Why Develop with the New MapGuide Technology?

The next generation of web mapping technology is now available from Autodesk, ready to provide a powerful distribution tool for your maps and spatial data. Why develop with the new technology? The answer may surprise you.

The new web mapping platform goes far beyond Autodesk MapGuide® 6.5 software, providing a completely new architecture, new programming language support, new data access methods, new viewing options, and a new authoring environment.

The new platform is available as open source software (MapGuide Open Source) and will soon be available as a commercial version (Autodesk MapGuide® Enterprise). For simplicity, the new product is referred to in this paper as "MapGuide." All concepts discussed here apply to both the open source and commercial versions of the new product. Autodesk MapGuide® Studio will be available separately.

This paper provides an overview of some of the features of the new MapGuide technology and its components. It describes the main components in a general way before moving into a more detailed description of each component and its benefits.

The new MapGuide technology can be installed, customized, and developed on multiple platforms, including the Linux® operating system. This paper discusses the opportunities to take advantage of multiplatform support and to connect to enterprise-wide systems.

MapGuide Components

The new MapGuide technology comprises four key components: MapGuide Server, MapGuide Studio, MapGuide Web Server Extensions, and the MapGuide Viewer, which provides two viewing options.
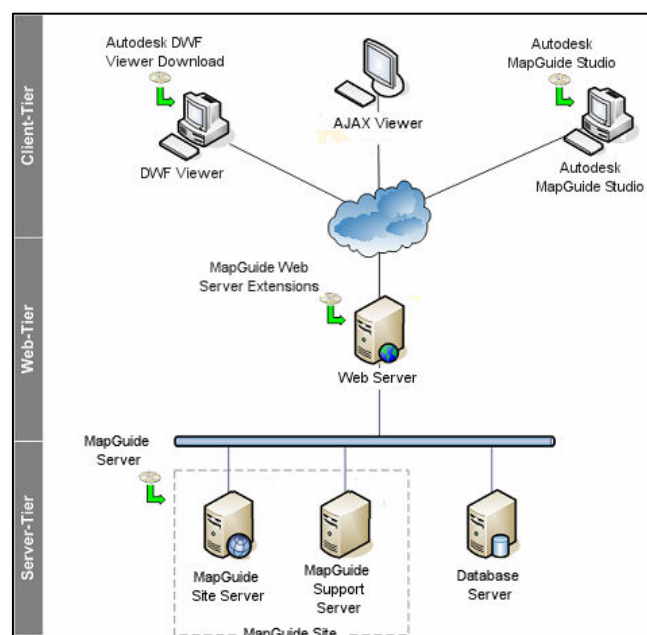
Why Develop with the New MapGuide Technology?

MapGuide Server

The new MapGuide technology runs on either the Microsoft® Windows® or Linux operating system. This flexibility opens up many possibilities, including an extremely low-cost enterprise mapping system on a Linux server, providing an attractive alternative to a Windows implementation. Regardless of which operating system you choose, the MapGuide Server component runs as a service that accesses data that is either on the server or linked to the server through Feature Data Objects (FDO), discussed later in this paper.

Web Server Extensions

The Web Server Extensions act as the Internet "wrapper" that enables you to communicate with the MapGuide Server. The web extensions provide a conduit for mapagent requests of the Autodesk MapGuide Enterprise application. There are three different types of web extensions:

- .NET
- Java™
- PHP 5.05+

The .NET interface is used primarily by those running Microsoft applications. You can communicate with the FDO Application Programming Interface (API) and retrieve maps from the Server on demand with tools such as Visual Studio® .NET and develop with C# or VB.NET.

The Java® Web Extension enables you to access the API and maps with Java Server Pages (JSP) regardless of operating system (Linux or Windows). Apache Tomcat is the Java server of choice when using the Java Web Extension. Since Apache Tomcat can be installed for either Linux or Windows, any code written in JSP that accesses the MapGuide API works in either environment.

PHP is widely used as web application framework and, like the Java Web Extension, works on both Windows and Linux servers. PHP (Hypertext Preprocessor) is open source, and its syntax is a blend of Java, Perl, and C languages. PHP can also be installed on either Linux or Windows servers, so the PHP code written to access MapGuide is portable to either operating system.

Note: The OpenGIS WMS and WFS services will also be available in all three languages.
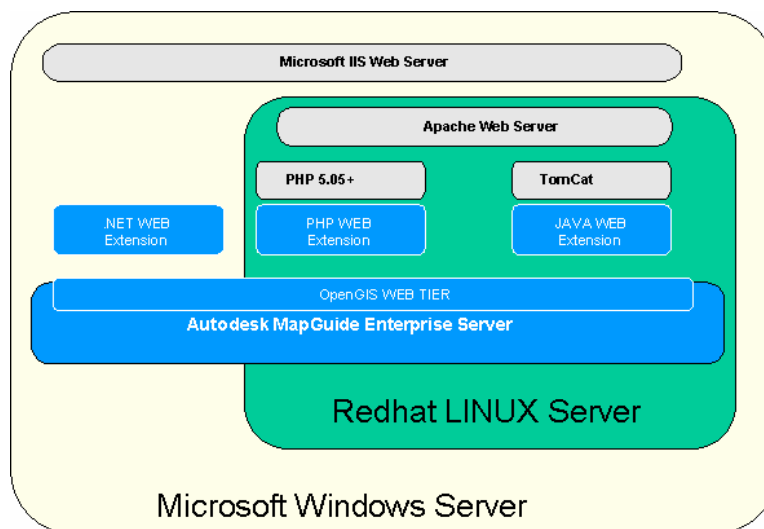
Top 10 New MapGuide Features That Autodesk MapGuide 6.5 Users Will Most Appreciate:

10. Linux server support
9. Full FDO API in three languages for advanced spatial queries
8. Server-side API for creating custom mapping applications
7. Web-based server administration
6. One-stop shopping for data loading, database links, and map publishing within Studio
5. Fast, HTML-based publishing from MapGuide Studio that does not require a plug-in
4. Division of labels and map tips from different sources
3. Direct connection to FDO data sources such as SDE, Oracle® Spatial, and OGC
2. Automated load procedures for putting data on the server with graphical user interface
1. Enhanced plotting, including DWF™ technology and attributes for offline and mobile usage

Why Develop with the New MapGuide Technology?

