Autodesk® Topobase™

Autodesk® Topobase™ Developer's Guide

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Introduction 1

What This Guide Covers

This guide describes how to use the Autodesk Topobase API and associated sample code.

It assumes you have read applicable ReadMe files, reviewed appropriate application Help (as needed), and are familiar with using Autodesk Topobase Client or Autodesk Topobase Web. All examples also assume that you have installed the sample data and sample applications supplied with Autodesk Topobase Client, which are included with the default installation package.

For more detailed information about the individual APIs, see the appropriate *Autodesk Topobase API References* located in the *<topobase>\Help* directory:

- Topobase_Client_API.chm
- Topobase_Modules_API.chm
- Topobase_ServerSide_API.chm

NOTE The API reference documentaiton is also available in Microsoft Help 2 format from inside Visual Studio (F1).

For more information about administration tasks for Autodesk Topobase, such as creating and editing data models, setting up users and application options, or customizing feature class forms, see *Autodesk Topobase Administrator Guide*.

What is Autodesk Topobase?

Autodesk Topobase is an infrastructure asset management solution that provides centralized, flexible, and secure access to spatial information for planning, design, operations and business teams. Built on AutoCAD Map 3D, Autodesk MapGuide Enterprise, and Oracle software, Autodesk Topobase helps you see the big picture and make better decisions by integrating CAD, map, asset, GIS and customer information for a more comprehensive view of your infrastructure.

Autodesk Topobase Plugins

Plugins play an important role in Autodesk Topobase. They allow you to extend and customize Autodesk Topobase to fit the needs of your organization. For example, they enable customization of the user interface, create and update data models, provide management of workspaces, and control how users interact with documents and workspaces.

In fact, many of the Autodesk Topobase components are plugins created by Autodesk developers. It enables developers to extend Autodesk Topobase for their own needs. To create your own plugin, you need to create a *.dll* with one or more plugin classes in it and create a *.tbp* file, which lists the plugin classes available in the library. See TBP File Format (page 353) for more information.

Preparing to Run the Examples

Autodesk Topobase provides over 80 samples demonstrating many different kinds of plugins and showing how to perform simple tasks using the API. These are provided as Microsoft® Visual Studio® 2008 projects in both C# and Visual Basic formats.

The section Developer Samples (page 179) describes how to compile, install, and run the samples, and gives a brief description of what each sample does. The samples are numbered, but since obsolete samples have been removed the numbers are not always consecutive. Unless otherwise stated, all the samples can be run in both Autodesk Topobase Client and Autodesk Topobase Web Client.

Creating Your First Plugin

Quick Guide: Creating a Topobase Plugin (page 75) describes how to code, configure, and run a simple C# or Visual Basic user interface plugin project. The process creates an Autodesk Topobase plugin that generates the familiar "Hello World" output. This basic instruction provides a foundation for using and creating other plugins and for exercising and customizing the many sample applications provided.

Autodesk Topobase and Visual Studio

Installing Project and Item Templates

Autodesk Topobase includes a project template for creating stand-alone plugins in Visual Studio 2008. It also includes a series of item templates for adding new workflows, update plugins, user interface plugins, and other classes and forms to an application module project or stand-alone plugin project.

Installing the Plugin Project Template

Autodesk Topobase includes a generic project template for creating stand-alone plugin projects in Visual Studio 2008. To install it, copy the project template named *CSSimpleTopobasePlugIn.zip* from the *<Topobase install directory>\Development\VS Templates\ProjectTemplates\Topobase* directory to the Visual Studio custom template directory (usually *My Documents\Visual Studio 2008\Templates\ProjectTemplates\C#*).

To create a stand-alone plugin project using the template:

1. Start Visual Studio.
2. Click File ➤ New ➤ Project.
3. In the New Project dialog box, select the Visual C# Project Type.
4. Select SimpleTopobasePlugIn from the list of templates and create a project.
5. Once the project has been created, check the project references to make sure that the references to the Autodesk Topobase libraries are valid.

Installing the Item Templates

Item templates provide a quick and standardized means to create Autodesk Topobase specific classes and forms.

Plugins can use regular Windows forms and user controls to interact with the user. However, any plugin that uses these will only work in the desktop environment and will not work in the Autodesk Topobase web client. To create user interface elements that are usable in both environments, you can use form templates provided by Autodesk Topobase in your projects. These forms are limited to the controls provided in the *Topobase.Form.dll* library.

To install the templates, copy the item template files (which are all *.zip* compressed files) from the *<Topobase install directory>\Development\VS Templates\ItemTemplates\Topobase* directory to the appropriate Visual Studio custom template directory (usually *My Documents\Visual Studio 2008\Templates\ItemTemplates\Visual C#* and *My Documents\Visual Studio 2008\Templates\ItemTemplates\Visual Basic*).

To add Autodesk Topobase forms to your project:

1. Click Project ➤ Add New Item.
2. From the list of available templates in the My Templates section, select the appropriate plugin component type.

The following is a list of the types of items available:

- **DocumentPlugIn** - Creates an class of type `Topobase.Forms.DocumentPlugIn`. This serves as the base for user interface plugins which deal with individual documents. For more information, see Creating a Document Plugin (page 139).
- **StructureUpdatePlugin** - Creates an class derived from the abstract class `Topobase.Update.DocumentStructureUpdatePlugIn`. The structure update plugin provides an interface to the data model definitions and provides a mechanism for updating the data model when the data model is modified. For more information, see Creating the Structure Update Plugin (page 88).
- **StructureUpdateVersion** - Creates an class derived from the abstract class `Topobase.Update.StructureUpdateVersionBase`. The data model is defined in a series of update version classes. Each time you change the data model you will add a new StructureUpdateVersionBase-derived class which codifies the changes between the previous version and the latest version. For more information, see Creating an Update Version Module (page 92).

- **TopobaseApplicationForm** - Creates a standard form with title bar based on the `Topobase.Forms.ApplicationForm` class. These forms are used to create dialog boxes for user interface plugins.
- **TopobaseApplicationOptionPage** - Creates a user control based on the `Topobase.Forms.OptionPages.ApplicationOptionPage` class. These are used to add new pages to the Autodesk Topobase Application Options dialog box. For more information, see Creating Option Pages (page 166).
- **TopobaseDocumentFlyIn** - Creates a user control based on the `Topobase.Forms.FlyIns.DocumentFlyIn` class. These serve as the container for the controls in a document flyin. For more information, see Creating a Document Flyin (page 149).
- **TopobaseDocumentForm** - Creates a standard form with title bar based on the `Topobase.Forms.DocumentForm` class. These forms are used to create dialog boxes for user interface plugins.
- **TopobaseDocumentOptionPage** - Creates a user control based on the `Topobase.Forms.OptionPages.DocumentOptionPage` class. These are used to add new pages to the Autodesk Topobase Document Options dialog box. For more information, see Creating Option Pages (page 166).
- **TopobaseUserControl** - Creates a user control based on the `Topobase.Forms.UserControl` class. These user controls are used for embedding controls within an Autodesk Topobase user interface element. For example, a workflow might use a user control within the Autodesk Topobase task pane.

Installing User Controls

Autodesk Topobase includes a number of controls for use in Autodesk Topobase forms, some of which replicate standard Windows user control and some of which are unique to Autodesk Topobase. To add Autodesk Topobase controls to the Visual Studio Toolbox:

1. In the Toolbox, right-click and click Choose Items.
2. In the Chose Toolbox Items dialog box, click Browse.
3. From the Autodesk Topobase Client */bin/* directory, select *Topobase.Forms.dll*.

New and Changed API Content in Topobase 2011

2

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This topic provides a brief overview of some of the important changes to the Autodesk Topobase 2011 application programming interface (API).

For more information about new and changed API content in previous releases, see *Autodesk Topobase Client API Help* (Topobase_Client_API.chm).

Structure Updates

In previouse releases of Autodesk Topobase, the developer had to use the API directly in C# or VB.NET in order to alther the structure data model. In Autodesk Topobase 2011, a new Topobase Structure Editor tool has been introduced that stores the structure as XML files. This enables a developer, or administrator or product designer, to easily customize the structure, thus introducing a more simplified method and adding much more flexibility.

An administrator can use the Topobase Structure Editor to create, update, and deploy specific data models, which provide

- new data models that are based on company specific or existing industry-specific data models.
- custom modules or extensions based on existing Topobase data models.
- modification of a standard Topobase data model to suit a particular country (country kit).

The Topobase Structure Editor creates XML files (**.genx* Data Model Files) that can be shared with other companies. You apply the Data Model files in the Topobase Administrator module to update, or to create data model structures.

For more information about the Structure Editor, see the Topobase Structure Editor topic in the *Autodesk Topobase Administrator Guide* (TopobaseAG.chm).

Structure Update PlugIns

The Document property cannot be used anymore. Use the TBConnection for database operations. The reason why this property is not supported anymore is that structure updates are now enabled in the Server Administrator, which cannot provide a Document instance due to performance reasons.

Derived classes of Topobase.Update.DocumentStructureUpdatePlugIn

A new property which should be overridden:

```
/// <summary>
/// Gets the prefix of the caption, which is used when a caption
of
/// the same type already exists. For example, a topic with the
/// caption 'Topology' was created by another module. When we
/// now try to create our own 'Topology' topic with another name,

/// we have to choose another caption otherwise it would fail due
/// to unique constraints. The structure update process uses this

/// property and adds it before the caption to avoid such con
flicts.
/// For our example,
/// we get now 'Exists already Topology' for our topic caption.
/// Structure update plug-ins can overwrite this property, which
/// allows to create a better caption (e.g. Electric Topology).
/// </summary>
public override string CaptionPrefixFallback
{
 get { return "DEMO "; }
}
```

NOTE The `GetVersions()` method is now implemented in the DocumentStructureUpdatePlugIn class. Sub classes do not need to implement it anymore.

Topobase.Update.StructureUpdateVersionBase

Topobase.Update.StructureUpdateVersionBase has been renamed to Topobase.Update.*Document*StructureUpdateVersionBase.

XML-Based Data Models

Overview

XML-based data models are defined in an XML file, which contains all necessary information to create a data model in Autodesk Topobase. It also contains version steps to support updating of existing data models. The XML file is edited with the new Topobase Structure Editor application (*Topobase.StructureEditor.exe*) , which is part of Autodesk Topobase Administrator.

For more information about the Structure Editor, see the Topobase Structure Editor topic in *Autodesk Topobase Administrator Help*.

Advantages (over the old update method):

- Partners and customers can create their own data models and enhance our data models (= data model extension) with the Structure Editor.
- Simplest data models (and data model extensions) works with a .genx file only. No programming is required

Supported Features

- Topics
- Feature classes (including label feature classes)
- Label definitions
- Model feature class
- Domain tables (including domain entries)
- Views (only for feature classes)
- Ordinary tables (not feature class nor domain table)
- Attributes (of a feature class or a table)
- Relations
- Topologies
    - Area Topology

    - Logical Topology

- Utility models
- Intersections
- Indexes (Only special cases have to be specified)
- Sequences
- Rows of tables (basic data exchange support)

Unsupported Features

- Feature rules
- Workflows
- Job Templates
- Data Checker Definitions
- Feature Search
- Reference rows
- *(Everything else not specified here)*

NOTE If a structure update requires creating, updating, or deleting an unsupported feature, the developer must use conventional structure update steps (for example, programmed in C#).

Important Rules

During development, Autodesk found some rules that are **extremely** important to follow. Otherwise, the process may fail:

- All structure changes must be done in the *.genx* file.
- All string resources must be stored in the *.genx* file.
- The generated resource file must not be updated manually.

If an update cannot be done in the *.genx* file completely then a 'before' or 'after' update event should be implemented (for example, rename a feature class).

Using conventional version updates are valid, however, the *.genx* file opened in the Structure Editor, must represent the data model **100%** (not 99%).

Example Project

An Autodesk Topobase module (for example, Land CH) may contain the following parts in the Visual Studio project (Visual Studio File Tree):

```
Root
+ ...
+ DataModel
 + CreateOrReplaceWorkflows.cs
 + MyDataModel.genx
 + MyDBResources.resx
 + StructureUpdatePlugIn.cs
 + Version10003.cs
+ ...
```

MyDataModel.genx

The *.genx* file contains the XML data model. It is created with the Structure Editor. Either a developer or a product designer creates and updates this file. In the Visual Studio project, it is added as an Embedded Resource. With this option, the compiler copies the file into the assembly. Later, it can be load again out of the assembly.

Example XML:

```
<?xml version="1.0" encoding="utf-8"?>
<StructureVersioning
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xmlns:xsd="http://www.w3.org/2001/XMLSchema">
 <Version>1.0.0</Version>
 <DataModelCode>100.0.0</DataModelCode>
 <Description Key="versionGraph100_0_0">Test Data Model</Descrip
tion>
 <LocalizationResourceFileName>MyDBResources.resx</
LocalizationResourceFileName>
 <ModifiedBy>weibelt</ModifiedBy>
 <ModifiedDate>2009-11-23T15:08:40.3075805+01:00</ModifiedDate>
 <MaxUpdateVersion>1.0.1</MaxUpdateVersion>
 <UpdateVersions>
 <UpdateVersion Version="1.0.0">
 <Description>New version 1.0.0</Description>
 <Topics>
 <Topic Operation="Add" Name="TOPIC_92802">
 <FeatureClasses>
 <FeatureClass Operation="Add" Name="FEATURE_CLASS_1" Type="Point">
 <Attributes>
 <Attribute Operation="Add" Name="ATTR_1" Type="Number" Preci
sion="10" Scale="0" Nullable="true" />
 </Attributes>
 </FeatureClass>
 </FeatureClasses>
 </Topic>
 </Topics>
 <DomainTables>
 <DomainTable Operation="Add" Name="WW_FUNCTION_TBD">
 <DomainEntries>
 <DomainEntry Operation="Add" Id="1" Active="true">
 <Value>Unknown</Value>
 </DomainEntry>
 <DomainEntry Operation="Add" Id="2" Active="true">
 <Value>Main Section</Value>
 </DomainEntry>
 </DomainEntries>
 </DomainTable>
 </DomainTables>
 </UpdateVersion>
 <UpdateVersion Version="1.0.1">
```

```
 <Description Key="updateVersion1_0_1">New version 1.0.1</Descrip
tion>
 <Topics>
 <Topic Operation="None" Name="TOPIC_92802">
 <FeatureClasses>
 <FeatureClass Operation="None" Name="FEATURE_CLASS_1"
Type="Point">
 <Attributes>
 <Attribute Operation="Update" Name="ATTR_1" Type="Number" Preci
sion="10" Scale="0" Nullable="false" />
 <Attribute Operation="Add" Name="ID_TYPE" Type="Number" Preci
sion="10" Scale="0" Nullable="true" />
 </Attributes>
 </FeatureClass>
 </FeatureClasses>
 </Topic>
 </Topics>
 <DomainTables>
 <DomainTable Operation="None" Name="WW_FUNCTION_TBD">
 <DomainEntries>
 <DomainEntry Operation="Add" Id="3" Active="true">
 <Value>Street Water</Value>
 </DomainEntry>
 </DomainEntries>
 </DomainTable>
 </DomainTables>
 </UpdateVersion>
 </UpdateVersions>
</StructureVersioning>
```

NOTE This example file contains two versions, each of them creates some objects in the database. Note that Version 1.0.1 contains `Nullable="false"`, which is different from the previous version. The XML attribute `Operation=""` specifies the operation to be done later during the structure update.

StructureUpdatePlugIn.cs

The plugin is similar to the plugin used for the old style update plugins. The base class has been changed, however, to XmlBasedDocumentStructureUpdatePlugIn. Some methods must be implemented to define the reference to data model specific resources (that is, the *.genx* file).

Example file:

```
using System;
using System.Collections.Generic;
using System.IO;
using Topobase.Data;
using Topobase.Sample.Properties;
using Topobase.Update;
namespace Topobase.Sample.DataModel
{
 /// <summary>
 /// Plug-in for creating a sample data model.
 /// </summary>
 public class StructureUpdatePlugIn :
 XmlBasedDocumentStructureUpdatePlugIn
 {
 private const string dataModelFileName = " MyDataModel.genx";
 /// <summary>
 /// Gets the XML structure path. The method has to return only
 /// one of the two return parameters.
 /// </summary>
 /// <param name="xmlStructureUpdateFile">A file referencing
 /// an XML structure file.</param>
 /// <param name="fullQualifiedXmlStructureUpdateResourceName">Full
 name of the qualified
/// XML structure update resource (e.g. Topobase.Mod
ules.LandCH.DataModel.LandCHDataModel.genx).
 /// The resource has to be in the same assembly than the
/// subclass of this abstract class.</param>
 protected override void GetXmlStructurePath(out FileInfo xmlStruc
tureUpdateFile, out string fullQualifiedXmlStructureUpdateResource
Name)
 {
 xmlStructureUpdateFile = null;
 fullQualifiedXmlStructureUpdateResourceName = GetType().Namespace
 + "." + dataModelFileName;
 }
 /// <summary>
 /// Subclasses may return a list of conventional structure
/// updates which add other updates versions.
 /// </summary>
 /// <returns>A collection of update versions or a null
/// reference.</returns>
 /// <remarks>Please notice that a version can only be added
/// once. Otherwise an exception will be thrown later.</remarks>
```

```
 protected override ICollection<DocumentStructureUpdateVersionBase>
 GetConventionalStructureVersions()
 {
 var conventionalVersions = new List<DocumentStructureUpdateVer
sionBase>
 {
 // If some changes (e.g altering features) which can't
// be done in XML it has to be added either as a conventional
version
// here or in the method
 // AttachVersionEvents.
 new DocumentStructureUpdateVersion(
 new VersionNumber(1, 0, 2),
 Resources.Version10002Description,
 CreateOrReplaceWorkflows.CreateOrUpdate),
 new Version10003(),
 };
 return conventionalVersions;
 }
 /// <summary>
 /// Attach some event handlers to the XML structure update.
 /// </summary>
 /// <param name="versionEvents">A dictionary with the version
/// as keys and a helper class for attaching the events to the
/// version. This dictionary shouldn't be altered.</param>
 protected override void AttachVersionEvents(IDictionary<System.Ver
sion, XmlBasedStructureVersionEvents> versionEvents)
 {
 versionEvents[new System.Version(1, 0, 1)].BeforeStructureUpdate
 += V10001_BeforeStructureUpdate;
 }
 private void V10001_BeforeStructureUpdate(object sender, EventArgs
 e)
 {
 // Do some data migration before Version 1.0.1 will be
// executed. Since this version will update the attribute 'ATTR_1'
// from nullable to not nullable we need to update the table here:
// Example: 'update FEATURE_CLASS_1 set ATTR_1 = 0 where ATTR_1
is
// null'
 }
 }
}
```

MyDBResources.resx

The Structure Editor can export all localizable resources to a *.resx* file. If this file is included in the Visual Studio project, it is embedded into the assembly and a localization team can then translate the data model to different languages. During the structure update the embedded resource are used.

CreateOrReplaceWorkflow.cs

The CreateOrReplaceWorkflow is an internal class that contains all Autodesk Topobase workflow configuration for the current data model.

```
internal static void CreateOrUpdate(Topobase.Update.DocumentStruc
ture structureHelper)
{
 // General
 structureHelper.AddOrUpdateWorkflow(
 "MY_WORKFLOW_NAME",
 "My Workflow Caption",
 "MyWorkflow", // Picture reference
 1, // Priority
 null, true, Workflow.ExecutionTarget.Client);
}
```

Version10003.cs

Specifies a version step that cannott be done in the XML file. For example, updating the value of a specific feature attribute (for example, ID_TYPE: null --> Main Section).

```
using System;
using System.Collections.Generic;
using System.IO;
using Topobase.Data;
using Topobase.Sample.Properties;
using Topobase.Update;
namespace Topobase.Sample.DataModel
{
 /// <summary>
 /// Runs some specific updates on the data model.
 /// </summary>
 public class Version10003 :
 Topobase.Update.DocumentStructureUpdateVersionBase
 {
 /// <summary>
 /// Gets the version number of this update
 /// </summary>
 public override Topobase.Data.VersionNumber Version
 {
 get { return new VersionNumber(1, 0, 3); }
 }
 /// <summary>
 /// Gets a commentary which may be shown in the update dialog.
 /// </summary>
 public override string Commentary
 {
 get
 {
 return Resources.Version10003Description;
 }
 }
 /// <summary>
 /// This method updates the data model.
 /// </summary>
 public override void UpdateStructure(IStatusDisplay status)
 {
 // Run the specific data update here
 // 'update FEATURE_CLASS_1 set ID_TYPE = 2
// where ID_TYPE is null'
 }
 }
}
```

Database Support

Although Oracle remains the only fully supported database for Autodesk Topobase, much of the underlying code in Autodesk Topobase has been re-written to accomodate potential support for other databases (for example, SQLite). The API remains compatible with the previous releases of Autodesk Topobase, but several key API have changed and set to obsolete (see Obsolete or Deprecated APIs (page 40)).

TIP It is common practice to later remove obsolete APIs, so it is therefore advisable to change these API calls.

For more information about how some of the Oracle-specific aspects of Autodesk Topobase have been altered to open up the possibility of using other databases, see Spatial Reference Identifier (SRID) (page 23) and SQL92 (page 24) (including Tables and Indexes (page 25), Sequences (page 27), Select Data / Query Class (page 27), and ISqlBuilder (Topobase.Data.DAL.ISqlBuilder) (page 33)).

ConnectionIdentifier

All API in Topobase that used an Oracle UserName and/or Password has been set to **obsolete**. A new version with ConnectionIdentifier was introduced in Autodesk Topobase.

Connection

Instead of providing username and password in the constructor, a ConnectionIdentifier is now required:

Obsolete Constructor:

```
[Obsolete("Use an OracleConnectionIdentifier instead of user
name/password/datasource.", false)]
public Connection(string username, string password, string data
source)
```

New Constructor:

```
public Connection(ConnectionIdentifier identifier)
```

Connect to Oracle (old constructor):

```
Connection connection = new Connection("TB11_LAND", "avs", "orcl");
```

Connect to Oracle (new API):

```
ConnectionIdentifier.Oracle identifier = ConnectionIdentifier.Cre
ate<ConnectionIdentifier.Oracle>();
identifier.UserName = "TB11_LAND";
identifier.Password = "avs";
identifier.ServiceName = "orcl";
Connection cn = new Connection(identifier);
```

Topobase.Data.Sys.Document

A document represents an Autodesk Topobase data schema that uses a SysConnection in order to manage the metadata table TB_DOCUMENT. The TB_DOCUMENT was used to store the username and encrypted password to establish a connection to Oracle. Because a document may not be in Oracle in a future release and different parameters are required to establish a connection, the ConnectionIdentifier is stored in new table TB_DOCUMENT_CONNECTION. The columns username and password are still updated but this might change in the future. What changed is the use of “name”: Prior to Autodesk Topobase 2011, “name” and “username” are identical. In Autodesk Topobase 2011, “name” is a mere description, or caption of the document.

```
[Obsolete("Use overloaded constructor with ConnectionIdentifier",
 false)]
public Document(SysConnection connection, string name, string
username, string password)

public Document(SysConnection connection, string name, Connec
tionIdentifier connectionIdentifier)
```

Spatial Reference Identifier (SRID)

An SRID (Spatial Reference IDentifier) is an integer value key into a table containing spatial reference information. For Oracle Spatial, that table is MDSYS.CS_SRS. Together with other information, each table has a column containing a text string that describes a coordinate system. This string is often referred to as the projection string. For Oracle, the column is called WKTEXT.

Oracle Spatial stores a large number of predefined projection strings in the table MDSYS.CS_SRS. The primary key into this table is the Oracle SRID.

Other databases like SQLite don't feature any spatial support and therefore don't have an SRID.

All API with an SRID in Topobase has therefore been replaced with an Topobase.Graphic.ICsDescription interface. This interface still has the srid for Oracle, but other database might not have the same id. The unique property in the interface is the Well Know Text (WKT).

Create FeatureClass (old constructor):

```
[Obsolete("Use constructor with coordinate system instead.",
false)]
public FeatureClass(TBConnection connection, string name, Feature
ClassType type, Topic parentTopic, int dimensions, double toler
ance, int srid, string spatialMask, double minX, double maxX,
double minY, double maxY, double minZ, double maxZ)
```

NOTE Note that `int srid` (above) is replaced with `iCsDescription coordinateSystem` (below).

Create FeatureClass (new API):

```
public FeatureClass([NotNull] TBConnection connection, string name,
 FeatureClassType type, Topic parentTopic, int dimensions, double
 tolerance, ICsDescription coordinateSystem, string spatialMask,
double minX, double maxX, double minY, double maxY, double minZ,
double maxZ)
```

Other Examples:

Obsolete API	New API
`Topobase.Data.Table.SRID`	`Topobase.Data.Table.CoordinateSystem`
`Topobase.Data.FeatureClass.SDOSRID`	`Topobase.Data.FeatureClass. SDOCoordinateSystem`
`Topobase.Data.TBConnection. DefaultSRID`	`Topobase.Data.TBConnection. DefaultCoordinateSystem`

SQL92

In the process of extending the API for possible use by other databases (other than Oracle), new API classes are introduced to avoid writing database-specific SQL. Instead, the more universal SQL92 standard is used, which “most major databases support”. For more information about this third revision of the SQL standard, SQL92, see *http://www.contrib.andrew.cmu.edu/~shadow/sql/sql1992.txt*.

Tables and Indexes

Get All Tables and Their Indexes:

```
// If you call GetSchemaInfo, it caches the Data for the current
// session so the next time you get the same result. If you are
// not sure that the structure was changed in between you should
// Clear the Cache. Of cause this is slower than using the
// cached informations

this.Document.Connection.ClearCachedSchemaInfo();
 ISchemaInfo info =
 this.Document.Connection.GetSchemaInfo();

 // Notice that GetAllTables returns Tables/Views and
 // Synonms. Check the Properties "IsView", "IsSynonym"
 // etc if you need only pure Tables
 foreach (ITable table in info.GetAllTables())
{
  foreach (IIndex index in table.Indexes)
  {
  }
  foreach (IAttribute attribute in table.Attributes)
  {
  }
}
```

Get One Specific Table:

```
ITable myTable;
 if (info.TryGetTable("TB_DICTIONARY", out myTable))
 {
}
```

Create a New Table with an Index:

```
// Always prefer to use the Structure.Editor.exe in combination
with
// a StructureUpdate Plugin. It is much easier for Versionupdates
// than doing it all manually. For FeatureClass and Domain Tables
// use the well known API.
// Use this only for other Tables.

 DBTable newTable = new DBTable(this.Document.Connection,
"MY_NEWTABLE");
 if (!newTable.Exists())
 {
  Topobase.Data.Attribute newAttribute;

  // Add a ID Attribute
  newAttribute = new Topobase.Data.Attribute(newTable, "ID",
DataType.Number);
  newAttribute.Precision = 10;
  newAttribute.Nullable = false;
  newTable.Attributes.AddSimple(newAttribute, true); // Add as
Primary Key
  // Add a NAME Attribute
  newAttribute = new Topobase.Data.Attribute(newTable, "NAME",
DataType.Varchar2);
  newAttribute.Length = 255;
  newTable.Attributes.AddSimple(newAttribute);
  // Create the Table in the DB
  newTable.Create();
  // Add a None Unique Index on the Column Name
  this.Document.Connection.ClearCachedSchemaInfo();
  ISchemaInfo info = this.Document.Connection.GetSchemaInfo();
  ITable table;
  if (info.TryGetTable(newTable.Name, out table))
  {
   IAttribute attrName;
   if (table.TryGetAttribute("NAME", out attrName))
   {
    List<IAttribute> newIndexAttributes = new List<IAttribute>();
    newIndexAttributes.Add(attrName);
    table.AddIndex("MY_NEWINDEX", false, newIndexAttributes);
   }
  }
 }
```

Drop a Table:

```
DBTable newTable = new DBTable(this.Document.Connection,
"MY_NEWTABLE");
 if (newTable.Exists())
 {  newTable.Drop();
 }
```

Sequences

This data access layer enables the factory process to determine—at runtime—whether to use Oracle or SQLite.

Instead of using the `.nextval` statement (for example, `select sequence.nextval from dual`), use the new IStructureSupport class.

```
// Sequences are not supported on all databases, but are needed
// by Topobase. Sequences are emulated on databases that do not
// supoprt them (for example, SQLite).
// This only works on tbsys and document schemas, not on other
// schemas.
Topobase.Data.DAL.Structure.IStructureSupport support = Factory.Get
Instance(this.Document.Connection).CreateStructureSupport(this.Doc
ument.Connection);

string mySequenceName = "MY_SEQUENCE";
 if (!support.ExistsSequence(mySequenceName))
 {
 support.CreateSequence(mySequenceName, 1);
}
```

Select Data / Query Class

This database-independent query code adds querying flexibility at runtime.

The Query class eliminates the need to use SQL in the code to execute simple queries. Instead, a symbolic framework is used.

NOTE Currently, a sub query cannot be used inside another query. If you need complicated queries, you must use SQL directly.

The important classes are as follows:

Class	Description
Query	Represents a query.
QField	Represents fields in tables. There is an implicit converter from Topobase.Data.Attribute to QField.
QTable	Represents tables. There are implicit converters from DBTable and FeatureClass.
Expression	Represents expressions, such as 'sum(area)' or 'upper(name)'.
Condition	Represents WHERE conditions.
OrderByExpression	Represents parts of an ORDER BY clause.
Record	A single record read by the query.

The following example highlights a simple query class:

```
QTable tbDictionary = new QTable("TB_DICTIONARY");
 QField fClassId = new QField(tbDictionary, "F_CLASS_ID");
 QField fClassName = new QField(tbDictionary, "F_CLASS_NAME");
 Query query = new Query();
 query.Select(fClassId, fClassName).From(tbDictionary);
 foreach (var record in query.Execute(this.Document.Connection))
 {
  int id = record.GetInt32(0).Value;
  string name = record.GetString(1);

}
```

The following example highlights a query using a FeatureClass instead:

```
FeatureClass myFeatureClass = this.Document.Connection.Feature
Classes[0];
 Query query = new Query();
 query.Select(myFeatureClass.Attributes["FID"]).From(myFeature
Class);
 foreach (var record in query.Execute(this.Document.Connection))
 {
  int fid = record.GetInt32(0).Value;

}
```

The following examples highlight more use of the query class:

```
query.Select(fClassId, fClassName)
 .From(tbDictionary);
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .OrderBy(fClassName);
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .Where(fClassName == "LM_BUILDING");
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .Where(fClassName != "LM_BUILDING");
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .Where(fClassName.IsNull);
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .Where(fClassName.IsNotNull);
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .Where(fClassId == 4 | fClassId == 7);
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .Where(fClassId.Between(3, 8));
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .Where(fClassName.Upper() == "LM_BUILDING");
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .Where(fClassId == 9 & fClassName == "LM_BUILDING");
query.Select(fClassId, fClassName)
 .From(tbDictionary)
 .Where(fClassId == 9 & fClassName == "LM_BUILDING");
```

The following example enumerates over the feature IDs of all point and line features that interact spatially; it is also shown in Sample 128 - Database Independant:

```
// Enumerates over the fids of all WA_POINT and WA_LINE features
// that interact spatially

FeatureClass pointFc = this.Document.Connection.Feature
Classes["WA_POINT"];
 FeatureClass lineFc = this.Document.Connection.Feature
Classes["WA_LINE"];

foreach (var record in new Query().
  Select(pointFc.Attributes["FID"], lineFc.Attributes["FID"]).
  From(pointFc, lineFc).
Where(Condition.AnyInteract(pointFc.Attributes.Geometry, lineFc.At
tributes.Geometry)).
  Execute(this.Document.Connection))
 {
 // We know that the FIDs cannot be null so we
 // do not need to test HasValue.
  long pointFid = record.GetInt64(0).Value;
  long lineFid = record.GetInt64(1).Value;
  // Do something with the FIDs.
 }
// This is a "complicated" example:
// Find all lines that interact with another line in the same
// feature class.
// Each FID should be returned once, so I use a DISTINCT select.
// Since the table is joined with itself, table aliases are needed,
// otherwise the database will not know what to select.
// The resulting SQL will therefore be something like:
// 'SELECT DISTINCT x.FID from WA_LINE x, WA_LINE y WHERE
// SDO_RELATE(...)'
// Also I only want to compare each pair once and not to compare
// features with themselves so a condtition is added:
// 'AND x.FID < y.FID'
// Finally, sort the FIDs.

QTable x = new QTable("WA_LINE", "x");
 QField fidX = new QField(x, "FID");
 QField geomX = new QField(x, "GEOM");
 QTable y = new QTable("WA_LINE", "x");
 QField fidY = new QField(y, "FID");
 QField geomY = new QField(y, "GEOM");
 foreach (var record in new Query().
  Select(fidX).
```

```
  From(x, y).
  Where(Condition.AnyInteract(geomX, geomY) & fidX < fidY).  Or
derBy(fidX).
  Execute(this.Document.Connection))
 {
  long fid = record.GetInt64(0).Value;
  // do something;
 }
```

ISqlBuilder (Topobase.Data.DAL.ISqlBuilder)

The SQL Builder interface is used to create database-independent string fragments for SQL commands. The new data access layer provides more flexibilty for possible use with databases other than Oracle.

DECODE()

DECODE is a Oracle-specific statement. If you cannot use the API, then use "case ~ when ~ else ~ end" instead.

This is standard SQL92 and works with Oracle, SQLite, SQLServer, and others.

For example:

```
SELECT
 (CASE FID
 WHEN 1 THEN 'England'
 WHEN 2 THEN 'India'
 WHEN 3 THEN 'America'
 ELSE 'Test'
 END)
 from MYFEATURECLASS
```

Or:

```
SELECT
 (CASE
 WHEN FID=1 THEN 'England'
 WHEN FID=2 THEN 'India'
 WHEN FID=3 THEN 'America'
 ELSE 'Test'
 END) from MYFEATURECLASS
```

TIP Use caution when using NULL values.

The following example does *not* work as expected; it returns 'Test' if the FID is NULL:

```
SELECT
(CASE FID
WHEN null THEN 'England'
WHEN 2 THEN 'India'
WHEN 3 THEN 'America'
ELSE 'Test'
END) from MYFEATURECLASS
```

Instead, use the following example if you have NULL values:

```
SELECT
 (CASE
 WHEN FID is null THEN 'England'
 WHEN FID=2 THEN 'India'
 WHEN FID=3 THEN 'America'
 ELSE 'Test'
 END) from MYFEATURECLASS
```

TIP By using the new API, the appropriate statement is automatically created.

The following example uses the new API to create a database-independent SQL statement:

```
// You have an SQL with a Decode statement like this Oracle select:
// select F_CLASS_NAME, decode(F_CLASS_TYPE, 'L','Line','P',
// 'Point', 'T', ......., F_CLASS_TYPE) from TB_DICTIONARY
 // Decode is not available in SQLite so it uses CASE WHEN
 // The SQL Builder helps to create Database independent SQL
 Dictionary<string, string> list = new Dictionary<string,
string>();
 list.Add("'L'", "'Line'");
 list.Add("'P'", "'Point'");
 list.Add("'T'", "'Attribute'");
 list.Add("'C'", "'Centroid'");
 list.Add("'O'", "'Polygon'");
 ISqlBuilder sqlBuilder = this.Document.Connection.CreateSqlBuild
er();
 string decodeCondition = sqlBuilder.BuildDecodeCondi
tion("F_CLASS_TYPE", list, "F_CLASS_TYPE");

 string sql = "select F_CLASS_NAME," + decodeCondition + " from
TB_DICTIONARY";
```

Command Parameters

If you must still use SQL directly—even though the new API provides more flexibility—parameter binding now requires a `ParameterType` rather than a `DataType`. For example:

```
using (command = new Command ("select text from user_views where
view_name = :1", Connection))
 {
#if Autodesk Topobase 2011
command.Parameters.Add (new DataParameter ("1", Topobase.Data.Pro
vider.ParameterType.String, view_name, ParameterDirection.Input));
#else
command.Parameters.Add (new DataParameter ("1", Topobase.Data.Data
Type.Varchar2, view_name, ParameterDirection.Input));
#endif
 using (reader = command.ExecuteReader ())
 if (reader.Read ())
 ret = Convert.ToString (reader[0]);
 else
 ret = null;
 }
```

Orientation

Autodesk Topobase API has been improved and is now more flexible because the orientation can be passed instead of hard-coded.

Usage of angular double values has been deprecated and replaced by either `MathOrientation` or `DocumentOrientation`. Although Autodesk Topobase uses a hard-coded zero base angular value as 'North', the `MathOrientation` has a

zero base angle of 'East', like real mathematics. `DocumentOrientation` provides an easier way to use the current document angular coordinates. For example:

```
// create the template
template = TemplateAdministration.CreateTemplate (
 connection.Templates,
 origin.Geometry.Bounds.CenterPoint,
 // orientation
 #if Autodesk Topobase 2011
 new MathOrientation (Math.PI / 2.0, false),
 #else
 0.0,
 #endif
 name,
 infos, // features
 relations, // relations
 true); // enable feature tracking
```

Plot

A PltPlotRenderer should now be created using the `Components.PltPlotRendererFactory` class instead of calling the constructor of PltPlotRenderer directly. Using the factory allows creating preconfigured PltPlotRenderer objects. The configurations are defined through the enumeration `Components.RendererConfiguration`. For example:

```
IPlotBase selectedPlot = …
PltPlotRenderer renderer = PltPlotRendererFactory.CreateRender
er(RendererConfiguration.Plot, selectedPlot);
```

Calling `Render()` on this object opens a DWG and creates the AutoCAD paperspace layout that is ready to be printed. Of course, the renderer object returned from `CreateRenderer()` can still be tweaked before calling `Render()`.

The renderer no longer distinguishes between maps (that is, 'fully captured map placeholders') being rendered as AutoCAD blocks and the primary map. `PltPlotRenderer.RenderBlocks` is now obsolete and does not provide any functionality. That is, setting this property has no effect. Instead, use `PltPlotRenderer.SetLoadMapDisplayModel()`. For example:

```
IPlotMap plotMap = …
PltPlotRenderer renderer = …
renderer.SetLoadMapDisplayModel(plotMap, true /* render the map;
[false] if the map should be excluded from rendering */);
```

Calling `SetLoadMapDisplayModel()` forces the renderer to (not) load the GIS display model for the IPlotMap (that is, the map placeholder) passed.

Sample 124 - Client Plot Commands (page 322) shows how to make us of the renderer and how to hook in your own context menu items.

For every display model used by a plot, that is, the GIS display models of all maps *and* that used to stylize the plot feature, a separate Display Manager (DM) map is created. As only one such DM map can be active at a time, the renderer sets the map of the primary map place holder active. Typically, this does not need to be changed by an API client. If required, the active DM map can be set through `PltPlotRenderer.CurrentMap` after the renderer has created all content (including the paperspace layout) in the DWG.

Server API Changes

TBINTERSECTION Package

The server-side Java PL/SQL API has changed to add Captions and Feature Class Captions to intersections. This improves the localization capability in Autodesk Topobase.

NOTE In the TBINTERSECTION package (in the TBSYS user), there are only two methods remaining. The `intersectionFClassCaption` and `intersectionCaption` parameters have been added as follows:

```
FUNCTION createIntersection( primFClassName IN VARCHAR2,
     secFClassName IN VARCHAR2,
     intersectionFClassName IN VARCHAR2,
     intersectionFClassCaption IN VARCHAR2,
     intersectionName IN VARCHAR2,
     intersectionCaption IN VARCHAR2,
     whereClausePrimFC IN VARCHAR2,
     whereClauseSecFC IN VARCHAR2,
     adjustSecFC IN NUMBER,
     toleranceAdjustAreaNominal IN NUMBER,
     whereClauseExcludeAdjust IN VARCHAR2,
     primJobID IN NUMBER,
     secJobID IN NUMBER,
     storeGeometry IN NUMBER,
     JobStateArray in numArray,
     updateStatementPrimFC IN VARCHAR2,
     updateStatementSecFC IN VARCHAR2,
     bufferSelectionPrimFC IN NUMBER)
RETURN NUMBER AS LANGUAGE JAVA
 NAME ...;
PROCEDURE dropIntersection( intersectionName IN VARCHAR2) AS LAN
GUAGE JAVA NAME ...;
```

NOTE Intersections are performed using the client .Net API, therefore three legacy methods to run the old server intersection code have been *removed* from TBINTERSECTION as follows:

```
PROCEDURE doIntersection(intersectionName IN VARCHAR2, progressID
 IN NUMBER,primFID in numArray) AS LANGUAGE JAVA ...;
PROCEDURE doIntersection(intersectionName IN VARCHAR2, primFID in
 numArray) AS LANGUAGE JAVA  NAME ...;
PROCEDURE doIntersection(intersectionName IN VARCHAR2, primFClassID
 IN NUMBER, secFClassID IN NUMBER, progressID IN NUMBER) AS LAN
GUAGE JAVA ...;
```

Customer-Defined Exceptions on Oracle Database Server

The customer can raise specific exceptions within Oracle code that are shown with a message box (or similar) instead of causing Autodesk Topobase to stop working (CER). Reserved range of ORA- codes: 20000 and 20099.

AutoCAD Map 3D Assembly References

Changes to the assembly names in the underlying AutoCAD Map 3D code, may mean some assembly reference name changes if you use the AutoCAD Map 3D API:

Old Topobase 2010 References	New Topobase 2011 References
Autodesk.Map.Platform.dll	Autodesk.Map.Platform.Core.dll
	OSGeo.MapGuide.PlatformBase.dll
	OSGeo.MapGuide.Foundation.dll

Extension Methods (.NET 3.5)

Extension methods, which enable you to “add” methods to existing types without creating a new derived type, recompiling, or otherwise modifying the original type, are used throughout the Autodesk Topobase code.

For more information about extension methods, see *http://msdn.microsoft.com/en-us/library/bb383977.aspx*.

The following namespaces should be included on top of the file to get the advantages of such extension methods:

```
using Topobase.Data;
using Topobase.Data.DAL;
using Topobase.Exception;
using Topobase.Forms;
using Topobase.Forms.UserControls;
using Topobase.Forms.WpfControls;
using Topobase.Graphic;
using Topobase.Map;
using Topobase.Modules.Common.API;
using Topobase.Templates;
using Topobase.Tools;
using Topobase.Tools.Extensions;
using Topobase.Utilities;
using Topobase.Utilities.App;
```

API Samples

The *<Topobase-installation-directory>/Development/Samples* directory contains over 80 API samples in both C# and VB.NET. The samples have been revised for this release, and new samples 124 - 140 have been added.

For more information and detailed descriptions of all the API samples, see Developer Samples (page 179).

