numeric value, but you inserted a text character instead. For a function that requires a hexadecimal value, a numeral can cause an error. For a function that requires a numeric property, a text property causes an error.
- A required value is missing or “empty.” Perhaps you failed to insert a property value or a value for an argument.
- The expression is missing a bracket, quotation mark, or parenthesis character. For example, there is an opening bracket that has no related closing bracket. This problem is common in complex expressions.

The validation process can help you avoid many errors, but it cannot guarantee that your expression will work the way you intend when it is applied. Validation does not execute the query against actual data. It only checks that the expression syntax is correct and that the properties and values are valid for the current data store.

**See also:**

- [Creating Expressions](#) (page 161)
- [Expression Builder - Reference](#) (page 199)

**To validate an expression**

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 Create the expression.
- 3 Save the expression or click Validate.
- 4 If the validation panel displays errors, click the error message to move the cursor to the problem area.
- 5 Resolve the problems and run the validation check again, until the validation panel indicates that the expression is valid.  
For help with any expression element, see [Expression Builder - Reference](#) (page 199).

## Saving and Reusing Expressions

You can save any expression for reuse. You can share expressions you saved with other users.

You cannot save a [calculation](#) (page 172). The calculation becomes a property for the current feature class in the current map, but is not saved back to the original data store. You can export the feature class layer from the Display Manager to create a feature that permanently includes the calculated property.

### See also:

- [Creating Expressions](#) (page 161)
- [Saving or Exporting a Display Manager Layer](#)

### To save an expression

- 1 [Select the command for which you want to create an expression.](#) (page 163).
- 2 Create the expression.
- 3 When your expression is complete, click Options and select Save Expression.
- 4 In the dialog box that displays, specify a location and name for the saved expression file.  
The next time you save or load an expression, this location will be displayed by default. To share this saved expression with another user, send that user the file from this location.  
By default, the expression file name is the first element in the expression. All expressions use the file extension *.fdq*.
- 5 Click Save.

### To reuse a saved expression

- 1 In your map, select the command that will use the expression.
- 2 Click Options and select Load Expression.
- 3 Select the saved expression file to open and click Load.  
The last location you used to save or load an expression is displayed by default. You can navigate to a different location.

The saved expression replaces whatever you entered in the expression area. Click OK to apply it.

## Customizing Expression Options

You can set display options and use navigation options while you are creating expressions.

**To set expression options, do any of the following**

- [Display the buttons that show expression templates.](#) (page 189)
- [Show or hide tooltips.](#) (page 189)
- [Use navigation options.](#) (page 190)

## Setting Expression Display Options

You can set the following display options for expressions:

- Display the buttons that show expression templates every time you start creating an expression.
- Show or hide tooltips.

---

**NOTE** You can also save or load expressions from the Options drop-down. For more information, see [Saving and Reusing Expressions](#) (page 188).

---

**To display the buttons that show expression templates**

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 Click Getting Started (at the bottom of the window).

**To show or hide tooltips**

- 1 [Select the command for which you want to create an expression.](#) (page 163)
- 2 Click Options (at the bottom of the window).
- 3 Click Show Tool Tips.

- 4 Click OK.

## Navigating While Creating Expressions

While creating an expression, use the following to navigate:

- **Zoom Extents.** You can zoom to the extents of the selected feature layers.

---

**NOTE** Zoom Extents is not available when you create a calculation or when you are using expressions for labeling.

---

- **Show Location.** If you applied a [location filter](#) (page 179), you can view the area on the map defined by that filter.

---

**NOTE** Show Location is not available in MapGuide Studio. In AutoCAD Map 3D, it is not available when you create a calculation or when you are using expressions for labeling.

---

### To navigate while creating expressions

- 1 To zoom the map to the extents of the current feature layer, click Zoom Extents (at the bottom of the window).
- 2 To see the dotted line representing the location filter currently applied to the map, click the location component of the expression and then click Show Location.

## Using Expressions to Filter Feature Data

You can filter layers based on a single property, multiple properties, a location in the map that you specify, or a set of conditions.

Before you create an expression for the filter, you select the feature layers to filter. Methods for selecting layers vary, depending on whether you are using AutoCAD Map 3D or MapGuide Studio. For example, in AutoCAD Map 3D, you can filter feature layers as you add them to the map. Only a subset of data is added. You can also select layers in Display Manager and filter the data after it is added to the map. You can filter a single layer or multiple layers at one time.

The result of a filter expression must be a Boolean value.

## Filtering the Layers You Add to a Map

When you connect to a geospatial data store in AutoCAD Map 3D, you can filter the data you bring into your map. Use Add To Map With Query in the Data Connect window.

You can filter a single layer or multiple layers. You can filter the data by location, by data properties, and by conditions that you define.

The result of a filter expression must be a Boolean value.

**See also:**

- [Creating Expressions](#) (page 161)
- [Evaluating Properties](#) (page 167)
- Filtering Features When You Add Them to a Map
- [Expression Builder - Reference](#) (page 199)

### To filter feature data when you add it to a map

- 1 In AutoCAD Map 3D, connect to the data source in the Data Connect window.  
For detailed information, see [Overview of Bringing In GIS Features](#).
- 2 In the Data Connect window, under Add Data To Map, select the layers to add.
- 3 Click the Add To Map down arrow and select Add To Map With Query.
- 4 In the Create Query dialog box, [create the expression for your query](#) (page 161).  
For help with any expression element, see [Expression Builder - Reference](#) (page 199).
- 5 Click OK.

## Filtering Feature Layers

Filter feature source layers so that only some of the features appear in your map. Using a filter can help you improve performance when working with large sets of feature data.

To filter the layers, define a query condition or a set of conditions that specify which features you want. The procedure is like performing a search.

The result of a filter expression must be a Boolean value.

---

**TIP** In AutoCAD Map 3D, you can filter data in two ways. You can filter after you bring data into your map. You can use the Add To Map With Query option *while* bringing it in and then use Query To Filter Data to apply a filter.

---

You can create a single filter for multiple layers from different data sources, as long as they share the property you are filtering on. For example, you can have an SDF layer of parcels, a SHP layer of parks, and an Oracle layer of hospitals. If they all share a STREET\_NAME property, you can filter by street name.