Autodesk MapGuide Studio

MapGuide Studio is an authoring environment used to consolidate data and produce publishable, web-based, printable maps. MapGuide Studio is a Windows-based application that acts as a thick client to MapGuide.

Each time you open MapGuide Studio, you are required to log in to an existing server using the mapagent.

You can publish maps to the web for viewing in two different ways:

- The Autodesk® DWF™ Viewer is a downloadable ActiveX® control that displays vector-based maps on Windows systems running either the Internet Explorer or Firefox® applications browser.

- The AJAX Viewer requires no download and delivers raster-based maps to almost any browser, including Safari.
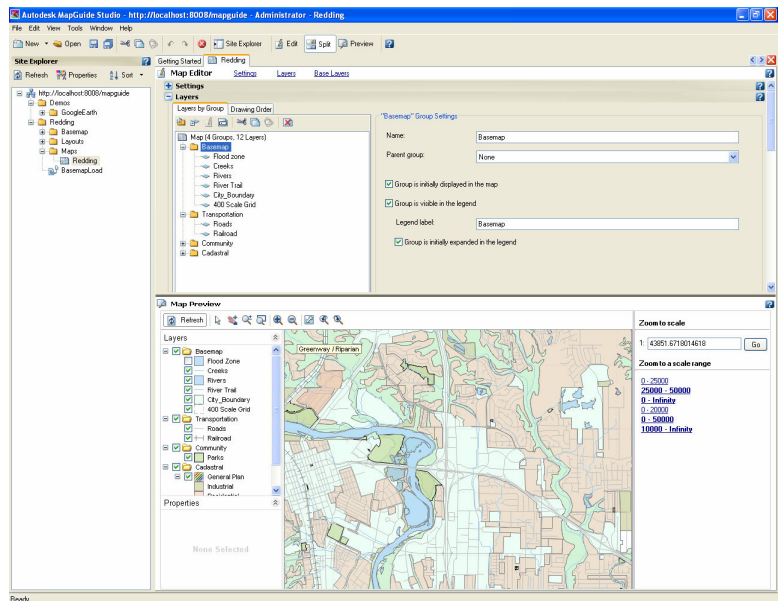
DWF Viewer

The best part of the new DWF Viewer is that it is now "streaming" information from the server. Since some geospatial data sets can be quite large (for example, the road network for the United States), it makes sense to provide a viewer that crops data to the window that the user is currently viewing. For example, if all you want is a road map for the city of Dublin, there is no need to download all the roads for Ohio. This intelligence means that you can now use one client, the DWF Viewer, to view all your design documents and stream live maps and data into the web browser without installing multiple plug-ins.
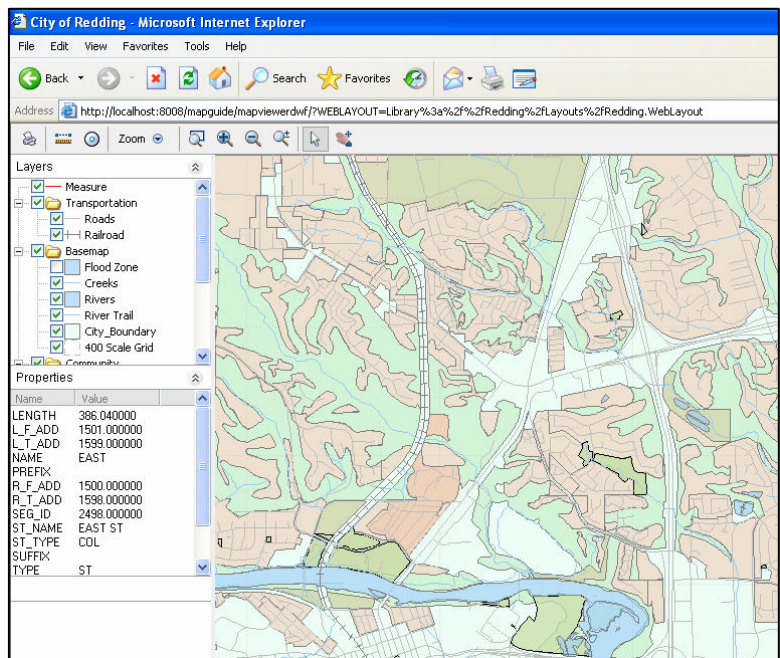
Why Develop with the New MapGuide Technology?