Obsolete or Deprecated APIs

If the source code for Autodesk Topobase 2011 API components is decorated with .NET attributes, the API reference documentation shows the attribute information. This information identifies classes, methods, properties, and so

on, that you should no longer use in your applications and refers you to preferred components. For example:

```
// .NET 'obsolete' attribute (C# syntax)
[Obsolete("Property is not supported anymore. Please use GetEnd
Point().", false)]
public UtilityPoint EndPoint;

// .NET 'obsolete' attribute (VB.NET syntax)
<Obsolete("Property is not supported anymore. Please use GetEnd
Point().", false)>
Public Property EndPoint() As UtilityPoint
```

API Overview 3

Database

This section covers basic database operations that are required for using the rest of the Autodesk Topobase API.

Connecting to the Database

To connect to the Oracle© database, initialize a new instance of the `TBConnection` class via its constructor and invoke its `Open()` method to open the connection. After successfully opening the connection, you can then proceed to carry out other tasks, such as creating feature classes and features. After completing all required tasks, close the connection by calling `TBConnection.Close()`.

NOTE The connection should also be disposed of when it is no longer used.

The following code snippet shows the procedure for connecting to Autodesk Topobase:

```
using (Topobase.Data.TBConnection myConnection =
 new Topobase.Data.TBConnection(
 Properties.Settings.Default.Oracle_User,
 Properties.Settings.Default.Oracle_Password,
 this.Application.Connection.DataSource,
 true,
 this.Application.Connection))
{
 // Open the connection to the database.
 // If the DB has no database structure it is created now
 myConnection.ShowForms = true;
 myConnection.Open();

 // Display the connection to the user.
 string state = myConnection.State.ToString();
 MessageBox.Show("Connection state:" + state);

 // Close connection.
 myConnection.Close();
}
```

Creating a New Database User

To create a new database user, use the `TBConnection.CreateTopobaseUser()` method. This method takes as one of its parameters a `Connection` object that corresponds to the current user name and password.

The following code snippet shows how to open a connection and create a database user:

```
// Create a new empty Oracle user.
string userName = Properties.Settings.Default.Oracle_User;
if (!this.Application.Connection.ExistsUser(userName))
{
 // Project settings store the new database and password.
 using (Topobase.Data.TBConnection myConnection =
 new Topobase.Data.TBConnection(
 Properties.Settings.Default.Oracle_User,
 Properties.Settings.Default.Oracle_Password,
 this.Application.Connection.DataSource,
 true,
 this.Application.Connection))
 {
 try
 {
 myConnection.CreateTopobaseUser(
 this.Application.Connection,
 "USERS",
 "TEMP",
 "USERS");
 }
 catch (Topobase.Exception.TBException ex)
 {
 if (ex.Caller == Topobase.Exception.TBExceptionCaller.TB3Server)
 {
 MessageBox.Show("Unable to create user:"
 + Environment.NewLine + ex.Message);
 }
 else
 {
 throw;
 }
 }
 finally
 {
 myConnection.Close();
 }
 }
}
else
{
 MessageBox.Show("User already exists.");
}
```

Feature Classes

About Feature Classes

A feature class represents a type of Autodesk Topobase object, and corresponds to a single table within the database. For example, the concept of "parcel" is a single feature class. The list of all feature classes within a database is contained within the `TBConnection` object's `FeatureClasses` property. To get a reference to an existing feature class, you can specify the feature id or string name as the index to the collection:

```
// Get a reference to the feature class named "MyPoint".
Topobase.Data.FeatureClass MyPointFeatureClass;
MyPointFeatureClass = myConnection.FeatureClasses["MyPoint"];
```

Topics

Topics are used to organize feature classes. A topic is a collection of feature class tables that have some relationship meaningful to the user. For example, all feature classes related to pipes can be placed within a single topic named "Pipes". Topics do not imply any table relationships between the feature classes contained within them. Topics may have subtopics as well. The collection of all topics within a database is contained within the `TBConnection` object's `Topics` property.

Topics are created by using the collection's `Add()` method. To create subtopics, you can either use the overridden `Add()` method that takes the parent topic id as a parameter, or you can directly add topics to the parent topic's `ChildTopic` property.

```
Topobase.Data.Topic MyTopic;
MyTopic = myConnection.Topics.Add("MyTopic", "Caption");
// Add a subtopic.
Topobase.Data.Topic SubTopic;
SubTopic = MyTopic.ChildTopics.Add("SubTopic", "Caption");
```

Creating Feature Classes

To create a new feature class, use the `FeatureClass` constructor to create a new object and then call the feature class object's `Create()` method to add the feature class to the database.

```
// Add a point-style feature class to the topic MyTopic.

Topobase.Data.FeatureClass MyPointFeatureClass;
// Do not create if it already exists.
if (!myConnection.FeatureClasses.Contains("MyPoint"))
{
 // Create the feature class object.
 MyPointFeatureClass = new Topobase.Data.FeatureClass(
 myConnection,
 "MyPoint",
 "My point caption",
 Topobase.Data.FeatureClassType.Point);
 MyTopic);

 // Add the feature class to the database and add references
 // of the object to the specified topic and other locations.
 MyPointFeatureClass.Create();
}
```

You can hierarchically organize feature classes by making one feature class a child of another feature class. To create a child feature class, use one of the constructor overrides where you specify the parent feature class id as one of the parameters. The following code sample creates a new feature class, which is a child of the previously created `MyPointFeatureClass` feature class:

```
Topobase.Data.FeatureClass ChildFeatureClass;

ChildFeatureClass = new Topobase.Data.FeatureClass(
 myConnection,
 "MyPoint",
 "My point caption",
 Topobase.Data.FeatureClassType.Point);
 MyTopic,
 MyPointFeatureClass.ID);

ChildFeatureClass.Create();
```

You can see all the children of a feature class by accessing the `FeatureClass.ChildFeatureClasses` property, and you can find the parent of a feature class by accessing the `FeatureClass.ParentFeatureClass` property.

Feature Class Types

Feature classes are based on pre-defined types. These types define the default properties and geometry of the feature class. Types are defined in the `Topobase.Data.FeatureClassType` enumeration. The possible values are:

Point	Represents a standalone point.
Centroid	Represents the geographic center point of the associated polygon feature class.
LineString	Represents a polyline - a connected series of line and arc segments.
Polygon	Represents a closed figure made of lines, arcs, and LineString elements.
Label	Represents a text string located relative to a standalone point location.
Collection	Represents a feature class containing a combination of Points, LineStrings, or Polygons.
Attribute	Represents a feature class without geometry.
CompoundPolygon	Represents multiple Polygon or LineString features, each with different attributes.
CompoundLineString	Represents multiple LineString features, each with different attributes.
Dimension	Represents a feature class that can store the Dimension Features; t is child from an Attribute feature class and parent from a Label feature class.

Attributes

Feature class tables have a fixed basic structure depending on the type, but you can add additional columns called “attributes”. A feature class can have any number of attributes. The collection of attributes for a feature class object are accessed through the `FeatureClass.Attributes` property.

The following code checks to see if a name attribute already exists in the `MyPointFeatureClass` feature class; if not, it adds a new string attribute, which can contain up to 255 characters.

```
if (!MyPointFeatureClass.Attributes.Contains("Name"))
{
 MyPointFeatureClass.Attributes.Add(
 "Name",
 Topobase.Data.DataType.Varchar2,
 255);
}
```

Attribute types are based on Oracle types, and are specified in the `Topobase.Data.DataType` enumeration:

Member of Topobase.Data.DataType Enumeration	Type
Array	Oracle ARRAY
BFile	Oracle BFILE
Blob	Oracle BLOB
Boolean	(Only valid in PL/SQL procedures)
Char	Oracle CHAR
Clob	Oracle CLOB
Date	Oracle DATE
Geometry	Oracle SDO_Geometry (not supported in ODP.NET)
Long	Oracle LONG
NChar	Oracle NCHAR

Member of Topobase.Data.DataType Enumeration	Type
NClob	Oracle NCLOB
Number	Oracle NUMBER
NVarchar2	Oracle NVARCHAR2
Raw	Oracle RAW
RowID	A RowID is a base 64-encoded physical address (location) of the row on the disk.
Table	Represents all Oracle Tables Types. (OraDirect.NET specific)
TimeStamp	Oracle TIMESTAMP
Varchar2	Oracle VARCHAR2

Events

Users can add and modify individual features within the feature class (that is, individual rows within the table) using the Autodesk Topobase Client user interface. Your application may need to know when these changes take place. Feature class objects have a wide variety of events to notify you when these actions are taking place or have taken place.

The following example adds three new events to the `myFeatureClass` feature class to trigger functions whenever features are either:

- in the process of being inserted
- inserted already

- canceled during the process of being inserted

```
// Add three new events to myFeatureClass.
myFeatureClass.Inserting +=
 new Topobase.Events.FeatureCancelEventHandler
 (myFeatureClass_Inserting);

myFeatureClass.Inserted +=
 new Topobase.Events.FeatureEventHandler
 (myFeatureClass_Inserted);

myFeatureClass.InsertingCanceled +=
 new Topobase.Events.FeatureEventHandler
 (myFeatureClass_InsertingCanceled);


// This event handler is invoked before a
// feature is inserted in myFeatureClass.
private void myFeatureClass_Inserting(object sender, Topo
base.Events.FeatureCancelEventArgs e)
{
}
// This event handler is invoked whenever a feature is
// inserted in myFeatureClass.
private void myFeatureClass_Inserted(object sender, Topo
base.Events.FeatureEventArgs e)
{
}
// This event handler is invoked whenever a feature insertion
// in myFeatureClass is canceled.
private void myFeatureClass_InsertingCanceled(object sender, Topo
base.Events.FeatureEventArgs e)
{
}
```

Feature Class Sample Code

The following sample code demonstrates a typical action you might do with feature classes. It first creates a connection to the database, gets a reference to an existing feature class, and then adds a series of attributes to it.

```
// Connect to Topobase.
Topobase.Data.TBConnection myConnection =
 new Topobase.Data.TBConnection(
 Properties.Settings.Default.Oracle_User,
 Properties.Settings.Default.Oracle_Password,
 this.Application.Connection.DataSource,
 true,
 this.Application.Connection);

myConnection.ShowForms = true;
myConnection.Open();

// Get an existing feature class.
Topobase.Data.FeatureClass MyPointFeatureClass;
MyPointFeatureClass = myConnection.FeatureClasses["MyPoint"];

// Add some attributes to the feature class.
if (!MyPointFeatureClass.Attributes.Contains("Name"))
{
 MyPointFeatureClass.Attributes.Add(
 "Name",
 Topobase.Data.DataType.Varchar2,
 255);
}

if (!MyPointFeatureClass.Attributes.Contains("Active"))
{
 MyPointFeatureClass.Attributes.Add(
 "Active",
 Topobase.Data.DataType.Number,
 1);
}

if (!MyPointFeatureClass.Attributes.Contains("Created"))
{
 MyPointFeatureClass.Attributes.Add(
 "Created",
 Topobase.Data.DataType.Date);
}

if (!MyPointFeatureClass.Attributes.Contains("Modified"))
{
 MyPointFeatureClass.Attributes.Add(
```

```
 "Modified",
 Topobase.Data.DataType.Date);
}

if (!MyPointFeatureClass.Attributes.Contains("Coordinates"))
{
 MyPointFeatureClass.Attributes.Add(
 "Coordinates",
 Topobase.Data.DataType.Varchar2,
 255);
}

// Close connection.
myConnection.Close();
```

Features

About Features

A feature represents an object in the real world. A feature is based on a feature class, and corresponds to a single row within a feature class table.

One way to access existing features is to use the `FeatureClass.GetFeatures()` method. This method returns a `FeatureList` object (a linked list of `Feature` objects using the `IList` interface). Certain overrides of this method allow filters and SQL `Where` clauses to limit the number of features returned.

Another way to get a list of features is to prompt the user to select them after they have generated graphics within the Autodesk Topobase Client. Calling the `Topobase.Forms.Document.Map.GetFeatures()` method pauses execution of your program while the user selects features using the Map interface. It returns a linked list of features, which may be of different kinds of feature classes.

Creating Features

To create a new blank feature, call the `FeatureClass.CreateFeature()` method. This reserves a unique key or feature identifier (FID) for the feature.

```
// Get the FeatureClass
Topobase.Data.FeatureClass myPointClass =
 myConnection.FeatureClasses["MYPOINT"];

// Create a new Feature
Topobase.Data.Feature myPointFeature =
 myPointClass.CreateFeature();
```

Once the feature instance is created, set its properties. For example, you can add geometry to the feature through the `Feature.Geometry` property:

```
myPointFeature.Geometry = new Topobase.Graphic.Point(100, 100);
```

To insert the new feature into Autodesk Topobase (that is, create a new record in the feature class table), use the `FeatureClass.InsertFeature()` method:

```
myPointClass.InsertFeature(ref myPointFeature);
```

To update an existing feature in Autodesk Topobase, use the `FeatureClass.UpdateFeature()` method :

```
myPointFeature.Geometry = new Topobase.Graphic.Point(200, 200);
// Now that a property has been changed, the feature needs to
// be updated.
myPointClass.UpdateFeature(ref myPointFeature);
```

To delete an existing feature from Autodesk Topobase, use the `FeatureClass.DeleteFeature()` method, which requires the identifier of the feature to be deleted.

```
bool success = myPointClass.DeleteFeature(myPointFeature.ID);
```

Geometry

This section explains the geometry of features and the namespaces that help in examining, computing, and manipulating geometric objects.

Graphic Namespace

The `Topobase.Graphic` namespace contains the most important geometry-related classes. The `Geometry` property of feature objects contain an object based on one of the classes in this namespace.

NOTE Be sure to reference *Topobase.Graphic.dll* in any project that uses this namespace.

Geometries

All of the geometries in the `Topobase.Graphic` namespace are derived from the abstract base class `Topobase.Graphic.Geometry` and contains features common to all the geometries. You will frequently see properties and parameters of type `Geometry` in the rest of the Autodesk Topobase API.

The following table lists the different geometric classes in the namespace:

Class	Topology
LinePoint	A 3D point, used as part of a LineString or Polygon.
LineString	A collection of LinePoints which form a single connected series of line segments.
MultiLineString	A collection of separate LineStrings.
MultiPoint	A collection of Points.
MultiPolygon	A collection of Polygons.
Point	A 3D point.
Polygon	A LineString where the last point is also connected to the first point, forming a closed figure.
Unknown	A collection of ordinates. Can be used to store geometries that are not supported by Oracle Spatial.

All classes have a bounding box property of type `Topobase.Graphic.BoundingBox`, which describes the furthest limits of the points in the X, Y, and Z dimensions. For classes that only contain a single

point, all of the bounding box coordinates are set equal to the coordinates of the point.

These classes have very few methods for geometry analysis, limited to finding the distance between points or determining whether a point is located within a bounding box.

TIP For more advanced analysis, such as determining intersections and distances between geometries, you need to convert the geometries into objects from the 2D PlaneGeometry Namespace (page 61) or 3D SpaceGeometry Namespace (page 66).

The following code is from a plugin or workflow, and uses the plugin or workflow's base object to have the user select two points. The distance between the two points is determined.

```
Topobase.Graphic.Point point1 =
  this.Document.Map.GetPoint("Select Point 1");
Topobase.Graphic.Point point2 =
  this.Document.Map.GetPoint("Select Point 2");
double distance = point1.Distance2D(point2);
```

Accessing the Geometry Property of a Feature

Point Geometry

The `Topobase.Graphic.Point` class represents a single 3D point location. The coordinates are stored in parameters named `X`, `Y`, and `Z`, which can also be set in the class constructor. The `Z` coordinate has a default value of zero (0).

The following code assigns a point with the X, Y, and Z coordinates "1234.5, 678.9, 0.0" to a feature:

```
pointFeature.Geometry = new Topobase.Graphic.Point(1234.5, 678.9);
```

LineString and Polygon Geometry

`Topobase.Graphic.LineString` and `Topobase.Graphic.Polygon` both consist of a collection of `Topobase.Graphic.LinePoint` objects. LinePoints are added to the collection one at a time using the `Add()` method (which adds the point to the end of the list of points) or the `Insert()` method (which inserts the point at the specified index in the existing list of points). LinePoints can also be added as a group by passing any collection of LinePoint objects that supports

the `IEnumerable` interface (such as a `List` or `ArrayList`) in the LineString or Polygon constructor or to the `AddRange()` method.

Like a Point, a LinePoint represents a single 3D point location and has `X`, `Y`, and `Z` parameters. It also has an `Interpretation` parameter, which describes the nature of the lines formed by the points. By default, LinePoints represent endpoints of straight line segments. LinePoints can also form arcs with one LinePoint representing the starting point of the arc (with the `Interpretation` parameter set to `Topobase.Graphic.Interpretations.ArcStart`), the next LinePoint representing a midpoint which the arc passes through (with the `Interpretation` parameter set to `Topobase.Graphic.Interpretations.ArcMidpoint`), and the last LinePoint representing the end point of the arc (with the `Interpretation` parameter set to `Topobase.Graphic.Interpretations.ArcEnd`). If two arcs are adjacent to each other, then the LinePoint separating the two arcs should be set to `ArcStart`.

The following code creates a Polygon consisting of three straight line segments and assigns it to the `Geometry` property of a feature:

```
// Create the Polygon geometry.
Topobase.Graphic.Polygon polygonGeometry =
   new Topobase.Graphic.Polygon();

polygonGeometry.Add(new Topobase.Graphic.LinePoint(15, 27));
polygonGeometry.Add(new Topobase.Graphic.LinePoint(11, 26));
polygonGeometry.Add(new Topobase.Graphic.LinePoint(20, 11));

// Add Geometry to the Feature.
polygonFeature.Geometry = polygonGeometry;
```

The following code creates a LineString consisting of two arc line segments and assigns it to the `Geometry` property of a feature:

```
// Create the LineString geometry.
Topobase.Graphic.LineString lineGeometry =
   new Topobase.Graphic.LineString();

lineGeometry.Add(new Topobase.Graphic.LinePoint(5, 10,
   Topobase.Graphic.Interpretations.ArcBegin));
lineGeometry.Add(new Topobase.Graphic.LinePoint(10, 26,
   Topobase.Graphic.Interpretations.ArcMidpoint));
// The end of the first arc and the start of the second.
lineGeometry.Add(new Topobase.Graphic.LinePoint(20, 13,
   Topobase.Graphic.Interpretations.ArcBegin));
lineGeometry.Add(new Topobase.Graphic.LinePoint(27, 7,
   Topobase.Graphic.Interpretations.ArcMidpoint));
lineGeometry.Add(new Topobase.Graphic.LinePoint(31, 20,
   Topobase.Graphic.Interpretations.ArcEnd));

// Add Geometry to the Feature
lineFeature.Geometry = lineGeometry;
```

Polygons can also contain holes. Each hole is defined by a separate Polygon object. New holes are added to the collection of holes using the `AddHole()` method.

```
// Create a triangular polygon for the hole.
List<LinePoint> lpList = new List<LinePoint>();

lpList.Add(new LinePoint(5, 5));
lpList.Add(new LinePoint(15, 5));
lpList.Add(new LinePoint(10, 15));

Polygon holePolygon = new Polygon(lpList);

// Assume outerPolygon already created and defined with line
// segments that fully enclose holePolygon.
outerPolygon.AddHole(holePolygon);
```

MultiLineString Geometry

`Topobase.Graphic.MultiLineString` consists of a collection of `Topobase.Graphic.LineString` objects. LineStrings are added to the collection one at a time using the `Add()` method (which adds the LineString to the end of the list of LineStrings) or the `Insert()` method (which inserts the LineString

at the specified index in the existing list of LineStrings). LineStrings can also be added as a group by passing any collection of LineString objects that supports the `IEnumerable` interface (such as a `List` or `ArrayList`) in the MultiLineString constructor.

MultiPolygon Geometry

`Topobase.Graphic.MultiPolygon` consists of a collection of `Topobase.Graphic.Polygon` objects. Polygons are added to the collection one at a time using the `Add()` method (which adds the polygon to the end of the list of polygons) or the `Insert()` method (which inserts the polygon at the specified index in the existing list of polygons). Polygons can also be added as a group by passing any collection of `Polygon` objects that supports the `IEnumerable` interface (such as a `List` or `ArrayList`) in the MultiPolygon constructor.

PlaneGeometry Namespace

The `Topobase.PlaneGeometry` namespace consists of a series of classes that represent simple 2D geometric objects. These classes allow you to perform many kinds of geometric analysis not possible with the objects in the basic Graphic Namespace (page 57).

NOTE Be sure to reference *Topobase.PlaneGeometry.dll* in any project that uses this namespace.

Overview of PlaneGeometry

`Topobase.PlaneGeometry` includes classes for many different kinds of simple and compound figures. These classes are all immutable, meaning that they cannot be added to or modified after they have been constructed with the exception of inner rings for polygons. Figures are created by either using the class constructor or by using the static `TryCreate()` method in each of the following classes:

Class Name	Description
ArcSegment2D	An arc connecting two points, which can form part of a Line2D or Polygon2D.
Circle2D	A circle, created using either a point and a radius, or an arc segment.

Class Name	Description
Line2D	A contiguous series of ArcSegment2D and StraightSegment2D objects.
LineSegment2D	Abstract base class of ArcSegment2D and StraightSegment2D.
PackedLine2D	A Line2D converted to take up less memory, but which does not allow you to directly access the constituent segments.
PackedPolygon2D	A Polygon2D converted to take up less memory, but which does not allow you to directly access the constituent segments.
Polygon2D	A continuous series of ArcSegment2D and StraightSegment2D objects forming a closed figure. Holes can be added after the polygon has been constructed.
Straight2D	A straight line.
StraightSegment2D	A straight line segment connecting two points, which can form part of a Line2D or Polygon2D.

There are also two structures representing the basic elements of position and direction:

Structure Name	Description
Point2D	A structure representing a point location.
Vector2D	A structure representing a vector.

Creating PlaneGeometry Objects From Graphic Objects

Some of the classes in the `Topobase.Graphic` namespace have methods that directly create equivalent PlaneGeometry objects that have been flattened on the Z axis.

Topobase.Graphic Object	Method for Creating Topobase.PlaneGeometry Object
Point	ToPoint2D()
LinePoint	ToPoint2D()
LineString	ToLine2D()
Polygon	ToLine2D(), ToPolygon2D()

These methods make it easy to perform analysis and mathematical operations on `Topobase.Graphic` objects. The following example determines the area of a `Topobase.Graphic.Polygon` object:

```
// Given a valid Topobase.Graphic.Polygon object named tmpPoly,
// compute the area of this polygon.

Topobase.PlaneGeometry.Polygon2D poly2D = tmpPoly.ToPolygon2D();
double area = poly2D.CalculateArea();
```

Those classes that are made up of collections of single geometries (MultiPoint, MultiLine, MultiPolygon) do not have direct methods for creating PlaneGeometry objects. Instead, you need to look through all the items in the collection and call the method for creating those objects for each item in the collection.

The following code snippet determines the total length of all LineString geometries within a MultiLineString object:

```
Topobase.Graphic.MultiLineString river =
   new Topobase.Graphic.MultiLineString();
//
// NOT SHOWN - Assigning LineStrings to "river".
//
double totalLength = 0.0;
foreach (Topobase.Graphic.LineString bank in river)
{
    Topobase.PlaneGeometry.Line2D bank2D = bank.ToLine2D();
    totalLength += bank2D.CalculateLength();
}
```

Moving, Scaling, and Rotating PlaneGeometry Objects

The `Topobase.PlaneGeometry.AffineTransformation` class provides a mechanisms for moving, scaling, and rotating PlaneGeometry objects. First create an `AffineTransformation` object with the correct series of transformations, and then call the `Transform()` method, which takes in either a `Circle2D`, `Line2D`, `Point2D`, `Polygon2D`, or `Straight2D` object, and returns a new transformed object of the same type.

For a simple transformation, you can create a new `AffineTransformation` object by calling one of the static creation methods: `CreateMirror()`, `CreateRotation()`, `CreateScaling()`, or `CreateTranslation()`.

```
// Create transformation that rotates by PI/2 around the origin
// point.

// Use the provided constant to get PI/2.
double angle = Topobase.PlaneGeometry.Vector2D.PiHalf;
Topobase.PlaneGeometry.AffineTransformation rotation;
rotation = Topobase.PlaneGeometry.AffineTransformation.
   CreateRotation(angle);

Topobase.PlaneGeometry.Polygon2D oldPolygon;
//
// NOT SHOWN - Creating a polygon object and assigning
// line segments to it.
//
Topobase.PlaneGeometry.Polygon2D newPolygon;
newPolygon = rotation.Transform(oldPolygon);

// Now newPolygon is a new Polygon2D object that is exactly
// like oldPolygon except it has been rotated PI/2 around the
// origin point.
```

To perform a series of transformations, create an instance of the AffineTransformation object and add each transformation in turn using the

`MirrorAt()`, `RotateBy()`, `ScaleBy()`, and `TranslateBy()` methods. The transformations are performed in the order they are added.

```
// Create transformation that first scales the object by
// a factor of 2, and then moves it 10 units along the X axis.

Topobase.PlaneGeometry.AffineTransformation transform1;
transform1 = new Topobase.PlaneGeometry.AffineTransformation();
transform1.ScaleBy(2.0);
Topobase.PlaneGeometry.Vector2D v;
v.X = 10.0;
transform1.TranslateBy(v);

Topobase.PlaneGeometry.Polygon2D oldPolygon;
//
// NOT SHOWN - Creating a polygon object and assigning
// line segments to it.
//
Topobase.PlaneGeometry.Polygon2D newPolygon;
newPolygon = transform1.Transform(oldPolygon);
```

TIP AffineTransformation objects can also be combined using the `CombineWith()` method. The order of transformations in an AffineTransformation object can be reversed by calling the `Reverse()` method.

SpaceGeometry Namespace

The `Topobase.SpaceGeometry` namespace is the 3D equivalent of PlaneGeometry, and consists of a series of classes that represent simple 3D geometric objects. These classes allow you to perform many kinds of geometric analysis not possible with the objects in the basic Graphic Namespace (page 57).

NOTE Be sure to reference *Topobase.SpaceGeometry.dll* in any project that uses this namespace.

Overview of SpaceGeometry

`Topobase.SpaceGeometry` includes classes for many different kinds of simple and compound figures. These classes are all immutable, meaning that they cannot be added to or modified after they have been constructed with the exception of inner rings for polygons. Figures are created by either using the

class constructor or by using the static `TryCreate()` method in each of the following classes:

Class Name	Description
Cluster	A group of geometries with similar characteristics.
Line3D	A contiguous series of StraightSegment3D objects.
PackedLine3D	A Line3D converted to take up less memory, but which does not allow you to directly access the constituent segments.
Polygon3D	A contiguous series of StraightSegment3D objects forming a closed figure. Holes can be added after the polygon has been constructed.
Sphere3D	A sphere created using a Point3D and a radius.
Straight3D	A straight line.
StraightSegment3D	A straight line segment connecting two points in 3D space, which can form part of a Line3D or Polygon3D.

There are also two structures representing the basic elements of position and direction:

Structure Name	Description
Point3D	A structure representing a point location in 3D space.
Vector3D	A structure representing a vector in 3D space.

Creating SpaceGeometry Objects From Graphic Objects

Some of the classes in the `Topobase.Graphic` namespace have methods that directly create equivalent SpaceGeometry objects.

Topobase.Graphic Object	Method for Creating Topobase.SpaceGeometry Object
Point	ToPoint3D()
LinePoint	ToPoint3D()
LineString	ToLine3D()
Polygon	ToLine3D(), ToPolygon3D()

These methods make it easy to perform analysis and mathematical operations on `Topobase.Graphic` objects. The following example determines the 3D area of a `Topobase.Graphic.Polygon` object:

```
// Given a valid Topobase.Graphic.Polygon object named tmpPoly,
// compute the area of this polygon.

Topobase.SpaceGeometry.Polygon3D poly = tmpPoly.ToPolygon3D();
double area = poly.CalculateArea();
```

Those classes that are made up of collections of single geometries (`MultiPoint`, `MultiLine`, `MultiPolygon`) do not have direct methods for creating PlaneGeometry objects. Instead, you need to look through all the items in the collection and call the method for creating those objects for each item in the collection.

The following code snippet determines the total length of all LineString geometries within a `MultiLineString` object:

```
Topobase.Graphic.MultiLineString river =
   new Topobase.Graphic.MultiLineString();
//
// NOT SHOWN - Assigning LineStrings to "river".
//
double totalLength = 0.0;
foreach (Topobase.Graphic.LineString bank in river)
{
    Topobase.SpaceGeometry.Line3D bank3D = bank.ToLine3D();
    totalLength += bank3D.CalculateLength();
}
```

Creating Graphic Objects From Geometry

Once you have created a PlaneGeometry or SpaceGeometry object, you can create an equivalent Graphic object using the `Topobase.Graphic.GeomFactory` class. First, you get an instance of this class by accessing the static `Default` property - GeomFactory has no new constructor. You then call the `BuildGeometry()` method with a `Point2D`, `Line2D`, `Polygon2D`, `Point3D`, `Line3D`, or `Polygon3D` as the parameter. The function returns a new `Graphic.Point`, `Graphic.Line`, or `Graphic.Polygon` as appropriate.

The following sample code gets the polygon geometry of a feature, converts it into a `Polygon2D`, and scales it by a factor of 2. It then uses that `Polygon2D` to create a `Graphic.Polygon` object using `GeomFactory`.

```
// Get the polygon geometry of a feature named "feature1".
Topobase.Graphic.Polygon tPolygon =
   feature1.Geometry as Topobase.Graphic.Polygon;

Topobase.PlaneGeometry.Polygon2D planePoly =
   tPolygon.ToPolygon2D();

// Use AffineTransformation to scale the polygon.
Topobase.PlaneGeometry.AffineTransformation scale;
scale =
   Topobase.PlaneGeometry.AffineTransformation.CreateScaling(2.0);
planePoly = scale.Transform(planePoly);

// Use GeomFactory to create a new Polygon called "graphicPoly".
Topobase.Graphic.GeomFactory gFactory =
   Topobase.Graphic.GeomFactory.Default;
Topobase.Graphic.Polygon graphicPoly;
graphicPoly = gFactory.BuildGeometry(planePoly);
```

Topologies

There are two main kinds of topologies available in Topobase: logical topologies and area topologies. The collection of all topology objects is obtained from the `TBConnection.Topologies` property.

Topology Related Assemblies

When creating projects that deal with topologies, you need to include assemblies from the following list:

- *Topobase.LogicalTopology.dll* contains classes to create, modify and analyze logical topologies. It also contains logical topology-specific implementations of the tracing algorithms.
- *Topobase.LogicalToplogy.FeatureRules.dll* contains the classes that can help you automatically update the topology if users add, update, or remove features.
- *Topobase.AreaTopology.dll* contains classes to create, modify, and analyze area topologies.
- *Topobase.AreaTopology.FeatureRules.dll* contains the classes that can help you automatically update the topology if users add, update, or remove features.
- *Topobase.Tracing.dll* contains the base network tracing classes and interfaces and the basic implementation of tracing algorithms, which are used by the tracing functionality of the `Topobase.LogicalTopology` and `Topobase.AreaTopology` namespaces.
- *Topobase.Data.dll* defines all the base metadata classes (topologies, feature classes, features) used throughout the `Topobase.LogicalTopology` and `Topobase.AreaTopology` namespaces.

Logical Topologies

Logical topologies connect features of any feature classes. The features do not need to be spatially connected. A logical topology can connect points with points, or lines with lines, or lines with points, or attribute features with attribute features. For example, a logical topology can represent a waste water network or electrical transmission lines.

A network topology is a subtype of a logical topology that is limited to lines, which are geometrically connected to each other at point nodes. Autodesk Topobase utility models are based on logical topologies that connect points and lines.

Topologies are maintained at the client-side using feature rules. For more information about feature rules, see *Autodesk Topobase Feature Rule Reference* (TopobaseFeatureRuleReference.chm).

LogicalTopology as Namespace and Class

It is important to note that `LogicalTopology` is both the name of a namespace and the name of a class in the `Topobase.Data` namespace. This means that this class must be fully qualified in your code (that is, always specified as "`Topobase.Data.Doc.Topologies.LogicalTopology`" instead of simply "`LogicalTopology`"). One remedy is to add the following line to your code:

```
using Topobase.Data.Doc.Topologies as TDDT;
```

You can then just write `TDDT.LogicalTopology` instead of the fully qualified name.

Initializing Logical Topologies

Initializing logical topologies is done with the `Topobase.LogicalTopology.Maintainance` object. Create a new instance of the maintenance object, use the `InitializeTopology` method, and dispose the maintenance object. One way to make sure the disposal is handled correctly is to use the `using` keyword. Initializing a logical topology is a little more

involved than an area topology because you need to account for possible third-party plugins that change how the topology behaves. For example:

```
// Initialize logical topology.
using (Topobase.LogicalTopology.Maintainance ma =
 new Topobase.LogicalTopology.Maintainance(myConnection))
{
 // Try to get third-party plugins that change the behavior
 // of the topology.
 Topobase.LogicalTopology.Initialization.
 ITopologyInitializationLogic logic = null;

 Topobase.LogicalTopology.FeatureRules.
 LogicalTopologyRules rules;

 if (Topobase.LogicalTopology.FeatureRules.
 LogicalTopologyRules.TryGetPlugIn(myConnection, out rules))
 {
 logic = rules.GetInitializationLogicFor(topology);
 }

 // Initialize the topology using the found plugins.
 ma.InitializeTopology (topology, logic, null);
}
```

Area Topologies

Area topologies are typically used to model surfaces or parcels. An area topology is made up of non-overlapping areas represented by closed polygons made up of line and polyline features. Each area also contains a point feature representing the polygon centroid.

Initializing Area Topologies

Initializing area topologies is done with the `Topobase.AreaTopology.Maintainance` object. Create a new instance of the maintenance object, use the `InitializeTopology` method, and dispose the

maintenance object. One way to make sure the disposal is handled correctly is to use the `using` keyword, as in the following example:

```
// Initialize area topology.
using (Topobase.AreaTopology.Maintainance ma =
 new Topobase.AreaTopology.Maintainance(myConnection))
{
 ma.InitializeTopology (topology, null);
}
```

Quick Guide: Creating a Topobase Plugin

4

Introduction

The instructions in this chapter guide you step-by-step through the process of creating an Autodesk Topobase plugin that modifies the Autodesk Topobase user interface. For a more detailed description of user interface plugins, see Creating User Interface Plugins (page 133).

C# is used in the following example, but all .NET programming languages can be used to create plugins.

NOTE Over 70 samples are provided in both C# and Visual Basic, located under <Topobase Install Directory>\Development\Samples, which are documented in Developer Samples (page 179).

In this example, you will create a new document menu item by performing the following tasks:

- Create a new Visual Studio C# project that builds a class library (that is, a file with a "*.dll*" extension).
- Configure the project so that your plugin and the related files are written to the *bin* folder in the Autodesk Topobase install folder when you build your project.
- Configure the project so that Autodesk Topobase is started when you run your plugin from Visual Studio.
- Configure the project with the class references your plugin class needs.

- Review the assembly properties to verify that the default values are valid.
- Add code to the default class.
- Create a Autodesk Topobase plugin definition file (identified by the *.tbp* extension) so that Autodesk Topobase knows about your plugin.
- Test your plugin.

The intent of the plugin is to add a menu item to the context menu within the Document Explorer in the Autodesk Topobase task pane. Selecting the menu item causes a message box to be displayed with the common "Hello World" text.

IMPORTANT Testing this plugin requires a workspace containing feature classes based on the Point feature class type. A suitable workspace for testing the plugin is the TB2009_LM_102 Land Management demonstration workspace. The creation of this workspace is described in the *Autodesk Topobase Installation and Configuration Guide*. Alternatively, another suitable workspace is the TBSAMPLE workspace described in Sample 01 - Create Structure (page 182).

Creating a New Project

This procedure describes how to create a new C# class library project. All Autodesk Topobase plugin types are based on class libraries.

1. Start Microsoft Visual Studio.
2. Click File ➤ New ➤ Project. The New Project dialog box is displayed.
3. In the New Project dialog box in the Project Types pane, click the Visual C# node.
4. In the Templates pane, click Class Library.
5. In the Name text box, type "MyTopobasePluginProject".
6. Set the path to the project folder by using the Location selection box or by clicking the Browse... button.
7. To close the New Project dialog box and create a new blank solution, click OK.

The Solution Explorer pane is now populated with a solution node as root with a project subnode. The project node has two subnodes: My Project and

Class1.cs. The editor pane is populated with a Class1.cs tab, and the contents of this tab is a skeleton class declaration:

```
class Class1
{
}
```

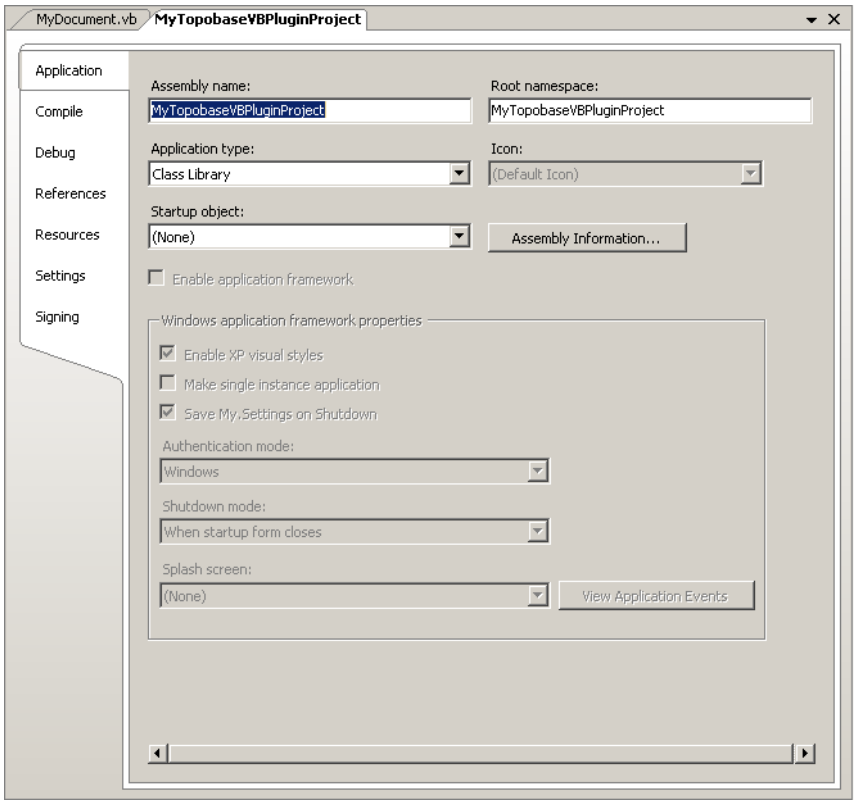
Accessing the Project Properties

To configure your project for use with Autodesk Topobase, you must edit the Visual Studio project properties. This brief procedure describes how to display the required panel and shows an example image. Specific information about configuring the properties starts with Configuring the Project to Write the Build Outputs to the Topobase Bin Folder (page 78).

To display the Visual Studio project properties:

- In the Solution Explorer pane, right-click the project node and select Properties.

The result is that the project properties are displayed in a tab in the Editor pane. The tab label is the name of the project. The contents of this tab is a set of vertical tabs on the left and a display area on the right. Depending on your Visual Studio configuration, the vertical tabs are from top to bottom: Application, Compile, Debug, References, Resources, Settings, and Signing (and possibly, Security, and Publish). Clicking a vertical tab causes the display of related properties in the display area on the right.



My Topobase PluginProject - Visual Studio Project Properties

After changing any of the properties, notice that the properties tab label now has an asterisk appended to it as does the label of the vertical tab where you made the change. Save the changes by placing the cursor over the properties tab label, right-click and select Save Selected Items. The result is that the asterisks are removed from the properties tab and vertical tab labels.

Configuring the Project to Write the Build Outputs to the Topobase Bin Folder

This procedure causes the project build outputs to be written to the Autodesk Topobase *bin* folder. The build outputs are `.dll`, `.pdb`, and `.xml` files.

1 Display the project properties.

2 In the properties tab, click the Compile vertical tab.

3 If required, change configuration to All Configurations.

4 To the right of the Build Output Path text box, click the Browse... button.

5 In the Select Output Path dialog box browse to the location of the Autodesk Topobase *bin* folder. The path is typically *C:\Program Files\Autodesk Topobase Client <yyyy>\bin*, where *<yyyy>* is the Autodesk Topobase version. Click Open. This causes the path that you selected to be written to the Build Output Path text box.

6 Save the properties.

Configuring the Project to Run Topobase from Visual Studio

This procedure causes Autodesk Topobase to run automatically when you start debugging your project in Visual Studio. This allows you to debug the plugin while Autodesk Topobase is running. You can place breakpoints in the code and use the "Edit and Continue" feature of Visual Studio .NET to make changes to your code without exiting Autodesk Topobase.

1 Display the project properties.

2 In the properties tab, click the Debug vertical tab.

3 If required, change configuration to All Configurations.

4 In the Start Action set of radio buttons, click the Start External Program radio button.

5 To the right of the text area for this radio button, click the Browse... button.

6 In the Select File dialog box, browse to the location of the Autodesk Topobase executable. This path is typically *C:\Program Files\Autodesk Topobase Client <yyyy>*, where *<yyyy>* is the Autodesk Topobase version. Select *acad.exe* and click Open.

7 Under the Start Options group in the Working Directory text box, type the location of *acad.exe*. For this exercise, the location is *C:\Program Files\Autodesk Topobase Client <yyyy>*, where *<yyyy>* is the Autodesk Topobase version.

8 Save the properties.

Adding References To Your Project

In order for the project to work properly, you must add a number of Autodesk Topobase class references.

1. In the Solution Explorer pane, right-click on the project node select Add Reference....
2. In the Add Reference dialog box, click the Browse tab.
3. Browse to the location of the Autodesk Topobase Client *bin* folder. Multiselect four files by holding down the Ctrl key, click on the following:
   - Topobase.Data.dll
   - Topobase.Forms.dll
   - Topobase.Graphic.dll
   - Topobase.Map.dll

   NOTE Not all plugins require all of these references. Some other kinds of plugins have their own requirements. For example, workflows require a reference to `Topobase.Workflows`.
4. Click OK.
5. In the Editor pane note that the properties tab label has an asterisk appended to it again. Click the References vertical tab. Note that Topobase.Data.dll, Topobase.Forms.dll, Topobase.Graphic.dll, and Topobase.Map.dll have all been added to the References list box.
6. In the References list box, do the following for each of these *.dll*'s:
   1. Select it. The result is that the Properties pane is populated with the properties associated with that *.dll*.
   2. In the Properties pane, select the Copy Local property. This displays a select control in the box containing the value for this property.