You can also create a filter for a group. All the layers in that group must be feature layers (not drawing layers). All the feature layers must contain features (that is, none of them can be empty).

**See also:**

- [Filtering the Layers You Add to a Map](#) (page 191)
- Finding and Selecting Features
- [Overview of Creating Expressions](#) (page 161)
- [Evaluating Properties](#) (page 167)
- [Filtering by Location](#) (page 179)

**To filter a feature layer**

- 1 If you are filtering by location, zoom the window to the extents of the selected feature class.
- 2 In Display Manager, select the feature layers and select the filter command.  
For example, in AutoCAD Map 3D Display Manager, right-click a selected layer and click Query To Filter Data.
- 3 In the Create Query window, to add more feature layers to the data being searched by the expression, click Add Layer and select the layer to add. To delete a layer, select it in the list and click Delete.

The list of layers at the top of the window shows any existing filters for the selected layers. If the layers use a common query (specifying a property that all the layers have in common), that query is listed separately.

- 4 Create an expression, using any of the following expression types:
  - [Filtering by Location](#) (page 179) — Selects all features in a location you specify. Select one of the Locate On Map options and define a location in your drawing.  
For example, use a location expression to find all manholes in one section of town. You can also find all parcels that touch a road, or all water pipes within 100 meters of a road.
  - [Evaluating Properties](#) (page 167)— Selects all features that have the property value you specify. Insert a property, an operator, and a value. For example, to select all pipes with a diameter greater than 10, specify `Diameter > 10`.  
The Property list displays the properties available for this feature class. You can [view and insert available values for a property from a list](#) (page 171).
- 5 Optionally, add conditions to the expression.
- 6 [Validate your expression](#) (page 186).
- 7 Click OK to apply the filter.

## Searching to Select Feature Layers

You can find and select features in your map based on their location or properties. You create an expression that specifies a set of conditions to use for finding and selecting the features.

For example, you can find just the roads in Shanghai within a circular area you specify. Specify criteria that limit the results to road features that lie within the circle you define and whose City field is "Shanghai."

You can search multiple layers from different data sources, as long as they share the property you are searching. For example, you can have an SDF layer of parcels, a SHP layer of parks, and an Oracle layer of hospitals. If they all share a STREET\_NAME property, you can search by street name.

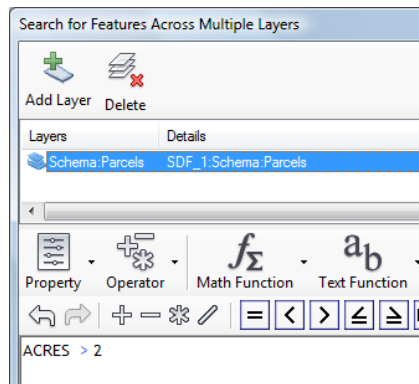
### See also:

- [Finding and Selecting Features](#)

- [Overview of Creating Expressions](#) (page 161)
- [Evaluating Properties](#) (page 167)
- [Filtering by Location](#) (page 179)

#### To search for and select parts of feature layers

- 1 If you are filtering by location, zoom the drawing window to see the area of interest.
- 2 In your map, select the feature layers and select the search command.  
For example, in AutoCAD Map 3D, click Home tab ► Data panel ► Search.
- 3 To add more feature layers to the data being searched by the expression, click Add Layer and select the layer to add. To delete a layer, select it in the list and click Delete.
- 4 In the expression area, use any of the following expression types:
  - [Location Condition](#) (page 179) — Select one of the Locate On Map options and define a location in your drawing.  
For example, use a location condition to find all manholes in one section of town. You can also find all parcels that touch a road, or all water pipes within 100 meters of a road.
  - [Property Condition](#) (page 167)— Selects all features that have the property value you specify. Insert a property, an operator, and a value.  
For example, to select all pipes with a diameter greater than 10, specify `Diameter > 10`.  
  
The Property list displays the properties available for this feature class. You can [view and insert available values for a property from a list](#) (page 171).



Add layers and specify the expression for the search.

- 5 Optionally, add conditions to the expression.
- 6 [Validate your expression](#) (page 186).
- 7 Click OK to apply the filter.

## About Expressions and Data Providers

Most expression functions behave the same way across all data providers, but there are a few exceptions.

### Unsupported Functions

You can use any function when creating a filter or a calculated property. These results are not saved back to the data store. However, if you use a function that returns an unsupported data type to insert a value into the Data Table, an exception results. That operation is not valid for the data provider. For example, SHP files do not support the `FdoInt16` or `FdoDouble` data types. If you try to save a value of that data type back to a SHP data store, an error occurs.

### ODBC Providers

You can apply an expression before you actually connect to the data store in AutoCAD Map 3D, for example, when you query to add features to a map. This situation can be an issue for ODBC providers, which can connect to multiple data sources. Not all ODBC sources support expression functions.

For this reason, the functions are evaluated as part of the expression-building process in all cases, even if the connected data source can do so.

### Soundex

The [Soundex function](#) (page 215) is natively supported by all relational database management systems (RDBMS). The underlying RDBMS evaluates any expression including this function. However, the result returned by a MySQL provider may differ from the result you receive from other providers.

### Boolean Value Representation

SDF and SHP providers represent a Boolean value with the terms TRUE and FALSE. RDBMS providers represent a Boolean value with 0 and 1. This difference can affect the display of labels. For example, the following expression defines a label that indicates whether a valve is open:

```
Concat('Valve is open: ', <valve_status_property>)
```

For SDF and SHP data, the label will read "Valve is open: True." For RDBMS data, the label will read, "Valve is open: 1."

### AddMonths and MonthsBetween

The [AddMonths and MonthsBetween functions](#) (page 221) do not take day information into account, but RDBMS systems do.

For example, for the expression `AddMonths(<date_property>, 88.7)`, an RDBMS provider might add 88.7 months to the provided date. The function in expressions you create in the product adds 88 months only.

Similarly, for the expression `MonthsBetween(<date_1>, <date_2>)`, an RDBMS provider might return a value of 77.4. The function in expressions you create in the product returns 77.