AJAX Viewer

Users who prefer to run browsers other than Internet Explorer, such as Firefox or Safari, can use the AJAX Viewer to view maps and spatial data. Using Asynchronous JavaScript and XML (AJAX) methodology, the AJAX Viewer uses JavaScript to generate dynamic mapping by consuming XML without having to reload the page. This interface looks almost identical to that of the DWF-based viewer yet has images rather than DWF files. IT managers will appreciate the AJAX Viewer because it conforms to environments that do not allow plug-ins and ActiveX controls to be installed on the local network.
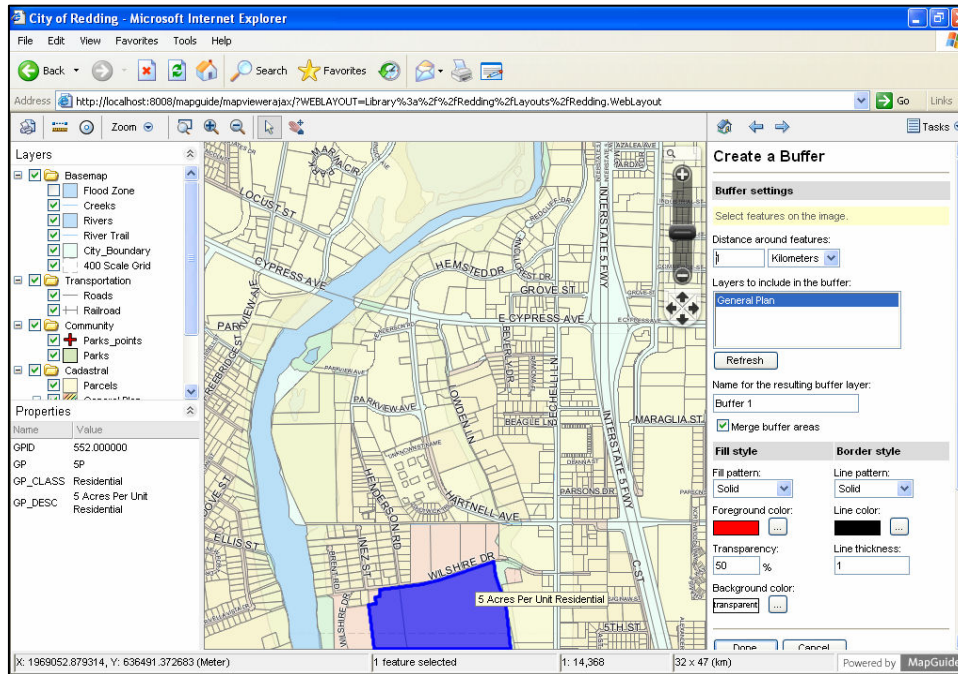
Sample AJAX Viewer Display

Autodesk MapGuide Studio: Simplicity in Web Map Publishing

Once you have decided which operating system to run on your server and which development language you prefer, you can then use Autodesk MapGuide Studio (available separately) to log on to your server.

The following example shows how to log into MapGuide Server from MapGuide Studio with the mapagent:

http://*servername*/MapGuide/

Note: The default username is *Administrator* and the default password is *admin*.

Once you log in to the server, you can manage your project remotely with Autodesk MapGuide Studio. You should be familiar with three key areas in the Studio environment:

- Site Explorer: The Site Explorer is where you can view all data and maps for your project. It is structured in a folder-based format for easy management.

- Edit Pane: The Edit Pane contains the details of the specific resource you want to create or modify.

- Preview Pane: The Preview Pane shows the results in a DWF window (or HTML only if requested).

The Split button displays the Edit and Preview panes simultaneously. This feature is handy for quick edits, but you may choose to work in the Edit pane for the bulk of your editing.
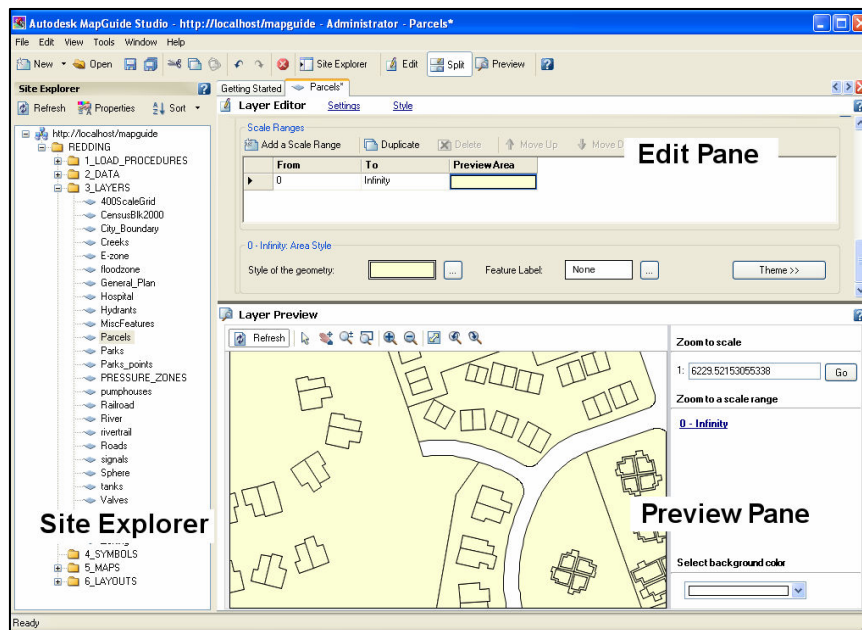
Site Explorer, Edit Pane, and Preview Pane in Autodesk MapGuide Studio

Why Develop with the New MapGuide Technology?

Data Organization for Autodesk MapGuide Studio

With MapGuide Studio the process of loading and connecting information to produce a - web-based map is simple as long as you follow one important rule: keep your data organized.

Since the new MapGuide technology typically hosts many applications, you must be able to navigate easily to the different components of your project.