      NOTE This also displays help text for that property, which reads: Indicates Whether The Reference Will Be Copied To The Output Directory.
   3. Use the select control to change the value of this property to False.

4. In the Properties pane, select the Specific Version property. This displays a select control in the box containing the value for this property.

   NOTE This also displays help text for that property, which reads: Indicates Whether This Reference Is To A Specific Version Of An Assembly.

5. Use the select control to change the value of this property to False.

7. Save the properties.

Inspecting the Assembly Information

This procedure describes how to the inspect the assembly information generated for this project.

1. In the project properties tab, click the Application vertical tab.
2. Click the Assembly Information button, which displays the Assembly Information dialog box.
3. Inspect or review the information and click OK.

Adding Code To The Default Class

When you created the project, a `Class1` default class was created in a *Class1.cs* file. We want to customize the class and add some code.

To change the name of the class and file to MyDocument:

1. In the Solution Explorer pane, right-click the Class1.cs node and select Rename. The display of the class node's label is changed to a text box.
2. In the text box, type MyDocument.cs.
3. In the Editor pane, click the tab containing the skeleton class definition. The tab label is changed to MyDocument.cs, and the class name in the skeleton class declaration is changed to `MyDocument`.

Now, let's add some code:

1. Modify the class declaration so that it looks like the following:

```
public class MyDocument : Topobase.Forms.DocumentPlugIn
{
 public Topobase.Forms.MenuItem myMenuItem1 =
 new Topobase.Forms.MenuItem();
}
```

The public declaration of the myMenuItem1 object allows Autodesk Topobase to communicate menu events in the user interface to the plugin.

2 Add the following code to the class. This overrides the event handler, which is called when the Autodesk Topobase document menus are first initialized.

```
public override void OnInitMenus
 (object sender, Topobase.Forms.Events.MenusEventArgs e)
{
}
```

3 Add a menu item to the popup menu by adding the following lines of code into the body of the new `OnInitMenus` subroutine:

NOTE This menu item is *only* available to point feature class items in the task pane.

```
// Obtain the context menu.
Topobase.Forms.Menu pointMenu =
 e.Menus.Item(Topobase.Data.FeatureClassType.Point);

// Add the menu item to the context menu.
pointMenu.MenuItems.Add(myMenuItem1, "My Menu Item");

myMenuItem1.Click += new Topobase.Forms.Events.
 MenuItemClickEventHandler(MyMenuItem1_Click);
```

4 Create a handler for menu events by adding the following lines of code below the `OnInitMenus` subroutine:

```
private void MyMenuItem1_Click
 (object sender, Topobase.Forms.Events.MenuItemClickEventArgs
e)
{
}
```

5 Display a message box when the menu item is clicked by adding the following line of code in the body of new `MyMenuItem1_Click` subroutine:

```
this.Application.MessageBox("Hello World");
```

6 Save the class file. After completing the above steps, the final class should look like the following:

```
public class MyDocument : Topobase.Forms.DocumentPlugIn
{
public Topobase.Forms.MenuItem myMenuItem =
 new Topobase.Forms.MenuItem();


public override void OnInitMenus
 (object sender, Topobase.Forms.Events.MenusEventArgs e)
{
 // Obtain the context menu.
 Topobase.Forms.Menu pointMenu =
 e.Menus.Item(Topobase.Data.FeatureClassType.Point);

 // Add the menu item to the context menu.
 pointMenu.MenuItems.Add(myMenuItem1, "My Menu Item");

 myMenuItem1.Click += new Topobase.Forms.Events.
 MenuItemClickEventHandler(MyMenuItem1_Click);
}


private void MyMenuItem1_Click
 (object sender, Topobase.Forms.Events.MenuItemClickEventArgs
e)
{
 this.Application.MessageBox("Hello World");
}

}
```

Creating a Topobase Plugin Definition File

When Autodesk Topobase starts, it reads the plugin definition files in the *bin* folder to determine what plugins are available.

You can use a text editor to create a file with a *.tbp* extension. For this example, name the file *MyTopobasePlugInProject.tbp*. Save it in the project directory with your source code. Add it to the list of files in the Visual Studio Solution Explorer dialog box.

TIP Display the properties of the file and make sure that the "Copy to Output Directory" property is set to "Copy Always". This automatically copies the *.tbp* file to the Autodesk Topobase Client *bin* folder with the *.dll* whenever you build your project.

The contents of the file are as follows:

```
<?xml version="1.0" encoding="utf-8"?>
<PlugIn>
 <Default
 AssemblyName="MyTopobasePlugInProject.dll"
 Namespace="MyTopobasePlugInProject"
 DocumentKey=""
 MapName=""
 Priority="100"
 ExecutionTargetWeb="True"
 ExecutionTargetDesktop="True"
 />
<DocumentPlugIn ClassName="MyDocument"/>
</PlugIn>
```

TIP If you copy the above text and paste it into your *MyTopobasePluginProject.tbp* file, ensure that the pasted quotation marks are ASCII-encoded.

NOTE The AssemblyName attribute value is `MyTopobasePlugInProject.dll`. By default the *.dll* name is the same as the project name.

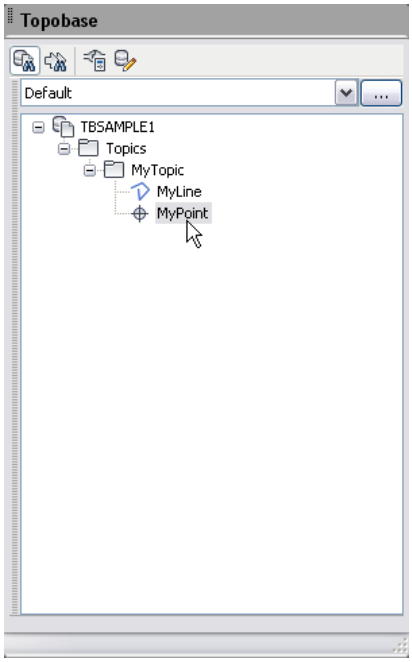
Testing the Plugin

If the plugin project is configured to start Autodesk Topobase (see Configuring the Project to Run Topobase from Visual Studio (page 79)), then you can test and debug your plugin from within Visual Studio. You can place breakpoints in the code and use the "Edit and Continue" feature of Visual Studio .NET to make changes to your code without exiting Autodesk Topobase.

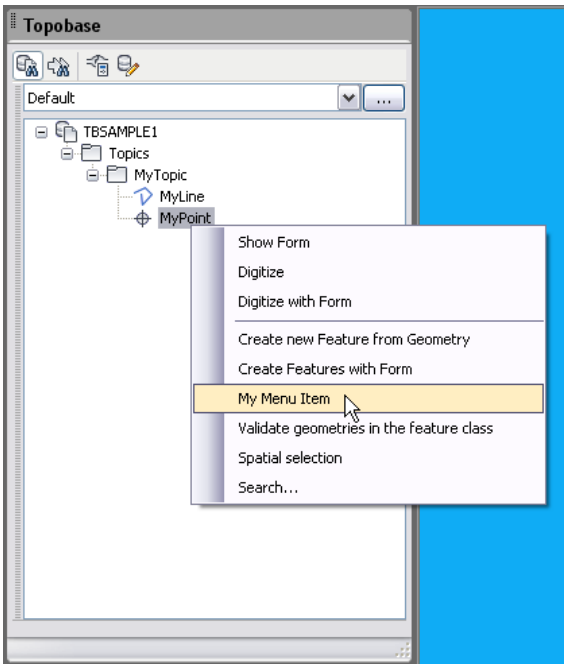
1 In Visual Studio, build the solution and then select the Start Debugging command. This starts the Autodesk Topobase Client application.

2 Log into Autodesk Topobase and select a workspace that contains some point feature classes.

3 In the Document Explorer, open the “Point” folder so that you see the following hierarchy:



4 Place the cursor over any leaf node based on the Point feature class type, and right-click to display the popup menu. You should see My Menu Item in the menu, as shown in the following graphic:



MyTopobasePluginProject - My First MenuItem

5 To display the message box with the “Hello World” text, select My Menu Item.

Creating Application Modules

5

A vertical application module serves as the basis for documents created in the Autodesk Topobase Administrator. An application module defines the data model (topics, tables, attributes, topologies, and so on) and provides tools for manipulating the data model (workflows, plugins, option pages). This chapter describes how to build an application module based on the example provided by Sample 117 - Simple Water Module (page 302) and how to create plugins and other tools, either as part of the application module or as stand-alone Autodesk Topobase extensions.

Creating the Data Model

About Data Models

A vertical application module often needs to create or update a data model, add domain values to a model, create or update a topology, add workflow definitions, or perform other administrative tasks. A type of plugin called the “structure update” plugin is used to perform these actions. If your application module does not need to perform these tasks, then do not include a structure update plugin as part of the project.

All data model changes that can be done manually in the Autodesk Topobase Administrator can be done in an automated way using the structure update mechanism. The advantage of using programmatic structure updates is that the changes are codified, documented, automated and, portable between Oracle© instances. For example, in moving from a test environment to a production environment, the same data model changes performed in the test environment must be exactly replicated in the production environment. If these updates have been performed manually, they would need to be documented, and repeated

exactly with no missing or extra steps. The structure update API and structure update plugin allows these steps to be automated, and hence reproduced with fidelity in the target system. A similar and even more compelling argument applies when deploying Autodesk Topobase customizations between branch offices of a company, or if the customization is part of a product for resale.

Creating the Structure Update Plugin

The first step in defining a data model is the creation of a structure update plugin. The structure update plugin provides an interface to the data model definitions and provides a mechanism for updating the data model when the data model is modified. Structure update plugins are derived from the `Topobase.Update.DocumentStructureUpdatePlugIn` abstract class.

Structure update plugins need to override the following abstract properties and methods:

- **Commentary** - Property returning a string that describes the data model. The return value can be null.
- **DataModelCode** - Property returning a DMCodeNumber structure containing the identification of the data model. The structure consists of three integers: the company code, the module code, and a subcode. You should pick a number between 3 and 99 for your company code and use it for all data models you create.

  NOTE Company codes 1, 2, and 42 are reserved by Autodesk. There are no central institutions for confirming that your company code is unique.

  Secondly, the module code usually serves to identify the type of module (such as wastewater, gas, electric and so on). Finally, the subcode is typically used to identify the localization. You can also return a null value for the DMCodeNumber structure, but you should then override the ModuleName property and return a meaningful value.
- **DataModelCodeText** - Property returning a string that gives the name of the data model. The return value can be null.
- **Image16** - Property returning a `System.Drawing.Image` object containing a 16x16 pixel icon. This image is used to help identify the module, and is displayed in the Autodesk Topobase Administrator Document Info dialog next to the module name. The return value can be null, in which case no icon is displayed.

NOTE To see the Document Info dialog, first load a document in Autodesk Topobase Administrator. Click Document ➤ Data Model. Right-click on the root of the data model and click Document Info.

- **GetVersions()** - Method that returns a `Topobase.Update.StructureUpdateVersions` collection containing all of the update version modules based on the `Topobase.Update.StructureUpdateVersionBase` abstract class. The `Topobase.Update.StructureUpdateVersions` collection is built using the `StructureUpdateVersions.CollectAllStructureUpdateClasses()` static method.

The following is an example of a structure update module:

```
public class StructureUpdatePlugIn:
 Topobase.Update.DocumentStructureUpdatePlugIn
{
 public override string Commentary
 {
 get
 {
 return Resources.StructureUpdateCommentary;
 }
 }

 public override DMCodeNumber DataModelCode
 {
 get
 {
 // Return an appropriate data model code if
 // this is the updater for an application module.
 return (new DMCodeNumber(
 int.Parse(Resources.DataModelCompanyCode),
 int.Parse(Resources.DataModelCode),
 int.Parse(Resources.DataModelSubCode)));
 }
 }

 public override string DataModelCodeText
 {
 get
 {
 // Return a name for this data model.
 return Resources.ModuleName;
 }
 }

 public override System.Drawing.Image Image16
 {
 get
 {
 return null;
 }
 }

 // Gets all data model versions of this data model.
```

```
 public override Topobase.Update.StructureUpdateVersions GetVer
sions()
 {
 // Gets all versions of this assembly through reflection.
 StructureUpdateVersions versions =
 StructureUpdateVersions.CollectAllStructureUpdateClasses(
 this.GetType(),
 this.TBConnection,
 this.Application);

 return versions;
 }
}
```

Creating an Update Version Module

The data model is defined in a series of update version classes, which are derived from the `Topobase.Update.StructureUpdateVersionBase` abstract class. Each time the data model is changed, a new `StructureUpdateVersionBase`-derived class—which codifies the changes between the previous version and the latest version—is added. The initial creation of the data model uses the same method; essentially you are just "updating" from an empty version 0.0.0 of the data model.

If your update version module is updating a separate, already existing module, such as the Water data model (data model code 2.5.0) you would still start at 0.0.0, but conditionally load your module based on the presence and version of the Water data model. Stand-alone update version modules can be conditionally loaded by adding a "DMCode" element to the *.tbp* file for your structure update plugin:

```
<DocumentStructureUpdatePlugIn Priority="90" DMCode="2.5.0"
Namespace="MyModifiedDataModel" ClassName="MyStructureUpdatePlugIn"
```

Version update classes need to override the following properties and methods:

- **Version** - Property returning a `Topobase.Data.VersionNumber` structure holding the version of the changes to the data model. Each version update class added to the module should be given a sequential version number. The order of the version numbers determines the order the structure updates are applied. You cannot use version "0.0.0", which is used to indicate the state before any data model information was added.

- **Commentary** - Property returning a string describing the nature of the update to the data model.
- **UpdateCondition** - Property returning a boolean value indicating whether the update should proceed or not in the current state. In most cases you should return True unless you can determine that the update has already been applied, in which case you should return False. If you return True without checking if the update has been applied, the first argument to your model update calls in `UpdateStructure()` should probably be `StructureUpdateExceptionHandling.Skip` to avoid throwing exceptions if domains, classes, or other elements already exist.
- **UpdateStructure()** - Method that actually defines the data model. This is done by adding or modifying topics, feature classes, labels, domain tables, domain entries, attributes, relations, rule bases, and workflows as needed using methods of the `Topobase.Update.Structure` class.

The following is an example of an update version module that creates a data model consisting of two topics and two feature classes:

```
public class Version10000:
 Topobase.Update.StructureUpdateVersionBase
{
 // Gets the version number of this update.
 public override Topobase.Data.VersionNumber Version
 {
 get
 {
 return new VersionNumber(1, 0, 0);
 }
 }

 // Gets a commentary, which may be shown in the update dialog.
 public override string Commentary
 {
 get
 {
 return Resources.Version10000Description;
 }
 }

 // Gets whether this update should be executed
 // or not by checking to see if items we are
 // going to add already exist.
 public override bool UpdateCondition
 {
 get
 {
 if (TBConnection.FeatureClasses.Contains("DEMO_PIPE"))
 return false;
 else
 return true;
 }
 }

 // This method updates the data model.
 public override void UpdateStructure()
 {
 AddTopic("Pipe", DataModelResources.topicPIPE);
 AddTopic("Point", DataModelResources.topicPOINT);

 AddFeatureClass(
 "Pipe",
```

```
 "DEMO_PIPE",
 DataModelResources.fcDEMO_PIPE,
 FeatureClassType.Attribute);
 AddFeatureClass(
 "Point",
 "DEMO_VALVE",
 DataModelResources.fcDEMO_VALVE,
 FeatureClassType.Attribute);
 }
}
```

Adding Changes to the Data Model

After a data model has been created, you can no longer modify the existing version update modules, as this would cause incompatibility with any document using the old data model. Instead, you add a new update version module that contains all the additions and modifications to the previous data model. Make sure that the overridden `Version` property returns a version number greater than any previous version number.

The following is an example of a version update module that adds two attributes to the DEMO_PIPE feature class created in the Version10000 class:

```
public class Version10001:
 Topobase.Update.StructureUpdateVersionBase
{
 // Gets the version number of this update.
 public override Topobase.Data.VersionNumber Version
 {
 get
 {
 return new VersionNumber(1, 0, 1);
 }
 }

 // Gets a commentary which may be shown in the update dialog.
 public override string Commentary
 {
 get
 {
 return Resources.Version10001Description;
 }
 }

 // Gets whether this update should be executed
 // or not by checking to see if items we are
 // going to add already exist.
 public override bool UpdateCondition
 {
 get
 {
 FeatureClass fc;
 fc = TBConnection.FeatureClasses["DEMO_PIPE"];
 if (!fc.Attributes.Contains("DATE_ACQUIRED") ||
 !fc.Attributes.Contains("DATE_INSTALLATION"))
 return true;
 else
 return false;
 }
 }

 // This method updates the data model.
 public override void UpdateStructure()
 {
 FeatureClass fc;
 Topobase.Data.Attribute attr;
```

```
fc = TBConnection.FeatureClasses["DEMO_PIPE"];

if (!fc.Attributes.Contains("DATE_ACQUIRED"))
{
attr = new Topobase.Data.Attribute(
fc,
"DATE_ACQUIRED",
Topobase.Data.DataType.Date);
attr.Caption =
DataModelResources.attrDATE_ACQUIREDCaption;
attr.Description =
DataModelResources.attrDATE_ACQUIREDDescription;
fc.Attributes.Add(attr);
}

if (!fc.Attributes.Contains("DATE_INSTALLATION"))
{
attr = new Topobase.Data.Attribute(
fc,
"DATE_INSTALLATION",
Topobase.Data.DataType.Date);
attr.Caption =
DataModelResources.attrDATE_INSTALLATIONCaption;
attr.Description =
DataModelResources.attrDATE_INSTALLATIONDescription;
fc.Attributes.Add(attr);
}

SendUpdateInfoMessage(
DataModelResources.UpdateInfoMessage,
fc.Caption);
}
}
```

NOTE Structure update versions are atomic revisions to the data model. These updates are unidirectional - the version can only be advanced from lower versions to higher versions. These updates are permanent. The data model in Oracle is being adjusted to the current version of the module. There is no reverse process to 'undo' version updates.

Data Model Elements

Topics

Topics are collections of feature classes, and are used to organize data elements in the Autodesk Topobase Data Model pane. Topics do not imply any relationship between the feature classes contained within them.

The following line creates a “Pipe” topic, which is used to contain all the pipe-related feature classes:

```
Topic pipeTopic = AddTopic("Pipe", "Pipe Related Classes");
```

Topics can also contain other topics to create a hierarchical data structure. The following line creates a “Special” topic, which is located under the parent “Pipe” topic:

```
// Get the name string from a resource file.
AddTopic("Special", "Pipe Related Classes", pipeTopic);
```

For more information about feature classes, see Feature Classes (page 47).

Feature Classes

A feature class represents a type of Autodesk Topobase object, and corresponds to a single table within the database. Feature classes are created using the `Structure.AddFeatureClass()` method.

NOTE Data model tables should have prefix describing the purpose (for example, “LM_” for land management). Sample 117 - Simple Water Module (page 302) uses the prefix “DEMO_”.

The following line creates a “DEMO_PIPE” feature class, which is displayed as part of the “Pipe” topic.

```
AddFeatureClass(
 "Pipe",
 "DEMO_PIPE",
 DataModelResources.fcDEMO_PIPE,
 FeatureClassType.Attribute);
```

Labels

Labels are a kind of feature classthat is attached to a parent feature class, which displays a text string at a specified point. Labels are created with the `Structure.AddLabelFeatureClass()` method.

NOTE Label feature classes automatically have suffix "_TBL" attached to them.

The following line adds a label feature class named "DEMO_PIPE_TBL" to the "DEMO_PIPE" feature class:

```
AddLabelFeatureClass(
 "DEMO_PIPE",
 "DEMO_PIPE_TBL",
 DataModelResources.lblFcDEMO_PIPE_TBL);
```

Attributes

Each feature class type contains a set of predefined attributes (that is, columns in the database table). User-defined attributes can also be added to feature classes. Attributes are added or modified using the `Attributes` collection in a feature class object.

The following code first gets a reference to the "DEMO_PIPE" feature class. It then checks to make sure the attribute has not already been added. If it has

not, then it creates a new attribute named “PIPE_LENGTH”, a numeric value, and then adds it to the feature class:

```
FeatureClass fc;
Topobase.Data.Attribute attr;

fc = TBConnection.FeatureClasses["DEMO_PIPE"];
if (fc == null)
 return;

if (!fc.Attributes.Contains("PIPE_LENGTH"))
{
 attr = new Topobase.Data.Attribute(
 fc,
 "PIPE_LENGTH",
 Topobase.Data.DataType.Number);
 attr.Precision = 20;
 attr.Scale = 8;
 attr.UnitID = TBConnection.GetUnit(MeasuringUnitType.Length);
 attr.Caption = DataModelResources.attrPIPE_LENGTHCaption;
 attr.Description = DataModelResources.attrPIPE_LENGTHDesc;
 fc.Attributes.Add(attr);
}
```

Attribute Relations

An attribute relation defines a relationship between attributes in different tables. It can define the association cardinality between attributes and/or an action to take with the child attribute when something happens to the parent attribute. Attribute relations are set using the `StructureAddAttributeRelation()` method.

The following line creates a relation between the parent “FID” attribute of the DEMO_PIPE feature class and the child “FID_FEATURE” of the DEMO_MAINTENANCE feature class. When a feature of type Pipe is deleted, the maintenance features associated to it are deleted as well.

```
AddAttributeRelation(
 "DEMO_MAINTENANCE",
 "FID_FEATURE",
 "DEMO_PIPE",
 "FID",
 RelationType.DeleteChild);
```

Domains

Domains

User-defined attributes can be created using common data types, such as numbers or strings. They can also be limited to a specified enumeration of values. A list of possible values such an attribute can have is called a "domain." Each domain corresponds to a single table in the database. Domains are created using the `Structure.AddDomainTable()` method.

NOTE Domain tables automatically have suffix "_TBD" attached to them.

The following line creates a "DEMO_MAINTENANCE_TYPE_TBD" domain:

```
AddDomainTable(
 "DEMO_MAINTENANCE_TYPE_TBD",
 "DEMO MAINTENANCE TYPE");
```

Domain Values

Values within a domain are added individually. The following code adds three new values to the DEMO_MAINTAINENANCE_TYPE_TBD domain: "u", "o", and "tbd":

```
AddDomainEntry("DEMO_MAINTENANCE_TYPE_TBD",
 1,
 "unknown",
 "u",
 "description",
 true);

AddDomainEntry("DEMO_MAINTENANCE_TYPE_TBD",
 10000,
 "other",
 "o",
 "description"
 true);

AddDomainEntry("DEMO_MAINTENANCE_TYPE_TBD",
 10001,
 "to be determined",
 "tbd",
 "description"
 true);
```

Domain Relations

A domain relationship is used to set a particular attribute to use the defined domain. The following line sets the ID_MAINTENANCE_TYPE attribute of the DEMO_MAINTENANCE feature class to use the DEMO_MAINTENANCE_TYPE_TBD domain:

```
AddRelationToDomain(
 "DEMO_MAINTENANCE_TYPE_TBD",
 "DEMO_MAINTENANCE",
 "ID_MAINTENANCE_TYPE");
```

Now an ID_MAINTENANCE_TYPE attribute can hold one of three values: “u”, “o”, or “tbd”.

Utility Model

A utility model is a system of organizing feature classes for utility networks. It contains the relationship between the geometry and the attribute feature classes and adds network geometry.

The following code creates a utility model where the feature classes DEMO_VALVE and DEMO_HYDRANT can be used as nodes in the network and the feature class DEMO_PIPE is used for the connecting lines:

```
// Make an array of all the feature class names that act
// as nodes.
string[] attrPoints = new string[]
 { "DEMO_VALVE", "DEMO_HYDRANT" };
// Make an array of all the feature class names that act
// as lines.
string[] attrLines = new string[] { "DEMO_PIPE" };
CreateUtility("DEMO", "DEMO_LINE", attrLines, "DEMO_POINT",
 attrPoints, 0.01d, "DEMO", true);
```

Client-Side Feature Rules

Another aspect of the data model is the client-side feature rule. Feature rules define the business rules of the data model, performing consistency checks, dependency checks, data correction, and many other tasks. A number of feature rules are predefined in Autodesk Topobase, but you can create more as needed. Rules are stored in the TB_RULE_DEF table.

For more information about feature rules, see Autodesk Topobase Feature Rules.

The following example accesses the predefined rule named "CreateStartEndNode" and assigns it to the DEMO_LINE feature class, passing the name of the DEMO_VALVE feature class as a parameter.

```
RuleDef ruleDef = TBConnection.RuleDefs
 ["CreateStartEndNode",
 "Topobase.Utilities.dll",
 "Topobase.Utilities.FeatureRules.UtilityLineFeatureRules"];

FeatureClass fc = TBConnection.FeatureClasses["DEMO_LINE"];
TBConnection.RuleBases.Add(ruleDef, fc, "DEMO_VALVE");
```

Workflows

Adding Workflows

Workflows are a kind of plugin that guides the user through a series of steps that analyze or modify the displayed geometry. Workflows can be created and added to the client environment in many different ways, but you may wish that data model-specific workflows be loaded when the rest of the data model is created. The following code can be used to load a workflow class that is defined within the application module project:

```
AcquisitionWorkflows acquisitionWorkflowInstance =
 new AcquisitionWorkflows();

AddOrUpdateWorkflow(
 acquisitionWorkflowInstance.NetworkPipeCreation,
 Resources.ResourceManager);
```

Organizing

A flat listing of large numbers of workflows may be difficult to use. You can organize workflows in a hierarchical structure by using the `Structure.AddOrUpdateWorkflow()` method to create nodes in the workflow

tree to contain other workflows. To create such a node, set the parameter that would normally contain the workflow script to null.

```
Workflow parentNode = AddOrUpdateWorkflow(
 "DEMO ACQUISITION ParentNode",
 Resources.WorkflowNameAcquisition,
 "Workflow",
 0, // Priority
 null, true);
```

You can then add workflows to this node by calling an override of `AddOrUpdateWorkflow()` that takes the parent node as a parameter:

```
// Create the code block that loads a workflow
// plugin library.
string codeBlock = "Sub Run";
codeBlock += Environment.NewLine;
codeBlock += "Me.RunMethod(\"workflow.dll\",";
codeBlock += "\"ProjectName.ClassName\", \"EntryPointFunction\")";

codeBlock += Environment.NewLine;
codeBlock += "End Sub"
codeBlock += Environment.NewLine;

// Create the workflow as a child of the parentNode
// created earlier.
AddOrUpdateWorkflow(
 "DEMO ACQUISITION workflow",
 Resources.WorkflowNameAcquisition,
 parentNode,
 null,
 0, // Priority
 codeBlock);
```

Further Information

For more information about workflows, see Creating Workflows (page 111)

Installing an Application With a Structure Update Plugin

.TBP File

The *.tbp* file for modules must have a line similar to the following for the structure update plugin:

```
<DocumentStructureUpdatePlugIn Priority="90" DMCode=""
Namespace="CSSample117.DataModel" ClassName="StructureUpdatePlugIn"
 />
```

Creating a Stand-Alone Autodesk Topobase Extension

Just as with all parts of a vertical application module, you can create a stand-alone component out of a `DocumentStructureUpdatePlugIn` module. Such extensions can be used to create portions of a data model that can be used in different workspaces. Dimension, Plot, Templates, COGO are all examples of extensions.

When creating a `DocumentStructureUpdatePlugIn` extension, be sure to override the `DocumentStructureUpdatePlugIn.Category` method and return the correct category type, as in the following example:

```
/// <summary>
/// Defines the Plot as an extension
/// </summary>
/// <returns>CategoryType.Extension</returns>
public override CategoryType Category()
{
 return CategoryType.Extension;
}
```

Adding Feature Rules

About Feature Rules

Feature rules are short procedures that are triggered whenever changes are made to the database. They are used to enforce business rules within a document by automatically setting attributes, rejecting incorrect new features, repairing errors, performing housekeeping actions, and other tasks. For example, feature rules might move child labels whenever a feature is moved,

or split a vertex when a new pipe it attached to it at a point besides one of the end points.

For more information about feature rules, see *Autodesk Topobase Feature Rules Reference* (TopobaseFeatureRuleReference.chm).

Creating Feature Rules

Creating the FeatureRulePlugin Module

Feature rule plugins are classes based on the `FeatureRulePlugIn` abstract class, which list and operate the feature rules for the application module. Feature rule plugins need to overwrite the `GetRules()` method to return an array of descriptions of all rules, each of which includes a reference to a function within the class.

```
public override Topobase.Data.FeatureRules.FeatureRuleDef[]
 GetRules()
{
 FeatureRuleDef[] result = new FeatureRuleDef[1];

 // Describe a feature rule that fires before any new
 // feature is inserted.
 result[0] = new FeatureRuleDef(
 100,
 "UpdateDateUserAttributes_BI",
 Resources.FeatureRule_UpdateDateUserAttributes_BI,
 RuleTriggerEvent.BeforeInsert,
 new InsertUpdateFeatureRuleDelegate
 (UpdateDateUserAttributes_BI),
 "UpdateModificationHistory",
 new VersionNumber("1.00.00"));

 return result;
}
```

Creating the Rules

The rule consists of a function that takes in the feature class, feature, and parameters being checked. It then performs whatever action is required by the rule, such as modifying an attribute of the feature. It also returns a boolean

value indicating whether the feature passes the rule or not. The following feature rule example updates the date created and username attributes:

```
private bool UpdateDateUserAttributes_BI(FeatureClass fc, Feature
 feature, params string[] parameters)
{
 if (fc.Attributes.Contains(DataModelResources.attrDateCreated))
 {
 feature.Attributes[DataModelResources.attrDateCreated]
 .Value = DateTime.Now;
 }
 if (fc.Attributes.Contains(DataModelResources.attrUserCreated))
 {
 feature.Attributes[DataModelResources.attrUserCreated]
 .Value = userName;
 }

 return true;
}
```

Rule Priorities

When defining a rule, the first parameter of the `FeatureRuleDef` constructor is the priority of the rule - an integer that indicates in which order the rule should be activated relative to other rules. A poorly chosen value can make it and other rules not work correctly. The recommended value for the priority parameter depends on the time the rule is activated (that is, what `RuleTriggerParameter` value is set for the fourth parameter of the constructor).

For “Before Insert”, “Before Update”, “Before Insert Or Update”, and “Before Delete” rules:

Priority value	Used to
10-19	Cancel operations when conditions do not depend on other rules. **Example: Cancel all updates of point features.**
30-39	Change attributes of features being inserted/updated. **Example: Set orientation of points.**
50-59	Cancel operations when conditions depend on other rules. **Example: Cancel all updates of points with invalid orientation.**

Priority value	Used to
70-79	Used for all other tasks. **Example: Find all lines connected to the point and store them in a variable.**
90-99	Make changes to the database. **WARNING It is recommended that you do not use this priority, and instead create an after-operation rule instead.**

For "After Insert", "After Update", "After Insert Or Update", and "After Delete" rules:

Priority value	Used to
110-119	(Reserved for future use.)
130-139	Delete features in the database. **Example: Delete lines connected to point.**
150-159	Update features in the database. **Example: Move lines connected to point.**
170-179	Insert features into the database. **Example: Split a line.**
190-199	Used for all other tasks. **Example: Regenerate graphics.**

Installation

The *.tbp* file for modules must have a line similar to the following for the feature rules plugin:

```
<FeatureRulePlugIn ClassName="FeatureRulesClassname" />
```

Creating Workflows

About Workflows

A workflow is a program that guides the user through a complicated task. When a workflow is started, the user is presented with a user interface prompt, such as a message box or controls in the Autodesk Topobase task pane, directing them through a series of steps such as setting workflow parameters, selecting features for analysis, or digitizing new features. There are two ways to create a workflow program: writing Visual Basic script in Autodesk Topobase Administrator, or by creating a workflow plugin using Visual Studio .NET.

Workflow Scripts in Autodesk Topobase Administrator

The Autodesk Topobase Administrator includes a tab for creating new workflows within a workspace document. A textbox allows the user to type in the workflow code in the Visual Basic .NET language.

To create a new blank workflow:

1. Launch the Autodesk Topobase Administrator and load the workspace.
2. In the tree view, under the document to which you want to add the workflow, click Workflows.
3. In the Workflow Administrator page, click the parent workflow in the tree view and click Create.
4. Type the name of the new workflow.

   A new entry for the workflow and a simple template for adding your workflow code is displayed. Adjust the name, display name, and icon as needed.
5. When you are done creating the workflow, click Save.

The entry point for a workflow script is the `Run` subroutine. You can create other subroutines and functions, but a script must contain at least the `Run` subroutine.

NOTE There are a number of limitations when working with workflow scripts. The code window is limited in size, and the script interpreter provides only the most basic of features. There are no debugging features. You can only access a subset of the Visual Basic .NET language. Because of these issues, workflow scripts are only useful for simple workflows.

The following is a sample workflow script. It prompts the user for a name for a new valve, has the user digitize a new WA_VALVE feature, and sets the name of the feature to the string the user gave earlier. It then opens the feature dialog box to allow the user to type in new attribute values.

```
Sub Run
 Dim name As String
 name = InputBox("Input name of new valve:", "Digitize Valve")

 If (not string.IsNullOrEmpty(name)) Then
 me.Digitize("WA_VALVE")
 ' "0" is that always the latest item that was digitized
 me.Features.List.Item(0).Attributes.Item("NAME_NUMBER").Value =
name
 me.Features.Update()
 me.OpenDialog()
 End If
End Sub
```

Use of the "Me" Object

Workflow scripts are derived from the `Topobase.Workflows.ScriptClass` abstract class. By using the `Me` object in the script, you can gain access to the many base objects and useful functions provided by `ScriptClass`.

The following are the objects provided by the `Me` object. With these you can access all of the main features of the Autodesk Topobase environment and document data:

- **Application** - This object contains information about the current working environment, the current user, and the open workspace and documents. It is a reference to the base application object derived from the `Topobase.Forms.Application` abstract class.
- **Document** - This objects allows you to interact with the document that this workflow is part of, including displaying dialog boxes or closing the document. It is a reference to one of the documents in the current

workspace, an object derived from the `Topobase.Forms.Document` abstract class.

- **Features** - This object provides methods for accessing and modifying the list of features that were just recently digitized. It is an instance of the `Topobase.Workflows.Features` class.
  The following is an example using the `Me` object:

```
' Digitize a new pipe and then display a message box with
' the feature ID of the newly created feature.
Me.Digitize("DEMO_PIPE")
Me.MessageBox(Me.Features.ListItem(0).Attrib
utes.Item("FID").Value)
```

The following are some of the useful methods provided by the `Me` object:

- **ShowMessage()** - Hides any explorer currently displayed in the Autodesk Topobase task pane and displays a string message inside. When the workflow ends, the Autodesk Topobase task pane reverts to its previous state.
- **MessageBox()** - Displays a standard message box with a single "Ok" button and a single string message with an optional title. Processing of the workflow pauses until the message box is dismissed.
- **InputBox()** - Displays a standard input box allowing the user to input a string value. Processing of the workflow pauses until the input box is dismissed.
- **Digitize()** - Allows the user to add features of the specified feature class to the document.
- **RunMethod()** - Runs a method from an external *.dll* library. The most important use of RunMethod is to launch workflow plugins.

Workflow Plugin

A workflow plugin is a class library created in Visual Studio .NET. It must contain a class based on `Workflows.WorkflowPlugIn`, but otherwise you have freedom in creating its design.

Create a Workflow Plugin Module

Workflow plugins are classes derived from the `Workflows.WorkflowPlugIn` abstract parent class.

```
class AcquisitionWorkflows : Topobase.Workflows.WorkflowPlugIn
{
}
```

Creating the Entry Point

Workflows are accessed by an entry point - a public function with no parameters and no return value. You can use any function name. Instead of parameters, the instance of the `WorkflowPlugIn`-derived class has many properties and methods for getting information about the current document and the state of the environment. That instance can be accessed using the `this` keyword in C# or `Me` keyword in Visual Basic .NET.

Generally, the entry point should perform three actions. First, check if the current state of Autodesk Topobase and of the document allows the workflow to work correctly. Second, request input from the user, and third, update the database based on the user's input.

The following sample entry point demonstrates a particular kind of workflow, which creates an interface in the workflow pane. This entry point checks the current state of Autodesk Topobase, creates the user interface elements for initializing the workflow into the workflow pane, and then adds an event to the user interface elements to start the interactive part of the workflow when

the initialization phase is complete. The `CreateNetworkPipe_Closed` event contains the code for updating the database.

```
public void NetworkPipeCreation()
{
 // Determine if Topobase is in the correct state for the
 // workflow to be meaningful.
 // Check if the utility is loaded.
 if (this.Utility == null)
 return;

 // Also check if the map is connected to the document.
 if (this.Document.Map.IsConnected(true))
 return;

 // Create the container in the workflow pane with Ok and
 // Cancel buttons.
 IWorkflowContainer container = WorkflowContainerFactory.Create(
 this.WorkflowSupport,
 ContainerButtons.OkCancel,
 Resources.ModuleName,
 false);

 // Add a control to the container that asks if the user
 // wants to set a reference for the features they are about
 // to digitize.
 FeatureClass fc = Document.Connection.
 FeatureClasses["DEMO_PIPE"];
 RefFeatureData refData = new RefFeatureData(
 this.WorkflowSupport, "refData", fc,
 string.Format(
 CultureInfo.CurrentCulture,
 Resources.ChooseReferenceOf,
 fc.Caption)
 );

 IWorkflowUserControl refControl =
 WorkflowUserControlFactory.Create(refData);

 container.AddUserControl(refControl);

 // Make the container visible.
 this.WorkflowSupport.WorkflowExplorerFlyIn.
 ShowWorkflowContainer(container);

 // Add an event for when the user clicks the Ok or
```

```
  // Cancel buttons on the container.
  container.Closed += new EventHandler(CreateNetworkPipe_Closed);
 }
```

Create a Workflow Pane UI

The defining characteristic of a workflow is that it guides the user through a process by using user interface messages and controls. Autodesk Topobase provides many different systems of interacting with the user, depending on the need of the workflow. You may only need the simplest message displays, or the full flexibility and options of a Windows user control, or the compatibility between different versions of the Autodesk Topobase Client that the Autodesk Topobase controls can provide.

Displaying Simple Messages

Message Box

One way to provide messages to the user is to display a modal message box, which the user can dismiss and then continue with the workflow process. Message boxes can be displayed with the `Application.MsgBox()` method.

```
this.Application.MsgBox("Hello");
```

This is the simplest way to present a message to the user. The `Application.MessageBox()` method performs a similar task, but also gives you the options of setting the message box title and using a mono-spaced font.

```
// Use a message of "Hello", a title of "Title", and the
// standard font.
this.Application.MessageBox("Hello", "Title", false);
```

ShowMessage

Another way to provide the user a message is to use the `WorkflowSupport.WorkflowExplorerFlyIn.ShowMessage()` method. This hides any explorer in the Autodesk Topobase task pane and display a string centered within that area. This message is modeless, so it continues to be displayed as the user performs workflow tasks, such as digitizing features.

```
this.WorkflowSupport.WorkflowExplorerFlyIn.
 ShowMessage("Start Digitizing. Press ESC when done.");
```

The Autodesk Topobase task pane returns to its previous state once the workflow ends. You can also dismiss the message by using the `HideUserControls()` method.

```
this.WorkflowSupport.WorkflowExplorerFlyIn.HideUserControls();
```

Displaying a Windows User Control

A workflow user interface can be implemented by creating a Windows user control. When a workflow is started, the user control is resized and rendered in the Autodesk Topobase task pane. A user control allows you to more exactly specify the location and organization of controls and gives you the ability to use a wide variety of Visual Studio toolbox components.

NOTE Workflows using Windows user controls are not compatible with the Autodesk Topobase Web Client.

To create a workflow using a user control for the workflow's user interface

1. In Microsoft Visual Studio, click Project ➤ Add User Control to add a Windows user control to the project .

   This user control contains the user interface for setting up the workflow. Add any controls and labels you need.

   TIP Be sure to design your control so it works correctly when resized to fit within the Autodesk Topobase task pane.

   ---

2. Next, add the workflow operations. This is usually in response to a control event (such as the click event of an Ok button). At the end of the workflow operation, hide the user control and return the Autodesk Topobase user interface to its previous state:

3. ```
   private void ButtonOk_Click(object sender, System.EventArgs e)
   {
    // Add code that conducts the Workflow operation here.
   [..]

    // Hide the user control and return the task
    // pane to its previous state.
    workflowSupport.WorkflowExplorerFlyIn.HideUserControls();
   }
   ```
   ```

4 Finally, create the WorkflowPlugin class with an entry point. In the entry point, create and display the Windows user control:

```
public void EntryPoint()
{

[..]

 // Create a new instance of the Windows user control
 // named "MyWorkflowUserControl".
 MyWorkflowUserControl form =
 new MyWorkflowUserControl(this.Workflow);

 // Display it in the Autodesk Topobase task pane.
 this.Workflow.WorkflowExplorerFlyIn.ShowControl(form);

[..]

}
```

For a demonstration of this technique, see Sample 85 - Workflows (page 275).

Using WorkflowContainerFactory

A workflow user interface can also be implemented by directly creating Autodesk Topobase workflow controls in the Autodesk Topobase task pane. This is done using an object based on the `IWorkflowContainer` interface (`GeneralWorkflowContainerDesktop` or `GeneralWorkflowContainerWeb`) created using the `WorkflowContainerFactory` static class. Workflows based on these container objects are compatible with the Autodesk Topobase Desktop Client and, unlike workflows using Windows user controls, the Autodesk Topobase Web Client as well. While the choice of controls and their placement is limited compared to Windows user controls, this also gives you access to Autodesk Topobase-specific controls. For more information about these controls, see Autodesk Topobase Workflow Controls (page 120).

In the entry point, make a container object that contains the `IWorkflowContainer` interface. This can be done by calling `WorkflowContainerFactory.Create()`, which returns an `IWorkflowContainer` interface to the new container object, either a `GeneralWorkflowContainerDesktop` or a `GeneralWorkflowContainerWeb` depending on whether the user is in the Autodesk Topobase Desktop Client or the Autodesk Topobase Web Client.

NOTE If you know the workflow will only be used in one type of client, you can directly create a new GeneralWorkflowContainerDesktop or GeneralWorkflowContainerWeb object.