### Cache-based Operation Versus RDBMS-based Operation

Some operations (for example, the creation of a calculated property) are cache-based operations and use the expression-building process for evaluation. Other operations (for example, a filter on an RDBMS data store) use the underlying RDBMS system.

Due to differences between providers, the results can differ. For example, if you connect to a MySQL data store, you can create two calculated properties: CP1 and CP2. CP1 is defined by the expression `Soundex(<property>)` and CP2 is defined by the expression `Soundex(<literal>)`. In the Data Table, the value for CP1 and CP2 may be identical. However, if you use a filter containing

the expression `Soundex(<property>) = Soundex(<literal>)`, the resulting values may be different. In the Data Table, the expression-building process evaluates the expressions. The MySQL data store (which uses a different function definition) evaluates the filter.



# Expression Builder - Reference

# 11

## Creating Expressions - Dialog Box

Use expressions to do the following tasks:

- Define conditions that retrieve the features you want from a feature source
- Select features for an operation
- Specify criteria for styling or labeling
- Define split/merge rules

### **Layers**

This area is displayed only when you search. Click Home tab ► Data panel ► Search.

#### Add Layer

Adds another feature layer to the search operation.

#### Delete

Deletes the selected layer from the search operation.

#### Layers list

Lists the layers to search.

### **Menus and Toolbar**

Inserts elements into your expression.

### Property

Displays a list of properties. Select a property to display its values. For example, for a Parcel feature with a Street\_Address property, you can examine the Street\_Address values and choose only parcels on a particular street. Properties are sometimes called **attributes** in other GIS systems. Properties can provide demographic, physical, historical, and other data about a geometric feature.

### Operator

Displays a list of [math](#) (page 202), [comparison](#) (page 203), and [logical](#) (page 204) operators.

### Math Function

Displays a list of math and numeric functions, including standard trigonometric operations, as well as functions for absolute value, exponents, and others.

### Text Function

Displays a list of functions that operate on text properties and are useful for formatting the results of text-related queries.

### Date Function

Displays a list of functions that return the current date or operate on a date string.

### Locate on Map

Specifies a location as a filter when you draw it on your map. For example, select all items within or touching a specified circle, rectangle, or polygon that you draw.

### Geometric

Displays the geometric elements Area2D and Length2D. Each of these elements takes only the argument `Geometry`. Using that argument, the expression determines the area or length of the data on the layer. You can then create an expression that filters data by its size. For example, you can select only pipes longer than 50 feet.

### Conversion

Displays a list of options for converting strings from one format to another. For example, you can convert text strings to dates, and then select only items before or after a particular date.

### Undo/Redo

Reverses or reinstates your most recent edit.

#### Math operators

Inserts +, -, \*, or / into your expression.

#### Comparison operators

Inserts Boolean comparison operators (equal to, less than, greater than, and so on) into your expression.

#### Logical operators

Inserts AND, OR, or grouping parentheses into your expression.

#### Get values

Displays a pane that lists property values. Select a property from the list and click the green arrow to see the values for that property. You can filter the list. If the list is long, use Previous and Next to page through it. Select a value and click Insert Value to add that value to your expression at the insertion point.

#### **Expression area**

Displays the current expression.

#### **Lower command area**

##### Validate

Checks whether the current expression is valid. If it is not, a message helps you determine where the problems are.

##### Clear

Deletes the current expression.

##### Zoom Extents

Zooms to the extents of the selected feature source.

##### Show Location

If you have defined a location condition, click that part of your expression and then click this button to display the location extents in the drawing window.

##### Options

Displays options for saving or reusing expressions and hiding or showing startup tips and tooltips.

## Overview of Expression Elements

Expressions that filter, search, or style geospatial features use one set of operators, functions, conditions, and options across all supported FDO providers. To check the syntax for a particular element, or to see examples of use, see the following topics:

- [Operators](#) (page 202)
- [Functions](#) (page 206)
- [Location Conditions](#) (page 222)
- [Options](#) (page 225)

## Operators

When you create an expression for geospatial features, you can use the following types of operators:

Type of Operator	Definition	Example
<a href="#">Math Operators</a> (page 202)	Simple arithmetic operators	Plus, minus, multiply, divide
<a href="#">Comparison Operators</a> (page 203)	Simple comparative operators	Greater than, less than, not equal to
<a href="#">Logical Operators</a> (page 204)	Operators that match or group values	Like, Not Like, Boolean operators (And, Or, Not)
<a href="#">Date-Time Operators</a> (page 205)	Operators that convert a string to a date or time value.	Date, Time, Timestamp

## Math Operators

Math operators are available from the Operator menu. They perform simple arithmetic operations. (Do not confuse the Math + operator with the Boolean AND operator. They are not interchangeable.)

When you create an expression for geospatial features, you can use the following math operators:

Operator	Definition	Syntax
+	Add	Property + Value Value + Property Property + Property
-	Subtract	Property - Value Value - Property Property - Property
*	Multiply by	Property * Value Value * Property Property * Property
/	Divide by	Property / Value Value / Property Property / Property

## Comparison Operators

Comparison operators are available from the Operator menu. They modify a property value. Make sure that every instance of a comparison operator is preceded by a property and followed by a value. For example, if you create an expression to find every parcel whose street number is greater than 100 but less than 200, your expression would be:

```
Parcel_Street_Address > 100 AND Parcel_Street_Address < 200
```

In the example, the property `Parcel_Street_Address` is inserted twice. A single instance of `Parcel_Street_Address` does not work.

Numeric properties are evaluated arithmetically. Date properties are evaluated chronologically. Text properties are evaluated alphabetically. For example, `Parcel_Area < 20000` will find parcels whose area is less than 20,000 square feet. `Purchase_Date > 01/01/2001` will find parcels purchased after the beginning of 2001. `Street_Address < "Mt. Whitney"` will find parcels whose street address comes before Mt. Whitney alphabetically.