There are four key processes that must be captured in your Site Explorer structure:

1. **Find data:**

    a. Load procedures that load vector data from Studio onto the Server.

    b. Directly connect to existing FDO data repositories.

2. **Build layers:**

    a. Set color and theming.

    b. Set labels, URLs, and map tips.

3. **Make a map:**

    a. Configure settings (e.g. coordinate system, color).

    b. Choose layers and display order.

4. **Place map on Internet:**

    a. Set toolbars and menus.

    b. Configure settings (e.g. title and initial view).

Before you begin step 1, you should create a workable environment to organize your data and maps. One way to organize with folders in Site Explorer is to organize your processes. For each project you may have all four steps broken out into logical folders.

An advantage of such a high level of organization is that you are better equipped to use the Studio API. For example, if you need to call a load procedure to refresh data (e.g. SHP or DWG file) on your server, it's easy to remember the folder paths.

Finding Data

You can directly load data to the server using several data types, including SDF, SHP, DWF, DWG, and DXF™ file formats and georeferenced images such as MrSID® and JPG.

Files loaded to the server go through Load Procedure. Each Load Procedure can be saved and reused to refresh the data on the server.

You may also connect directly to an FDO data source such as Oracle® Spatial or SDE. This connection does not require a Load Procedure because you connect directly to the data on the server. This method is recommended for corporate solutions, because the data is refreshed automatically when the corporate FDO repository is updated.
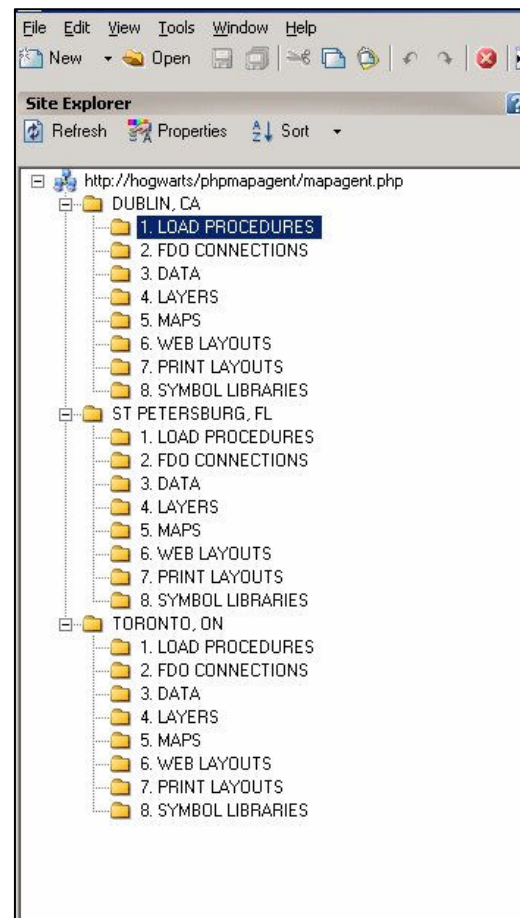
Why Develop with the New MapGuide Technology?

Build Layers

Once you have connected the FDO or loaded spatial data, you can then modify how it would look in each layer. If the data is vector (lines, points, polygons), you can theme the data based on some property (e.g. color-code parcels based on price). You can also create and use symbol libraries so that your points can appear anyway you choose. The supported symbol formats include BMP, JPG, EMF, WMF, PNG, and DIB.
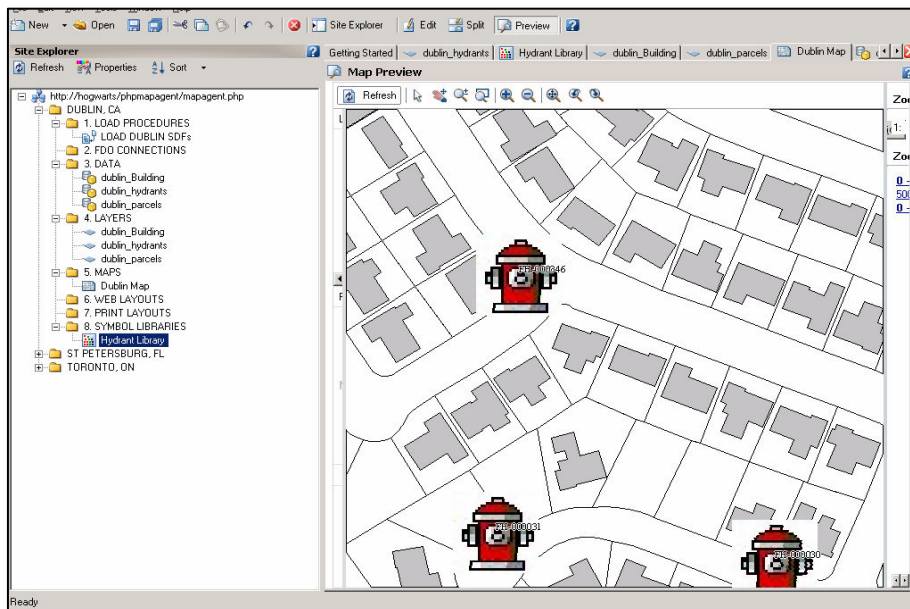
Make a Map

Once you have created layers and determined how they will be displayed, you can make a map. The map's coordinate system does not need to be the same as that of the layers, since you already assigned the coordinate system when you loaded or linked to the data. Within the map Edit Pane, you choose the layers for the map and what order they should be in.