When creating this container, you specify some features of its behavior, such as the presence of a “Close”, “Ok”, or “Cancel” buttons.

```
IWorkflowContainer container = WorkflowContainerFactory.Create(
 this.WorkflowSupport,
 ContainerButtons.OkCancel,
 Resources.ModuleName,
 false);
```

When your workflow has finished, be sure to clear the Autodesk Topobase task pane and return it to its previous state with the following code:

```
this.WorkflowSupport.WorkflowExplorerFlyIn.HideUserControls();
```

For demonstrations of these techniques, see Sample 85 - Workflows (page 275), Sample 116 - Advanced Workflows (page 300), and Sample 117 - Simple Water Module (page 302).

Autodesk Topobase Workflow Controls

The following controls can be placed within a container based on IWorkFlowContainer:

- CheckBox Control (page 120)
- RadioButton Control (page 122)
- ComboBox Control (page 124)
- RefFeatureControl Control (page 125)
- ChoseFeatureClass Control (page 126)
- ChoseFeature Control (page 127)

CheckBox Control

A check box control creates a series of check boxes positioned vertically within a group box. The data object contains an array of data items, one for each check box within the control.

Creating a CheckBox Control

```
// Create the data object of the control.
CheckBoxData checkData = new CheckBoxData
 (this.Workflow,
 "CheckBoxKey",
 "Title", /* title of the group box */
 "MyWorkflowTest",
 "CheckBoxKey");
// Create the individual check box designs. Create an array of
// DataItems, one for each check box. The following code
// creates one check box.
 CheckBoxData.DataItem[] cbItems = new CheckBoxData.DataItem[1];
// Define the specifics of a single check box. It has the
// text "Check 1", and it is checked.
CheckBoxData.DataItem cbItem1 = new CheckBoxData.DataItem
 ("Check 1", "Check1Tag", true);
// Assign the newly created specifics to a place within the array.
cbItems.SetValue(cbItem1, 0);
// Assign the array to the data container.
checkData.AvailableItems = cbItems;
// Create a control containing the group box and check boxes as
// defined in the control data object.
CheckBoxControlDesktop checkControl =
 new CheckBoxControlDesktop(checkData);
// Add the control to the workflow container.
container.AddUserControl(checkControl);
```

Getting User Input From CheckBox

The status of a check box is determined by looping through all the data object data items, determining which data item represents the check box you are interested in, and testing its `CheckState` property.

```
// Get the list of all control data objects.
WorkflowDataList dataList = container.DataList;
// Retrieve the check box data object from the list of
// control data objects.
CheckBoxData checkData = dataList["CheckBoxKey"] as CheckBoxData;
foreach (CheckBoxData.DataItem check in checkData.CheckedItems)
{
 if (check.CheckState == true)
 {
 // Do something if the checkbox is checked.
 }
}
```

RadioButton Control

A radio button control creates a series of related radio buttons positioned vertically within a group box. The data object contains an array of data items, one for each radio button within the control.

Creating a RadioButton Control

```
// Create the data object of the control.
RadioButtonData radioData = new RadioButtonData
 (this.Workflow,
 "RadioKey",
 "Radio Title",
 Properties.Resources.ModuleName,
 "RadioKey");
// Create the individual radio button designs. Create an array
// of DataItems, one for each radio button. The following
// code creates one radio button.
RadioButtonData.DataItem[] rdItems =
 new RadioButtonData.DataItem[1];
// Define the specifics of a single radio button. It has the
// text "Radio 1", and it is selected.
RadioButtonData.DataItem rdItem1 =
 new RadioButtonData.DataItem("Radio 1", "Radio1Tag", true);
// Assign the newly created specifics to a place within the array.
rdItems.SetValue(rdItem1, 0);
// Assign the array to the data container.
radioData.AvailableItems = rdItems;
// Create a control containing the group box and radio buttons
// as defined in the control data object.
RadioButtonControlDesktop radioControl =
 new RadioButtonControlDesktop(radioData);
// Add the control to the workflow container.
container.AddUserControl(radioControl);
```

Getting User Input From RadioButton

The selected radio button is determined by checking the `CheckedItem` property of the data object. The `CheckedItem` property is a reference to a single `RadioButtonData.DataItem` object.

```
// Get the list of all control data objects.
WorkflowDataList dataList = container.DataList;
// Check which radiobutton option the user selected.
RadioButtonData RadioSelections =
 dataList["RadioKey"] as RadioButtonData;
// Look at the Tag property to see if the checked
// radio button is the one we are interested in.
bool IsSelected =
 RadioSelections.CheckedItem.Tag.Equals("Radio1Tag");
```

ComboBox Control

The ComboBox control creates a drop-down list combo box with a label above it. The data object contains an array of data items, one for each item within the drop-down list.

Creating a ComboBox Control

```
// Create the data object of the control.
ComboBoxData comboData = new ComboBoxData
 (this.Workflow,
 "ComboBoxKey",
 "Combo Title",
 Properties.Resources.ModuleName,
 "ComboBoxKey");
// Create the lines that populate the drop-down list.  Create an
// array of DataItems, one for each line.  The following code
// creates two lines.
ComboBoxData.DataItem[] cmbItems = new ComboBoxData.DataItem[2];
ComboBoxData.DataItem cmbItem1 =
 new ComboBoxData.DataItem("List Item 1", "tag1");
cmbItems.SetValue(cmbItem1, 0);
ComboBoxData.DataItem cmbItem2 =
 new ComboBoxData.DataItem("List Item 2", "tag2");
cmbItems.SetValue(cmbItem2, 1);
// Assign the array to the data container.
comboData.AvailableItems = cmbItems;
// Create a control containing the combobox and label as
// defined in the control data object.
ComboBoxControlDesktop comboControl =
 new ComboBoxControlDesktop(comboData);
// Add the control to the workflow container.
container.AddUserControl(comboControl);
```

Getting User Input From ComboBox

The text of the selected item is determined by checking the `SelectedItem` property of the combo box data object.

```
// Get the list of all control data objects.
WorkflowDataList dataList = container.DataList;
// Get the data object of the combobox control from the list of
// all control data objects.
ComboBoxData comboData = dataList["ComboBoxKey"] as ComboBoxData;
// Display the text of the selected item.
System.Windows.Forms.MessageBox.Show
 ("Combobox selected item: " + comboData.SelectedItem.Text);
```

RefFeatureControl Control

The RefFeatureControl control is a combo box that allows the user to select a reference for the features to be digitized. It also contains a pre-defined label prompting the user to select the reference type.

Creating a RefFeatureControl

```
// Get a reference to the feature class to be digitized.
FeatureClass fc = Document.Connection.FeatureClasses["DEMO_PIPE"];

// Create the setup information for the RefFeatureControl.
RefFeatureData refData = new RefFeatureData(
 this.WorkflowSupport,
 "refData",
 fc,
 string.Format(CultureInfo.CurrentCulture,
 Resources.ChooseReferenceOf,
 fc.Caption));

// Create the control generically, so that it works in both
// desktop and web versions.
IWorkflowUserControl refControl =
 WorkflowUserControlFactory.Create(refData);

// Add the control to the pane.
container.AddUserControl(refControl);
```

Getting User Input From RefFeatureControl

```
WorkflowDataList dataList = container.DataList;

RefFeatureData refData = dataList["refData"] as RefFeatureData;
```

ChoseFeatureClass Control

The ChooseFeatureClass control creates a list box populated with a list of all feature class names. The list box allows selection of multiple lines. It also contains a pre-defined label prompting the user to select one of the feature classes.

Creating a ChooseFeatureClass Control

```
// Create the data object of the control.
ChooseFeatureClassData chooseClassData = new ChooseFeatureClassData
 (this.Workflow,
 "ChooseClassKey",
 this.Document.Connection.FeatureClasses,
 false,
 false,
 true,
 Properties.Resources.ModuleName,
 "ChooseClassKey");
// All options to set for the ChooseFeatureClass control are
// set within the constructor for the control data.
// Create a control containing a populated list
// as definied by the control data object.
ChooseFeatureClassControlDesktop chooseClassControl =
 new ChooseFeatureClassControlDesktop(chooseClassData);
// Add the control to the workflow container.
container.AddUserControl(chooseClassControl);
```

Getting User Input From ChooseFeatureClass

An array of `FeatureClass` objects is contained in the `SelectedFeatureClasses` property of the `ChooseFeatureClassData` data object. These `FeatureClass` objects represent those items in the list box that are currently selected.

```
WorkflowDataList dataList = container.DataList;
ChooseFeatureClassData chooseFeatureClassData =
 dataList["ChooseClassKey"] as ChooseFeatureClassData;
// Make sure the user selected a feature class.
if (chooseFeatureClassData.SelectedFeatureClasses.Count == 0)
{
 // The user didn't select any feature class. Simply hide the
 // user controls and return so the workflow is terminated.
 Workflow.WorkflowExplorerFlyIn.HideUserControls();
 return;
}
// Get the first FeatureClass object from the list of
// selected feature class names.
FeatureClass selectedFeatureClass =
 chooseFeatureClassData.SelectedFeatureClasses[0];
```

ChoseFeature Control

The ChooseFeature control consists of a button, group box, and a pre-defined label with the number of currently selected features. Pressing the button allows the user to select features within the drawing.

Creating a ChooseClass Control

```
// Create the data object of the control.
ChooseFeatureData choosefeatureData = new ChooseFeatureData
 (this.Workflow,
 "ChooseKey",
 true, /* Allow multiple selection */
 true); /* Need at least one feature selected */
// Create a control as defined in the control data object.
ChooseFeatureControlDesktop choosefeatureControl =
 new ChooseFeatureControlDesktop(choosefeatureData);
// Add the control to the workflow container.
container.AddUserControl(choosefeatureControl);
```

Acquisition Workflows - Basics of Digitizing

Using DigitizeFeatures

The `WorkflowSupport.Document.Map` object contains a method for digitizing features. Calling `DigitizeFeatures()` allows the user to create any number of the specified type of features. The features created is returned as a `FeatureList`. The prompt to display while digitizing is set by one of the parameters. The workflow application is paused until the user finishes digitizing the new features or presses Escape to cancel the operation. If the user cancels the operation, then `DigitizeFeatures()` returns a valid list containing zero elements.

```
FeatureList digitized;
digitized = this.WorkflowSupport.Document.Map.DigitizeFeatures(
 featureClass,
 featureClass.Type,
 "Please digitize a " + featureClass.Caption,
 null,
 true);
```

Digitizing Utility Features

If you need to digitize node or line features into a utility network (such as a water pipe or electrical network), then use the digitize methods of the `UtilityFeatreClass` class.

`UtilityFeatureClass` represents a feature class that is part of a utility. Objects of this type are created by the static factory class `UtilityFeatureClassFactory`. `UtilityFeatureClass` contains the methods `Digitize()` and `DigitizeMultiple()`, which allow the user to create new utility features within the document.

NOTE No prompt is displayed to the user. You should use `ShowMessage` (or some other method) to tell the user what state they are in and what action they should take.

The following sample creates an instance of the `UtilityFeatureClass` based on the existing DEMO_PIPE feature class using the `UtilityFeatureClassFactory`. It then loops, allowing the user to create any

number of individual DEMO_PIPE features, which represent lines within the water utility network:

```
FeatureClass fc;
fc = Document.Connection.FeatureClasses["DEMO_PIPE"];

UtilityFeatureClass pipeUfc;
pipeUfc UtilityFeatureClassFactory.GetInstance(fc);
ArrayList pipes = new ArrayList();

bool newPipe = true;
while (newPipe)
{
 // Give the user a prompt.
 this.WorkflowSupport.WorkflowExplorerFlyIn.
 ShowMessage("Digitize Pipe.  Press ESC to exit.");
 UtilityLine pipe = pipeUfc.Digitize(Document) as UtilityLine;

 if (pipe == null)
 {
 newPipe = false;
 break;
 }
 pipes.Add(pipe);
}
```

The `UtilityFeatureClass` class contains many other methods that can be useful in workflows:

- **ConvertFeature** - Allows the user select a feature in the document that is converted to a utility feature and returned.
- **HighlightFeatures** - Takes an array of utility features and highlights them in the display. It can optionally zoom the display to show all the highlighted features.
- **SelectSingleFeatureInGraphic** - Allows the user to select a utility feature in the document. It can optionally return which line segment of the feature was selected.

Analysis Workflows - Basics of Analysis

Selecting Points and Regions

You can prompt the user to select points, rectangles, or polygons within the document by using methods of the `WorkflowSupport.Document.Map` object.

`GetPoint()` gives the user a prompt that is displayed as a tooltip by the cursor and in the command window. The method returns the point location in the map where the user clicked. The workflow application is paused until the user selects a point or presses Escape to cancel the operation.

```
// The prompt says "Select Point".
Topobase.Graphic.Point pt;
pt = this.WorkflowSupport.Document.Map.GetPoint("Select Point");
```

`GetRectangle()` gives the user a prompt that is displayed as a tooltip by the cursor and in the command window. The method returns the polygon region in the map defined by *two* clicks from the user. The workflow application is paused until the user selects the rectangle or presses Escape to cancel the operation.

```
Topobase.Graphic.Polygon rect;
rect = this.WorkflowSupport.Document.Map.
 GetRectangle("First Corner", "Second Corner");
```

`GetPolygon()` also gives the user a prompt that is displayed as a tooltip by the cursor and in the command window. The method returns the polygon region in the map defined by at least *three* clicks from the user. The workflow application is paused until the user selects the region or presses Escape to cancel the operation.

```
Topobase.Graphic.Polygon poly;
poly = this.WorkflowSupport.Document.Map.
 GetPolygon("Select Polygon");
```

Selecting Features in the Document

One way for the user to select features in the document is to call the `GetFeatures()` method of the `WorkflowSupport.Document.Map` object. `GetFeatures()` allows the user to select any number of features (either one at

a time or through selection windows and crossing windows) until they press the Enter key. The features selected are returned as a `FeatureList` as follows:

```
FeatureList features;
features = this.WorkflowSupport.Document.Map.GetFeatures();
```

NOTE You cannot set the prompt; it automatically displays the text "Select Entities". The workflow application is paused until the user finishes selecting features or presses Escape to cancel the operation.

Installation

Adding Workflows Automatically

If your workflow class is part of a vertical application, you can add your workflow to the workspace while creating your data model. This is done using the `AddOrUpdateWorkflow()` method.

There are many different overridden versions of the `AddOrUpdateWorkflow` method, but there are two general forms. Most versions have you pass the same information as you would manually enter in the Workflow Administrator page of the Autodesk Topobase Administrator. The following example creates a new workflow by passing the workflow name, the caption to be displayed in Autodesk Topobase, the path to the icon file, the priority value, the script code, and a boolean value indicating that this workflow should not be modified by the user.

```
AddOrUpdateWorkflow(
 "DEMO ACQUISITION ParentNode",
 Resources.WorkflowNameAcquisition,
 NodeWorkflowPictureName,
 0,
 null, true);
```

NOTE This particular sample passes a null string for the script code, which means that this entry in the list of workflows does not actually do anything, but it can serve as the parent of other workflows for organizational purposes.

Another overridden form of the `AddOrUpdateWorkflow` method takes a reference to the workflow entry point method and a reference to the resource that contains the caption string. Attached to the entry point method is a series of

function attributes defining the icon file path, priority, and other settings that would normally be passed to `AddOrUpdateWorkflow` as parameters.

The following example features the `AddOrUpdateWorkflow` method:

```
// In a structure update module where the data model
// is defined.
public override void UpdateStructure()
{
 AcquisitionWorkflows acquisitionWorkflowInstance =
 new AcquisitionWorkflows();

 AddOrUpdateWorkflow(
 acquisitionWorkflowInstance.NetworkPipeCreation,
 Resources.ResourceManager);
}



// Inside the workflow plugin class.

// Set the function attributes describing the workflow.
[WorkflowMethodDescription(
 AcquisitionWorkflows.WorkflowNameCreateNetworkPipe,
 "WorkflowNameNetworkPipeCreation",
 "WaterPipeCreation",
 1, // Priority
 ParentWorkflowName = "DEMO ACQUISITION ParentNode",
 IsSystem = false)]
public void EntryPoint()
{
[...]
```

NOTE The benefit of this is to locate all the workflow-related settings within the workflow class itself for easier editing. A vertical application might contain a large number of very complicated structure update classes, and it can be hard to locate the correct AddOrUpdateWorkflow method to make changes.

Adding Workflows Manually Using Administrator

If your workflow is located in a stand-alone class library file (that is, a standalone *.dll*), you must add your workflow information manually.

To add your workflow manually into the Autodesk Topobase Administrator:

1. Build the project. Place the plugin library into the Autodesk Topobase Client *bin* directory. The associated *.tbp* file must also be copied to the Autodesk Topobase Client *bin* directory.
2. Launch the Autodesk Topobase Administrator application and load your workspace.
3. In the left pane, under the appropriate document, select the Workflows folder.
4. In the Workflow Administrator page, click Create.
5. In the Create Workflow dialog box, enter a name for the workspace and click Create.
6. Create a script in the Script Code edit field that uses the `Me.RunMethod` function to call the entry point function in your plugin library. The first parameter is the filename of the workflow library. The second parameter is the namespace and class name of the workflow. The third parameter is the name of the entry point method.

```
Sub Run
 Me.RunMethod("workflow.dll",
 "ProjectName.ClassName", "EntryPointFunction")
End Sub
```

7. Click the Save button.

Organizing Workflows

You can organize workflows in a hierarchy by creating blank workflows using the `AddOrUpdateWorkflow` method while passing a null string for the Script Code parameter. These blank workflows can act as parents for your functional workflows. Assign the child workflows by using one of the overloads of the `AddOrUpdateWorkflow` method that takes a parent workflow object as a parameter.

Creating User Interface Plugins

User interface plugins are small applications that provide functionality to the Autodesk Topobase user, usually by creating a new control integrated into some part of the Autodesk Topobase client user interface. There are many different kinds of plugins that correspond to the different user interface

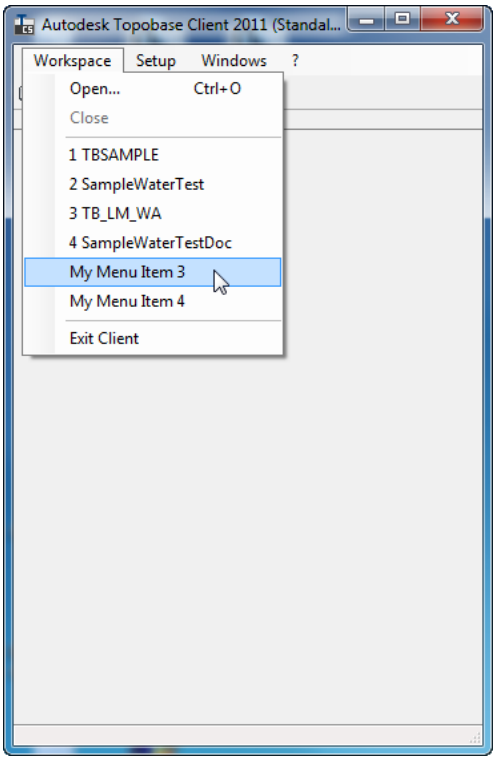
elements of Autodesk Topobase and to the different levels of information (that is, application-wide tasks, single document tasks, or single table tasks).

Creating an Application Plugin

About Application Plugins

Application plugins are a mechanism for performing application-wide operations. They may run without a user interface until an application event fires, or they may modify the application menu bar or add application toolbars and toolbar buttons to the Autodesk Topobase task pane.

NOTE The application menu bar is only visible in the stand-alone Autodesk Topobase Client application or in the desktop Autodesk Topobase Client application when no workspace is loaded. If a workspace is loaded in the desktop Autodesk Topobase Client, the menu bar is not visible.



Application menu of the Autodesk Topobase task pane in the Autodesk Topobase standalone client showing two custom entries from an application plugin.

These plugins are derived from the `Topobase.Forms.ApplicationPlugIn` class:

```
public class MyApplication : Topobase.Forms.ApplicationPlugIn
{
}
```

Responding to Application Events

The `ApplicationPlugIn` class contains a number of virtual functions that you override to respond to application events. These functions include:

- `OnPreLoad` - Triggered first when the plugin is loaded and executed.

- `OnLoad` - Triggered during the initialization process when the plugin is loaded and executed.
- `OnInitComplete` - Triggered after the initialization process is complete.
- `OnInitMenus` - Override this event to create application menu items.
- `OnUnload` - Triggered when the plugin is unloaded.

NOTE Not triggered when the Autodesk Topobase Client is closed.

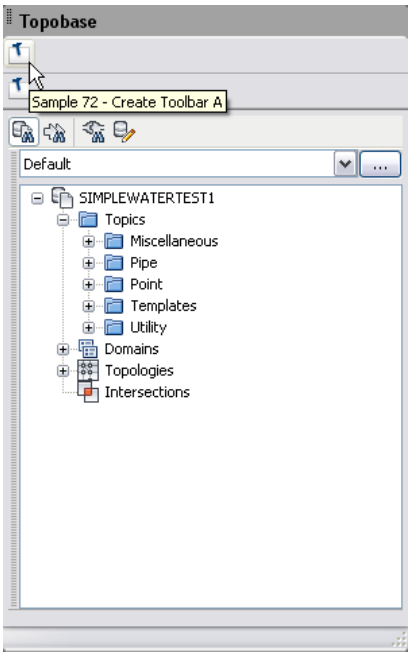
In the following example, an application plugin named "MyApplication" displays a dialog box when the plugin is first loaded:

```
public class MyApplication : Topobase.Forms.ApplicationPlugIn
{
 public override void OnLoad(object sender, EventArgs e)
 {
 base.OnLoad(sender, e);

 // Display the dialog box (defined elsewhere).
 Form1 theForm = new Form1();
 theForm.Show();
 }
}
```

Adding Custom Toolbars and Toolbar Buttons

By default, no application toolbars are shown in the Autodesk Topobase task pane. Application plugins can create new toolbars by passing a string containing the new toolbar name to the `Item` property of the `ToolBars` collection. These toolbars can be shared between different plugins if they use the same toolbar name. For more information about adding toolbars, see Sample 72 - Application Toolbar (page 264).



Sample 72, and application plugin, adds two application toolbars.

To create a toolbar and toolbar button, create a global public variable of type `Topobase.Forms.ToolBarButton`. Override the `ApplicationPlugIn` class's `OnInitToolBars` event, create a new application toolbar, and insert a new button using the `Add` method of the toolbar's `Buttons` collection. You can

then create an event handler for the new button and can respond to button events. For example:

```
public Topobase.Forms.ToolBarButton myToolbarButton =
 new Topobase.Forms.ToolBarButton();

public override void OnInitToolBars
 (object sender, Topobase.Forms.Events.ToolBarsEventArgs e)
{
 // Create a custom toolbar.
 Topobase.Forms.ToolBar customToolbar;
 customToolbar = e.ToolBars.Item("Custom Toolbar");

 // Add a new toolbar button to the application toolbar
 // using the "Topobase" icon and "My Toolbar Button"
 // as the tooltip text.
 customToolbar.Buttons.Add
 (myToolbarButton,
 "Topobase",
 "My Toolbar Button");

 // Add event handler for the button.
 myToolbarButton.Click +=
 new EventHandler(myToolbarButton_Click);
}


private void myToolbarButton_Click
 (object sender, System.EventArgs e)
{
 // Perform the plugin action here.
 this.Application.MessageBox("Toolbar button was clicked");
}
```

Adding Menu Items

To add a menu item, create a public variable of type `Topobase.Forms.MenuItem`. Override the `ApplicationPlugIn` class's `OnInitMenus` method (which is triggered when the menu initialization is taking place), obtain a reference to the application menu, and insert a new menu item using the `Add` method of the

menu's `MenuItems` collection. You can then create an event handler for the new menu item and can respond to menu events. For example:

```
public Topobase.Forms.MenuItem myMenu =
 new Topobase.Forms.MenuItem();

public override void OnInitMenus
 (object sender, Topobase.Forms.Events.MenusEventArgs e)
{
 // Get the application's project menu.
 Topobase.Forms.Menu vlobMenu =
 e.Menus.Item(Topobase.Forms.ApplicationMenuType.Workspace);

 // Add the new menu item.
 vlobMenu.MenuItems.Add(myMenu, "My Menu Item");

 // Bind the events.
 myMenu.Click += new Topobase.Forms.Events.
 MenuItemClickEventHandler(myMenu_Click);
}

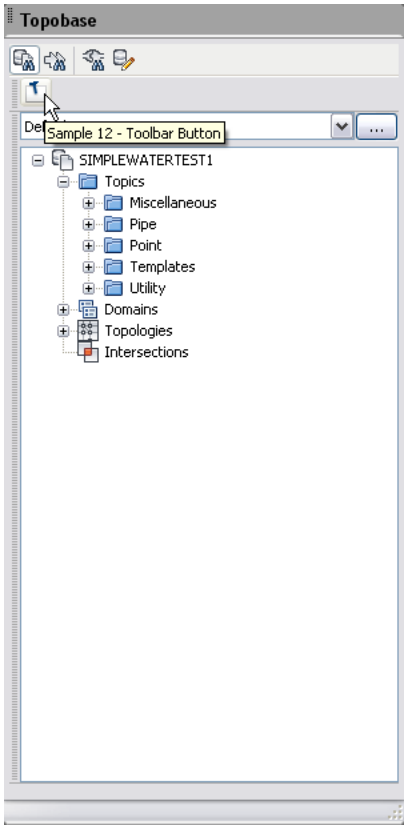

private void myMenu_Click
 (object sender, Topobase.Forms.Events.MenuItemClickEventArgs e)
{
 // Perform the plugin action here.
 this.Application.MessageBox("Menu item was clicked");
}
```

Creating a Document Plugin

About Document Plugins

Document plugins are a mechanism for performing document-level operations. They can set up event handlers for document-level notifications, or they can add new features to the user interface. For example, a document plugin can set up an event handler for job state transitions, and perform client-side validation or reports prior to a job being committed to the "Live" state. Document plugins can also modify the user interface by adding items to the document toolbar or menu items to the context menus within the Autodesk

Topobase task pane. For more information about document plugins, see Sample 12 - Document Toolbar Button (page 196).



Sample 12 adds a document-specific toolbar in the Autodesk Topobase task pane.

These plugins are derived from the `Topobase.Forms.DocumentPlugIn` class:

```
public class MyDocument : Topobase.Forms.DocumentPlugIn
{
}
```

Creating Custom Toolbars and Toolbar Icons

By default, no document toolbars that can be modified by document plugins are shown in the Autodesk Topobase task pane. Document plugins can create

new toolbars by passing a string containing the new toolbar name to the `Item` property of the `ToolBars` collection. These toolbars can be shared between different plugins if they use the same toolbar name.

To create a toolbar and toolbar button, create a global public variable of type `Topobase.Forms.ToolBarButton`. Override the `DocumentPlugIn` class's `OnInitToolBars` event, create a new toolbar, and insert a new button using the `Add` method of the toolbar's `Buttons` collection. You can then create an event handler for the new button and can respond to button events. For example:

```
public Topobase.Forms.ToolBarButton myToolbarButton =
 new Topobase.Forms.ToolBarButton();

public override void OnInitToolBars
 (object sender, Topobase.Forms.Events.ToolBarsEventArgs e)
{
 // Create a custom toolbar.
 Topobase.Forms.ToolBar customToolbar;
 customToolbar = e.ToolBars.Item("Custom Toolbar");

 // Add a new toolbar button to the document toolbar
 // using the "Topobase" icon and "My Toolbar Button"
 // as the tooltip text.
 mainToolbar.Buttons.Add
 (myToolbarButton, "Topobase", "My Toolbar Button");

 myToolbarButton1.Click +=
 new EventHandler(myToolbarButton_Click);
}


private void myToolbarButton_Click
 (object sender, System.EventArgs e)
{
 // Perform the plugin action here.
 this.Application.MessageBox("Toolbar button was clicked");
}
```

Modifying the Context Menu

To create a new menu item within the Document Explorer's context menu

1. Create a public class variable of type `Topobase.Forms.MenuItem`. This serves as the communication point between Autodesk Topobase and your plugin.
2. Override the `DocumentPlugIn` class's `OnInitMenus` event so you can modify the menus at the correct time after they have been created.
3. Obtain a reference to the specific document's context menu you want to modify. There are a collection of `MenuItem` menus, each assigned to a specific feature class. This way you can add menu items only to the context menu of the particular feature class you want.
4. Insert a new menu item using the `Add` method of the menu's `MenuItems` collection
5. Add an event handler for the `Click` event of the new menu item.

The following example demonstrates these steps. It adds a new menu item to the context menu of "Point" feature classes. When you right click on a "Point"

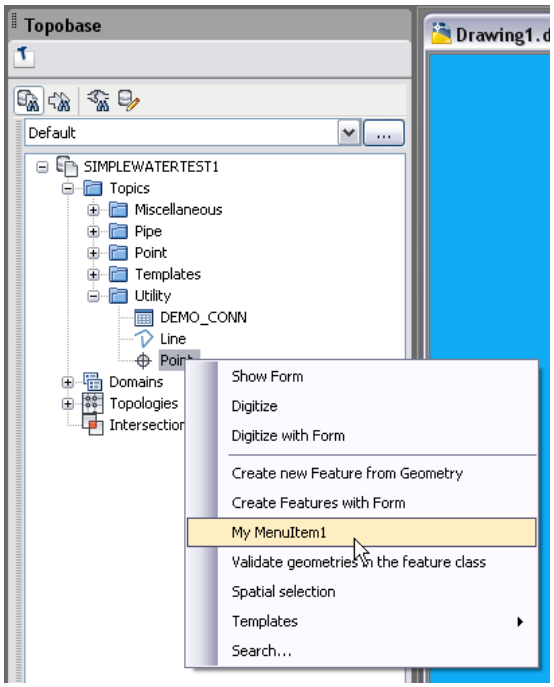
feature class in the Document Explorer, you see a new menu item called My Menu Item, which displays a message box when selected.

```
public Topobase.Forms.MenuItem myMenuItem1 =
 new Topobase.Forms.MenuItem();

public override void OnInitMenus
 (object sender, Topobase.Forms.Events.MenusEventArgs e)
{
 // Obtain the context menu to which you want to add
 // your new MenuItem.
 Topobase.Forms.Menu pointMenu =
 e.Menus.Item(Topobase.Data.FeatureClassType.Point);

 // Add your MenuItem to the menu.
 pointMenu.MenuItems.Add(myMenuItem, "My Menu Item");
 myMenuItem1.Click += new Topobase.Forms.Events.
 MenuItemClickEventHandler(MyMenuItem_Click);
}


private void MyMenuItem_Click
 (object sender, Topobase.Forms.Events.MenuItemClickEventArgs e)
{
 // Perform the plugin action here.
 this.Application.MessageBox("Menu Item Clicked");
}
```



A menu item has been added to the context menu of the Point class.

Creating a Dialog Plugin

About Dialog Plugins

Dialog plugins modify the toolbars, menus, and other user-interface elements of the feature dialog boxes, and are used to provide added features while users are viewing and manipulating individual feature attributes.

These plugins are derived from the `Topobase.Forms.DialogPlugIn` class:

```
public class MyDialog : Topobase.Forms.DialogPlugIn
{
}
```

Creating Toolbar Items

To create a toolbar icon, create a public variable of type `Topobase.Forms.ToolBarButton`. Override the `DialogPlugIn` class's `OnInitToolBar` event, obtain a reference to the dialog toolbar, and insert the new button using the `Add` method of the toolbar's `Buttons` collection. You can then create an event handler for the new toolbar button and can respond to toolbar events. For example:

```
public Topobase.Forms.ToolBarButton myToolbarButton =
 new Topobase.Forms.ToolBarButton();

public override void OnInitToolBar
 (object sender, Topobase.Forms.Events.ToolBarEventArgs e)
{
 // Add a new toolbar button to the toolbar of the
 // generic dialogs.
 e.ToolBar.Buttons.Add
 (myToolbarButton,
 "Topobase",
 "My Toolbar Button");
 myToolbarButton3.Click +=
 new EventHandler(myToolbarButton_Click);
}


// Event is raised when the button is clicked.
private void myToolbarButton_Click
 (object sender, System.EventArgs e)
{
 // Perform the plugin action here.
 this.Application.MessageBox("Toolbar button clicked");
}
```

Creating a Menu Bar

Generic dialog boxes generally do not have menu bars, but it is possible to add them. To create a menu, create public variables of type `Topobase.Forms.MenuItem` for each menu title and menu item. Override the `DialogPlugIn` class's `OnInitMenu` event, obtain a reference to the application menu bar, and insert a new menu title using the `Add` method of the menu's `MenuItems` collection. Submenus for each menu title can be added using the

`Add` method of the menu title's `MenuItems` collection. You can then create an event handler for the new menu items and can respond to menu events. For example:

```
// Create a Main Menu Item "File".
public Topobase.Forms.MenuItem mnuFile =
 new Topobase.Forms.MenuItem();

// Create two Menu Items as sub-menus "Open".
public Topobase.Forms.MenuItem mnuFileOpen =
 new Topobase.Forms.MenuItem();


public override void OnInitMenu
 (object sender, Topobase.Forms.Events.MenuEventArgs e)
{
 // Add the Main Menu Item.
 e.Menu.MenuItems.Add(mnuFile, "&File");

 // Add SubMenuOItems to the Menu "File".
 mnuFile.MenuItems.Add(mnuFileOpen, "&Open");

 //  Bind the event handlers.
 mnuFileOpen.Click += new Topobase.Forms.Events.
 MenuItemClickEventHandler(mnuFileOpen_Click);
}


private void mnuFileOpen_Click
 (object sender, Topobase.Forms.Events.MenuItemClickEventArgs e)
{
 // Perform the plugin action here.
 this.Application.MessageBox("File Open clicked");
}
```

Adding Controls to a Dialog

Autodesk Topobase-specific controls, such as buttons and list boxes, can be added to dialog boxes using the Autodesk Topobase Administrator (for an example, see the Sample 16 - Dialog Button (page 203) Help). To create a plugin that responds to events from such controls, create variables of the correct `Topobase.Forms` type for each control. When the plugin is loaded, obtain references to the dialog controls using the `this.Dialog.Controls.ApiItem`

method using the name of the control assigned through Autodesk Topobase Administrator. You can then create an event handler for the dialog control and can respond to control events. For example:

```
private Topobase.Forms.Button myButton;

public MyDialog()
{
 // We cannot get access to the dialog controls in the
 // constructor. Instead, create an event handler
 // for the load event, and get access to the dialog controls
 // in there.
 this.Load += new EventHandler(MyDialog_Load);
}


private void MyDialog_Load(object sender, EventArgs e)
{
 // Get a reference to the button already added to the
 // dialog using Autodesk Topobase Administrator.
 myButton1 = this.Dialog.Controls.ApiItem("$myButton")
 as Topobase.Forms.Button;

 // Add an event handler to catch when the button is selected.
 myButton1.Click += new System.EventHandler(MyButton_Click);
}

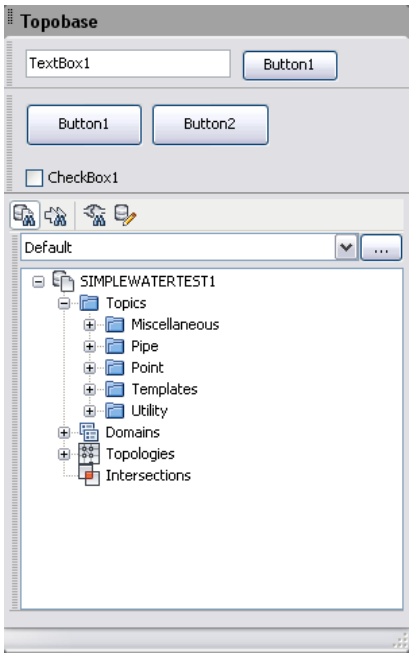

private void MyButton_Click
 (System.Object sender, System.EventArgs e)
{
 // Perform the plugin action here.
 this.Application.MessageBox("Button clicked");
}
```

Creating an Application Flyin

About Application Flyins

An application flyin is a dockable, moveable window that can be docked within the Autodesk Topobase application part of the Autodesk Topobase task

pane. All docking operations are performed automatically. For more information on flyins, see Sample 22 - Document Flyin (page 211) and Sample 67 - Dialog Box FlyIn (page 257).



Docked application flyin at the top of the Autodesk Topobase task pane.

Flyins are based on either one of two different kinds of Autodesk Topobase forms: `Topobase.Forms.Desktop.ApplicationFlyIn` and `Topobase.Forms.FlyIns.ApplicationFlyIn`. Flyins based on the `Desktop.ApplicationFlyIn` class can only be used in the desktop Autodesk Topobase Client, while flyins using the `FlyIns.ApplicationFlyIn` class can be used with the web-based Autodesk Topobase Client as well. Desktop application flyins can use any Windows Form component (such as buttons, text boxes, or tree views), while the more universal style are limited to only the Autodesk Topobase form components.

The following sample shows the code behind a `Topobase.Forms.FlyIns.ApplicationFlyIn` fly-in that contains a single button. In response to a button click, it displays a message box:

```
public class MyApplicationFlyIn :
 Topobase.Forms.FlyIns.ApplicationFlyIn
{
 private void MyApplicationFlyIn_Load
 (object sender, System.EventArgs e)
 {
 // Set the flyin title.
 this.Text = "Sample FlyIn";
 }


 // This flyin contains a single button.
 private void Button1_Click
 (object sender, System.EventArgs e)
 {
 this.Application.MessageBox(this.TextBox1.Text);
 }
}
```

Creating a Document Flyin

About Document Flyins

A document flyin is a dockable, moveable window that can be docked within the Autodesk Topobase document tabs of the Autodesk Topobase task pane. All docking operations are performed automatically.

Flyins are based on either one of two different kinds of Autodesk Topobase forms: `Topobase.Forms.Desktop.DocumentFlyIn` and `Topobase.Forms.FlyIns.DocumentFlyIn`. Flyins based on the `Desktop.DocumentFlyIn` class can only be used in the desktop Autodesk Topobase Client, while flyins using the `FlyIns.DocumentFlyIn` class can be used with the web-based Autodesk Topobase Client as well. Desktop document flyins can use any Windows Form component (such as buttons, text boxes, or tree views), while the more universal style are limited to only the Autodesk Topobase form components.

The following sample shows the code behind a `Topobase.Forms.FlyIns.DocumentFlyIn` fly-in that contains a single button. In response to a button click, it displays a message box:

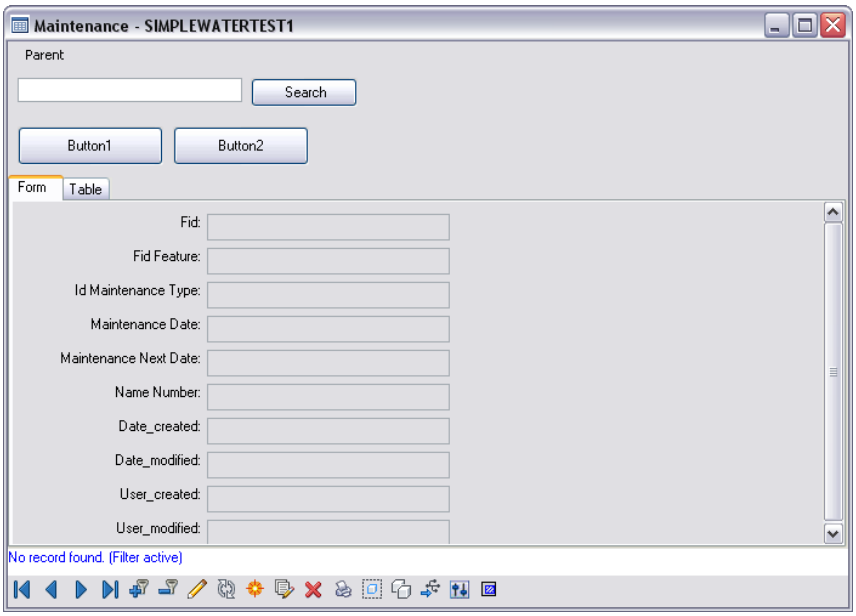
```
public class MyDocumentFlyIn :
 Topobase.Forms.FlyIns.DocumentFlyIn
{
 private void MyDocumentFlyIn_Load
 (object sender, System.EventArgs e)
 {
 // Set the flyin title.
 this.Text = "Sample FlyIn";
 }


 // This flyin contains a single button.
 private void Button1_Click
 (object sender, System.EventArgs e)
 {
 this.Application.MessageBox(this.TextBox1.Text);
 }
}
```

Creating a Dialog Flyin

About Dialog Flyins

A dialog flyin is a frame within Autodesk Topobase dialog boxes. Unlike other kinds of flyins, these cannot be undocked and moved.



Docked dialog flyin at the top of the form showing buttons and a text box.

Flyins are based on either one of two different kinds of Autodesk Topobase forms: `Topobase.Forms.Desktop.DialogFlyIn` and `Topobase.Forms.FlyIns.DialogFlyIn`. Flyins based on the `Desktop.DialogFlyIn` class can only be used in the desktop Autodesk Topobase Client, while flyins using the `FlyIns.DialogFlyIn` class can be used with the web-based Autodesk Topobase Client as well. Desktop dialog flyins can use any Windows Form component (such as buttons, text boxes, or tree views), while the more universal style are limited to only the Autodesk Topobase form components.

The following sample shows the code behind a `Topobase.Forms.FlyIns.DialogFlyIn` flyin that contains a single button. In response to a button click, it displays a message box:

```
public class MyDialogFlyIn : Topobase.Forms.FlyIns.DialogFlyIn
{
 private void MyDialogFlyIn_Load
 (object sender, System.EventArgs e)
 {
 // Set the flyin title.
 this.Text = "Sample FlyIn";
 }


 // This flyin contains a single button.
 private void Button1_Click
 (object sender, System.EventArgs e)
 {
 this.Application.MessageBox(this.TextBox1.Text);
 }
}
```

User Interaction

Using Forms

Basics of Using Forms

When designing plugin and flyin forms, be sure to take into account the size and shape of the area where the form is displayed. Plugin forms and flyin forms based on `Topobase.Forms.Desktop.ApplicationFlyIn` allow you to use the standard Windows `Anchor` and `AutoSize` properties for controls, which can help you create forms that are useable and attractive in a wide variety of situations.

Using Autodesk Topobase Forms in Visual Studio

For more information on setting up Visual Studio to use Autodesk Topobase form classes, see Installing the Item Templates (page 161).

Autodesk Topobase Forms Controls

A wide variety of standard and Autodesk Topobase-specific controls are available for use in forms based on Autodesk Topobase classes. The following table lists all the available controls from the *Topobase.Forms.dll* library. If you need to use controls that are not in this list, you can create a standard Windows form and use any control. The resulting plugin, however, only works in the desktop Autodesk Topobase Client and not in the Autodesk Topobase Web Client.