When you create an expression for geospatial features, you can use the following comparison operators:

Operator	Definition	Syntax
=	Equals	Property = Value Value = Property
>	Is greater than	Property > Value Value > Property
<	Is less than	Property < Value Value < Property
<=	Is less than or equal to	Property <= Value Value <= Property
>=	Is greater than or equal to	Property >= Value Value >= Property
<>	Is not equal to	Property <> Value Value <> Property

## Logical Operators

Logical operators are available from the Operator menu. They create conditions that return a value for a text property if it matches a particular pattern, or appears within a particular list.

When you create an expression for geospatial features, you can use the following logical operators:

Operator	Definition	Syntax
LIKE	Finds text that matches a pattern. The pattern you specify (within single quotation marks) can include regular characters and the percent (%) wildcard character. In order to match, regular characters must exactly match the characters specified in the pattern; the percent character can match an arbitrary fragment of the pattern.	Property LIKE 'text%'

Operator	Definition	Syntax
NOT LIKE	Finds text that does not match a pattern. You can use the percent wildcard as you do with LIKE.	NOT Property LIKE 'text%'
IN	Determines whether a specified value matches any value in a list.	Property IN (Value, Value)
NOT IN	Determines whether a specified value does not match any value in a list.	NOT Property IN (Value, Value)
IS NULL	Returns the specified property if it is null. An expression with a bitwise or arithmetic operator evaluates to NULL if any one of the operands is NULL.	Property IS NULL
IS NOT NULL	Returns the specified property if it is not null. An expression with a bitwise or arithmetic operator evaluates to NULL if any one of the operands is NULL.	NOT Property IS NULL
AND	Combines conditions and matches a value if it meets all conditions.	Expression AND Expression
OR	Combines conditions and matches a value if it meets any one of the conditions.	Expression OR Expression
NOT	Negates a Boolean expression.	NOT Value
()	Groups the selection in parentheses.	(Value, Value)

## Date-Time Operators

A date-time property from the Get Values panel uses one of the following operators, depending on the field type. If you are an advanced user, you can also add one of these operators to an expression if you know its FDO syntax. These operators are not available from a list.

The Date-Time operators are parsed using the standard SQL literal strings:

- DATE 'YYYY-MM-DD'
- TIME 'HH:MM:SS[.sss]'
- TIMESTAMP 'YYYY-MM-DD HH:MM:SS[.sss]'

To use other formats, use TODATE or TOSTRING instead. See [Conversion Options](#) (page 226).

Function	Definition	Syntax	Example
DATE	Converts the string you specify into a date value using the format you choose from a list.	DATE 'string'	DATE '1971-12-24'
TIME	Converts the string you specify into a time value using the format you choose from a list.	TIME 'string'	TIME '11:00:02'
TIMESTAMP	Converts the string you specify into a date and time value using the format you choose from a list.	TIMESTAMP 'string'	TIMESTAMP '2003-10-23 11:00:02'

## Functions

When you create an expression for geospatial features, you can use the following types of functions:

Type of function	Definition	Example
<a href="#">Math Functions</a> (page 207)	Trigonometric, exponential, log, and other functions	Absolute value, modulus, remainder, square

Type of function	Definition	Example
		root, logarithmic operators, exponent
<a href="#">Numeric Functions</a> (page 213)	Functions that round off, truncate, or find the sign of a numeric value	Ceiling, Floor, Round, Truncate
<a href="#">Text Functions</a> (page 215)	Functions that operate on text strings	Concatenate, pad, or trim the left or right side of a string, specify the length or position of a string
<a href="#">Date Functions</a> (page 221)	Functions that operate on date values	Specify the current date, find the result of adding months to a date

## Math Functions

Math functions are available from the Math Function menu. They include standard trigonometric operations, as well as functions for absolute value, exponents, and others. These functions are available for every data provider except for raster, WFS, and WMS providers.

The functions that return angles (for example, ARCCOS) are helpful in formulating expressions that define rotation.

When you create an expression for geospatial features, you can use the following math functions.

Function	Definition	Syntax	Example
ABS	Returns the absolute value of a number (without its sign) using the input data type. For example, $ABS(-2)=2$	ABS(Numeric_Property)	ABS(Pipe_Angle)

Function	Definition	Syntax	Example
ACOS	Returns the arccosine, or inverse cosine, of a number between or equal to -1 and 1. (Arccosine is the angle that has a cosine equal to a given number.) The returned value is in radians with a Double data type. For example, $ACOS(.5) = \pi/3$	ACOS (Numeric_Property)	ACOS(Pipe_Property)
ASIN	Returns the arcsine, or inverse sine, of a number between or equal to -1 and 1. (Asin is the angle that has a sine equal to a given number.) The returned value is in radians with a Double data type. For example, $ASIN(.5) = \pi/6$	ASIN (Numeric_Property)	ASIN(Pipe_Property)
ATAN	Returns the arctangent, or inverse tangent, of any number. (Atan is the angle that has a tangent equal to a given number.) The returned value is in radians	ATAN (Numeric_Property)	ATAN(Pipe_Property)

Function	Definition	Syntax	Example
	with a Double data type. For example, $ATAN(1) = \pi/4$		
ATAN2	Returns the arctangent, or inverse tangent, of X and Y coordinates of a point. Each coordinate can be any real number. The returned value is in radians with a Double data type. For example, $ATAN2(-.7071, .7071) = 3\pi/4$	$ATAN2(x\_Numeric\_Property, y\_Numeric\_Property)$	$ATAN2(NS\_Street\_Property, EW\_Street\_Property)$
COS	Returns the cosine of an angle. The returned value has a Double data type. (In a right triangle, the cosine of an angle is the ratio of the adjacent side to the hypotenuse.) For example, $COS(\pi/3) = .5$	$COS(Angle\_Property)$	$COS(Pipe\_Angle)$
EXP	EXP returns e raised to the specified power, where e = 2.71828183 ...	$EXP(Numeric\_Property)$	$EXP(Street\_Length\_Property)$