Note: You can make many different maps using the same layer. If you change the source data or color of a particular layer, the change is reflected in all maps that use that layer. For example, if you had a parcel layer that was green and that was used in three maps, you could change the color of the layer to yellow, and all three maps would reflect that change to the parcels.

Overall, making maps is simple: just choose the layers you want to display and add them to the map. The layers are already stylized. The next step is putting the map on the Internet.

Why Develop with the New MapGuide Technology?

Place Map on Internet

To place a map on the Internet you have to create a web layout. Once you choose a map for your web layout, you can then choose which type of viewer you want to use: DWF Viewer or AJAX Viewer. Your choice depends on the end users of the maps. For example, if all the clients of this web site use Internet Explorer and can install the DWF Viewer, then you would use the DWF Viewer option. Otherwise, choose the AJAX Viewer so that users can see the map regardless of operating system or browser type.

In the web layout, you can modify what is viewed in three sections of the browser:

1. Left Pane: layers and properties.

2. Middle Pane: toolbar, context menu, status bar, and map.

3. Right Pane: task bar and pane.

With Autodesk MapGuide Studio you have full control over the toolbar and menus. You can use the dozens of pre-made functions, such as Zoom, Pan, and Select, or define your own button or menu item that calls a script or HTML. You can customize your interface to call your own reports or make custom GIS functional calls on the server using these custom menus and buttons.

Once you have created your web layout, you can simply link to it in the browser. For example:

```
http://hogwarts/phpmapagent/DwfViewer.php
?WEBLAYOUT=Library://DUBLIN, CA/6. WEB LAYOUTS/Dublin Web Layout.WebLayout
```
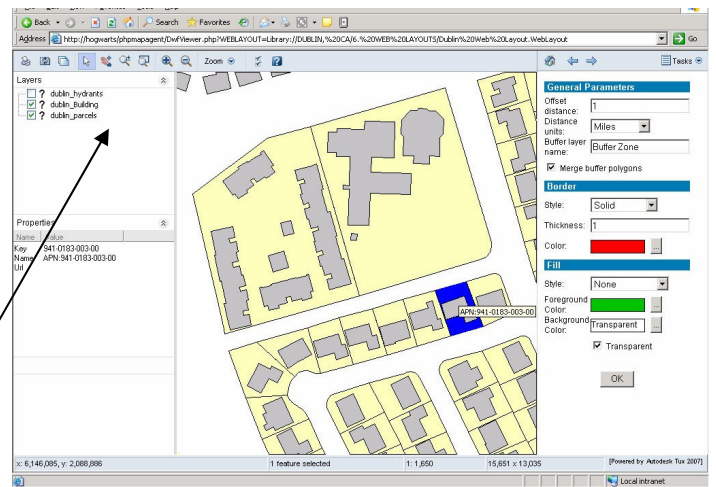
MapGuide and FDO: Powerful Enterprise GIS Connectivity

The Autodesk Feature Data Objects (FDO) is a set of application programming interfaces (APIs) for connecting Autodesk® products to various native data stores. For example, you can connect directly to Oracle Spatial and SQL Server (commercial version of MapGuide only), ArcSDE®, or the OpenGIS Web Map Service (WMS).

Although MapGuide Studio enables you to run load procedures to easily put your GIS files on the server for making maps, it is far more efficient to connect directly to your corporate GIS data stores without the need to upload to the server or translate files. FDO provides a single interface to all your corporate data, so that you can create layers and maps in Studio without having to refresh your data. It updates automatically within the system.

FDO and Oracle Spatial

You can use Oracle Standard Edition to store geographical data in Oracle Spatial. The spatial data objects (SDO) in Oracle can be

created, modified, and queried with FDO. The FDO connection can be used by Autodesk Map® 3D software to write data to the Oracle database, and then be used by Autodesk MapGuide Enterprise to create maps and query geographic and non-geographic data. If you are going to store your data in Oracle, you must ensure that the server is one of the following:

- Oracle Server 9i R2

- Oracle Server 10g

Also, you must use the Oracle 10g Client to connect to the Oracle Database.

Autodesk recommends that you use Autodesk Map 3D and the *SysAdmin.exe* tool for Oracle. Autodesk provides a System Administrator for FDO for Oracle so that you can set up your data store and its users.

The application is installed, by default, at `c:\Program Files\Common Files\Autodesk Shared\GIS\DFO\3.0\Oracle\SysAdmin.exe`.

Once you set up your data store in Oracle, you can load data into the data store in Oracle using Autodesk Map 3D. You can then easily use that data in Autodesk MapGuide Studio by directly connecting to that live data store.
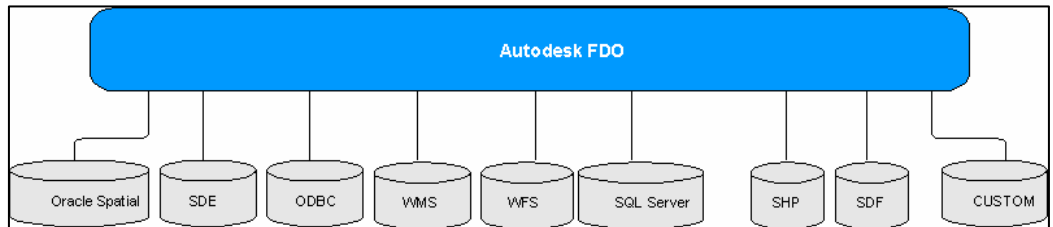
Note: Autodesk FDO SDK 2.0 Provider for Oracle and Autodesk FDO Provider for ArcSDE are included with Autodesk Map 3D 2006. Autodesk MapGuide Enterprise and Autodesk Map 3D 2007 use FDO SDK 3.0.