Control	Samples Demonstrating the Control
Button	16, 17, 20, 22, 28, 29, 31, 34, 41, 45, 46, 50, 53, 56, 59, 61, 62, 67, 68, 70, 71, 74, 76, 77, 79, 80, 100, 102, 111
Canvas	76, 80
CheckBox	62, 68, 76, 78 ,79, 111
CheckedListBox	71, 76
ComboBox	53, 62, 76
DateTimePicker	50, 62, 76
DirectoryTextBox	51, 62, 76
FileTextBox	51, 62, 76
FileUploadBox	34, 62, 76
Grid	41
GroupBox	62, 76
Label	20, 28, 34, 41, 51, 53, 62, 76, 78, 100
Line	76
ListBox	16, 20, 28, 29, 30, 31, 53, 56, 62, 71, 74, 76
MapButton	30, 62, 76

Control	Samples Demonstrating the Control
Matrix	45, 62, 76
MenuControl	76, 77
Panel	62, 76
PictureBox	20, 62, 76
PictureComboBox	102
RadioButton	62, 76
Splitter	none
TabControl	62, 79
TextBox	20, 22, 28, 31, 46, 47, 59, 62, 67, 68, 70, 76, 77, 78, 79, 100
ToolBarControl	44, 62, 76
TreeView	29, 48, 62, 76
WebBrowser	78

Progress Bar

Progress bar dialog boxes display the current progress of a task that may take a long time to complete. To display a progress bar dialog box, first create a `Topobase.Data.Util.StatusForm<>` object. The constructor requires a reference to a `BackgroundJob<>` delegate. The progress bar is displayed by calling its `ShowDialog()` method. This triggers the background job, which is where the ongoing task is performed. During the processing of the task, regular updates to the `Value` property of the `IStatusDisplay` parameter informs the user of

the current task status. Once the background job is complete, the progress bar is automatically removed.

```
// This method does "something long and complicated" with a
// topobase connection. It shows a progress bar while doing so.
public void DoComplicatedWorkAndShowProgress(TBConnection connec
tion)
{
 // Define which method does the complicated work
 BackgroundJob<TBConnection> job =
 new BackgroundJob<TBConnection>(Work);

 // Create the status form
 using (StatusForm<TBConnection> form =
 new StatusForm<TBConnection>(job))
 {
 // Set some example values.
 form.CancelButtonEnabled = true;
 form.Type = TopobaseProgressBarType.ProgressBarWithPercent;

 // Set the parameter for the method.
 // You can omit this if your method does not need
 // any parameters.
 form.SetParameters(connection);

 // Show the status form - this calls the method
 form.ShowDialog();
 }
}


// The status form calls this method in a background thread.
// A background thread is used to keep the user interface
// responding. If you use a foreground thread, the user interface

// does not react when the user wants to move or resize a window.
private void Work
 (IStatusDisplay status, params TBConnection[] connections)
{
 // Get the parameter that have been set with SetParameters.
 TBConnection connection = connections[0];

 // Set the values of the status form.
 status.Minimum = 0;
 status.Maximum = 42;
 status.Value = 0;
```

```
status.Status = "Doing important work";

// Do the actual work
for (int i = 0; i < 42; i++)
{
// We would do something complicated here 42 times

// Update the progress bar
status.Value += 1;

// Abort if the user presses cancel.
// The user can press cancel because we enabled the cancel
// button in the calling code.
if (status.CancelRequested)
{
return;
}
}
}
```

Message Box and Input Box

The `Topobase.Forms` namespace includes many simple dialog boxes to give information to or take input from the user. Unlike the Windows Form equivalents, these are compatible with Autodesk Topobase Web Client.

Message Box

`Topobase.Forms` contains a simple message box than can display a message and an optional title.

```
Topobase.Forms.Application.MessageBox("Message", "Title");
```

Input Box

An input box can be used to get a single line of text from the user. It can be displayed asynchronously, so your plugin can continue processing while the user types.

```
// Declare the input box variable.
public Topobase.Forms.Interaction.InputBox myInputBox =
 new Topobase.Forms.Interaction.InputBox();

public void Init()
{
 // Assign the input box event handler.
 myInputBox.Executed += new Topobase.Forms.Events.
 InputBoxEventHandler(MyInputBox_Executed);

 // Show the input box.
 myInputBox.ShowAsynchronous("What\'s your Name ?", "Name");
}


private void MyInputBox_Executed
 (object sender, Topobase.Forms.Events.InputBoxEventArgs e)
{
 Application.MessageBox("Your Name is:" + e.Value);
}
```

Another kind of input box has multiple text boxes, allowing more complicated input while retaining a simple programming interface.

```
// Declare the input box variable.
public Topobase.Forms.Interaction.MultiInputBox myMultiInputBox =

 new Topobase.Forms.Interaction.MultiInputBox();


public void Init()
{
 // Assign the input box event handler.
 myMultiInputBox.Executed += new Topobase.Forms.Events.
 CancelEventHandler(MyMultiInputBox_Executed);

 // Show the input box.
 myMultiInputBox.Add("p1", "Parameter 1");
 myMultiInputBox.Add("p2", "Parameter 2", "Test");
 myMultiInputBox.Add("p3", "Parameter 3");
 myMultiInputBox.Show();
}


private void MyMultiInputBox_Executed
 (object sender, Topobase.Forms.Events.CancelEventArgs e)
{
 if (e.Cancel)
 {
 Application.MessageBox("Canceled");
 }
 else
 {
 string outString = myMultiInputBox.Item("p1");
 outString = outString + "," + myMultiInputBox.Item("p2");
 outString = outString + "," + myMultiInputBox.Item("p3");
 Application.MessageBox("Result:" + outString);
 }
}
```

Installation

For each plugin, the *.tbp* file must have a line similar to the following for libraries that expose:

Application Plugins

```
<ApplicationPlugIn ClassName="MyApplicationPlugin" />
```

Document Plugins

```
<DocumentPlugIn ClassName="MyDocumentPlugIn" />
```

Dialog Plugins

```
<DialogPlugIn ClassName="MyDialogPlugIn" />
```

Application Flyins

```
<ApplicationFlyIn ClassName="MyApplicationFlyIn"/>
```

Document Flyins

```
<DocumentFlyIn ClassName="MyDocumentFlyIn2" />
```

Dialog Flyins

```
<DialogFlyIn ClassName="MyDialogFlyIn" Name="" />
```

Plugins and Visual Studio

Installing the Project Template

Autodesk Topobase includes a generic project template for creating plugins in Visual Studio. To install it, copy the project template named *CSSimpleTopobasePlugIn.zip* from the *<Topobase install directory>\Development\VS Templates\ProjectTemplates\Topobase* directory to the Visual Studio custom template directory (usually *My Documents\Visual Studio\Templates\ProjectTemplates\C#*).

To create a stand-alone plugin project using the template:

1. Start Visual Studio.
2. Click File ➤ New ➤ Project.
3. In the New Project dialog box, click the Visual C# Project Type.
4. From the list of templates, click SimpleTopobasePlugIn and create a project.
5. Once the project has been created, check the project references to make sure that the references to the Autodesk Topobase libraries are valid.

Installing the Item Templates

Plugins can use regular Windows forms and user-controls to interact with the user. Any plugin that uses these, however, only works in the Autodesk Topobase desktop environment and does *not* work in the Autodesk Topobase web clients. To create user interface elements that are usable in both environments, you can use form templates provided by Autodesk Topobase in your projects. These forms are limited to the controls provided in the *Topobase.Form.dll* library.

To install the templates, copy the item template files (which are all *.zip* compressed files) from the *<Topobase install directory>\Development\VS Templates\ItemTemplates\Topobase* directory to the Visual Studio custom template directory (usually *My Documents\Visual Studio \Templates\ItemTemplates\Visual C#* or *My Documents\Visual Studio \Templates\ItemTemplates\Visual Basic*).

To add Autodesk Topobase forms to your project:

1. In Visual Studio, click Project ➤ Add New Item.
2. From the available templates in the My Templates section of the template list, click the appropriate plugin component type.

Installing User Controls

Autodesk Topobase includes a number of controls for use in Autodesk Topobase forms, some of which replicate standard Windows user control and some of which are unique to Autodesk Topobase.

To add Autodesk Topobase controls to the Visual Studio Toolbox:

1. In the Toolbox, right-click and click Choose Items.
2. In the Chose Toolbox Items dialog box, click Browse.
3. From the Autodesk Topobase Client */bin/* directory, click *Topobase.Forms.dll*.

Creating Survey File Format Plugins

Creating a Survey File Format Module

The Autodesk Topobase Survey wizard allows reading of survey field measurements. By defaukt, it supports the CPlan RO and Leica GSI data formats, but it is possible to read other formats by creating your own plugins that translate the data in a file to data structures Autodesk Topobase Survey understands. Survey file format plugins are based on the `FileFormatPlugIn` class.

```
// Create a plugin for reading survey measurements
// from a custom file format.
class SampleImportPlugin : FileFormatPlugIn
{
    // Be sure to call the base class constructor in your own
    // constructor.
    public SampleImportPlugin(TBConnection connection)
        : base(connection)
    {
    }
}
```

Survey file format plugins need to override the following abstract properties and methods:

- **Author** - Read-only property returning a string containing the organization name. The return value can be null.
- **FormatName** - Read-only property returning a string containing the name of the format. This string is used in the File Format combo box of the Import Measurements page of the Autodesk Topobase Survey wizard. The return value cannot be null.
- **StartImport()** - Method that performs the file reading operation. Each line of text from the source file is retrieved using the base class's `ReadLine()` method. The information is then returned to Autodesk Topobase using the base class's `InsertCoordinate()`, `InsertMeasurement()`, and `InsertStation()` methods. For more information, see Implementing StartImport (page 163).

Implementing StartImport

Reading the Survey File

The survey file is selected by the user in the Autodesk Topobase Survey wizard. The file is read one line at a time using the base class's `ReadLine()` method. Usually each line of text corresponds to one survey measurement, although this is not required. `ReadLine()` returns a string containing one line from the file, and automatically advances which line is returned each time it is called. When there are no more lines in the file, `ReadLine()` returns null.

```
// Read the first line of the file.
string line = this.ReadLine();
while (line != null)
{
    // Parse the line and inform Autodesk Topobase what it indic
ates.

    // Read the next line of the file.
    line = this.ReadLine();
}
```

Determining Instrument Type

Just like the file, the type of instrument is selected by the user in the Autodesk Topobase Survey wizard. The type of instrument and settings for the instrument determine the units, error correction, and other meanings of the values read from the file. It is important to check the type of instrument selected by the user to make sure the measurements in the file are meaningful. The base class property `SelectedInstrumentType` contains one of an enumerated set of values describing the instrument type.

SelectedInstrumentType Value	Meaning
Digitizer	Direct measurements of northing and easting at each point.
Nivellement (Leveling)	Measurements taken from a dumpy level or other form of builder's level.
Tachymeter	Measurement of direction and distance from station points, measured by indirect methods (such as optically or by laser).

SelectedInstrumentType Value	Meaning
Tape	Measurement of direction and distance from station points, measured by physical methods (such as by tape or chain).
Transformation	Direct measurement of northing and easting at each point, such as by a GPS device.

Suppose a line was read from the file containing a measurement that is only valid for tape or tachymeter survey measuring techniques. We can check that the instrument selected from the user is valid, and perform different actions depending on which instrument was selected:

```
switch (this.SelectedInstrumentType)
{
    case InstrumentType.Tachymeter:
        // Interpret the data as coming from a tachymeter.
        break;
    case InstrumentType.Tape:
        // Interpret the data as coming from tape measurments.
        break;
    case InstrumentType.Transformation:
        throw new DemoImportException
          ("Invalid line for GPS\Transformation instrument");
        break;
    default:
       throw new DemoImportException("Unexpected instrument selec
ted");
}
```

Interpreting Survey Measurements From the File

When reading a file containing survey measurements, there are two basic kinds of data: stations and measurements based off a particular station. When you have parsed the information for a station, call the base class's `InsertStation()` method. At a minimum, this method requires a unique identifier for the station, a field code, and the height of the instrument. This method returns an integer feature identifier (FID) for the station

Interpreting GPS Coordinates From the File

When reading a file containing GPS coordinates or other measuring system where each point is measured directly, you should see only one kind of

information in the file - the point coordinate. When you have parsed the information for one point, call the base class's `InsertCoordinate()` method. At a minimum, this method requires a unique identifier for the point, a field code, and the easting, northing, and elevation of the point. The method also requires the FID of a station, which is used to identify the session for all the points you are inserting. To get this FID, call the `InsertStation()` method with no parameters and store the integer return value. Use that integer for all your calls to `InsertCoordinate()`.

```
public override string StartImport()
{
    string identifier;
    string fieldCode;
    double easting;
    double northing;
    double altitude;

    // Get a blank stationFID.
    long stationFID = this.InsertStation();
    string line = null;

    // Read the file one line at a time until there are no
    // more lines.
    while ((line = this.ReadLine()) != null)
    {
        //
        // NOT SHOWN - parse the line of text to extract the
        // identifier, fieldCode, easting, northing, and
        // altitude.
        //

        this.InsertCoordinate(
           stationFID,
           identifier,
           fieldCode,
           PointType.Base,
           easting,
           northing,
           altitude);
    }
}
```

Handling Errors

If an error occurs during the reading of the measurement file, you can report the nature of the error to the user by using the base class's `AddErrorMessage()` and `ThrowImportException()` methods. `AddErrorMessage()` takes a single string parameter that describes the error (such as a value being out of bounds). `ThrowImportException()` displays an error message to the user containing all the text from all `AddErrorMessage()` calls made up to that point.

```
catch (DemoImportException e)
{
   // Handle import exception
   this.AddErrorMessage(e.Message);
   this.ThrowImportException();
}
```

Creating Option Pages

Creating an Option Page Module

An option page is a form within the Application Options or Document Options dialog box. A plugin can be used to add new forms to these dialogs. These plugins are objects based on the `Topobase.Forms.ApplicationOptionPage` class or `Topobase.Forms.DocumentOptionPage` class.

```
// Create an option page for the Application
// Options dialog box.
public class MyOptionPage :
 Topobase.Forms.Desktop.ApplicationOptionPage
{
}
```

Option pages are based on either Windows user controls or Autodesk Topobase Forms. Option pages using Windows user controls, however, can only be used in the Autodesk Topobase Desktop Client, while option pages using Autodesk Topobase Forms can be used with both the Autodesk Topobase Desktop Client and the Autodesk Topobase Web Client.

Reading and Writing User Settings

Autodesk Topobase includes a built-in mechanism for handling user settings. Settings are stored in the TB_SETTINGS table of the TBSYS User database, which can be accessed using methods of the `Topobase.Settings` namespace. Application option pages access these methods through the `this.Application.Settings` property and document option pages access them though the `this.Document.Settings` property, but their use is the same for both.

NOTE Be sure your project references the *Topobase.Settings.dll* library to access these methods.

The TB_SETTINGS table contains the following columns:

Table Column	Type
ID	number(10)
User_ID	number(10)
ItemThema	varchar2(255)
ItemKey	varchar2(255)
ItemValue	varchar2(2000)

The *ItemThema* column is used to group keys together. If your application Option Page creates new setting keys, give them all the same theme name based on the name of your module.

Items in the TB_SETTINGS table can be accessed through the `Topobase.Settings.Database` methods `get_Item` and `set_Item` and their type-safe variants, `get_BoolItem` and `set_BoolItem` for Boolean values, `get_DblItem` and `set_DblItem` for floating point numbers, and `get_LngItem` and `set_LngItem` for integers.

TIP Using the type-safe versions is highly recommended because it can prevent conversion errors.

Settings can be assigned to all users or to specific users depending on the `Dependency` parameter of the `get_Item` and `set_Item` methods. If a setting is assigned to a specific user, the setting is also copied to the settings table for

all users. This serves as a default value if you attempt to read specific user settings that have not yet been set.

The following sample demonstrates reading and writing user settings. It is based on a Autodesk Topobase Form with two textbox controls. When the form is first displayed, it accesses the existing settings and displays them in

the textboxes. When the user closes the option page dialog box, the settings are saved.

```
// Constructor.
public MyOptionPage()
{
 InitializeComponent();

 // Add event handlers for when the form is loaded
 // and unloaded.
 this.Unload += new Topobase.Forms.Events.
 UnloadEventHandler(this.MyOptionPage_Unload);
 this.Load += new System.EventHandler(this.MyOptionPage_Load);
}

private void MyOptionPage_Load(object sender, System.EventArgs e)
{
 // Set the title of your TabPage.
 this.Text = "MyOptions";
}


// This event is fired if the user selects the TabPage the first
// time. If your data took a very long time to initialize,
// initialize it here next time instead of at the Load Event.
// This prevents the whole Option Dialog from opening
// very slowly.
private void MyOptionPage_ActivatedFirstTime
 (object sender, System.EventArgs e)
{
 // Read the option from the settings.
 this.TextBox1.Text = this.Application.Settings.get_Item
 ("CSSampleOptions",
 "Name1",
 Topobase.Settings.Dependency.CurrentUser,
 "Test1");
}


// This is called every time the user clicks the Main TreeNode
// on the Left Tree of the Option Page.
// You can use this to reset your data if
// you have more than one Option Page Plugin,
// and the Plugins depend on one another.
private void MyOptionPage_Reset(object sender, System.EventArgs
e)
```

```
{
 // do nothing
}


private void MyOptionPage_Unload
 (object sender, Topobase.Forms.Events.CancelEventArgs e)
{
 // If the user cancels the dialog, do not save the changes.
 if (e.Cancel)
 {
 return;
 }

 // Save the Options. Note how the theme name (the first
 // parameter) is set to the name of the module to identify
 // this and any additional settings as originating from this
 // program.
 this.Application.Settings.set_Item
 ("CSSampleOptions",
 "Name1",
 Topobase.Settings.Dependency.CurrentUser,
 this.TextBox1.Text);
}
```

Installation

For each option page, the *.tbp* file must have a line similar to the following for libraries that expose:

Application Option Pages

```
<ApplicationOptionPage ClassName="MyOptionPage" />
```

Document Option Pages

```
<DocumentOptionPage ClassName="DocumentOptionPage1"/>
```

Creating Administrator Pages

Creating an Administrator Page Plugin

Vertical application modules may also require custom types of initialization in the Autodesk Topobase Administrator application. You can add new pages to the "Setup" branch of the tree by creating a plugin based on the `ApplicationAdminPage` class and you can add pages to the document branches (which are visible only after loading a workspace) by creating a plugin based on the `DocumentAdminPage` class. Sample 122 includes a plugin based on `DocumentAdminPage` - there are no samples using `ApplicationAdminPage`, but the two classes are very similar.

```
public partial class MyAdminPage :
   Topobase.Forms.Desktop.DocumentAdminPage
{
}
```

The name of the page must be set when the plugin is loaded. If you are creating a `DocumentAdminPage`-based plugin, the name is displayed in each document tree once a workspace is loaded. If you are creating an `ApplicationAdminPage`-based plugin, the name is displayed in the "Setup" section of the tree view. If the name property has not been set, the title of your page is three question marks ("???").

```
// Constructor
public MyAdminPage()
{
   // Set up the event handler for the Load event so that the
   // function MyAdminPage_Load is called when the plugin
   // is first loaded.
   this.Load += new System.EventHandler(this.MyAdminPage_Load);
}


private void MyAdminPage_Load(object sender, EventArgs e)
{
   // Set the text shown in the Autodesk Topobase Administrator
tree view.
   this.Text = "My Custom Admin Page";
}
```

Responding to Administrator Events

Load

If you are creating a `DocumentAdminPage`-based plugin, the `Load` event is fired when the user loads a workspace in the Autodesk Topobase Administrator application. If you are creating an `ApplicationAdminPage`-based plugin, this event is fired when the user runs the Autodesk Topobase Administrator application. This is the preferred location for the initialization of your plugin, including setting the name of the page.

ActivatedFirstTime

This event is fired the first time the user selects the page title from the tree view on the left side of the Autodesk Topobase Administrator, just before the user interface is displayed. You can perform additional initialization in this event. `ActivatedFirstTime` is fired before the `Reset` event.

Reset

This event is fired each time the user selects the page title from the tree view. It is possible that changes made in other pages in the Autodesk Topobase Administrator makes the data displayed in your form obsolete, so you can use this event to reload your data, if needed.

Close and Unload

If you are creating a `DocumentAdminPage`-based plugin, these events are fired when the user either closes the currently open workspace or exits the Autodesk Topobase Administrator application with a workspace loaded. If you are creating an `ApplicationAdminPage`-based plugin, these events are fired when the user exits the Autodesk Topobase Administrator. `Close` is fired before `Unload`. Both of these events are passed a `CancelEventArgs` parameter, and you can prevent the workspace or application from closing by setting the parameter's `Cancel` property to `True`.

Installing Administrator Plugins

For each option page, the *.tbp* file must have a line similar to the following for libraries that expose:

Application Administrator Pages

```
<ApplicationAdminPage ClassName="MyAppAdminPage" ExecutionTarget
Desktop="True" ExecutionTargetWeb="False"/>
```

Document Administrator Pages

```
<DocumentAdminPage ClassName="MyAdminPage" ExecutionTarget
Desktop="True" ExecutionTargetWeb="False"/>
```

NOTE The *.tbp* file and the plugin *.dll* file must both be moved to the Autodesk Topobase Administrator *bin* directory. If your plugin *.dll* has both administrator pages and other kinds of plugins, copy the *.tbp* and *.dll* files to the Autodesk Topobase Client *bin* directory as well - the correct plugins is automatically loaded in each case. To remove the plugin, delete the *.tbp* file.

Installation

Building and Installing an Application Module

Vertical application modules are created from .NET "class library" projects. The library you get from building the project (that is, a file with a *.dll* extension) must be copied into the Autodesk Topobase Client *bin* directory. If the dll contains administrative methods (such as structure update model changing code) in addition to user code (such as workflows), it also needs to be placed in the Autodesk Topobase Administrator *bin* directory. The associated *.tbp* file needs to be copied into those directories as well. When Autodesk Topobase is started, it searches the *bin* folder for *.tbp* files and automatically loads all modules listed in those files.

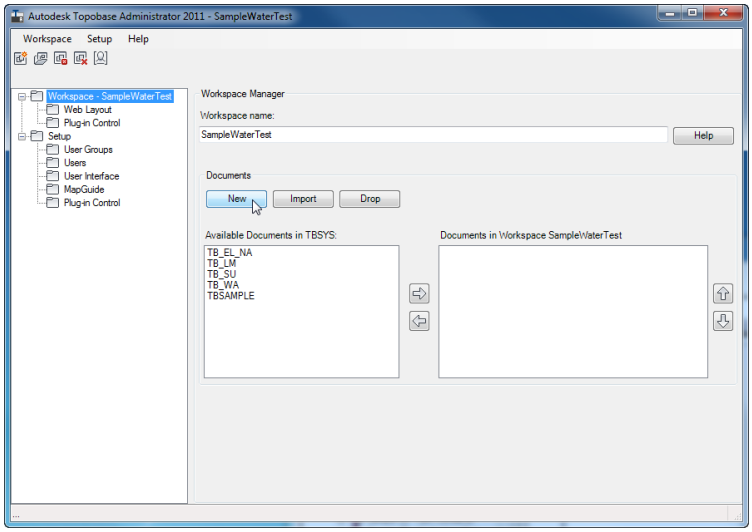
Creating a Document Using the Module

After a vertical application module has been installed, use the module to create a document.

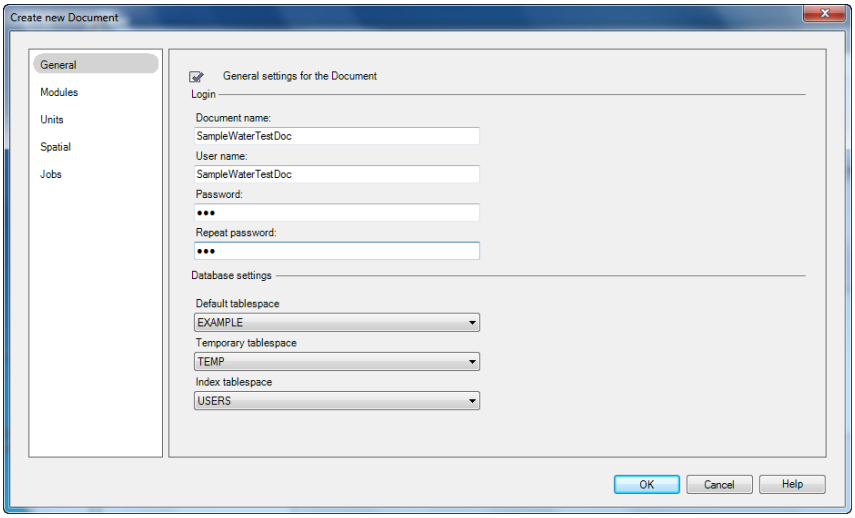
To create a new document:

1. Launch the Autodesk Topobase Administrator application.
2. Load an existing workspace or create a new workspace (for more information, see Create a Workspace (page 185)).

3 In the Document box, click New to create a new document.

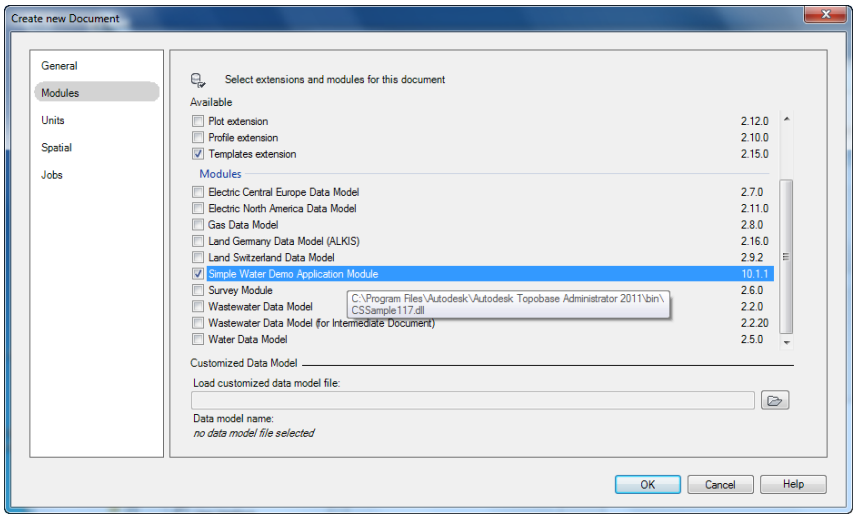


4 In the Document tab of the Create New Document dialog box, enter a valid password.



5 On the left side of the Create New Document dialog box, click Modules.

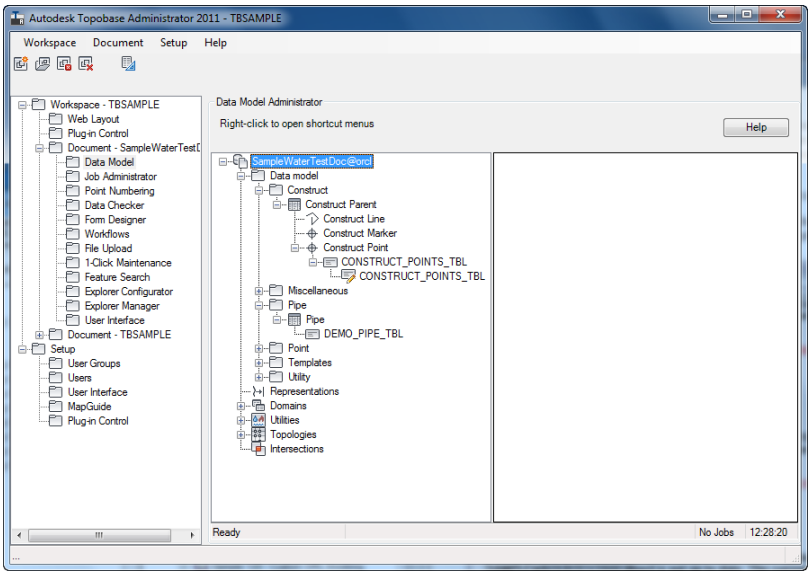
6 From the list of available modules, click to check the name of the module (for example, “Simple Water Demo Application Module”).



NOTE If your application module is not in the list, it means the *.dll* and *.tbp* files are not in the Autodesk Topobase Administrator *\bin* directory. Close the Autodesk Topobase Administrator, copy the files from the Autodesk Topobase Client *\bin* directory, restart the Autodesk Topobase Administrator, and try again.

7 Press OK. This begins the process of creating a new document.

8 After a series of status message boxes, the Update Modules and DataModels dialog box is displayed listing all the updates specified in the structure update plugin of the application module. Press Update.



9 This creates the data model and applies all the updates specified in the structure update plugin. When the process is complete, press Close.

10 The document based on the vertical application module has now been created in the workspace. To see the data model and workflows provided by the module, click the Data Model and Workflows tree elements .

Manually Installing a Stand-Alone Workflow

Workflows are created from .NET “class library” projects. The library you get from building the project (that is, a file with a *.dll* extension) must be copied into the Autodesk Topobase Client *bin* directory. The associated *.tbp* file needs to be copied into that directory as well.

Workflows need to be associated with a particular workspace using the Autodesk Topobase Administrator, and are loaded when the workspace is loaded in the Autodesk Topobase Client.

To associate a workflow with a workspace:

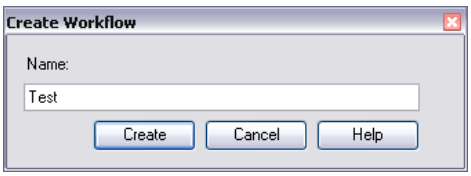
1 Launch the Autodesk Topobase Administrator application.

2 Click Workspace ➤ Open.

3 In the left pane, click the Workflows folder.

4 In the Workflow Administrator area, click Create.

5 In the Create Workflow dialog box, enter a name for the workspace and click Create.



6 In the Workflow Administrator area, type the description of the workflow and click a bitmap or icon file containing a 16 by 16 pixel image to represent the workflow in the client application. Select the client application(s) in which workflow is available.

7 Add code into the Script Code edit field, which calls the plugin when the user activates the workflow. The code consists of a single call to `RunMethod` within the `Run` subroutine. The first parameter is the filename of the workflow library, the second parameter is the namespace and class name of the workflow, and the third parameter is the name of the entry point method:

```
Sub Run
 Me.RunMethod("Sample.dll", "Sample.MyWorkflowPlugIn", "MyWork
flowEntrypoint")
End Sub
```

When you are done, click Validate to make sure the code is correct.

8 Click Save. The workflow has now been added to the workspace document and is listed in the document's Workflow Explorer in the appropriate client application(s).

Installing a Stand-Alone Plugin

Plugins and flyins are created from .NET "class library" projects. The library you get from building the project (that is, a file with a *.dll* extension) must be copied into the Autodesk Topobase Client *bin* directory. The associated *.tbp* file needs to be copied into that directory as well. When Autodesk Topobase is started, it searches the *bin* folder for *.tbp* files and automatically loads the plugin and flyin libraries listed in those files. No further steps are required.

Developer Samples 6

Introduction

Autodesk® Topobase™ provides over 80 samples showing how you can use the API. These are provided in both Visual Basic and C# formats. They cover a broad range of categories, such as creating users, connecting to the database, customizing the user interface, and manipulating features.

This chapter describes how to build, install, and run the samples, and gives a brief description of what they do. For more details, see the sample code itself. The sample code is installed into *<topobase>\Development\Samples* where *<topobase>* is the Autodesk Topobase installation directory. This is typically *C:\Program Files\Autodesk Topobase Client <yyyy>*, where *<yyyy>* is the product version.

NOTE The samples are numbered, but since obsolete samples have been removed the numbers are not always consecutive.

Most of the samples use a Autodesk Topobase plugin configuration file (*.tbp*). For more information, see Quick Guide: Creating a Topobase Plugin (page 75)TBP File Format (page 353) and TBP File Format (page 353)

IMPORTANT Most of the samples can be run independently. However, some of them use the required features and workspace set up by Sample 01 so you MUST build and run Sample 01 first. See Sample 01 - Create Structure (page 182) for details.

Some of the samples require the use of a workspace more fully featured that the one setup by Sample 01. The workspace referred to here is the demo Land Management workspace (TB_LM_WA) whose creation is described in the Setting

up the Demo Data topic in the Getting Started section of the *Autodesk Topobase Administrator Guide*.

Unless otherwise stated, all the samples can be run in either the desktop Autodesk Topobase Client or Autodesk Topobase Web Client.

Building The Samples

When configured appropriately (see Configuring the Project to Write the Build Outputs to the Topobase Bin Folder (page 78)), during each sample build the required output files are copied to the Autodesk Topobase *bin* folder (that is, the required *.dll*, *.xml*, *.pdb*, *.tbp*, and/or *.exe* are copied). For more detailed information about each of the samples, see the Common Steps (page 181) and Sample Details (page 182) sections for each sample.

Usernames and Passwords

If you are not using the default Oracle© service name `orcl`, or Autodesk Topobase system username `TBSYS` and password `TBSYS`, you must change them in all lines as follows:

```
Topobase.Data.TBConnection myConnection = new Topobase.Data.TBCon
nection("TBSample", "avs", "orcl", true, "TBSYS", "TBSYS", "orcl");
```

TIP The user with username `TBSample` and password `avs` is created by Sample 01 and is used in several other samples.

Topobase Database Server (TBSYS)

The Autodesk Topobase database server `TBSYS` can be installed on the same computer as the Autodesk Topobase Client version or on a separate database server. Use the Autodesk Topobase Server Administrator to install the Autodesk Topobase server.

For more information about installing TBSYS, see the Setting up the Database topic in the Getting Started section in *Autodesk Topobase Administrator Guide*.

Running The Samples

Sample 01 - Create Structure (page 182) needs to be built and run *first* to create the TBSAMPLE workspace (see Create a Workspace (page 185).)

Create a Drawing Template (page 187) is also a required procedure to create the TBSAMPLE drawing table. The steps are documented at the end of Sample 01.

Common Steps

There are some steps that are required for running all of the samples:

1. Build the sample.

   The build process automatically places the program or plugin into the *bin* folder. If you move the project from the Autodesk Topobase *Development\Samples* folder, be sure to change the project output path so that the executable is placed in the correct location (the output path is adjusted in the Build tab of the project properties in Visual Studio). For projects that create a plugin, the associated *.tbp* file is also automatically copied to the Autodesk Topobase Client *bin* folder. For more information about *.tbp* files, see Quick Guide: Creating a Topobase Plugin (page 75) and TBP File Format (page 353)

2. Run the sample.

   For applications, run the executable in the Autodesk Topobase *bin* folder. For plugins, start Autodesk Topobase, connect to the database, and open a workspace. This triggers the loading of the plugins.

To disable a plugin, remove the sample's *.dll* and *.tbp* files from the *bin* folder and close the current workspace. Remove any *.xml* and *.pdb* files associated with the project as well.

NOTE Unless otherwise noted, menu references (for example, click Workspace ➤ Create) refer to the menu in the Autodesk Topobase task pane.

Sample Details

Sample 01 - Create Structure

WARNING The workspace and feature classes in Sample 01 are required in some of the other samples, so building and running Sample 01 is a prerequisite.

Purpose

This sample shows how to:

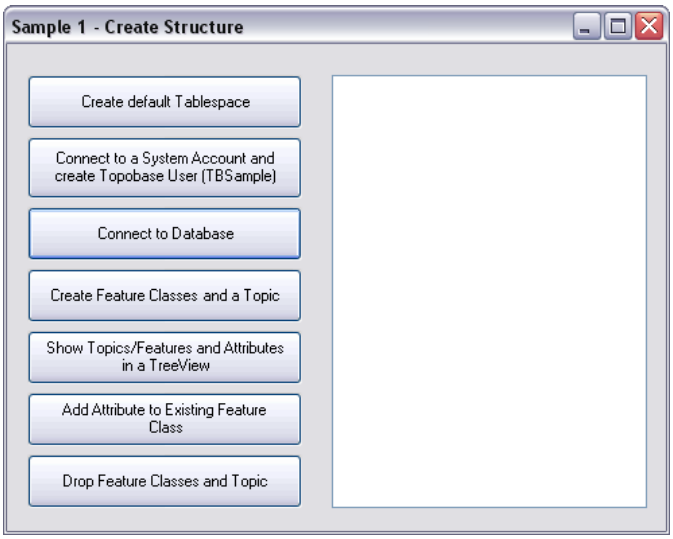
- Create a new database (Oracle) user
- Connect to a database
- Create feature classes
- Get information about feature classes
- Delete feature classes

The workspace and feature classes created here are also used in some of the other samples.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample01.dll* or *CSSample01.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase Client.
3. Click the application toolbar button with the tooltip Sample 01 - Create Structure. The sample's dialog box is displayed.



4 Click Connect to a System Account and Create a Topobase User (TBSample). This creates an Oracle user with username `TBSample` and password `avs`. This may take a few minutes to complete.

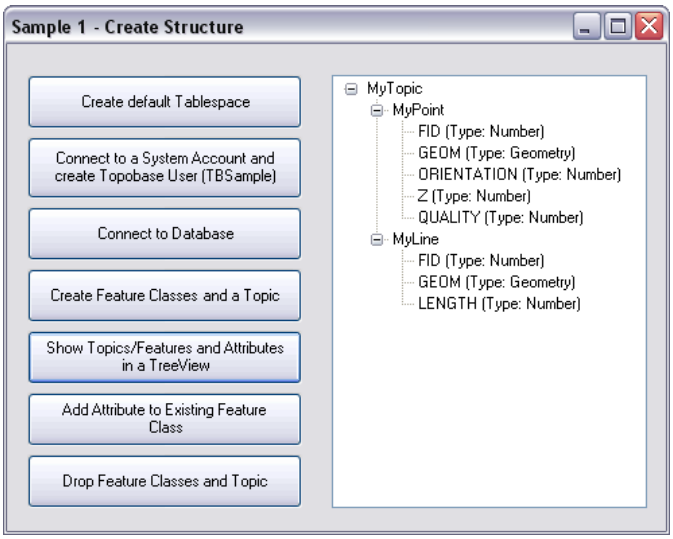
NOTE You only need to do this step once. Subsequent attempts display a message saying the user was already created.

5 Click Connect to Database. This connects to the Oracle database.

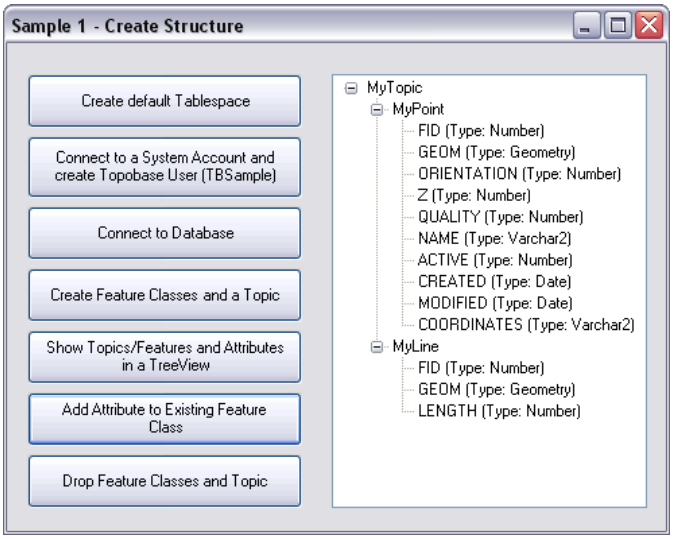
6 Click Create Feature Classes and a Topic. This creates a topic (data model) called MyTopic and two feature classes: MyLine and MyPoint.

NOTE This step only needs to be run once to create the Feature Classes and Topic. If needed, click Drop Feature Classes and Topic then recreate them at another time for use with other samples.

7 Click Show Topics / Features and Attributes in a Treeview. This shows information about the features on the right.



8 Click Add Attribute to Existing Feature Class. This adds some more attributes to the feature class.



NOTE Some of the other samples use the MyLine and MyPoint feature classes, so if you click Drop Feature Classes and Topic you should click Create Feature Classes and a Topic again before you exit the sample.

9 Exit the sample.

Create a Workspace

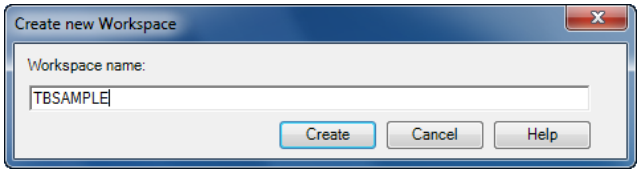
The TBSAMPLE workspace is used in many of the following samples. It is important to create it now for later use.

To create the TBSAMPLE workspace:

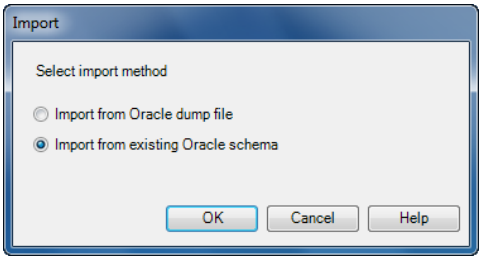
1 Start Autodesk Topobase Administrator.

2 Click Workspace ➤ New.

3 For the workspace name, enter TBSAMPLE and click Create.



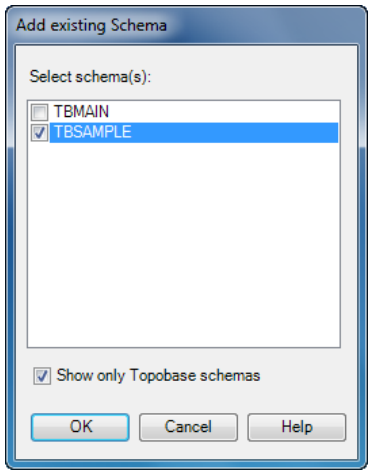
4 Click Import.



5 Click Import From Existing Oracle schema.

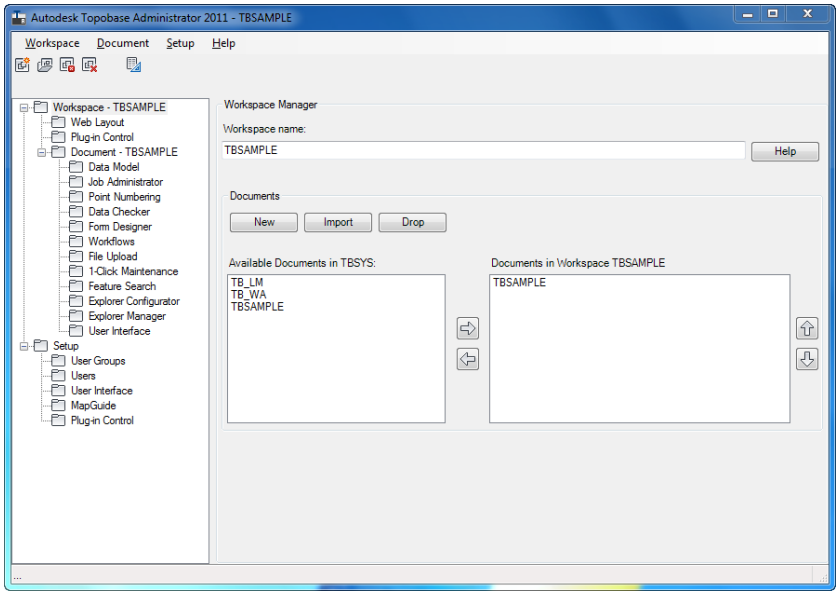
6 If prompted, enter the login information required for a User with DBA privileges (for example, SYSTEM).