Function	Definition	Syntax	Example
	<p>EXP returns a value with a Double data type. For example, <math>EXP(2)=7.389056099\dots</math></p>		
LN	<p>Returns the natural logarithm of a positive number. The returned value has a Double data type. The natural log is often used to determine how long it will take to achieve a stated level. For example, <math>LN(2.71828183)=1</math></p>	<p>LN(Numeric Property)</p>	<p>LN(Desired_Level_Property)</p>
LOG	<p>Returns the logarithm, to the base specified, of a number. The returned value has a Double data type. The base can be any positive value other than 1 and the number can be any positive value. For example, <math>LOG(10,100)=2</math></p>	<p>LOG(Base, Numeric_Property)</p>	<p>LOG(10, Cost_Property)</p>
MOD	<p>Returns the remainder of a number (the dividend) after be-</p>	<p>MOD(Dividend, Divisor)</p>	<p>MOD(Parcel_Value, Parcel_Area)</p>

Function	Definition	Syntax	Example
	<p>ing divided by another number (the divisor). For example, <math>\text{MOD}(11, 4) = 3</math></p> <p>Uses the <a href="#">FLOOR</a> (page 213) function to round. For more information, see <a href="#">Using Mod and Remainder</a> (page 213).</p>		
POWER	<p>Returns the result of one number raised to the power of a second number. The returned value has a Double data type. The base and the exponent can be any numbers, but if the base is negative, then the power must be an integer. For example, <math>\text{POWER}(5, 2) = 25</math></p>	$\text{POWER}(\text{Base\_number}, \text{Power\_number})$	$\text{POWER}(\text{Parcel\_Cost}, 2)$
REMAINDER	<p>Returns the remainder of a number after being divided by another number. For example, <math>\text{REMAINDER}(11, 4) = 3</math></p>	$\text{REMAINDER}(\text{Dividend}, \text{Divisor})$	$\text{REMAINDER}(\text{Parcel\_Cost}, 4)$

Function	Definition	Syntax	Example
	Uses the <a href="#">ROUND</a> (page 213) function to round. For more information, see <a href="#">Using Mod and Remainder</a> (page 213)		
SIN	Returns the sine of an angle. The returned value has a Double data type. In a right triangle, the sine of an angle is the ratio of the opposite side to the hypotenuse. For example, $SIN(pi/6) = .5$	<code>SIN(Angle_Property)</code>	<code>SIN(Pipe_Angle)</code>
SQRT	Returns the square root of a positive number. The returned value has a Double data type. For example, $SQRT(25) = 5$	<code>SQRT(Numeric_Property)</code>	<code>SQRT(Parcel_Area)</code>
TAN	Returns the tangent of an angle. The returned value has a Double data type. In a right triangle, TAN is the ratio of the opposite side to the adjacent side.	<code>TAN(Angle_Property)</code>	<code>TAN(Pipe_Angle)</code>

Function	Definition	Syntax	Example
	For example, <code>TAN (pi / 4) = 1</code>		

## Using Mod and Remainder

The functions `MOD` and `REMAINDER` both return the remainder of a division of two numbers. The difference is that `MOD` uses the function `FLOOR` in its algorithm, and `REMAINDER` uses the function `ROUND` instead. This difference can affect the result. For example, the call to `MOD (34.5, 3)` returns 1.5. The call `REMAINDER (34.5, 3)` returns -1.5. For `REMAINDER`, `n` cannot equal zero.

The formulas for the two functions are:

$$\text{MOD (m, n)} = \text{SIGN (m)} * (\text{ABS (m)} - (\text{ABS (n)} * \text{FLOOR}(\text{ABS (m)} / \text{ABS (n)})))$$

$$\text{REMAINDER (m,n)} = m - (n * \text{ROUND (m/n)})$$

You can see the differences that can result by examining the following table:

If m=	And n=	MOD (m,n) returns	REMAINDER (m,n) returns
11	4	3	-1
11	-4	3	-1
-11	4	-3	1
-11	-4	-3	1

## Numeric Functions

Numeric functions are available from the Math Function menu. They operate on numeric values to round numbers up or down, truncate them, or determine whether the number is negative or positive. These functions are available for every data provider except for raster, WFS, and WMS providers.

When you create an expression for geospatial features, you can use the following numeric functions:

Function	Definition	Syntax	Example
CEIL	Rounds a number up to the next highest integer. The return value uses the input data type. For example, CEIL(2.6)=3 CEIL(-2.6)=-2	CEIL(Numeric_Property)	CEIL(Part_Cost)
FLOOR	Rounds a number down to the next lowest integer. The return value uses the input data type. For example, FLOOR(2.6)=2 FLOOR(-2.6)=-3	FLOOR(Numeric_Property)	FLOOR(Part_Cost)
ROUND	Rounds a number to the specified decimal places. The return value uses the input data type. For example, ROUND(1.476,2)=1.48	ROUND(Numeric_Property, Number of decimal places)	ROUND(Part_Cost,2)
SIGN	Finds the sign of a number. Returns 1 if the number is positive; 0 if the	SIGN(Numeric_Property)	SIGN(Partial_Sale_Profit)

Function	Definition	Syntax	Example
	number is 0; -1 if the number is negative. The return value uses an Int16 data type. For example, SIGN(-3.76)=-1		
TRUNC	Truncates a date property to the specified format ('YEAR', 'MONTH', 'DAY', 'HOUR' or 'MINUTE') or Truncates a numeric property to the specified number of decimal places. The return value uses the input data type. For example, TRUNC(1.476, 2)=1.47 This function returns a DOUBLE.	TRUNC(Date_Property, 'Format') TRUNC(Numeric_Property, Number of decimal places)	TRUNC(Repair_Date, 'DAY') or TRUNC(Repair_Cost, 2)

## Text Functions

Text functions are available from the Text Function menu. They operate on text properties and are useful for formatting the results of text-related queries. These functions are available for every data provider except for raster, WFS, and WMS providers.