Why Develop with the New MapGuide Technology?

FDO and ArcSDE

The FDO can also connect to ArcSDE. Within your organization, you may have a data repository that is stored in ArcSDE. You may want to maintain some of that data using Autodesk Map 3D or view and maintain that data with Autodesk MapGuide Enterprise. The FDO for ArcSDE assumes that a data store already exists and that you want to connect to an existing environment, which is commonly the case. For this reason, there is no *SysAdmin.exe* interface as there is with Oracle Spatial.

You must have the ArcSDE client installed where Autodesk MapGuide Enterprise is installed, so that the Autodesk FDO Provider for ArcSDE can communicate with the ArcSDE Server. The ArcSDE Server may be installed on Oracle, Microsoft SQL Server, or IBM® DB2, yet the FDO Provider for ArcSDE requires only a connection to the SDE client.

FDO and ODBC

Open database connectivity (ODBC) is one of Microsoft's many ways of connecting to a wide range of databases and platforms. The Autodesk FDO Provider for ODBC provides FDO with access to an ODBC-based data store. This FDO Provider is used to access simple X, Y, and Z features. The X, Y, an optionally Z columns in a database table are used to render the feature through FDO. Autodesk MapGuide Studio can create the metadata that maps the table name, X, Y (and optionally Z) columns.

The ODBC FDO Provider is read-only so that the X, Y, and Z columns must be populated in another way, such as a global positioning system (GPS) data collection or custom third-party application.

Note: The schema configuration of the data store is provided to FDO Provider for ODBC through an optional XML file containing the geographic markup language (GML) version that can map the tables and columns of the features.

The new MapGuide technology offers a significant advantage when working with point data that comes from ODBC in the form of X, Y, Z columns: it can re-project from coordinate systems. For example, if you collected GPS points and stored them in a Microsoft® Access database in UTM (Universal Transverse Mercator), you can project those points on your map, even if your map is in State Plane coordinates.

FDO and OGC

Open Geospatial Consortium (OGC) Web Map Service (WMS) is an image-based service that renders geographic data in a standard way to the client as an image. WMS images are viewed as PNG, GIF, or JPEG. The FDO Provider for WMS renders the information that comes from an OGC Web Map Service. The data viewed in MapGuide is raster (image) but is georeferenced in an appropriate coordinate system.

The FDO for WMS is primarily a read-only connection that queries maps and map information and renders it as images in Autodesk MapGuide Studio.

Why Develop with the New MapGuide Technology?

Web Feature Services (WFS) enables a user to retrieve feature data in Geography Markup Language (GML). WFS is a neutral OGC environment that allows MapGuide to consume WFS from any WFS Server with FDO.

Autodesk MapGuide Studio can consume both WMS and WFS. In addition, both can be published from the web-based MapGuide Site Administrator.

Future FDO Providers

Autodesk will continue development of direct FDO Providers to databases and GIS data stores. The need to translate and batch convert data sets from one format to another will soon be a thing of the past, as Autodesk develops FDO Providers that connect to live enterprise data stores.

Autodesk Map 3D 2007 and FDO

Autodesk Map 3D inherently supports feature classes and, more recently since Autodesk Map 3D 2006, feature sources. The FDO Providers that are available to Autodesk MapGuide Enterprise will also be available to Autodesk Map 3D. Using Autodesk Map 3D, most of the corporate and enterprise data that is stored within an organization can be maintained through the FDO Providers.

With both Autodesk Map 3D and the new MapGuide technology, the corporate data stores within an organization are centrally managed. This combination of products enables any organization to use existing technologies and databases without having to translate or re-engineer existing applications. All data management, queries, and analysis can occur through the FDO Providers directly with Autodesk products.

A good example of FDO Providers at work can be seen in a local government environment. For example, an Engineering Department stores the bulk of its data in Oracle Spatial with Autodesk Map 3D. This department also maintains the Single Line Street Network (SLSN), which is housed in another department in ArcSDE. Using FDO, the Engineering Department can connect directly to the ArcSDE data store and continue to maintain the SLSN with Autodesk Map 3D.

Why Develop with the New MapGuide Technology?

In this example, multiple departments can work together regardless of the spatial technology each department uses to store the data. This distribution of data stores has historically posed a problem, but with MapGuide and the FDO Providers, each data store is connected with ease. A web-based map is available to the whole network without laborious data translation or batch files.