7 Select the TBSAMPLE schema check box.



If prompted, enter the password for TBSAMPLE (for example, `avs`).

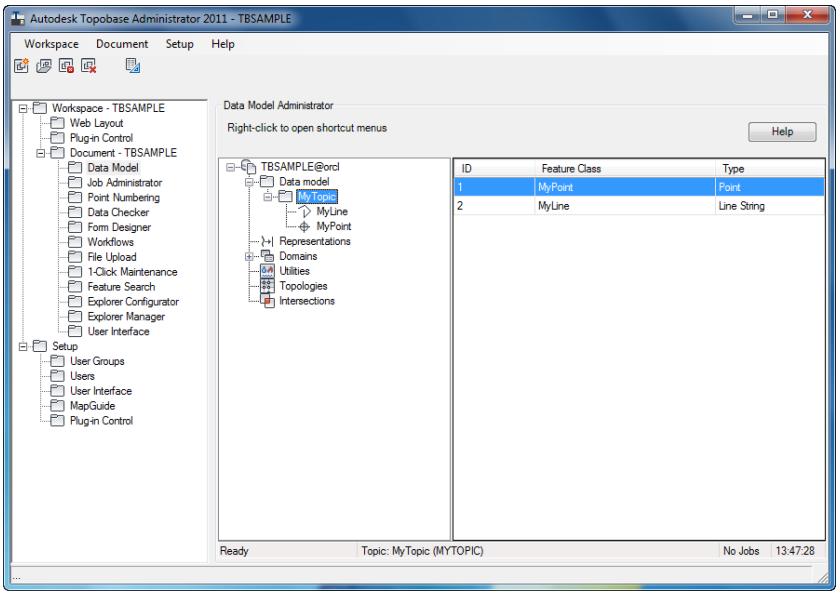
The TBSAMPLE document is now listed in the Documents in Workspace TBSAMPLE column.



8 Set the features to be shown in the Feature Explorer:

1 Select Data Model in the left tree.

2 Verify MyLine and MyPoint. These feature classes are used in many of the following samples.



3 Select the Document root node and click Save.

9 Optionally, create a web layout for the workspace.

10 Close Autodesk Topobase Administrator.

NOTE For information about creating a web layout, see the Setting up Topobase Web topic in the Topobase Administration section of the *Autodesk Topobase Installation Administrator Guide*.

The workspace is now ready to use. This workspace is used in many of the other examples.

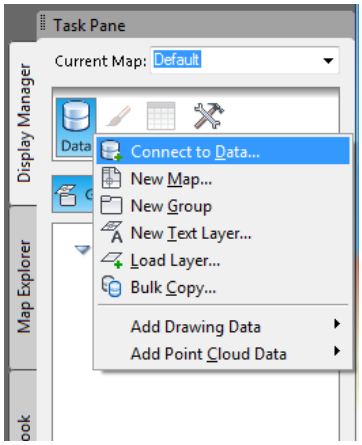
Create a Drawing Template

The TBSAMPLE workspace is used in many of the following samples. In particular, a graphic is generated from the points and lines in the TBSAMPLE workspace for display in the graphics pane. Before you can generate this graphic, you must create a drawing template.

For more information about creating a display model, see the Setting up the Demo Data topic in the Getting Started section in the *Autodesk Topobase Administrator Guide*.

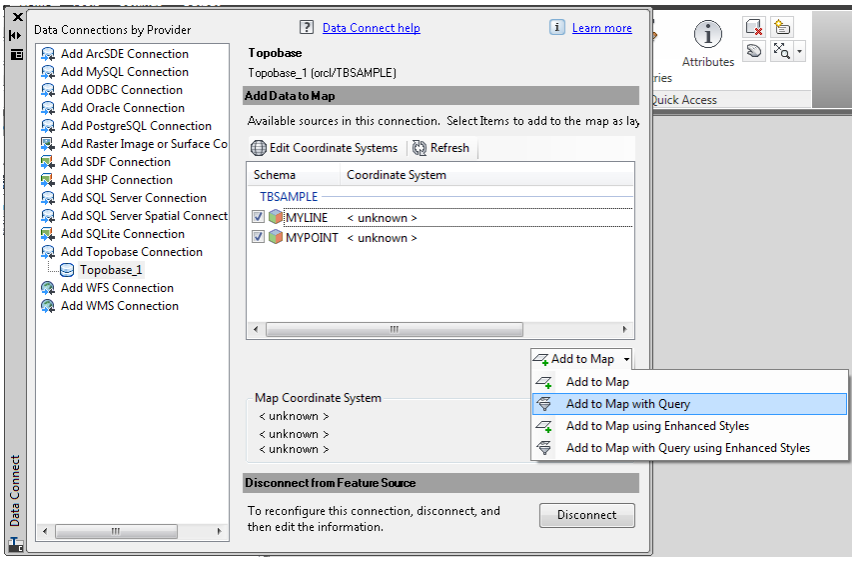
To manually create the TBSAMPLE drawing template:

1. Start Autodesk Topobase.
2. In the Open Workspace dialog box, select TBSAMPLE and click Open.
3. In the Task Pane, select the Display Manager tab.
4. Click the Data icon. Select Add Drawing Data... from the menu. The DATA CONNECT dialog box is displayed.



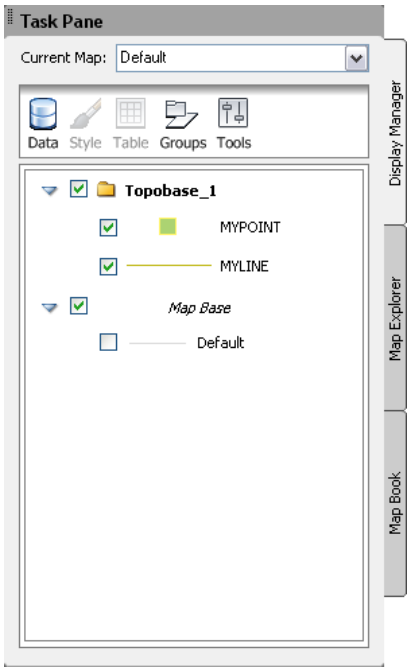
5. In the Data Connections By Provider pane, click Add Topobase Connection. An Add a New Connection form is displayed on the right.
6. Do not change the default value in the Connection name text box. For this exercise the default value is Topobase_1.
7. In the Service Name: text box, type orcl.
8. In the Topobase Main or System User name: text box, type tbsys.
9. In the Topobase Main or System User password: text box, type tbsys.
10. In the Document: dropdown box, select TBSAMPLE.
11. Click Connect. A subnode with the connection name “Topobase_1” is displayed under the Add Topobase Connection feature source node on the left. An Add Data to Map form is displayed on the right.

12 In the Available sources in this connection pane, select the MYPOINT and MYLINE check boxes. Click the Add to Map dropdown button and select Add to Map With Query. A Feature Source Query dialog box is displayed.



13 In the Feature Source Query dialog list box, both TBSAMPLE:MYLINE@Topobase_1 and TBSAMPLE:MYPOINT@Topobase_1 should be listed. Click OK.

14 In the DATA CONNECT dialog box, the Data Connections by Provider pane displays two new subnodes under the Topobase_1 node: MYLINE and MYPOINT. A Source Settings form is displayed on the right. In the Display Manager tab, a Topobase_1 node with the MYPOINT and MYLINE subnodes are displayed. In the graphics pane the points and lines in TBSAMPLE are plotted.



15 Save the drawing template. Select Save As... from the File menu of the main menubar.

16 In the Save Drawing As dialog box, select AutoCAD Drawing Template (*.dwt) from the Files Of Type dropdown box. Name the file TBSAMPLE. Browse to *C:\Program Files\Autodesk Topobase Client <yyyy>\Template\Modules\Sample* (create the Sample folder if needed). Click Save.

17 In the Template Description dialog box, click OK to accept the English measurement default.

18 Click the Topobase Administrator icon.

19 Click Drawing Template in the left pane. A Drawing Template form is displayed on the right.

20 Click Browse.

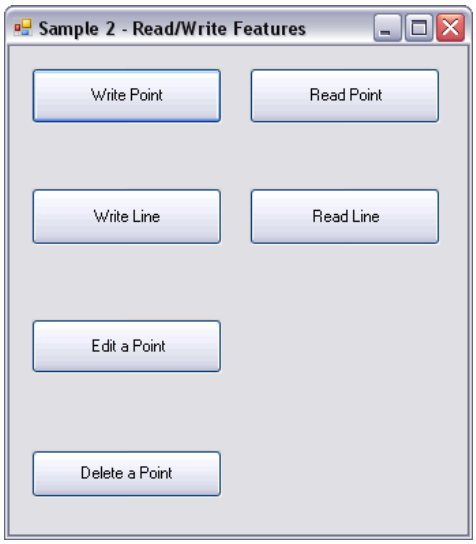
21 In the Open dialog box browse to *C:\Program Files\Autodesk Topobase Client <yyyy>\Template\Modules\Sample*. Select *TBSAMPLE.dwt*. Click Open.

22 Bring Autodesk Topobase to the foreground. Click Generate Graphic.

Sample 02 - Read/Write Features

Purpose

This sample demonstrates reading, writing, editing, and deleting point features in a Autodesk Topobase workspace within an application. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.



Procedure

The write, edit and delete operations are followed by read operations for verification. This procedure also tells you how to monitor the effects of the application operations in the Oracle database using Oracle SQL*Plus commands.

To use this sample:

1. Build the sample. The plugin (*VBSample02.dll* or *CSSample02.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Click the application toolbar button with the Sample 02 - Read Write Features tooltip. The sample's dialog box is displayed.
4. Click the Write Point button.

   NOTE A form with a progress bar is displayed. This indicates that a connection is being made to the Autodesk Topobase workspace. At the end of the write operation the connection is closed. Each time you click a button on this form a connection to a workspace is opened and closed. The descriptions of the other operations do not repeat this information.

5. In the XY Input dialog box, type a number in the X text box and in the Y text box and click OK. The result is that an untitled message box is displayed telling the feature ID number of the point that you just added. Click OK.

   To display the results of this operation in the TBSAMPLE user tables in your Oracle instance, enter the following commands at a command prompt:

   ```
   sqlplus /nolog
   connect tbsample/avs
   select fid,geom from mypoint;
   ```

6. Click the Read Point button. Type the feature ID number returned by the write point operation into the FID text box in the Feature Class ID dialog box. Click OK. A message box is displayed showing the X and Y values that you specified during the write point operation. Click OK.
7. Click the Edit a Point button. Type the feature ID number returned by the write point operation into the FID text box in the Feature Class ID dialog box. Click OK. In the XY Input dialog box type a number in the X text box and in the Y text box and click OK. Use Read Point from the previous step again to verify that you have changed the values of this feature.
8. Click the Delete a Point button. Click the OK button in the TBConnectionState: Successful message box. Type the feature ID number returned by the write point operation into the FID text box in the Feature Class ID dialog box. Click OK. Click the OK button in the Deletion of MYPOINT Feature With FID = <number> Succeeded message box.

9 Click the Read Point button. Type the feature ID number returned by the write point operation into the FID text box in the Feature Class ID dialog box. Click OK. Click the OK button in the Feature With This FID Not Found message box.

At any time during the execution of this sample, right-click MyPoint and select Show Form to display the points and lines created by this sample.

Sample 03 - Oracle Data Provider (ODP) .Net

Purpose

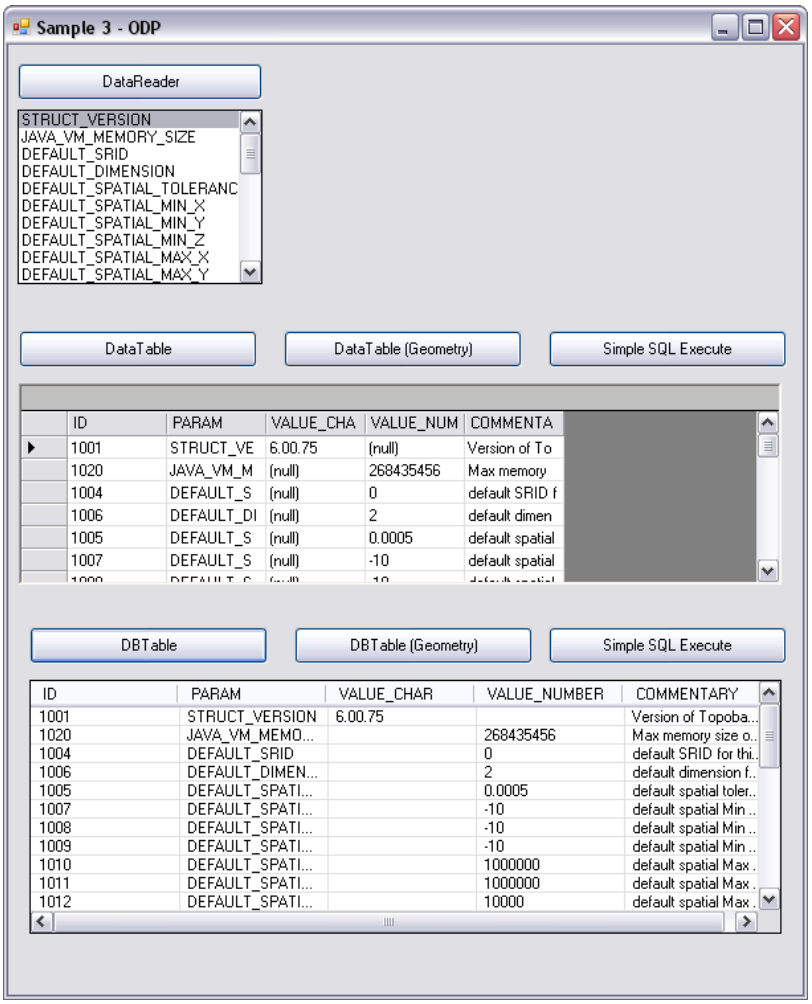
This sample shows how to access data using the Oracle Data Provider (ODP) and Microsoft's .Net technology. The code features the use of the following classes:

- `Topobase.Data.TBConnection`
- `Topobase.Data.Provider.Command`
- `Topobase.Data.Provider.DataReader`
- `Topobase.Data.Provider.DataAdapter`
- `Topobase.Data.DBTable`
- `Topobase.Data.Row`
- `Topobase.Data.Attribute`

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample03.dll* or *CSSample03.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Click Setup ➤ Sample 03 - ODP. The samples dialog box is displayed.



This dialog box and associated buttons illustrate how you can programatically retrieve and modify data. For example, click DataReader to retrieve data from the database. Other buttons perform similar tasks. For more information about the functionality and sequence of calls, review the sample code.

Sample 10 - Document Context Menu

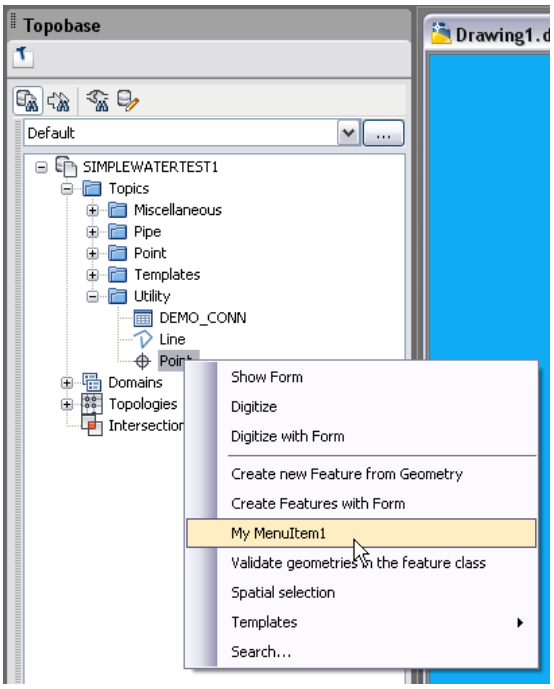
Purpose

This sample shows how to add a menu item to the context menu of the Feature Explorer tree. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

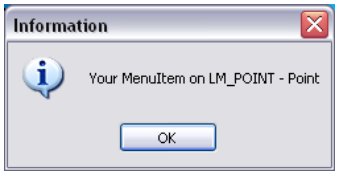
Procedure

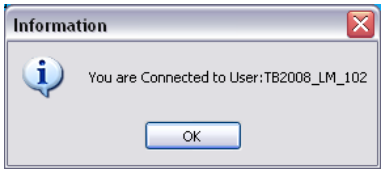
To use this sample:

1. Build the sample. The plugin (*VBSample10.dll* or *CSSample10.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Right-click MyPoint. A new My MenuItem1 menu item is displayed.



4 If you click the menu item, the event handler is triggered.





Sample 12 - Document Toolbar Button

Purpose

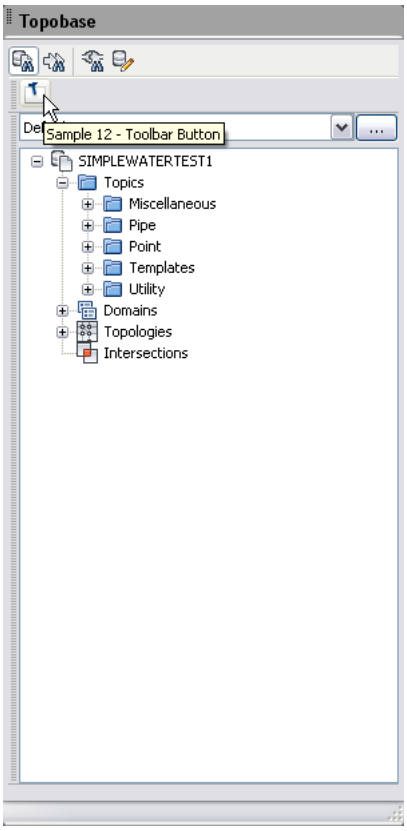
This sample shows how to add a toolbar button to a document.

Procedure

To use this sample:

1 Build the sample. The plugin (*VBSample12.dll* or *CSSample12.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Start Autodesk Topobase and open any workspace. A new toolbar button with the Sample 12 - Toolbar Button caption is displayed in a document-level toolbar in the Autodesk Topobase task pane.



3 If you click the button, the event handler is triggered.

Sample 13 - Dialog Toolbar Button

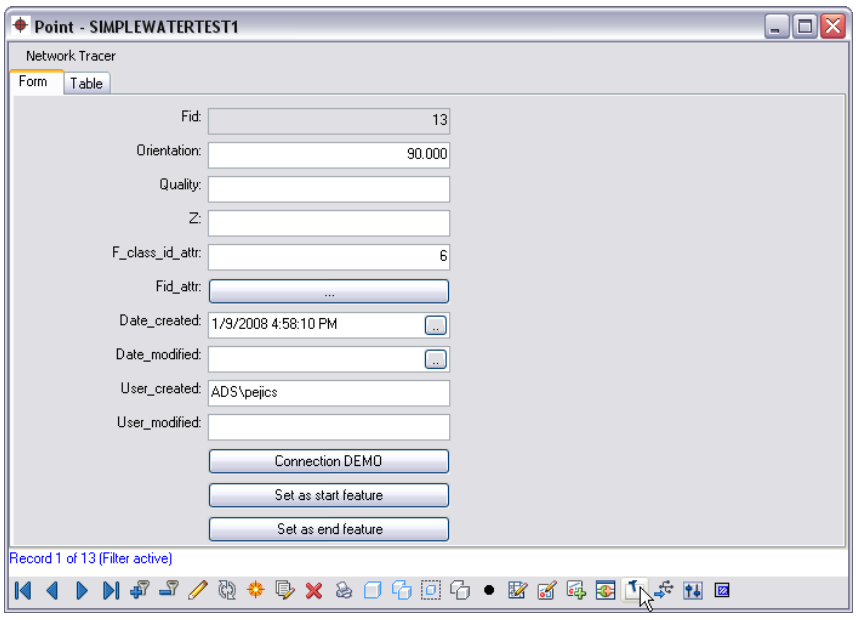
Purpose

This sample shows how to add a toolbar button to a generic dialog box.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample13.dll* or *CSSample13.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace.
3. Right-click any feature and select Show Form. A new button with the Sample 13 - Toolbar Button caption is displayed on the bottom toolbar of the dialog box.



4. If you click the button, the event handler is triggered.

Sample 14 - Main Menu

Purpose

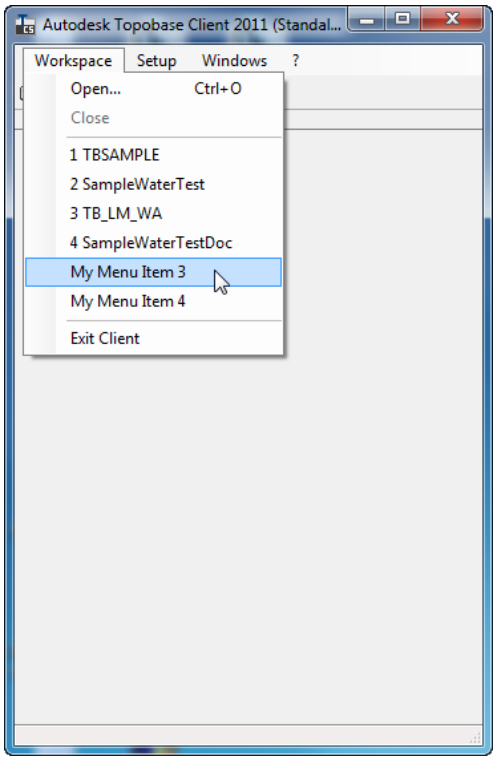
This sample shows how to add menu items to the main menu of the Autodesk Topobase application.

Procedure

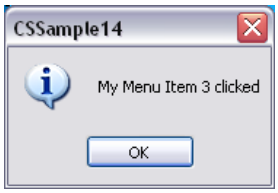
To use this sample:

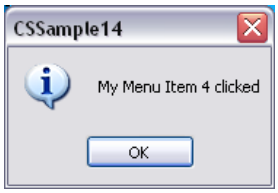
1. Build the sample. The plugin (*VBSample14.dll* or *CSSample14.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start the Autodesk Topobase *Standalone* Client without a workspace loaded. Two new menu items (My Menu Item 3 and My Menu Item 4) are added to the Workspace menu of the Autodesk Topobase task pane.

NOTE If you run the Autodesk Topobase client *with* a workspace loaded, the application menu pane is not shown, and the custom menus are not seen.

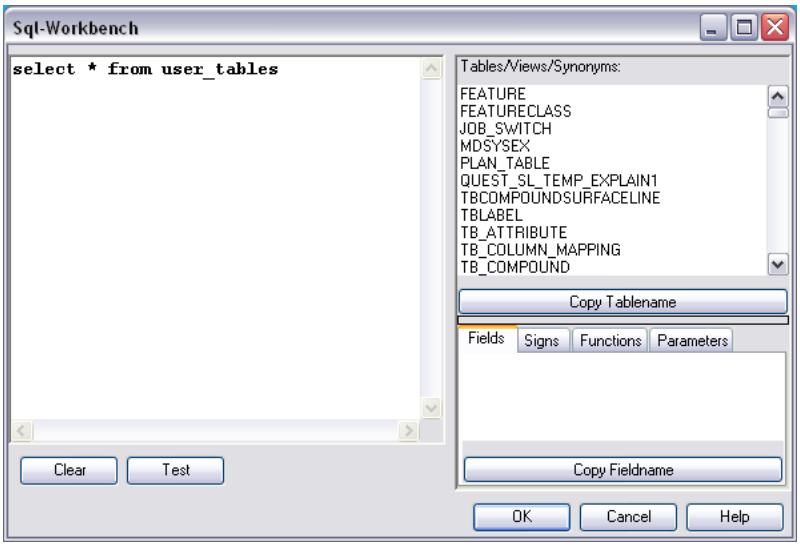


3 If you click the menu items, the corresponding event handler is triggered.





My Menu Item 4 opens the SQL Workbench (if a document is loaded).



Sample 15 - Main Toolbar

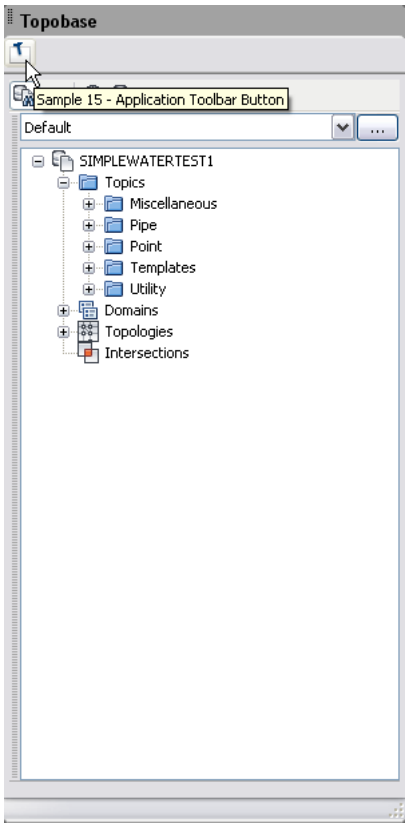
Purpose

This sample shows how to add a toolbar button to the main application toolbar.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample15.dll* or *CSSample15.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase. A new button with the Sample 15 - Application Toolbar Button caption is displayed in an application-level toolbar in the Autodesk Topobase task pane.



3 If you click the button, the event handler is triggered.

Sample 16 - Dialog Button

Purpose

This sample shows how to add a toolbar button to a generic dialog box. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

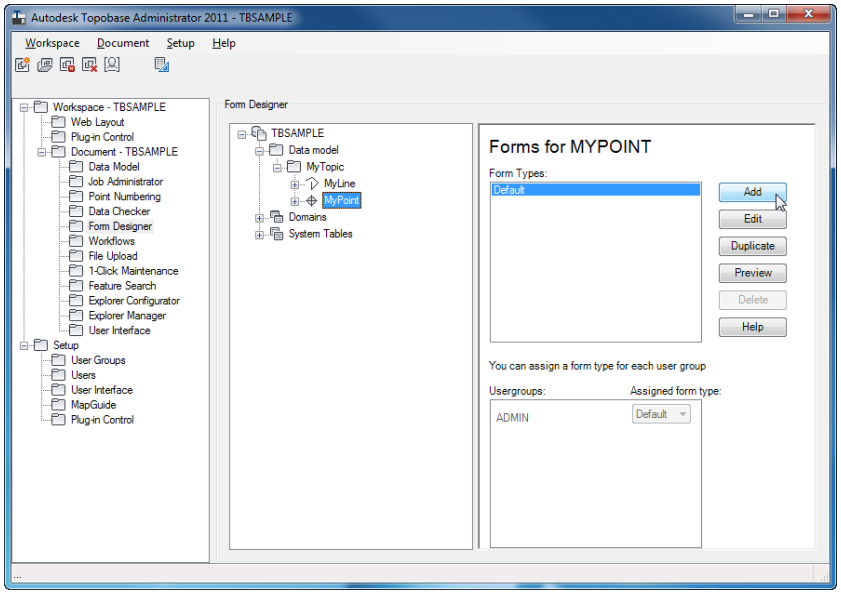
Procedure

To use this sample:

1. If you have not already done so, run Sample 01 to create the TBSAMPLE workspace. (See Sample 01 - Create Structure (page 182).)
2. Add a control to the generic dialog box for MyPoint.

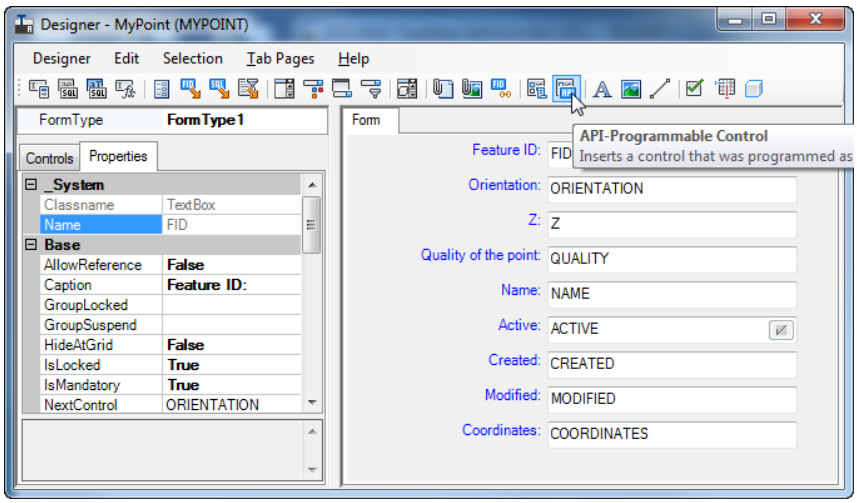
NOTE You must do this *first* before building the sample. If you do not, an error message "Control $myButton1 not found in Dialog" is displayed.

   1. Start Autodesk Topobase Administrator and open the TBSAMPLE workspace.

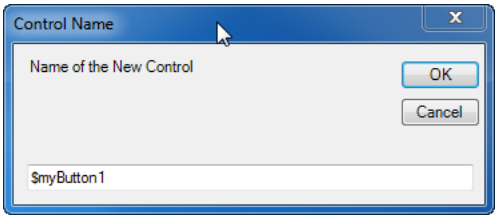


2 In the Form Designer, select MyPoint, then click Designer.

3 Click the API-Symbol icon.

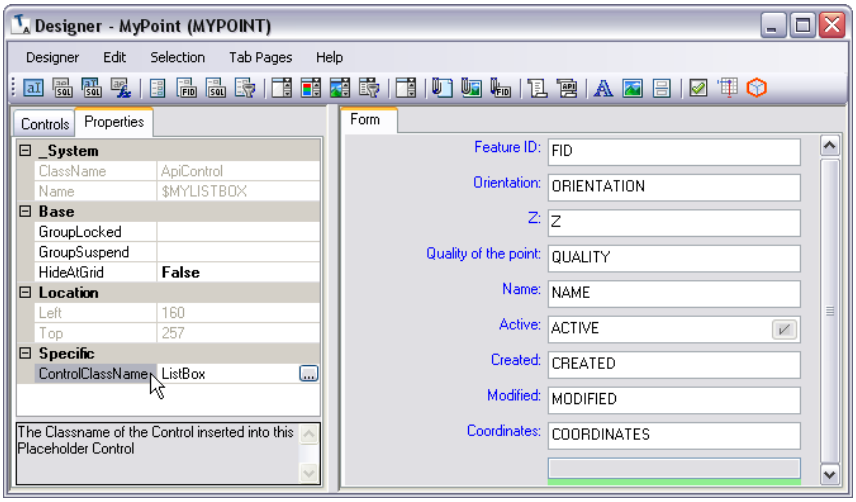


4 Give the new control the name $myButton1.



5 Click the API-Symbol again to create another control and give the new control the name $myListBox1.

6 Select that new control on the right, select ControlClassName on the left, and click the browse button that is displayed beside ControlClassName.



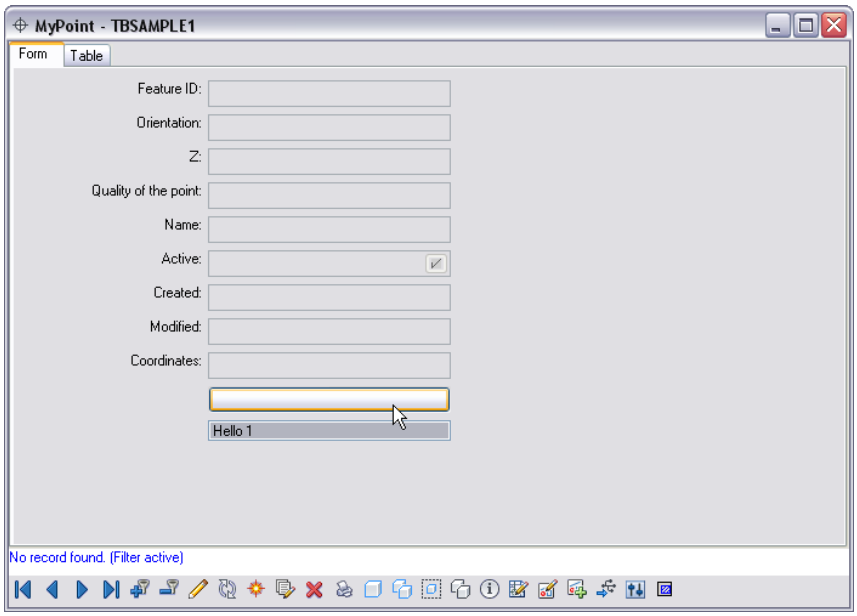
Set the Classname to ListBox.

7 Close the Designer and exit the Administrator.

3 Build the sample. The plugin (*VBSample16.dll* or *CSSample16.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

4 Start Autodesk Topobase and open the TBSAMPLE workspace.

5 Right-click MyPoint and select Show Form. Two new controls are displayed on the dialog box representing $myButton1 and $myListBox1.



Sample 17 - Dialog Menu

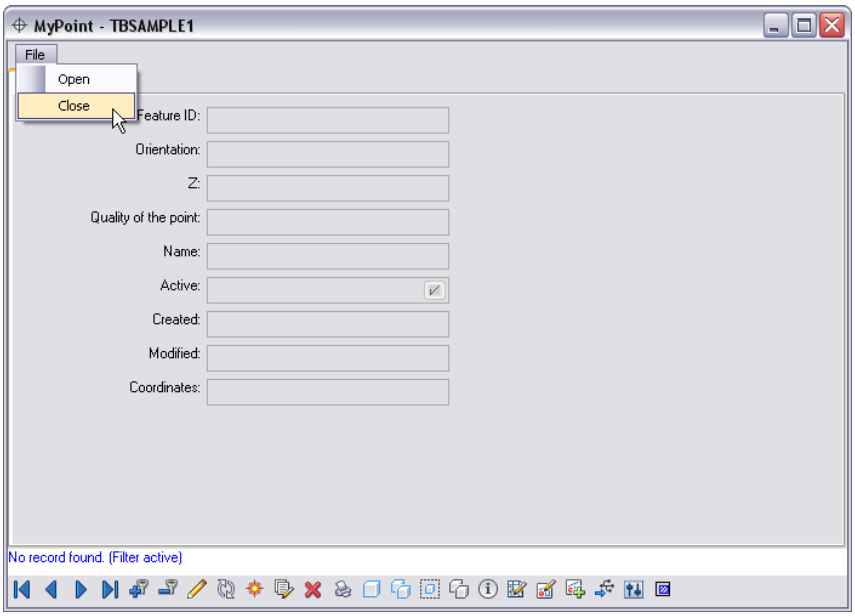
Purpose

This sample shows how to add a menu to a generic dialog box. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample17.dll* or *CSSample17.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Right-click MyPoint and select Show Form. A new File menu is added to the dialog box.



Sample 18 - Dialog Events

Purpose

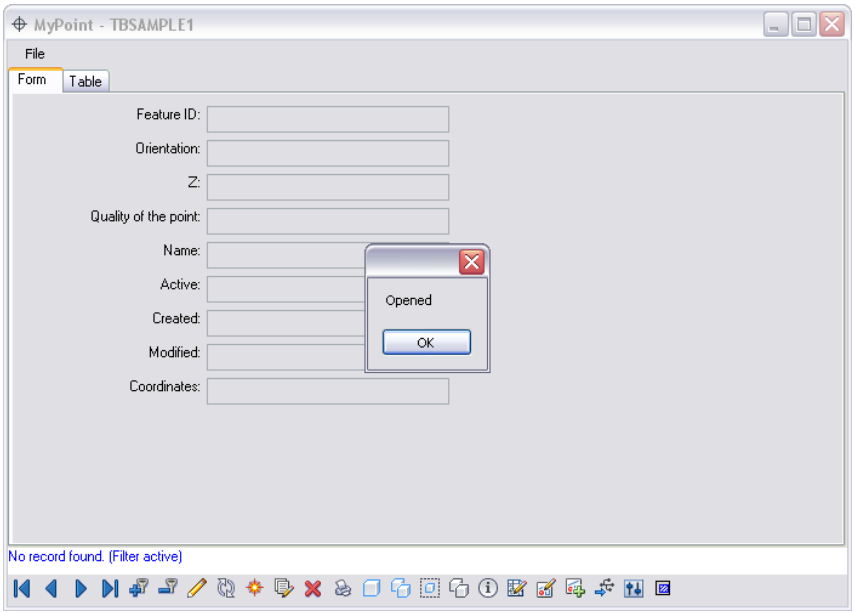
This sample shows how to detect events that are triggered as the user interacts with dialog boxes. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample18.dll* or *CSSample18.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.

3 Right-click MyPoint and select Show Form. The sample displays messages when various events are triggered.



TIP After completing this sample, remove the Sample 18 *.dll*, *.tbp*, and *.xml* from the Autodesk Topobase *bin* directory to avoid extra dialog boxes.

Sample 19 - Input Box, Confirm Box, and Multiple Input Box

Purpose

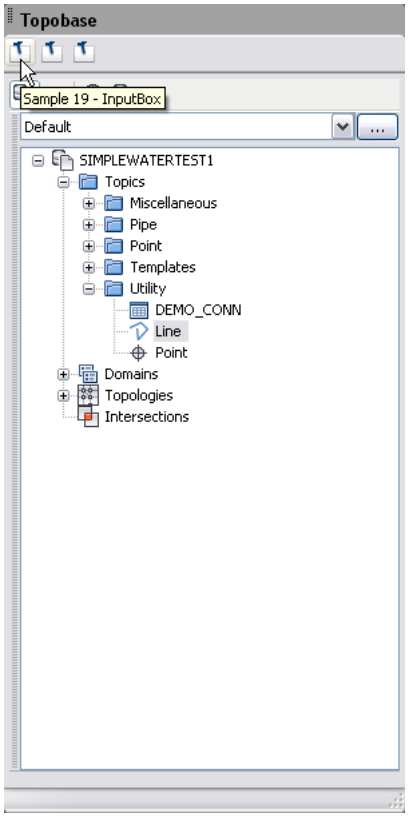
This sample shows how to use input boxes, confirmation boxes, and multiple input boxes. These work on both the Autodesk Topobase Client and the Autodesk Topobase Web interface.

NOTE The default Windows InputBox does not work for web applications.

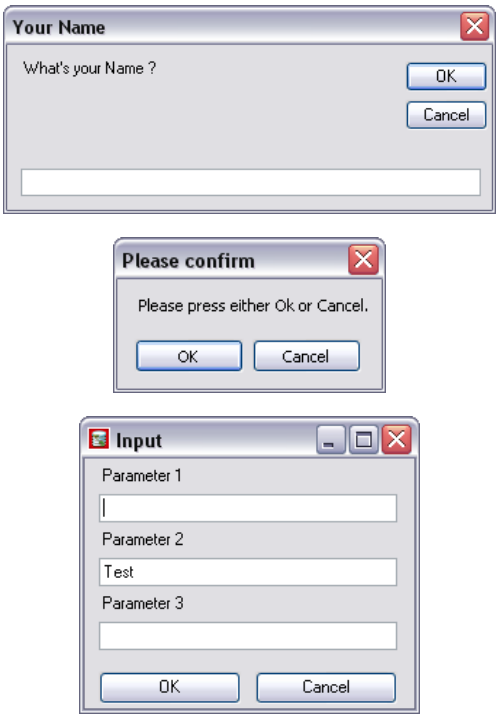
Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample19.dll* or *CSSample19.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Select one of the three buttons that the plugin added to the application toolbar of the Autodesk Topobase task pane.



The sample displays the different kinds of dialog boxes with interaction for each (that is, Your Name, Please Confirm, and Input).



Sample 20 - Forms and Controls

Purpose

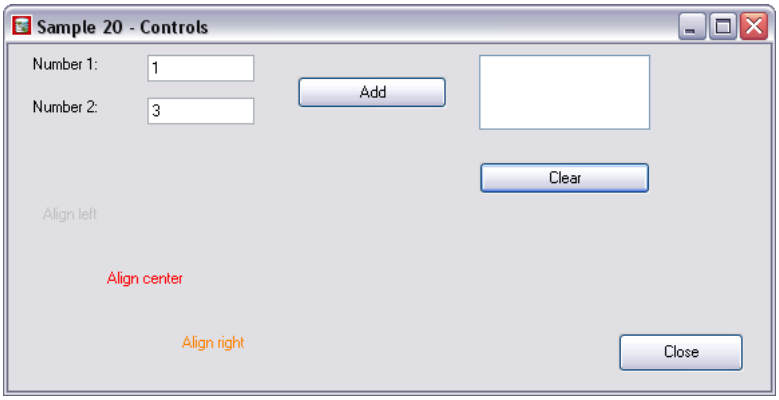
This sample shows how to create forms and controls.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample20.dll* or *CSSample20.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.

3 Click the application toolbar button with the Sample 20 - Forms and Controls caption. The sample's dialog box shows the various controls that you can use.



Sample 22 - Document Flyin

Purpose

Flyins are components of a Autodesk Topobase task pane that can either be docked in (that is, included in the application window) or docked out (that is, independently "flying" on the desktop). For example, the following elements of the Autodesk Topobase user interface are flyins:

- Document Explorer
- Job Management
- Workflow Explorer

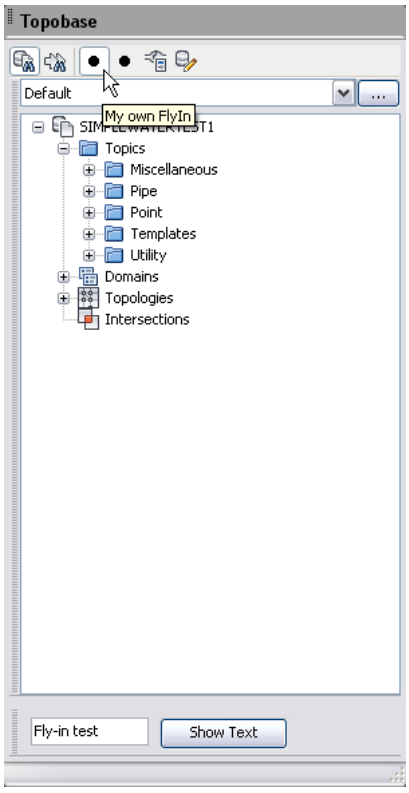
For each document and user group, you can define which flyins are available.