When you create an expression for geospatial features, you can use the following text functions:

Function	Definition	Syntax	Example
CONCAT	Joins two strings into one. CONCAT takes two arguments, which can be any property type except Geometry or Raster properties. The return value uses the String data type. You must nest any functions you use with this function, because it takes only two parameters.	CONCAT (Property, Property)	CONCAT (First_Name, Last_Name)
INSTR	Finds the position of the first occurrence of a substring in another string. Specify the source string as the first argument and the string you are searching for as the second argument. Returns an integer with the data type Int64.	INSTR (Text property or value, Text value or property)	INSTR (Parcel_Owner, 'field') This example looks for the substring "field" within the parcel owner string. If the name of the parcel owner is Smithfield, the value returned would be 6.
LENGTH	Returns the number of characters of the spe-	LENGTH (Text_property)	LENGTH (First_Name)

Function	Definition	Syntax	Example
	<p>ified string as an integer with the data type Int64. Does not include trailing blank characters.</p>		<p>This example finds the number of characters in the First_Name property.</p>
LOWER	<p>Converts text to lowercase. The return value uses the String data type.</p>	<p>LOWER(Text_property)</p>	<p>LOWER(Product_Name) This example changes a product name entry to lowercase (for example, PIPE COMPOUND to pipe compound).</p>
LPAD	<p>Pads the left side of a string with the characters specified. The return value uses the String data type. LPAD can take two to three parameters. If you do not specify the text character argument, a space character is used.</p>	<p>LPAD(Text_property, Number of characters, 'text character')</p>	<p>LPAD(High_Priority, 3, '*') This example would show a value for the property High_Priority (for example, "Emergency Repair") preceded by ***.</p>
LTRIM	<p>Trims characters from the left side of a text string. The return value uses the String data type.</p>	<p>LTRIM(Text_property)</p>	<p>LTRIM(Parcel_ID) This example removes leading characters from parcel identifiers.</p>
RPAD	<p>Pads the right side of a string with the charac-</p>	<p>RPAD(Text_property, Number</p>	<p>RPAD(Costly_Repair, 3, \$)</p>

Function	Definition	Syntax	Example
	<p>ters specified. The return value uses the String data type. RPAD can take two to three parameters. If you do not specify the text character argument, a space character is used.</p>	<p>of characters, 'text character')</p>	<p>This example would show a value for the property Costly_Repair (for example, "Complete Redesign") followed by \$\$\$.</p>
RTRIM	<p>Trims characters from the right side of a text string (trailing characters). The return value uses the String data type. To remove leading characters, use TRIM. See <a href="#">TRIM</a> (page ?).</p>	<p>RTRIM(Text_property)</p>	<p>RTRIM(Parcel_ID) This example removes characters that follow parcel identifiers.</p>
SOUNDEX	<p>Returns names that, in English, sound like the specified text string. The return value uses the String data type. The underlying RDBMS evaluates any expression including the SOUNDEX function. How-</p>	<p>SOUNDEX(Text_property) = SOUNDEX('text string')</p>	<p>SOUNDEX (Last_Name) = SOUNDEX ('Smith') This example finds last names that sound like Smith (for example, "Smythe").</p>

Function	Definition	Syntax	Example
	<p>ever, the result returned by a MySQL provider may differ from the result you receive from other providers.</p>		
SUBSTR	<p>Extracts a substring from a string. If the start position is 0, it is treated as 1. If you specify a negative value for this position, the expression counts backwards from the end of the string. The return value uses the String data type. For example, <code>SUBSTR('ABCDEFG', -6, 4)</code> finds BCDE.</p>	<p>SUBSTR(Text_property, Starting_position, Length_of_substring)</p>	<p><code>SUBSTR (Last_Name, 0, 4)</code></p>
TRANSLATE	<p>Replaces a sequence of characters with another set of characters. The return value uses the String data type. For example, <code>TRANSLATE('AGIS Specialist's Guide to C#', ' ', '_')</code></p>	<p>TRANSLATE(Text_property, 'from_text', 'to_text')</p>	<p><code>TRANSLATE (Comment_Property ' '#', '___')</code>  This example changes spaces, quotation marks, and # characters to underscore characters.</p>

Function	Definition	Syntax	Example
	<p>'#', '___')</p> <p>transforms the book title shown to "A_GIS_Specialist_s_Guide_to_C.)"</p> <p>The original title required an additional single quote as an escape character.</p>		
TRIM	<p>Trims leading characters from a text string. To remove trailing characters, use RTRIM. The return value uses the String data type.</p> <p>You can specify an optional argument: be BOTH, LEADING or TRAILING.</p> <p>If you do not specify the trim character, a blank space is assumed.</p> <p>See <a href="#">RTRIM</a> (page ?).</p>	<p>TRIM('optional_argument', Text_property)</p>	<p>TRIM('trailing', Parcel_ID]</p> <p>This example trims trailing characters from the parcel ID.</p>
UPPER	<p>Converts text to uppercase. The return value uses the String data type.</p>	<p>UPPER(Text_property)</p>	<p>UPPER(Parcel_Owner)</p> <p>This example would display the value "John McMansion" as "JOHN MCMAN-SION."</p>

## Date Functions

Date functions are available from the Date Function menu. They return the current date or operate on a date string. These functions are available every data provider except for raster, WFS, and WMS providers.

When you create an expression for geospatial features, you can use the following date functions.

Function	Definition	Syntax	Example
ADDMONTHS	Finds the result of adding months to a date. The property value provided must have an integer value. Returns a string with a DateTime data type in the format of the original date value.	ADDMONTHS (Date_property, Number)	ADD_MONTHS (Start_Date,1) This example adds one month to the value of Start_Date. If Start_Date is June 1, 2008, ADDMONTHS would return July 1, 2008.
CURRENTDATE	Returns the current date as a string with a DateTime data type.	CURRENTDATE ( )	CURRENTDATE ( )
EXTRACT	Extracts a date/time field from a date/time value. Returns a value in the Gregorian calendar with a DateTime data type. The date/time field can be 'YEAR', 'MONTH', 'DAY',	EXTRACT (field, Date_property)	EXTRACT (YEAR, Start_Date) This example extracts the year from the value of Start_Date. If Start_Date is June 1, 2008, EXTRACT would return 2008.