In addition to directly connecting to live FDO data sources, the maps you create in Autodesk Map 3D can be published directly to MapGuide. Potentially you could use Autodesk Map 3D not only as the place to create and edit your data, but as a tool to publish your data as well.
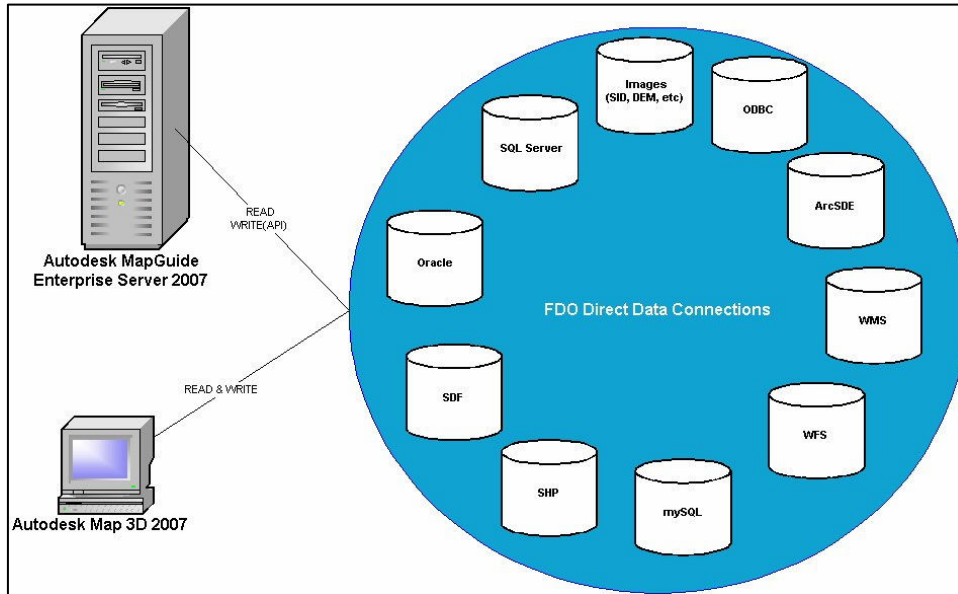
Autodesk Map 3D and MapGuide work seamlessly together to provide a complete solution regardless of the back-end data store you decide to use.

MapGuide Web Server Extensions: Multiplatform Support

.

Having the flexibility to choose whether to implement MapGuide with a Microsoft Windows Server or a Red Hat® Linux Server frees you from being forced to develop in an environment that is counter to your business needs. For example, if an engineering firm primarily uses Firefox browser and Red Hat Linux Server, you would not want to force the company to use Internet Explorer and Microsoft Windows Server because that was the only environment your application could be developed in. This would force the organization to:

- Rethink the use of that application.

- Pursue a technology they are not familiar with.

Either way, the success of the project could be in jeopardy because of a difference in technological philosophy. Fortunately, the new MapGuide technology enables you to choose the operating system and development tools most appropriate for your organization's needs.

APIs for MapGuide

There are many APIs for developing with MapGuide. If you want to customize or automate any aspect of the Autodesk MapGuide Studio, the API is available. If you want to access any aspect of the feature geometries, you can use the FDO API to change, manipulate, re-project, or analyze the features.

The following APIs are available for developers:

Resource Service	Enables you to manipulate repositories and resources. Can also be used for loading data.
Feature Service	Provides access to FDO providers.
Mapping Service	Provides access to maps and to layers within a map.
Drawing Service	Allows low-level access to drawing sources. Can manipulate DWF files.
Rendering Service	Renders a map into a bitmapped image. This image is typically used for display in the HTML Viewer.
Coordinate System	Supports coordinate system transformations.
Geometry	Manipulates geometric objects.
Site Service	Configures users, groups, and user sessions.

Since much of MapGuide and Autodesk MapGuide Studio is driven by XML, including the resource definitions, settings, and layer display configurations, much of the development must be done in applications that can use the Document Object Model (DOM) for XML and that can instantiate and control the APIs.

Why Develop with the New MapGuide Technology?

The following three web development environments are represent the three mapagents that are already developed for MapGuide and have development examples included in the product:

- PHP 5

- JAVA (JSP)

- ASP.NET

Developing with PHP 5

PHP is a -server-side, web-based scripting language that runs on many platforms, including

- Linux (e.g. Red Hat®, Fedora®)

- Microsoft Windows

- Unix® e.g.,(Solaris™)

- Mac® OS® X

Since PHP is open source, you do not have to purchase this language. Since it is constantly being revised and debugged, you can be confident that it is robust. It works on most web servers, including Apache, Microsoft Internet Information Server (IIS), Netscape® and O'Reilly.

The Autodesk MapGuide Enterprise Site Administrator is written in PHP. This administration tool is installed when you install the Web Extensions.

If you choose to install the PHP mapagent, you can use it to call different aspects of the Autodesk MapGuide Enterprise API using PHP.

The following is an example of accessing a map session from Autodesk MapGuide Enterprise within PHP:

```php
<?php
  include 'AppConstants.php';

 MgInitializeWebTier ($configFilePath);

  $userInfo = new MgUserInformation("Administrator", "admin");
  $site = new MgSite();

  $site->Open($userInfo);

  $HTTP_SESSION_VARS['MgSessionId'] = $site->CreateSession();
  $mapDefinition = "Library://DUBLIN, CA/5. MAPS/Dublin Map.MapDefinition";
  $webLayout = "Library://DUBLIN, CA/6. WEB LAYOUTS/Dublin Web Layout.WebLayout";
?>

<frameset rows="110,*" frameborder="NO" border="0" framespacing="0">
 <frame src="Title.php?AppName=Sample Application" name="TitleFrame" scrolling="NO" noresize>
 <frame src="/PhpMapAgent/DwfViewer.php?SESSION=<?=
$HTTP_SESSION_VARS['MgSessionId'] ?>&WEBLAYOUT=<?= $webLayout ?>"
name="ViewerFrame">
</frameset>
```
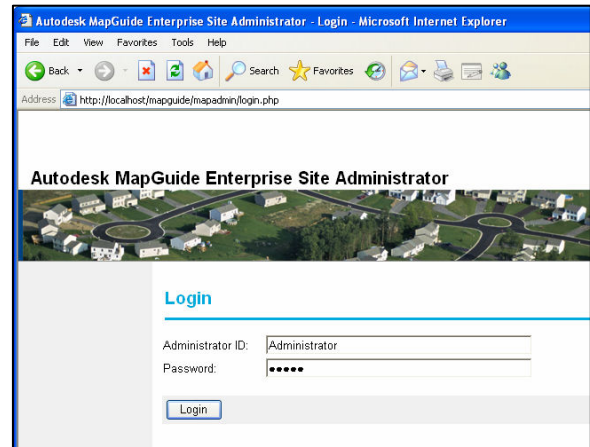
Note: The Library on the server at *Library://DUBLIN, CA/6. WEB LAYOUTS/Dublin Web Layout.WebLayout* is used. This is the web layout created in Autodesk MapGuide Studio.