This sample shows how to extend a document with two flyins.

Procedure

To use this sample:

1. Build the sample. The flyin (*VBSample22.dll* or *CSSample22.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace. Two new buttons are added to the document toolbar in the Autodesk Topobase task pane. These buttons launch the two flyins: My Own Flyin and My Personal Desktop Flyin.
3. Select one of the toolbar buttons. A docked flyin is shown at the bottom of the Autodesk Topobase task pane. Only one of the added flyins can be shown at one time.



NOTE For use in the Autodesk Topobase Web mode, the dock state of the flyin should not be set. For use in the Autodesk Topobase Client mode, only one control can have the dock state set to "Full". Normally, this is the Feature Explorer. If you remove the Feature Explorer and replace it with your own navigator, however, then you should set its dock state to "Full".

Sample 25 - Progress Bar

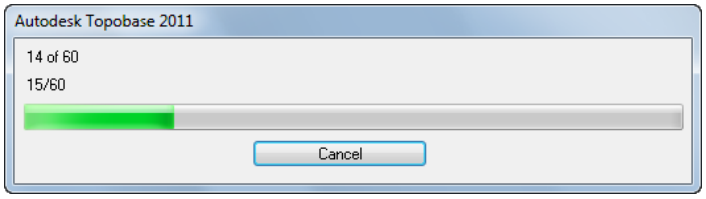
Purpose

This sample shows how to display a progress bar while your application performs a lengthy task.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample22.dll* or *CSSample22.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace.
3. Click the application toolbar button with the Sample 25 - Progress Bar caption. The sample's progress bar is displayed.



Sample 28 - List Box With Context Menu

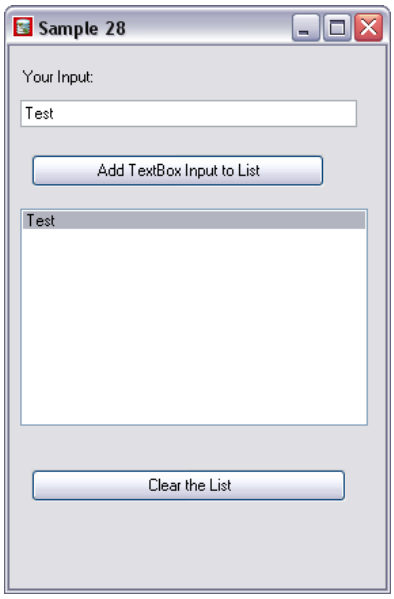
Purpose

This sample shows how to display a list box with a context menu for each item in the list.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample28.dll* or *CSSample28.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 28 - Listbox with ContextMenu caption. The sample's dialog box is displayed.



Sample 29 - Tree View

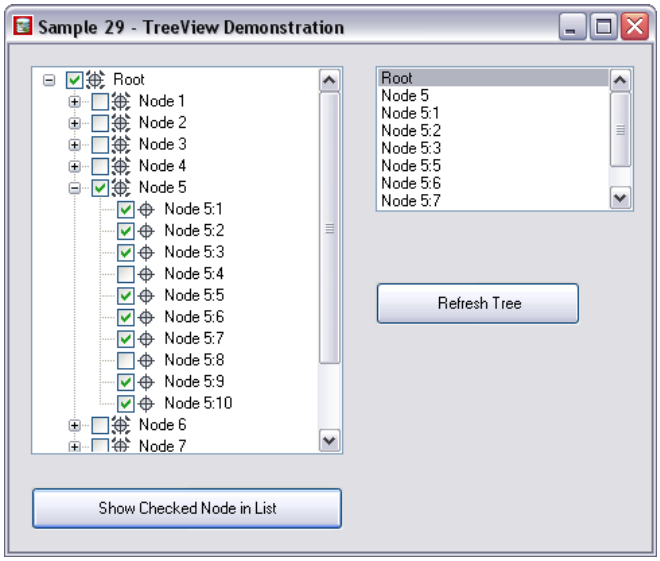
Purpose

This sample shows how to use a tree view control.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample29.dll* or *CSSample29.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 29 - TreeView Control caption. The sample's dialog box is displayed.



Sample 30 - Map Button

Purpose

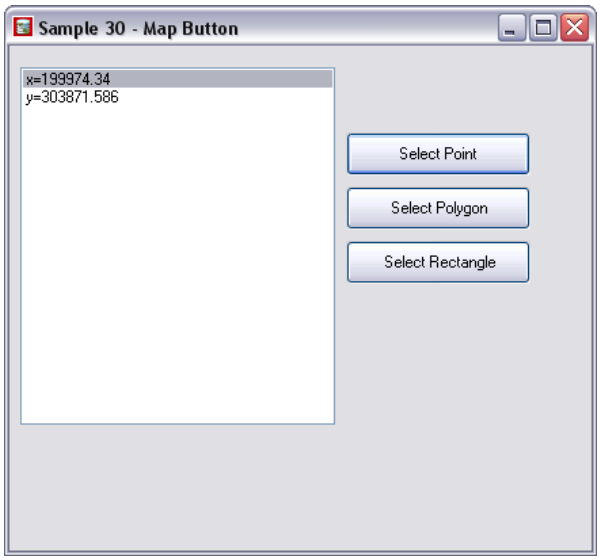
This sample shows how to retrieve the coordinates defining features for three feature types: point, polygon, and rectangle.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample30.dll* or *CSSample30.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the land management demonstration workspace (for example, TB2009_LM_102) whose creation is described in the *Autodesk Topobase Installation and Configuration Guide*.
3. Click Generate Graphic.
4. Click the document toolbar button with the Sample 30 - MapButton Control caption.

   The sample's dialog box is displayed.



5 Click Select Point. Move the cursor over the generated graphic and click. Bring the Sample 30 dialog to the foreground. The x and y values of the point's coordinates are displayed in the list box.

6 Click Select Polygon. The Autodesk Topobase window is moved to the foreground. Move the cursor over the generated graphic and click. Move the cursor and click. Move the cursor again and click. Now right-click to display a popup menu and select Close. You have defined a triangle. Bring the Sample 30 dialog to the foreground. There are four XY coordinates in the list box. The first and last coordinates have the same value.

7 Click Select Rectangle. The Autodesk Topobase window is moved to the foreground. Move the cursor over the generated graphic and click. Move the cursor again and click. Bring the Sample 30 dialog to the foreground. There are MaxX, MaxY, MinX, and MinY values in the list box.

Sample 31 - List Box

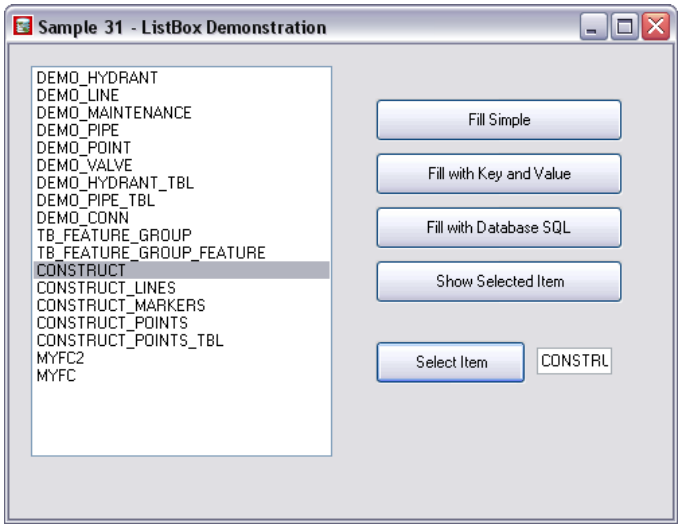
Purpose

This sample shows how to use the list box control.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample31.dll* or *CSSample31.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase Client (desktop) or Autodesk Topobase Web Client and open any workspace.
3. Click the desktop toolbar button with the Sample 31 - Listbox caption.
4. The sample's dialog box is displayed allowing you to experiment with the functionality of the buttons.



Sample 32 - Highlight

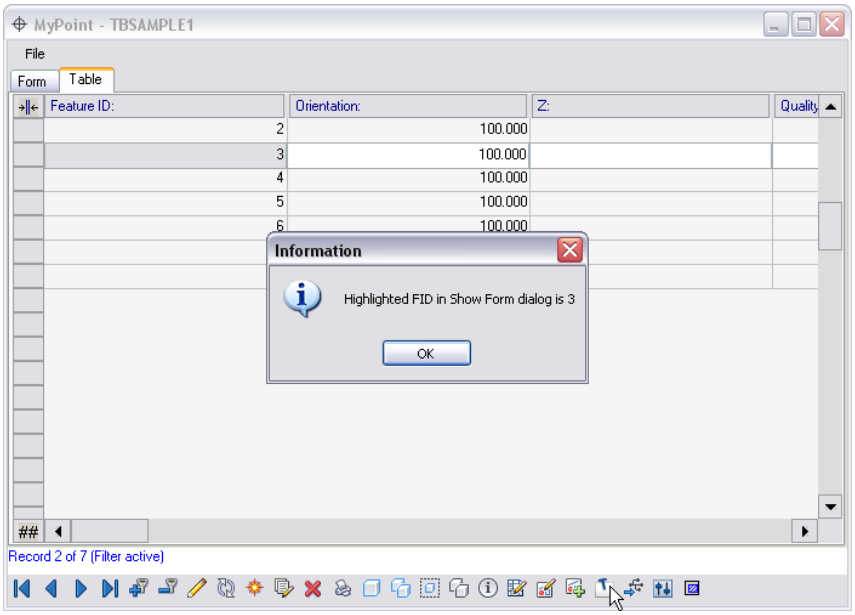
Purpose

This sample shows how to get information about currently selected items in a form. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample32.dll* or *CSSample32.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Right-click MyPoint and select Show Form. The points form is displayed.
4. Select the Table tab.
5. Select one of the rows in the table.
6. In the bottom toolbar, click the "Sample 32 - Highlighting" icon.



The sample displays a message box with information about the FID of the selected row. It then highlights the selected point in the graphics pane.

Sample 33 - Information

Purpose

This sample shows how to use the Feature Information icon to display the Show Form dialog box with a selected feature displayed in the dialog box. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample33.dll* or *CSSample33.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.

   NOTE If you have not already done so, use Sample 02 to add a couple of points and a line to the TBSAMPLE workspace. Or, add them manually by right-clicking MyPoint and MyLine, choosing Show Form, and adding records.

3. Click Generate Graphic.

   TIP If needed, you can right-click on a feature in the Display Manager pane and select Zoom to Extents to more easily view the object.

4. In the graphics pane, click a point.
5. Click the Attributes item in the ribbon or in the context menu of the point. The message box is displayed with the Sample 33 OnInfo handler running: e.DialogName: MYPOINT text. Click OK. A show form MyPoint - TBSAMPLE dialog box is displayed with the Form tab selected. This tab contains information about the selected point.
6. In the graphics pane, click a line.
7. Click the feature information button. A message box is displayed with the Sample 33 OnInfo handler running: e.DialogName: MYLINE text. Click OK. A show form MyLine - TBSAMPLE dialog box is displayed with

the Table tab selected. This tab contains information about the selected line.

Sample 34 - File Upload and Download

Purpose

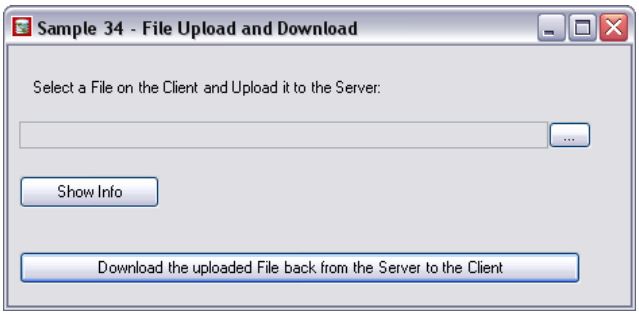
This sample shows how to upload files from the client to the server and download from the server to the client.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample34.dll* or *CSSample34.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase Client (desktop) or Autodesk Topobase Web Client and open any workspace.
3. Click the document toolbar button with the Sample 34 - File Upload/Download caption.

   The upload/download dialog box is displayed. Select a file to "upload" and click Show Info. Note that in the client mode, the uploading and downloading of files to/from the server/client is unnecessary. This only applies when the client and server are different, such as in web mode.



Sample 37 - Windows Menu Items

Purpose

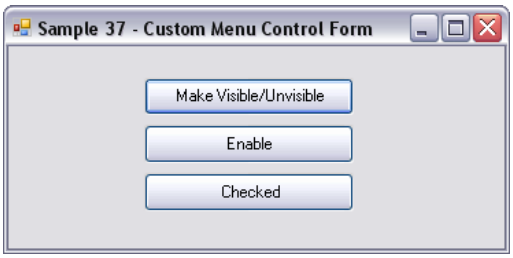
This sample shows how to manipulate menu items in the client.

NOTE All the properties for the `Topobase.Forms.MenuItem` class are safe under both Autodesk Topobase Client and Autodesk Topobase Web mode. This sample shows how to use extra properties (enabled, visible, checked) but the form can only be used in Autodesk Topobase Client mode, not Autodesk Topobase Web mode.

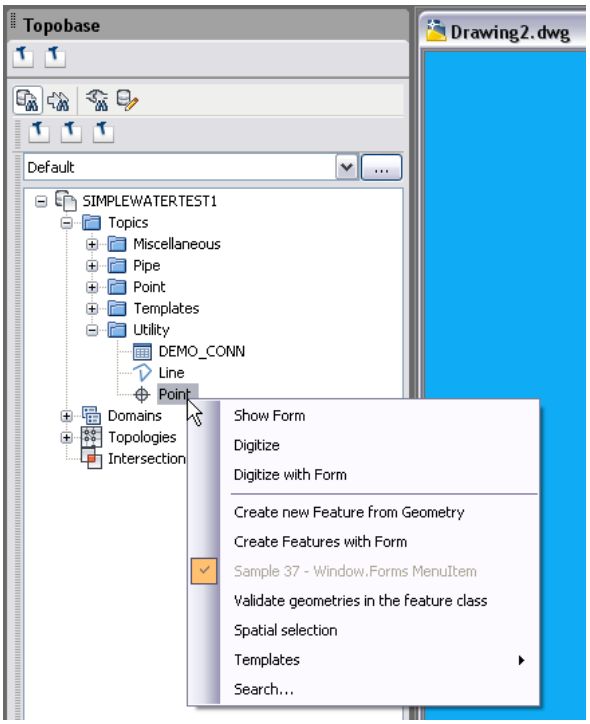
Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample37.dll* or *CSSample37.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open a workspace that contains a Point feature type, such as TBSAMPLE. The sample's dialog box is displayed.



3. In the Document Explorer, expand the document tree until you can see a point feature class. Right-click on the feature class to display the context menu. Notice the Sample 37 - Windows.Forms MenuItem entry. Select this entry. An information dialog box is displayed with the Menu Clicked text.



4 Bring the sample's dialog box to the foreground. The buttons in this dialog box operate on the Sample 37 - Windows.Forms MenuItem entry. Click Enable. Display the MyPoint context menu again. The Sample 37 - Windows.Forms MenuItem entry is greyed out and inactive. Click Enable again. The Windows.Forms MenuItem entry is active again.

5 Bring the sample's dialog box to the foreground. Click Checked. Display the point feature class context menu again. The Sample 37 - Windows.Forms MenuItem entry now has a check mark prepended to it. Click Checked again. The check mark has been removed from the Sample 37 - Windows.Forms MenuItem entry.

Sample 40 - Create All Dialogs Boxes

Purpose

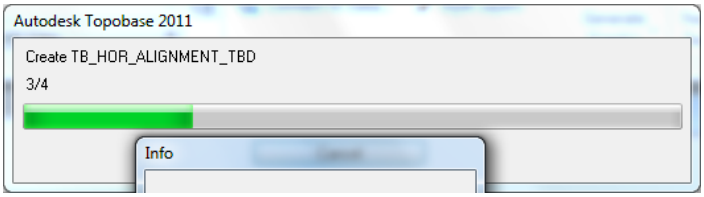
This sample shows how to create all the dialog boxes' entries in the database. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

Normally, if you create a new Feature Class or Domain Table through the Autodesk Topobase Administrator, the entries in various tables (such as `TB_GN_DIALOG`, `TB_GN_CONTROL` etc.) for the generic dialog boxes are not created until the user opens the dialog box for the first time. However, it can be useful to make sure that all entries are created in the database. Doing so enables you to batch-modify them all by using SQL without having to use the Form Designer manually.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample40.dll* or *CSSample40.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Click the document toolbar button with the Sample 40 - Create All Dialogs caption. A progress dialog box is displayed followed by a message box at the end of the process.



The code contains commented lines that, if restored, displays all dialogs as well as creates them. By default, this is disabled because of the large number of possible dialog boxes.

Sample 41 - Grid Control

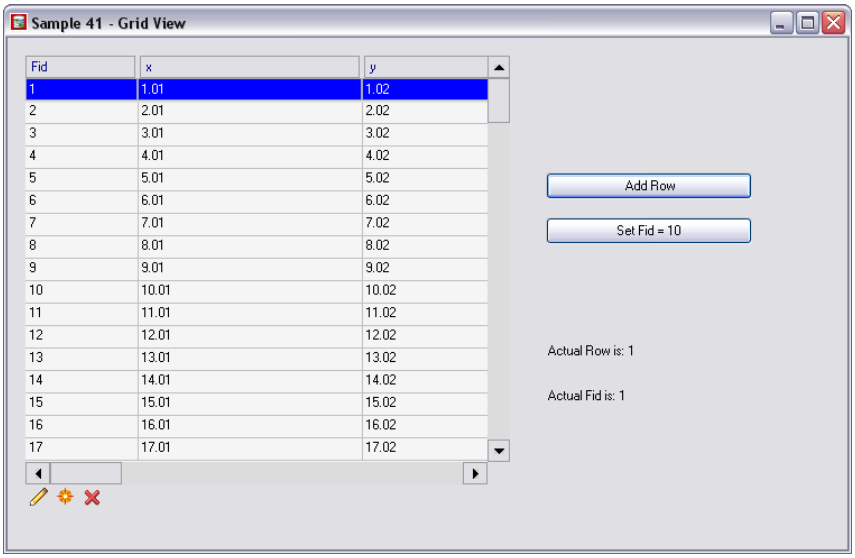
Purpose

This sample shows how to use a grid control.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample41.dll* or *CSSample41.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 41 - Grid View caption.



You can use the grid control, buttons, and icons in the dialog box to trigger various events and edit the data.

Sample 43 - Dialog Box Validation

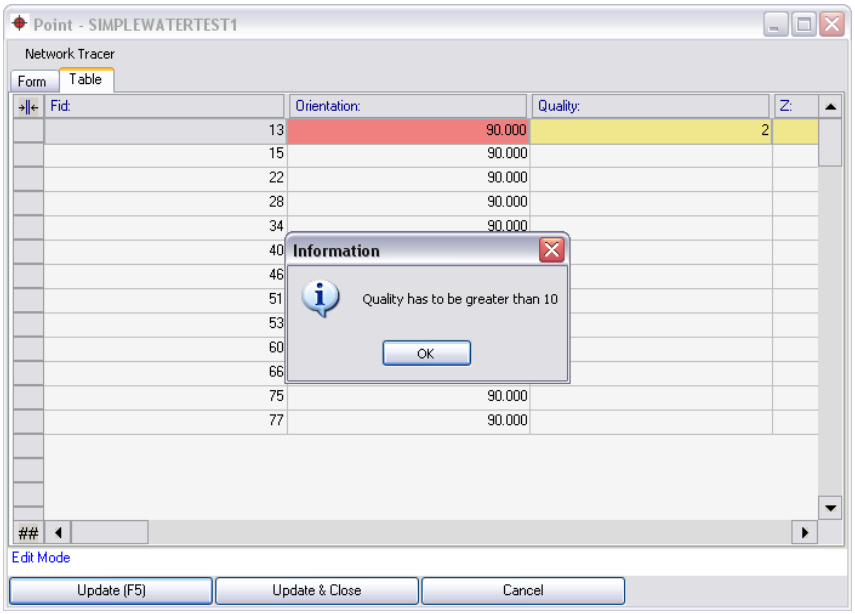
Purpose

This sample shows how to validate the data that a user enters in a generic dialog box. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

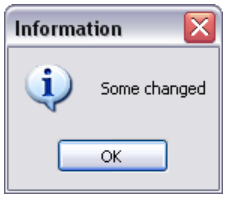
Procedure

To use this sample:

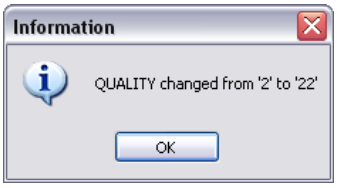
1. Build the sample. The plugin (*VBSample43.dll* or *CSSample43.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. In the Autodesk Topobase pane, right-click MyPoint and select Show Form.
4. Change the Quality field to a value less than 10 and click Update. An Information dialog box is displayed with the Quality Has To Be Greater Than 10 text. Click OK.



5 Change the Quality field to a value greater than 10 and click Update. An Information dialog box is displayed with the Some Changed text.



6 Click OK. An Information dialog box is displayed with the Quality Changed From '<number>' To '<number>' text. Click OK.



Sample 44 - Menus and Toolbars

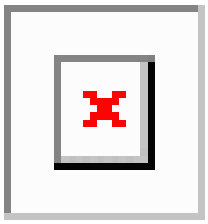
Purpose

This sample shows how to create menus and toolbars in a Autodesk Topobase form.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample44.dll* or *CSSample44.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 44 - Form with Menu and Toolbar caption. A new form is displayed.



When you select the menu items or click the icons, message boxes are displayed indicating which event took place.

Sample 45 - Matrix

Purpose

This sample shows how to use a matrix control.

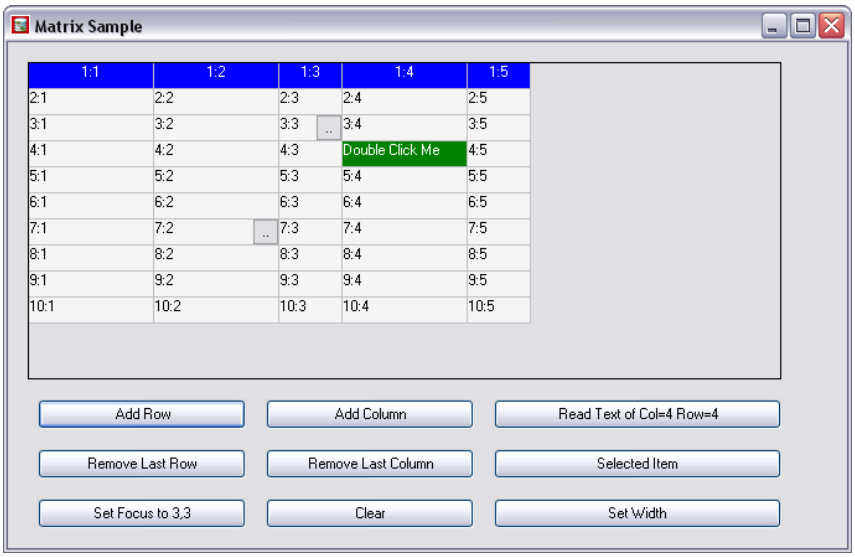
Matrix controls are designed to work with small amounts of data, that is, between 10 - 80 rows with up to 5 columns. These controls are cell oriented,

so each cell can have a different color or be set to read-only. The Grid control, in contrast, is always in edit mode and is row oriented.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample45.dll* or *CSSample45.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 45 - Matrix caption. A new form is displayed.



The buttons show various ways you can programatically control the matrix.

Sample 46 - Interaction with a Map

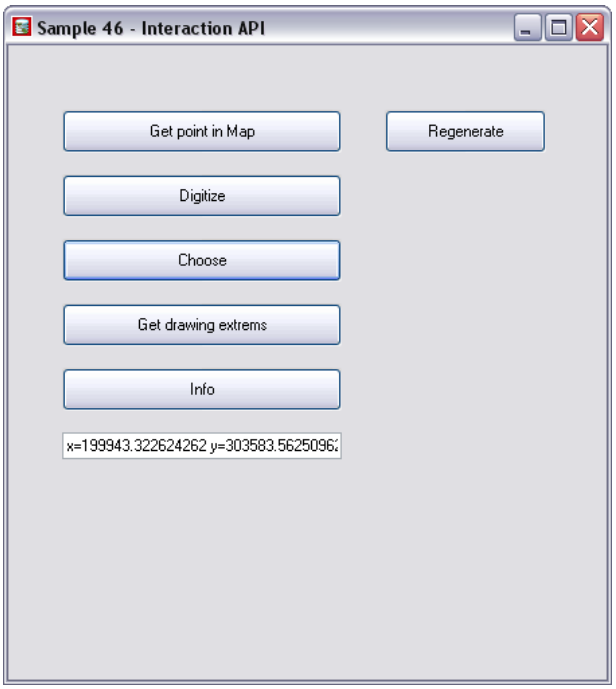
Purpose

This sample shows how a plugin can interact with a map. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

Procedure

To use this sample:

1. Add some points and lines to the TBSAMPLE workspace. This can be done by using Sample 02 - Read/Write Features (page 191) or within Autodesk Topobase by right-clicking MyPoint and MyLine, choosing Show From, and adding records.
2. Build the sample. The plugin (*VBSample46.dll* or *CSSample46.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
3. Start Autodesk Topobase and open the TBSAMPLE workspace.
4. Click Generate Graphic.
5. Specify an appropriate viewport and click Generate.
6. Click the document toolbar button with the Sample 46 - Web Interaction caption. A new form is displayed.



This form illustrates how you can interact with a map:

- Click Get Point in Map and then click on a point in the generated graphic. Autodesk Topobase displays an information dialog box with the x=<number> y=<number> text. Click OK. Autodesk Topobase displays an information dialog box with the Now You Are Back In The Main Thread text. Click OK.
- Click Choose and then select a feature in the map. Autodesk Topobase displays an information dialog box containing information about the feature you selected. Assuming you selected a point, the following text is displayed in the dialog box:

  ```
  Fid=<number>

  Class=MYPOINT

  FirstPointIndex=-1

  SecondPointIndex=-1
  ```

- Click Get Drawing Extremes. Autodesk Topobase displays information about the extents of the map. It displays an information dialog box with

the Xmin=<number> Ymin=<number> Xmax=<number> Ymax=<number> text. Click OK.

- Click Info and then click one point in the map. Press Enter. Autodesk Topobase displays an information dialog box with the Fid=<number> text. Click OK.
- Click Info. Click anywhere in the map, drag the cursor to form a selection rectangle around a set of points and click. Press Enter. Autodesk Topobase displays an information dialog box with the Fid=<number> text. Click OK. Autodesk Topobase displays another information dialog box with the Fid=<number> text. Click OK. Autodesk Topobase continues to display information dialog boxes until the feature class identifier for each of the points selected have all been displayed.

Sample 47 - Application Options

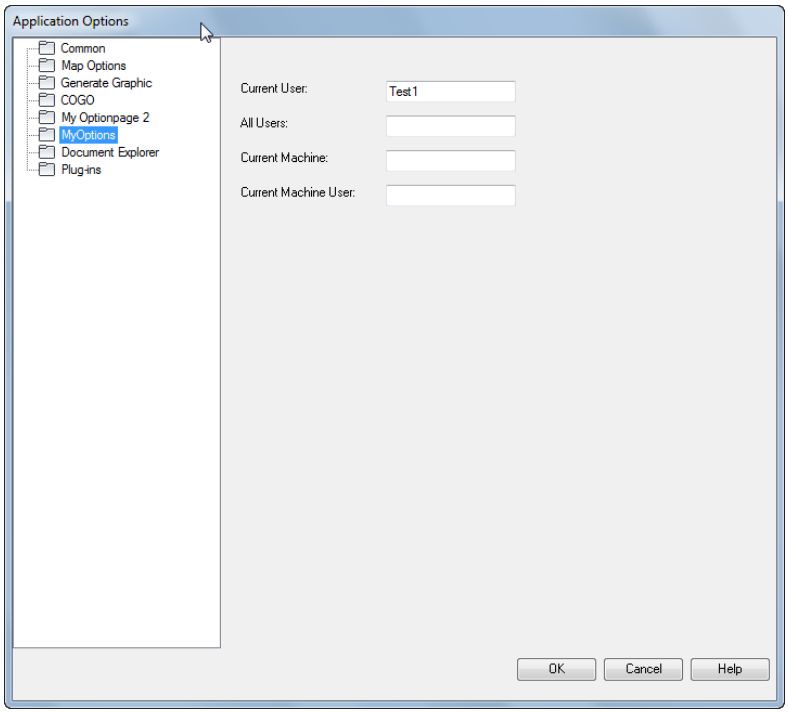
Purpose

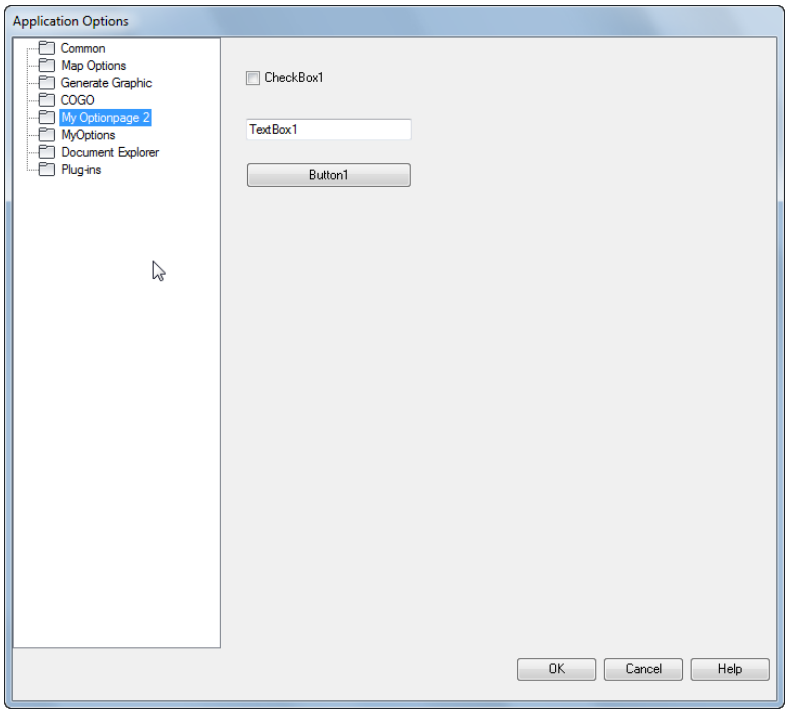
This sample shows how to create your own application-related option forms.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample47.dll* or *CSSample47.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click Setup ➤ Topobase Application Options.
4. In the tree, click MyOptions or My Optionpage 2. The new option forms are shown.


Application Options
Common
Map Options
Generate Graphic
COGO
My Optionpage 2
MyOptions
Document Explorer
Plug-ins
Current User:
Test1
All Users:
Current Machine:
Current Machine User:
OK
Cancel
Help



For a sample showing how to create *document*-related options, see Sample 59 - Settings and Document Options (page 246).

Sample 48 - Treeview With Context Menu

Purpose

This sample shows how to create a treeview complete with context menus.

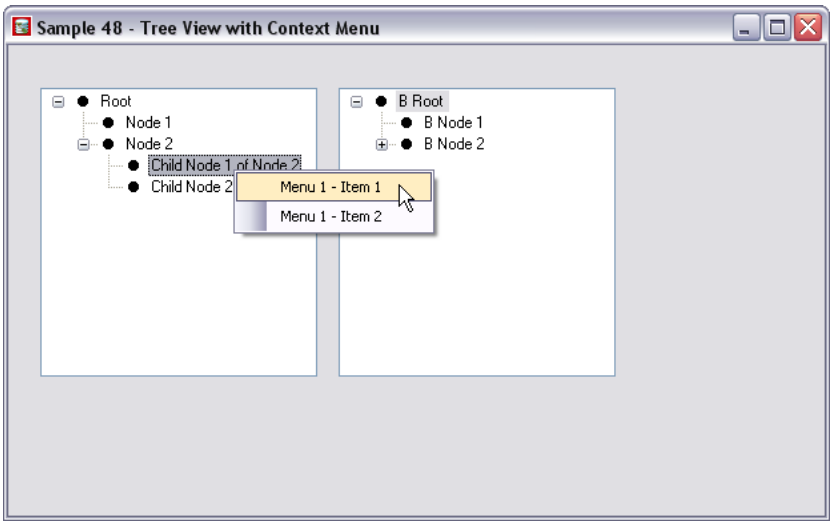
Procedure

To use this sample:

1 Build the sample. The plugin (*VBSample48.dll* or *CSSample48.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Start Autodesk Topobase.

3 Click the application toolbar button with the Sample 48 - TreeView with ContextMenu caption. The sample form with two treeview controls is displayed. Some of the nodes in the treeview controls have context menus.



Sample 50 - Date/Time Picker

Purpose

This sample shows how to use the date/time control.

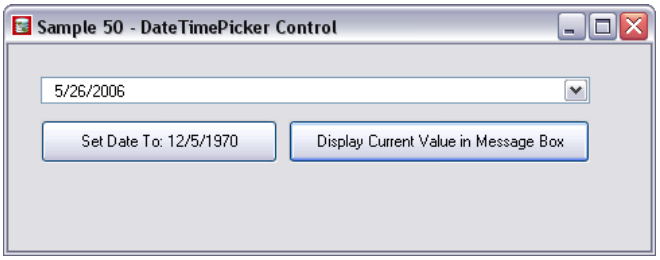
Procedure

To use this sample:

1 Build the sample. The plugin (*VBSample50.dll* or *CSSample50.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Start Autodesk Topobase.

3 Click the application toolbar button with the Sample 50 - DateTime Picker caption. The control is displayed.



Sample 51 - File and Directory Text Box

Purpose

This sample shows how to use the directory text box control and the file text box control.

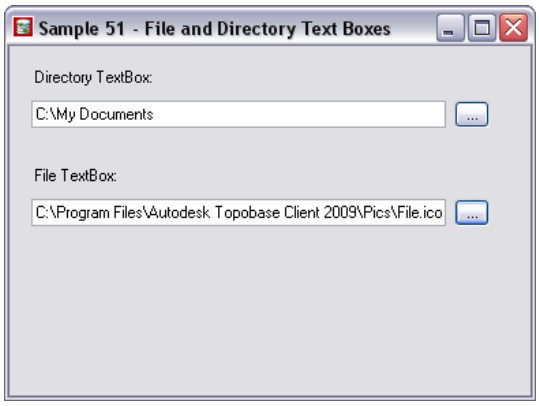
Procedure

To use this sample:

1 Build the sample. The plugin (*VBSample51.dll* or *CSSample51.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Start Autodesk Topobase.

3 Click the application toolbar button with the Sample 51 - File And Directory Text Box caption. The new form is displayed, which enables you to select directories and files.



NOTE This control is not recommended for use in the Autodesk Topobase Web client. In the Autodesk Topobase Web client, these controls show the files and directories of the web server machine, which may be a security risk. If you want to select a file on the web client machine, use the FileUploadBox control.

Sample 52 - Dock In Container

Purpose

This sample shows how to use the `Topobase.Forms.Application.Desktop.DialogDockInContainer` control and the `Topobase.Forms.Desktop.DockableForm` object.

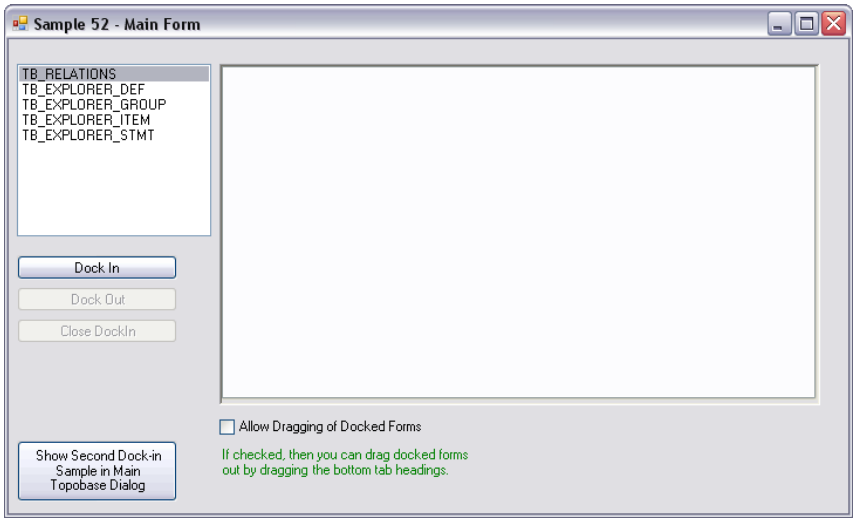
NOTE All docking controls only work in the Autodesk Topobase Client mode. The `DockInContainer` control and the `DockableForm` class cannot be used in the Autodesk Topobase Web mode.

Procedure

To use this sample:

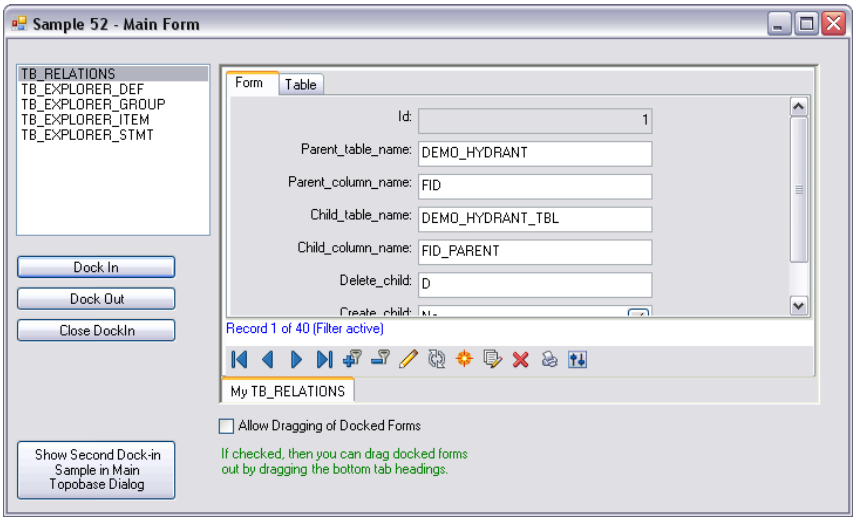
1. Build the sample. The plugin (*VBSample52.dll* or *CSSample52.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace.

3 Click the application toolbar button with the Sample 52 - DockIn Container caption. The new form is displayed.

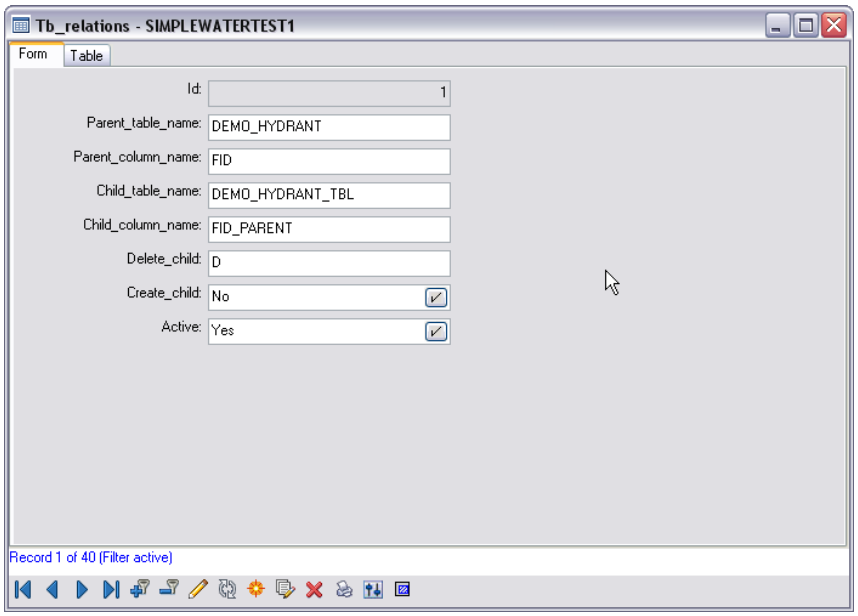


This illustrates different ways a form can be positioned:

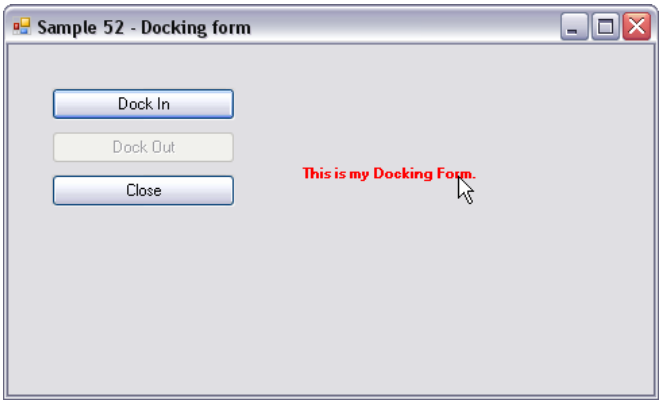
- Click Dock In to show the selected table docked into the form.



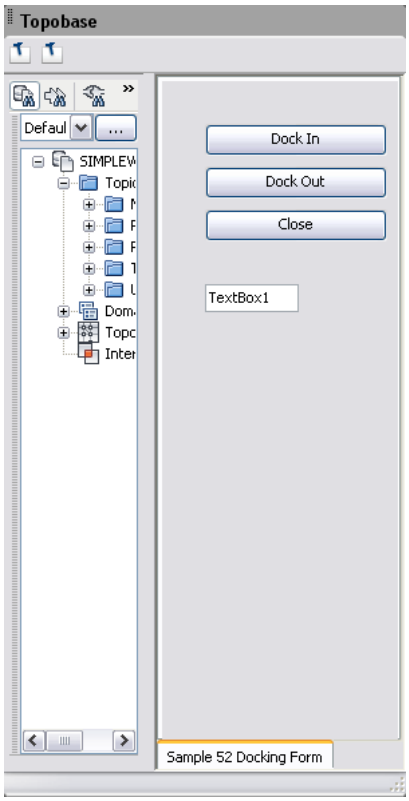
- Click Dock Out to show the form in a separate window.



- Click Close.
- Click Sample Dockin into Main Topobase Dialog.



Then click Dock In to dock the form into the Autodesk Topobase task pane.