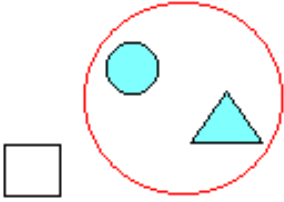
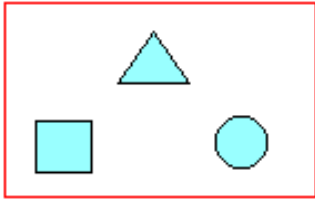
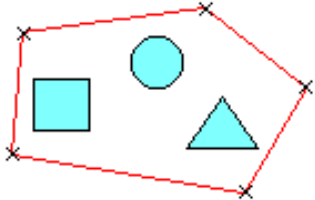
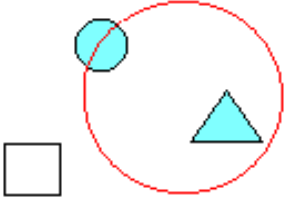
Function	Definition	Syntax	Example
	'HOUR', 'MINUTE', or 'SECOND'.		
MONTHSBETWEEN	Returns the number of months between two dates as a Double data type. If the first date is later than the second one, the result is positive. If the first date is earlier than the second one, the result is negative. If both dates are the same day of a month or are both the last day of a month, the result is an integer. Otherwise, it is the fractional portion of the result based on a 31-day month.	MONTHS- BETWEEN(Date_prop- erty,Date_prop- erty)	MONTHS- BETWEEN(Start_Date, End_Date) In this example, if Start_Date is March 1, 2007 and End_Date is April 1, 2007, MONTHSBETWEEN would return 1.

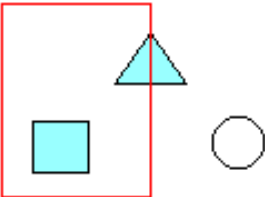
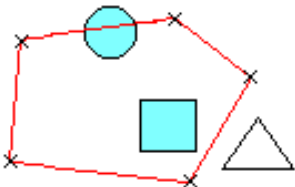
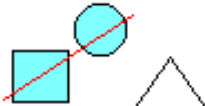

## Location Conditions

Location conditions are available from the Locate On Map menu. They filter or select data based on a location you specify in your map.

For example, you can find all roads within 100 meters of a power line, or all parcels within a specific section of the drawing.

In the following illustrations, the objects that are retrieved are highlighted:

Condition	Definition	Illustration
Inside Circle	Selects features entirely inside a circle drawn on the map.	
Inside Rectangle	Selects features entirely inside a rectangle drawn on the map.	
Inside Polygon	Selects features entirely inside a polygon drawn on the map.	
Touching Any Part Of Circle	Selects features touching a circle drawn on the map.	

Condition	Definition	Illustration
Touching Any Part Of Rectangle	Selects features touching a rectangle drawn on the map.	
Touching Any Part Of Polygon	Selects features touching a polygon drawn on the map.	
Touching Any Part Of Fence	Selects features touching a line drawn on the map.	
Touching Any Part Of Point	Selects features touching a point drawn on the map.	

## Options

When you create an expression for geospatial features, you can use the following types of options:

Type of Option	Definition	Example
<a href="#">Geometric Options</a> (page 225)	Ways to calculate length and area	Length, area
<a href="#">Conversion Options</a> (page 226)	Ways to convert values from one format to another	ToDate, ToDouble, ToFloat
<a href="#">Aggregate Options</a> (page 230)	Operate on a set of values	Average, Count, Standard Deviation

## Geometric Options

Geometric options are available from the Geometric menu. They calculate the length of lines and the perimeters or areas of polygons in a particular feature layer. These options perform calculations on fields in the data store, but the results of these calculations are not saved back to the data store. In AutoCAD Map, you can create a calculated field to store this information. These functions are available for every data provider except for raster, WFS, and WMS providers.

To use these options, select the object whose length or area you want, and then create the exact expression shown in the example that follows. Do not replace the argument `Geometry` with an actual value.

Option	Definition	Syntax	Example
LENGTH2D	Calculates the length of lines and perimeters of polygons	LENGTH2D(Geo- metry)	LENGTH2D(Geometry)
AREA2D	Calculates the area of a polygon	AREA2D(Geo- metry)	AREA2D(Geometry)

## Conversion Options

Conversion options are available from the Conversion menu. They convert strings from one format to another. These functions are available for every data provider except for raster, WFS, and WMS providers.

The functions TODATE and TOSTRING support [date formatting options](#) (page 228).

Option	Definition	Syntax	Example
NULVALUE	Evaluates two properties. If the first one is not null, NULVALUE returns the value for that property. Otherwise, NULVALUE returns the second property value.	NULL- VALUE(Text_Property, Value)	NullValue(Parcel_Owner, 'No Owner Listed') In this example, NULVALUE evaluates the value of Parcel_Owner. If it is null, it converts that null value to the string "no owner listed." If there is a value for Parcel_Owner, it returns the owner value.
TODATE	Converts a text string representing date/time information to a date object. The returned value has a DateTime data type. The text property provided must match the format provided. If it does not match, the conversion	TOD- ATE(Text_property, format)	TODATE(Purchase_Date, MM/DD/YYYY) In this example, the value for purchase date is converted to a date value with the format MM/DD/YYYY. If the purchase date value is November 2, 2002, it would convert to 11/02/2002.

Option	Definition	Syntax	Example
	does not take place. See <a href="#">Date Formatting Options</a> (page 228).		
TODOUBLE	Converts a numeric or text string to a double-precision, floating-point number.	TO- DOUBLE(Text_property)	TODOUBLE(Parcel_Value) In this example, the Parcel_Value value is converted to a text string.
TOFLOAT	Converts a numeric or text string to a single-precision floating-point number.	TO- FLOAT(Text_property)	TOFLOAT(Parcel_Value) In this example, the Parcel_Value value is converted to a string.
TOINT32	Converts a numeric or string expression to an int32.	TOINT32(Text_property)	
TOINT64	Converts a numeric or string expression to an int64.	TOINT64(Text_property)	
TOSTRING	Converts a numeric or date expression to a string using	TO- STRING(Date_property, format) or	TOSTRING(Parcel_Sale_Date, MM/DD/YYYY) In this example, if the value for Parcel_Sale_Date is January 12, 2007, it is converted to the text string 01/12/2007.

Option	Definition	Syntax	Example
	<p>an optional format you specify or</p> <p>Converts a numeric property to a text string (no format can be assigned). See <a href="#">Date Formatting Options</a> (page 228) for format options.</p>	<p>TOSTRING (Numeric_property)</p>	

## Date Formatting Options

The TOSTRING and TODATE [Conversion Options](#) (page 226) provide different formatting options.