Why Develop with the New MapGuide Technology?

Example of Instantiating Map with PHP:

$map = new MgMap();

$map->Open($resourceService, 'Dublin Map');

Since the API for Autodesk MapGuide Enterprise is robust, you can use PHP to upload data or link to FDO, create layers with the new information, and then create a map and add that map to the web layouts. The entire process viewed in Autodesk MapGuide Studio could be automated with the API.

Developing with Java

The mapagent installed with the MapGuide Web Server Extensions is a Java Server Page (JSP) called *mapagent.jsp.* Developed by Sun Microsystems, JSP is a web server scripting agent that communicates requests to the server. JSP is compiled on the server side as a servlet, as opposed to an applet (a java application that runs on the client). JSP can communicate with existing servlets and Java servlets that are on the server.

To run JSP pages, you need a web server that is capable of running Java. The most common is the Apache Tomcat Server. Tomcat is another open source application that can be downloaded for free from http://tomcat.apache.org and installed on either Linux or Windows. If you are using Windows or you are running Tomcat in parallel with another web server, you might choose an alternative port when installing it. For example, you may install Autodesk MapGuide Enterprise Web Extensions and use the Java mapagent. It might be found at :

http://hogwarts:8080/JavaMapAgent/MapAgent.jsp

Example of Instantiating Map with JSP:

```
<%@ page import="Mg.*" %>
<%@ page import="MgApi.*" %>
  MgMap map = new MgMap();
  map.Open(resourceService, "Dublin Map");
```

All the API calls in MapGuide are also available with the Java Web Server Extension.

Developing with ASP.NET

Active Server Pages (ASP) .NET is based on the Microsoft .NET Framework. This programming framework is installed on a Microsoft Windows operating system. Unlike PHP or Java, .NET works only with Microsoft IIS. Using the Microsoft Web Services that .NET provides, you can create many server-side custom applications in a Microsoft environment.

ASP.NET can be programmed in many scripting languages:

- C# (C Sharp)

- VB

- JScript

ASP.NET developers usually choose between C# or VB.NET. Using development tools such as Microsoft® Visual Studio® .NET, or Microsoft® Visual Basic® .NET, you can easily put together complex applications using the WYSIWYG (what you see is what you get) features of an Integrated Development Environment (IDE).

Why Develop with the New MapGuide Technology?

The MapGuide Web Server Extensions come with an ASP.NET mapagent as well. The sample files that are bundled with the Web Server Extensions are developed in C# .NET but any of the .NET scripting languages that are compatible with ASP.NET can be used to develop applications.

Example of Instantiating Map with ASP.NET:

```
<%@ Import Namespace="Mg" %>
<%@ Import Namespace="MgApi" %>
 MgMap map = new MgMap();
 map.Open(resourceService, "Dublin Map");
```

Note: Although not formally supported, Adobe's Macromedia® ColdFusion® application could be used to customize MapGuide through its ability to instantiate server-side objects and call other applications. For example,

```
<CFOBJECT ACTION="CREATE" NAME="myMap" CLASS="MgAPI.MgMap">
```
<CFSET myMap.Open(resourceService, "Dublin Map")>

Potential Applications with MapGuide

With so much of the API available for development, including coordinate systems, user security, load procedures, and FDO Providers, the opportunities for development are endless.

MapGuide: The Complete Mapping Package

MapGuide is a great all-in-one application to load your data, author each layer (thematically if you wish), and create dynamic maps for publishing. Autodesk MapGuide Studio enables you to log on to the server and upload files with the Load Procedures and link to existing data with FDO. There's no need to translate data and then use File Transfer Protocol (FTP) or network logins because the Studio user can be anywhere that has a web connection to the server.

You can manage all your data layers and organize them into appropriate maps. You can choose which maps should be published to the web with web layouts. You can also choose how to print the maps with the print layout. Publishing to the web is easy. The final web layout can use the DWF Viewer, or you can simplify your rollout with the HTML web layout.

Autodesk MapGuide Studio enables you to publish your data on either Microsoft Windows or Linux servers, thus opening up most enterprise Internet infrastructures to your data solution.

Finally, with the ability to develop in three key web-based languages, PHP, Java and ASP.NET, you can take your published maps to the next level and add new functionality and uses to your published data.

Why Develop with the New MapGuide Technology?

So why develop with the new MapGuide technology? For the following reasons:

- Use your preferred development environment: PHP, Java, or ASP.NET, with the same declarations between APIs.

- Use an intuitive, developer-friendly authoring environment to manage all aspects of collecting, preparing, and publishing spatial data.

- Use flexible viewing options to deliver maps and applications to almost any browser.

- Get direct data access to several industry-standard geospatial formats and databases using FDO.

- Deliver OpenGIS-compliant information using WMS and WFS.

- Administer servers remotely using a web browser.

- Load your data, author and stylize each layer, preview and publish maps quickly and easily using a single tool.

The answer is clear.

Autodesk