### TOSTRING Formatting

TOSTRING takes a date value and creates a representation of it as a string. The optional format specification parameter defines the structure of the string to create. For example, if the date information is 1998-APR-02, you can format the resulting string as April 2, 1998.

You can use any combination in your format except the ones that return the number of a day or week within a year for a given date. For example, TOSTRING (1998-APR-02, 'MONTH DD, YY') returns the value APRIL 02, 98.

If you use a relational database management system, your data store may not be able to use its native (built-in) functions to execute the request. If this is the case, the program performs the conversion, which can take more time than if the data store did the conversion.

### TODATE Formatting Options

TODATE takes a string value representing a date or time and converts it to a date object. The optional format specification parameter defines the format used to represent the date in the string. For example, for a string containing

the date April 2, 1998 ,the format specification should contain Month DD, YYYY. The following table outlines the formatting options available:

<b>Abbreviation</b>	<b>Description</b>
YY	Defines the year as a two-digit number, for example, 07.
YYYY	Defines the year as a four-digit number, for example, 2007.
MONTH	Defines the month using its name in uppercase letters, for example, APRIL.
month	Defines the month using its name in lowercase letters, for example, april.
Month	Defines the month using its name with an initial capital letter, for example, April.
MON	Defines the month using its three-letter abbreviation in uppercase, for example, APR.
mon	Defines the month using its three-letter abbreviation in lowercase, for example, apr.
MM	Defines the month using its two-number abbreviation, for example, 04.
DAY	Defines the day using its name in uppercase letters, for example, FRIDAY.
day	Defines the day using its name in lowercase letters, for example, friday.
Day	Defines the day using its name with an initial capital letter, for example, Friday.
DY	Defines the day using its abbreviation in uppercase, for example, FRI.

Abbreviation	Description
dy	Defines the day using its abbreviation in lowercase, for example, fri.
DD	Defines the day using its two-number abbreviation, for example, 06.
hh24	Defines an hour using its number in the range [0-24].
hh12	Defines an hour using its number in the range [0-12].
hh	Defines an hour using its number in the default representation (by default, hh24).
mm	Defines minutes.
ss	Defines seconds.
ms	Defines milliseconds.
am pm	Uses the ante-meridiem (morning) and post-meridiem (after noon) specification. Noon is often called 12:00 p.m. and midnight 12:00 a.m., as at the beginning of a day. This format is considered only when used with the time range [1-12] (format hh12).

## Aggregate Options

Aggregate functions are not available from a menu. They operate on a set of values. These functions are available for every data provider except for raster, WFS, and WMS providers (which can use only the SpatialExtent function).

Option	Definition	Syntax	Example
AVG	Returns the average of the values as	AVG('all', Numeric_property)	AVG('all', Parcel_Value)

Option	Definition	Syntax	Example
	<p>a Double data type.</p> <p>You can specify an optional argument: ALL or DISTINCT.</p> <p>For example:</p> <pre>AVG(Id), AVG('all', Id), AVG('distinct', Id)</pre>		<p>This example finds the average of all parcels that have a Parcel_Value property, including the ones that are null or empty.</p>
COUNT	<p>Returns the number of rows as an Int64 data type.</p> <p>You can specify an optional argument: ALL or DISTINCT.</p> <p>For example:</p> <pre>COUNT(Id), COUNT('all', Id), COUNT('distinct', Id)</pre>	<pre>COUNT('optional_argument', Numeric_property)</pre>	<pre>COUNT('all', Parcel_ID)</pre> <p>This example counts all the rows containing a Parcel_ID property, including the ones that are null or empty.</p>
MAX	<p>Returns the maximum value with the same data type as the input parameter.</p>	<pre>MAX('optional_argument', Numeric_property)</pre>	<pre>MAX('all', Parcel_Area)</pre> <p>This example finds the largest parcel area value for all parcels containing a Parcel_Area property, including the ones that are null or empty.</p>

Option	Definition	Syntax	Example
	<p>You can specify an optional argument: ALL or DISTINCT.</p> <p>For example:</p> <pre>MAX(Id), MAX('all', Id), MAX('distinct', Id)</pre>		
MEDIAN	<p>Takes a numeric value and returns the middle value or an interpolated value that would be the middle value once the values are sorted. The returned value has the same data type as the input parameter. Represents an inverse distribution function that assumes a continuous distribution model.</p>	<pre>MEDIAN(Numeric_ property)</pre>	<pre>MEDIAN(Parcel_Value)</pre> <p>This example finds the median value for all parcels that have a Parcel_Value property. It includes parcels with null or empty values for Parcel_Value if it is a numeric property.</p>

Option	Definition	Syntax	Example
MIN	<p>Returns the minimum value with the same data type as the input parameter. The returned value has the same data type as the input parameter.</p> <p>You can specify an optional argument: ALL or DISTINCT.</p> <p>For example:</p> <pre>Min(Id), Min('all', Id), Min('distinct', Id)</pre>	<pre>MIN('optional_argument', Numeric_property)</pre>	<pre>MIN('all', Parcel_Area)</pre> <p>This example finds the area of the smallest parcel that has a Parcel_Area property, including the ones that are null or empty.</p>
SPATIALEXTENT	<p>Returns the smallest possible bounding rectangle of all geometries in a layer.</p>	<pre>SPATIALEXTENT(geometry)</pre>	<pre>SPATIALEXTENT(geometry)</pre>
STDDEV	<p>Returns the sample standard deviation as a Double data type.</p>	<pre>STDDEV(Numeric_property)</pre>	<pre>STDDEV(Parcel_Value)</pre> <p>This example finds the standard deviation among parcel values for all parcels with a Parcel_Value property, including the ones that are null or empty.</p>

Option	Definition	Syntax	Example
SUM	Returns the sum of the values as a Double data type. You can specify an optional argument: ALL or DISTINCT. For example: Sum(Id), Sum('all', Id), Sum('distinct', Id)	SUM('all', Numeric_property)	SUM('all', Parcel_Value) This example finds the total of parcel values for all parcels with a Parcel_Value property, including the ones that are null or empty.

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