Sample 53 - Connection Tools

Purpose

This sample shows how to insert, select, and update rows in a table in the database. The code features the use of the following classes:

- `Topobase.Data.Tools.DataStructure`
- `Topobase.Data.Tools.RecordWriter`
- `Topobase.Data.Tools.RecordReader`
- `Topobase.Data.Tools.RecordBuffer`

- `Topobase.Data.Tools.ConnectionTools`
- `Topobase.Data.Tools.SqlExport`

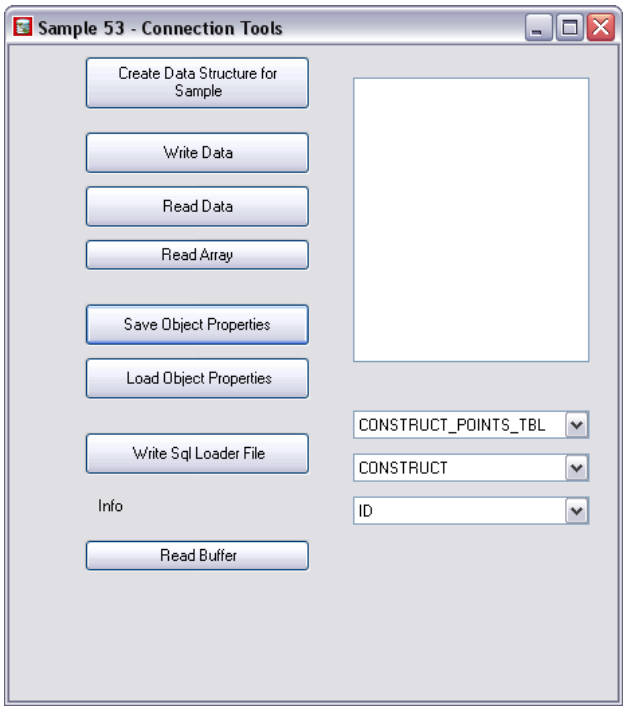
Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample53.dll* or *CSSample53.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Click the application toolbar button with the Sample 53 - Connection Tools caption. The new form is displayed.

NOTE If you have run the sample previously (you can use Step 6 to determine if the table exists) and want to start again from the beginning, you must remove the `sample_person` table from the database. In an Oracle SQL*Plus session enter the following commands:

```
connect tbsample/avs
drop table sample_person cascade constraints;
```



4 Click Create Data Structure For Sample. The handler for this button uses the `Topobase.Data.Tools.DataStructure` class. An information dialog box is displayed with the Creating Structure text. Click OK.

5 Verify that the table was created and determine its structure. In an Oracle SQL*Plus session, enter the following commands:

```
connect tbsample/avs
select table_name from user_tables where table_name =
'SAMPLE_PERSON';
desc sample_person
```

6 Click Write Data. The handler for this button uses the `Topobase.Data.Tools.RecordWriter` class to set name/value pairs before performing the SQL command. An information dialog box is displayed with the There are 0 values in SAMPLE_PERSON text. Click OK.

7 A message box is displayed with a SQL statement for an insertion into SAMPLE_PERSON. Click OK. The inserted data is displayed in the list box; the source of the data is a `select` on SAMPLE_PERSON. This pattern of

events is repeated several times with some of the SQL statements being insertions and some being updates.

8. Click Read Data. The handler for this button uses the `Topobase.Data.Tools.RecordReader` class. Some data from each row in the SAMPLE_PERSON table is displayed in the list box.
9. Click Read Array. The handler for this button uses the `Topobase.Data.Tools.RecordBuffer` and the `Topobase.Data.Tools.ConnectionTools` classes. A message box is displayed with the Gabi del la Blub has Size 0.58 text. Click OK.
10. Click Save Object Properties. The handler for this button uses the `Topobase.Data.Tools.RecordWriter` class to serialize properties extracted from an object before executing the insert SQL statement.
11. Click Load Object Properties. The handler for this button uses the `Topobase.Data.Tools.RecordReader` class to select a row from SAMPLE_PERSON and deserialize the properties to create an object. A message box is displayed with information extracted from the object. Click OK.
12. Click Write SQL Loader File. The handler for this button uses the `Topobase.Data.Tools.SqlExport` class to extract rows from SAMPLE_PERSON and write them to a file. A text editor window is displayed displaying the extracted information. Close the window.
13. Click Read Buffer. The handler for this button uses `Topobase.Data.Tools.RecordReader` class to select a row from SAMPLE_PERSON, uses the select results to create an object, displays two of the object's properties in a message box, changes one of the object properties that was displayed and then uses the `Topobase.Data.Tools.RecordWriter` class to extract the object properties and update the corresponding row in the SAMPLE_PERSON table. Finally, it displays the updated row in the list box.

Sample 55 - Drop Down Buttons

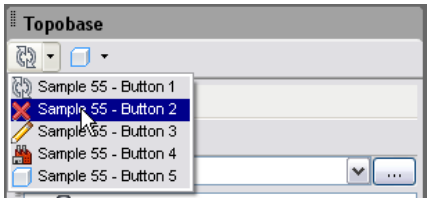
Purpose

This sample shows how to add drop down lists.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample55.dll* or *CSSample55.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase. Two new icons appear on an application toolbar.



3. After you select one of the items from the menu, that item's icon is shown on the toolbar. The second button also demonstrates submenus.

Sample 56 - List Box

Purpose

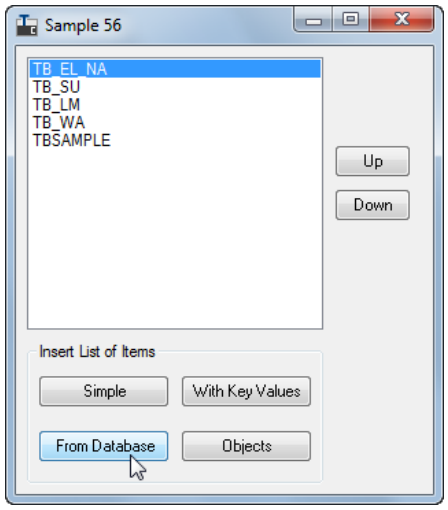
This sample shows how to use the `Topobase.Forms.ListBox` control.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample56.dll* or *CSSample56.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 56 - Listbox caption. The plugin form is displayed.
4. To display current workspaces available, under Insert List of Items, click From Database. To display other items, click other buttons.

5



Sample 57 - Special Menu Items

Purpose

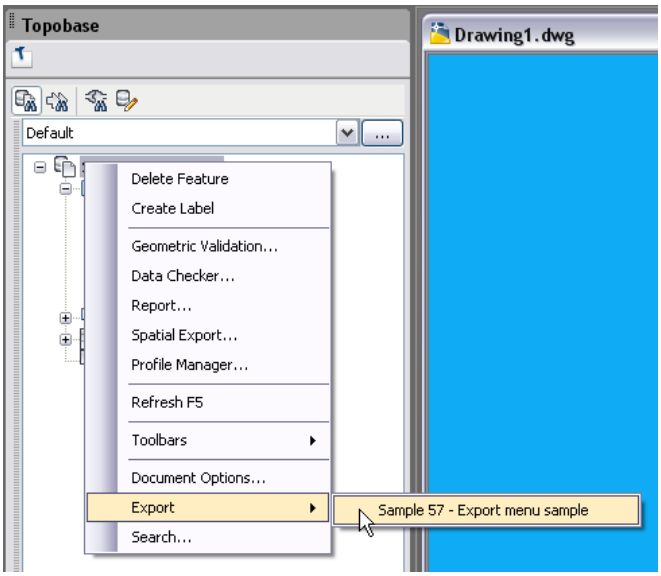
This sample shows how to create special menu items for imports and exports. These differ from normal menu items because Autodesk Topobase shows all imports and exports in one list in the menu.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample57.dll* or *CSSample57.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace.
3. Right-click on the base object in the Document Explorer and select Export.

   The Sample 57 - Export Menu Sample menu item is added.



Sample 59 - Settings and Document Options

Purpose

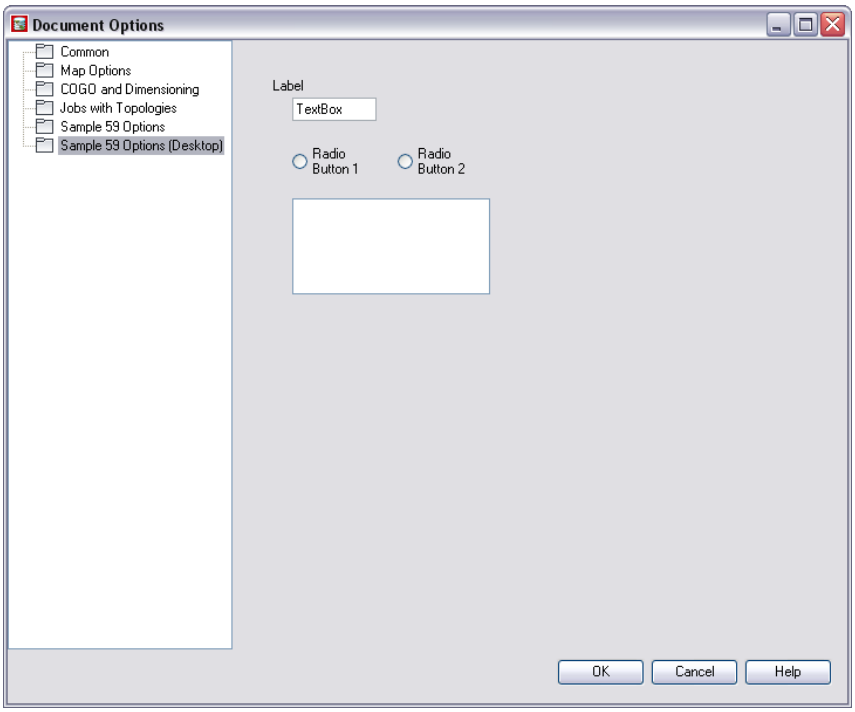
This sample shows how to create pages for the document option dialog box. It uses both the `Topobase.Forms.OptionPages.DocumentOptionPage` class (which works in both the Autodesk Topobase Client (desktop) and Autodesk Topobase Web Client) and the `Topobase.Forms.Desktop.DocumentOptionPage` (which allows the use of Windows Forms elements, but *cannot* be used in the Autodesk Topobase Web Client). It also demonstrates how to store settings for recording the options the user has selected.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample59.dll* or *CSSample59.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace.

3 In the Settings ribbon, select Document Options. The sample's new Sample 59 Options and Sample 59 Options (Desktop) menu items appear in the tree on the left.



For a sample showing how to create *application*-related options, see Sample 47 - Application Options (page 232).

Sample 61 - Dialog Box User Controls

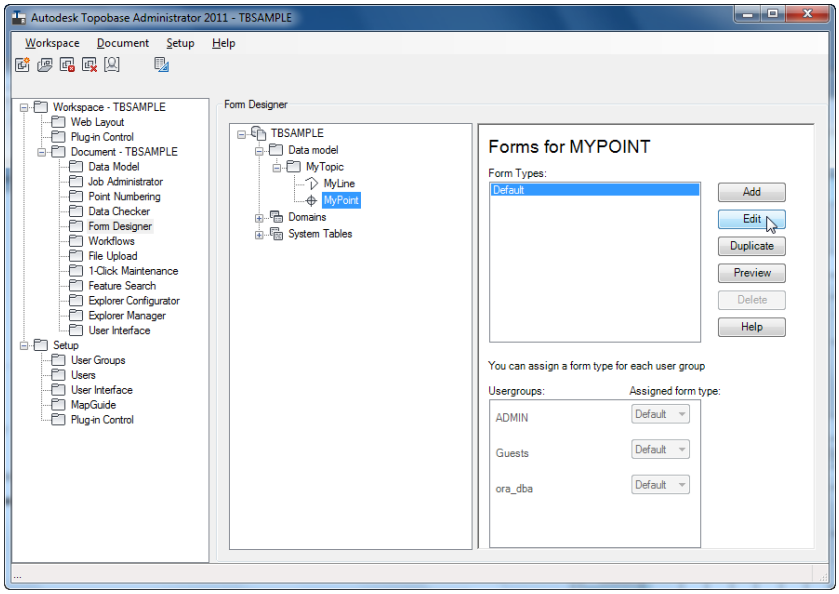
Purpose

This sample shows how to use controls in a generic dialog box. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

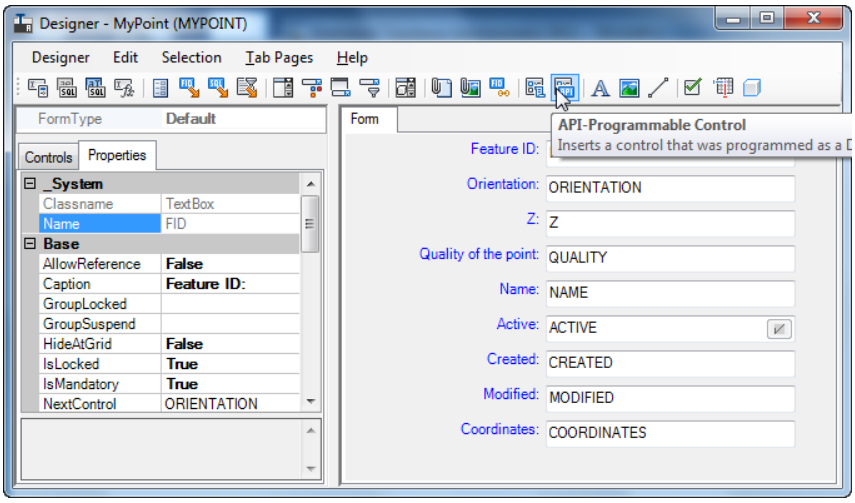
Procedure

To use this sample:

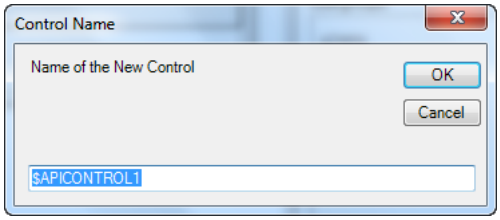
1. Build the sample. The plugin (*VBSample61.dll* or *CSSample61.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Copy the sample's *.dll* and *.tbp* files from the Autodesk Topobase Client */bin* directory to the Autodesk Topobase Administrator */bin* directory.
3. Start the Autodesk Topobase Administrator and open the TBSAMPLE workspace.
4. In the Autodesk Topobase Administrator, select the Form Designer in the left tree, and select MyPoint on the right.



5. Click Edit. The form designer opens.
6. Click the APIControl icon.



7 Name the new control `$APIControl1`. Click OK.

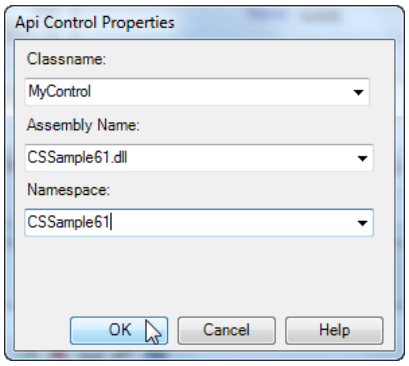


8 On the Properties tab, select the ControlClassName field and click the field's browse button.

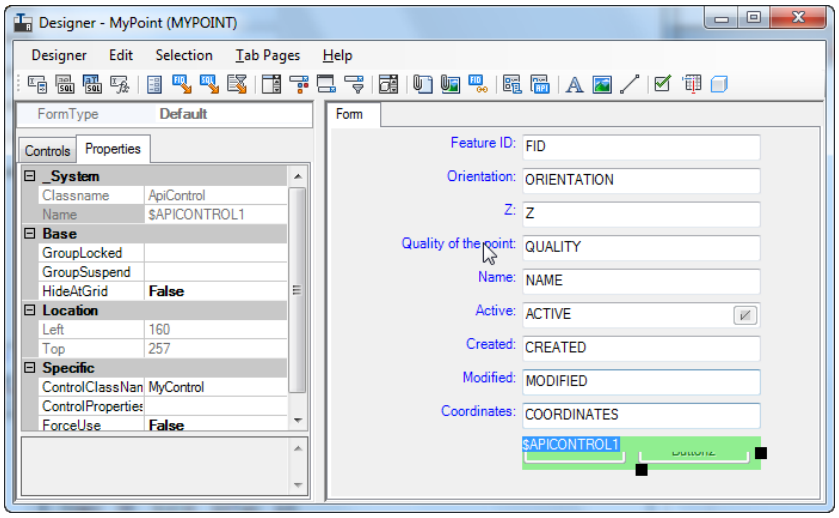
9 Set the Classname to MyControl.

10 Set the Assembly Name to CSSample61.dll if you are using C#, or to VBSample61.dll if you are using Visual Basic.

11 Set the Namespace to CSSample61 if you are using C#, or to VBSample61 if you are using Visual Basic. Click OK.



12 Two buttons are now shown where the control was placed.



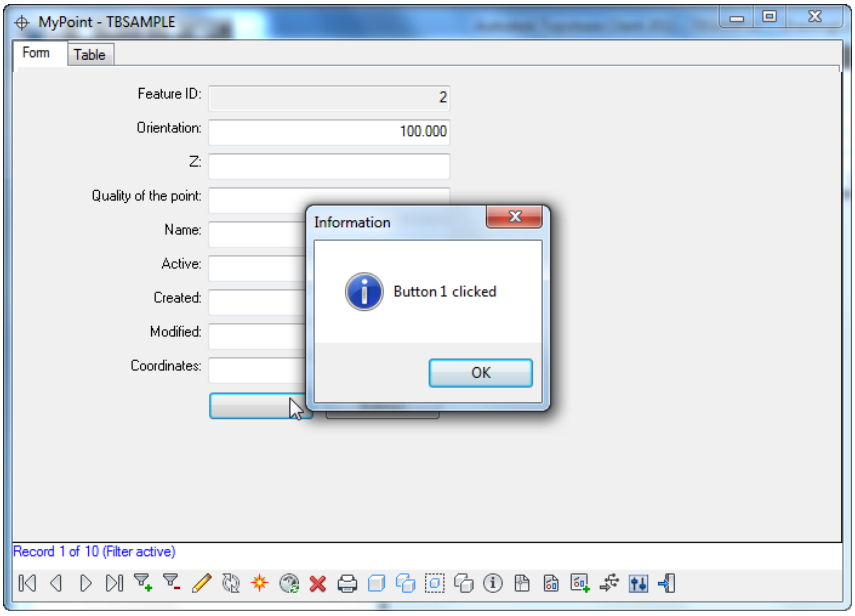
13 Close the Designer form and Autodesk Topobase Administrator.

14 Load the *.tbp* file (*VBSample61.dll* or *CSSample61.dll*) in the Autodesk Topobase Client *bin* directory into a text editor. Modify the Name attribute of the DialogPlugIn element from `[Name="specified_table_name"]` to `[Name="MYPOINT"]`. Save the *.tbp* file.

15 Start Autodesk Topobase Client and open the TBSAMPLE workspace.

16 In the Autodesk Topobase task pane, right-click MyPoint and select Show Form. A new user control consisting of Button1 and Button2 buttons is

added to the form. Click either button to display a simple information dialog box.



To restore the dialog box to its default state:

1. Start the Autodesk Topobase Administrator.
2. Open the MyTopic dialog box again in the Forms Designer.
3. Select the control (the two buttons) on the Form tab.
4. Click Edit ➤ Delete Control.

Sample 62 - Control Test

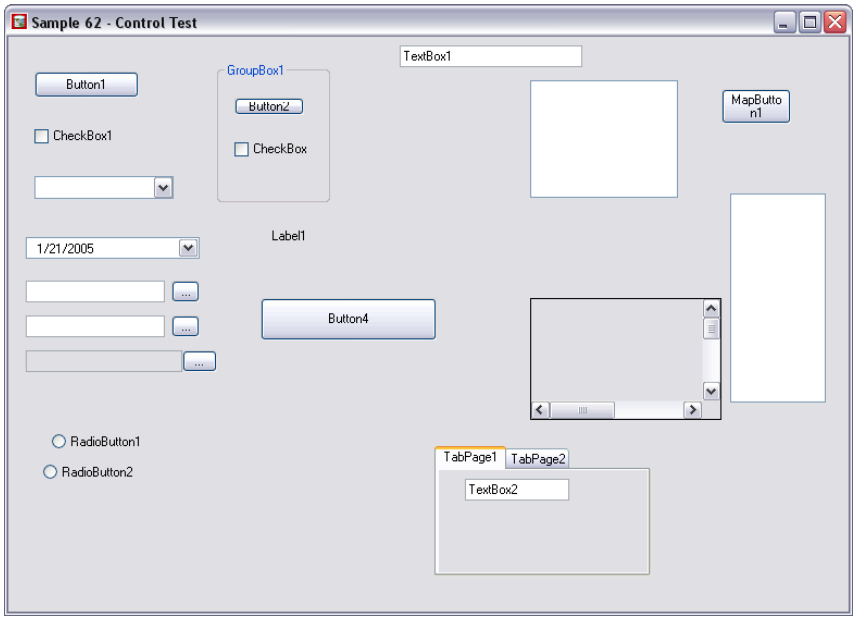
Purpose

This sample shows how to use controls in a generic dialog box.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample62.dll* or *CSSample62.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 62 - Controls caption. The new form is displayed that provides various functionality for buttons, text boxes, scrolling lists, and so on.



Sample 64 - Desktop Option Pages

Purpose

This sample shows how to create standard options dialog boxes using the `Topobase.Forms.Desktop.DocumentOptionPage` and

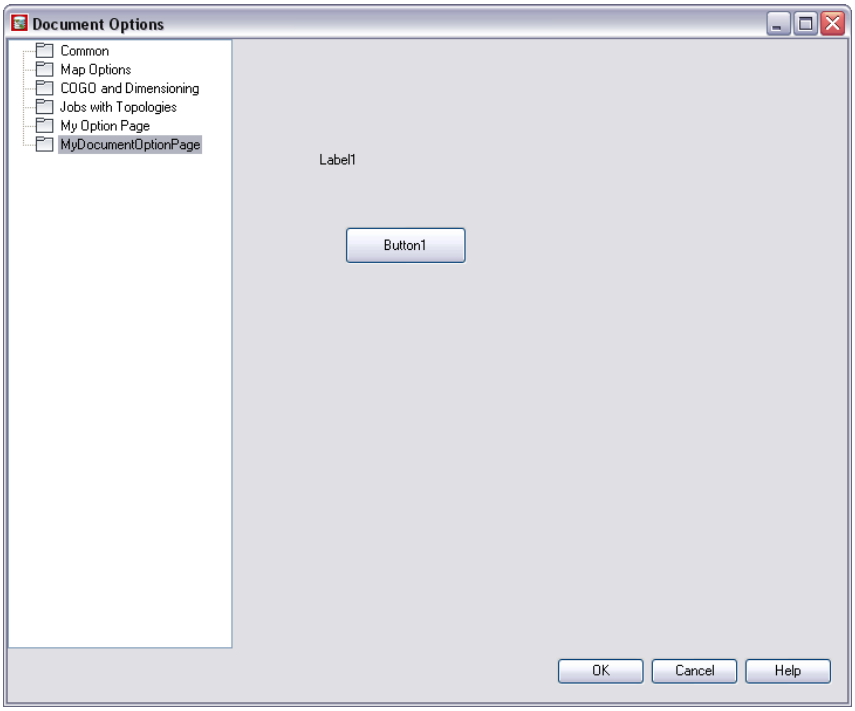
`Topobase.Forms.Desktop.ApplicationOptionPage` classes. It also demonstrates the events that option pages have access to.

NOTE This sample only works in the Autodesk Topobase Client (desktop), not in the Autodesk Topobase Web Client.

Procedure

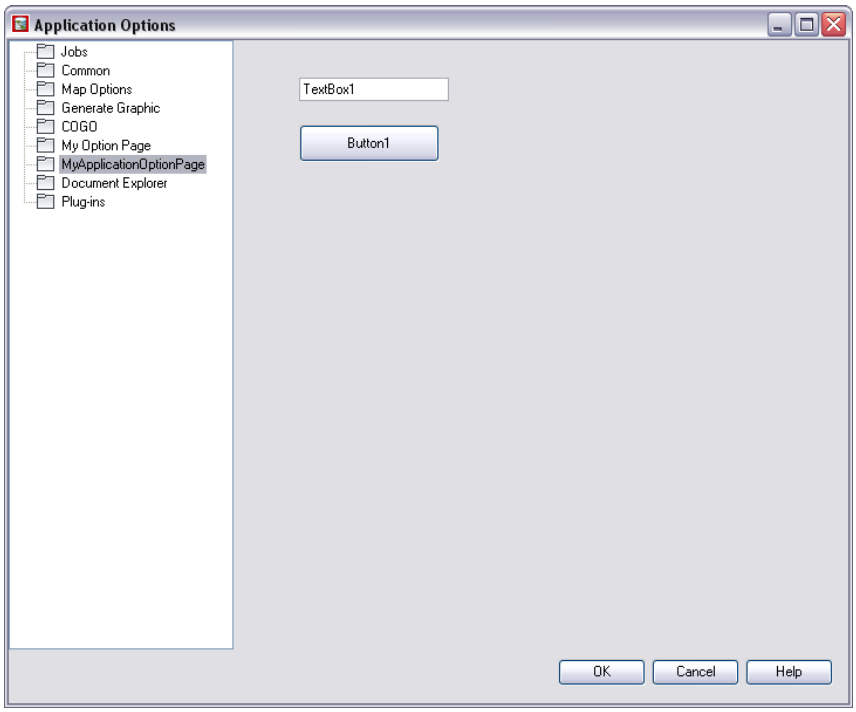
To use this sample:

1. Build the sample. The plugin (*VBSample64.dll* or *CSSample64.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace.
3. In the Settings ribbon, select Document Options.



The sample has added the MyDocumentOptionPage choice. Message boxes are displayed while performing actions with the Document Options dialog box as events in the sample option page fire.

4 In the Settings ribbon, select Application Options.



The sample has added the MyApplicationOptionPage choice. Message boxes are displayed while performing actions with the Application Options dialog box as events in the sample option page fire.

Sample 66 - Reports

Purpose

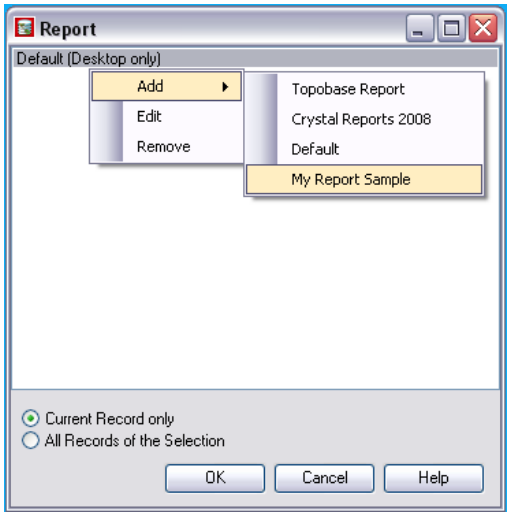
This sample shows how to create a connection to a report engine.

Procedure

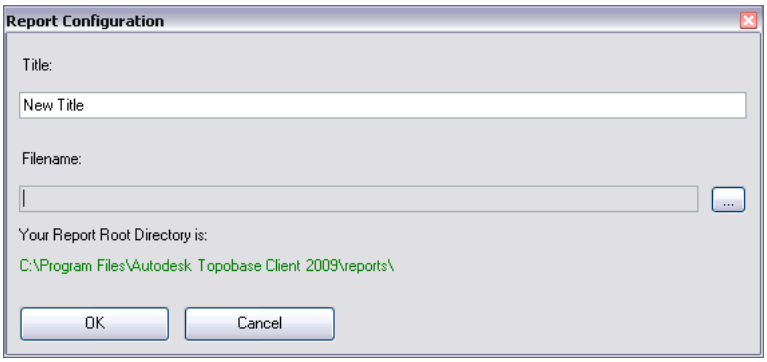
To use this sample:

1. Build the sample. The plugin (*VBSample66.dll* or *CSSample66.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace.
3. In the Autodesk Topobase pane, right-click any feature and select Show Form.
4. In toolbar at the bottom of the feature form, click the Print icon.

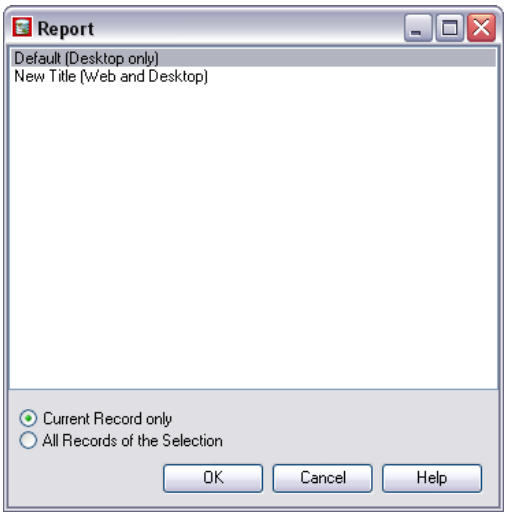
   The Report dialog box is displayed.
5. Right-click Default (Desktop only) and select My Report Sample.



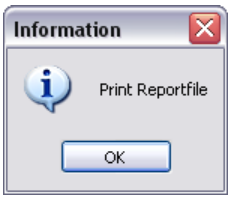
6. Enter a title for your report and click OK.



7 Select the report and click OK.



8 The event handler is triggered, which, in this case, is simply a dialog box displayed.



Sample 67 - Dialog Box FlyIn

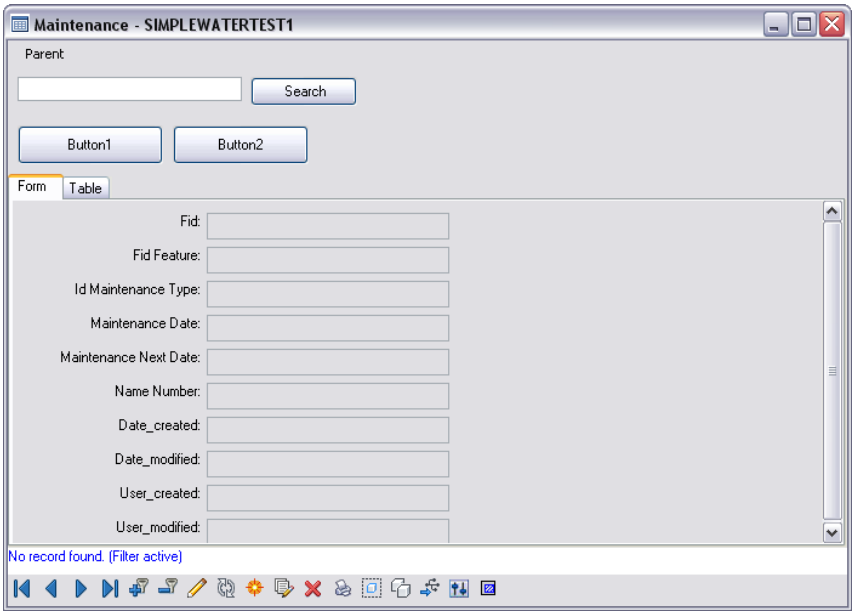
Purpose

This sample shows how to create a document FlyIn to customize a dialog box.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample67.dll* or *CSSample67.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace.
3. In the Autodesk Topobase pane, right-click any feature and select Show Form. The sample has added new controls to the dialog box.



To restore the dialog box to its default state remove the *.dll* and *.tbp* files from the Autodesk Topobase *bin* directory, and restart Autodesk Topobase.

Sample 68 - Option Page With Tree Nodes

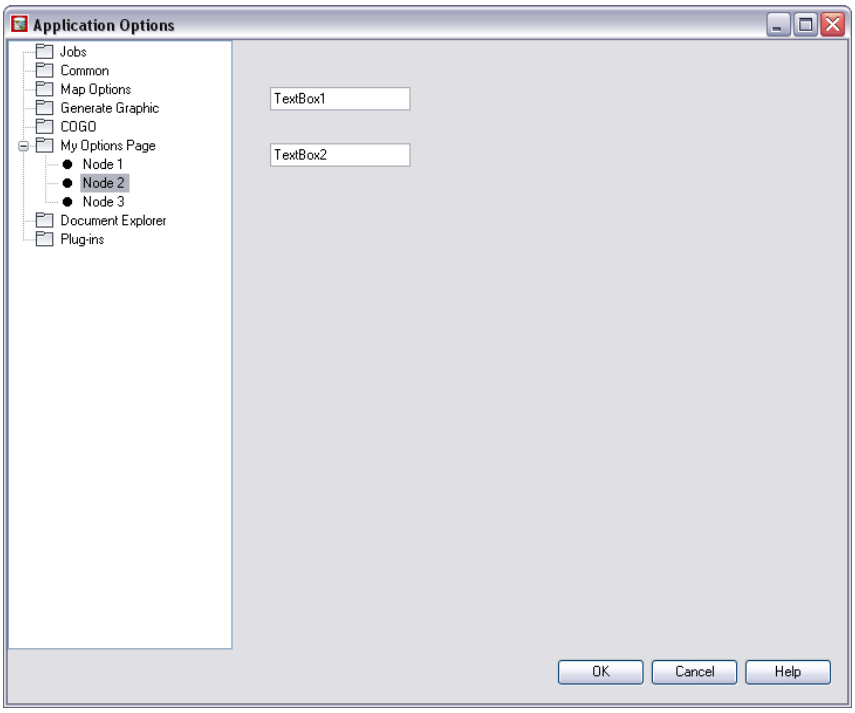
Purpose

This sample shows how to add an item with sub nodes to the document options tree.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample68.dll* or *CSSample68.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open any workspace.
3. In the Settings ribbon, select Application Options. The sample has added a new item, My Options Page, to the treeview with three different nodes.



Sample 69 - FlyIn Container

Purpose

Sample 69 is an application that runs outside of Autodesk Topobase. This sample shows how to create a standalone container form that can contain Autodesk Topobase flyins based on the `Topobase.Forms.Desktop.FlyInMode.FlyIn` class. .

Procedure

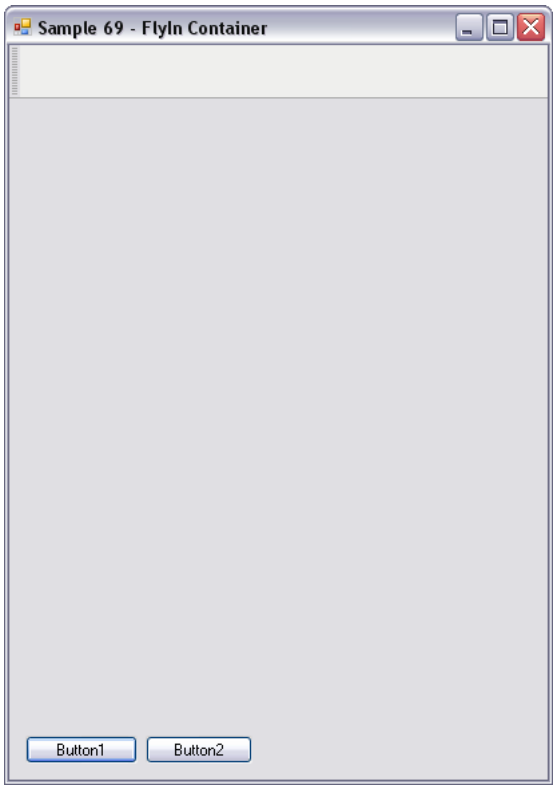
To use this sample:

1 Run the program by either selecting Debug ➤ Start Debugging in Visual Studio or by directly running the samples *.exe* file (by default, this is

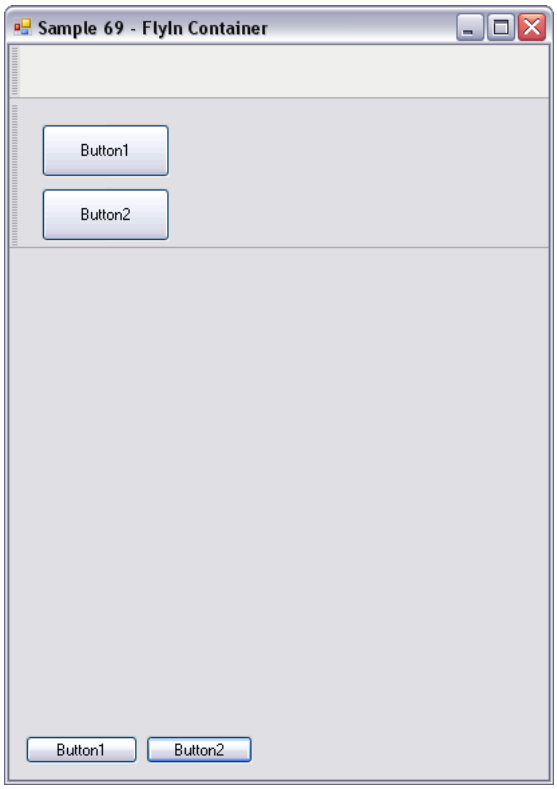
placed in the Autodesk Topobase client *bin* directory). You do not need to run Autodesk Topobase to run this sample.

A dialog box with two buttons is displayed.

2 Click Button1. A new flyin containing an array of unlabeled toolbar buttons is created and docked within the form.



3 Click Button2. A new flyin containing two labeled buttons is created and docked within the form.



Sample 70 - Application Flyin

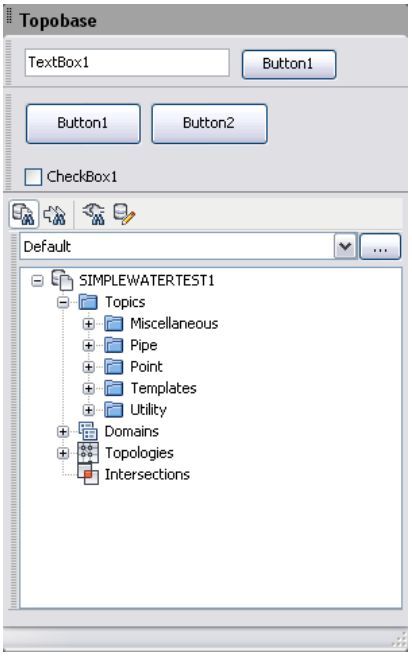
Purpose

This sample shows how to add an application flyin to the Autodesk Topobase task pane. Application flyins dock at the top of the Autodesk Topobase task pane unlike document flyins, which dock at the bottom within the document tabs.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample70.dll* or *CSSample70.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase. The sample adds the flyin to the top of the Autodesk Topobase task pane. The flyin can be undocked by dragging it out of the Autodesk Topobase task pane.



Sample 71 - Checked List Box

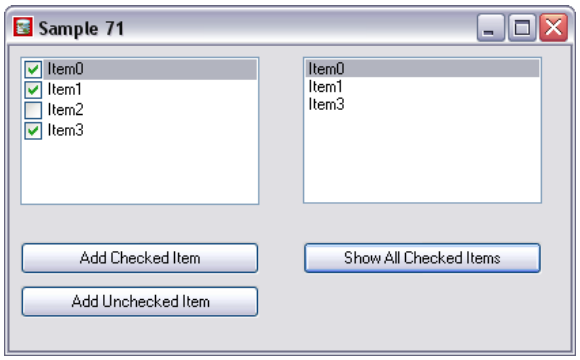
Purpose

This sample shows how to use the `Topobase.Forms.CheckedListBox` control.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample71.dll* or *CSSample71.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 71 - CheckedListBox caption. The new form is displayed that allows you to add checked or unchecked items to the left column, and show checked items in the right column.



Sample 72 - Application Toolbar

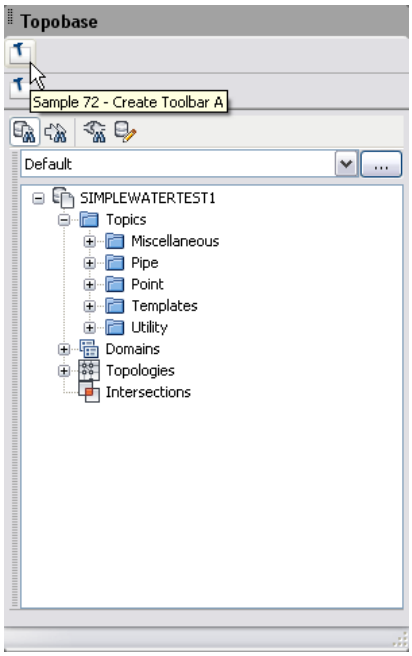
Purpose

This sample shows how to create custom application toolbars and add buttons to them.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample72.dll* or *CSSample72.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase. The sample adds two new application toolbars to the Autodesk Topobase task pane. Each toolbar contains one button.



3 If you click either button, a message box is displayed.

Sample 74 - List Box Multi Selection

Purpose

This sample shows how to use the `Topobase.Forms.Listbox` control to allow multiple selection.

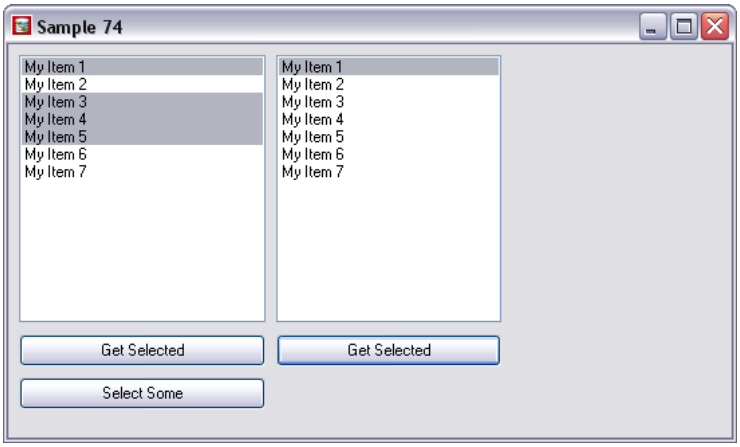
Procedure

To use this sample:

1 Build the sample. The plugin (*VBSample74.dll* or *CSSample74.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Start Autodesk Topobase.

3 Click the application toolbar button with the Sample 74 - ListBox with Multiselection caption. The plugin form is displayed. You can select multiple items by dragging through the list or by holding down the Ctrl key and selecting multiple items. You can also select items programatically, as shown by the Select Some button.



Sample 75- SQL Export

Purpose

This sample shows how to export SQL queries and demonstrates the use of the `Topobase.Data.Tools.SqlExport` class.

Procedure

To use this sample:

1 Build the sample. The plugin (*VBSample75.dll* or *CSSample75.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Start Autodesk Topobase and open any workspace.

3 Click the application toolbar button with the Sample 75 - SQL Export caption. A file named *test1.sql* is written to *C:\Program Files\Autodesk*

Topobase Client <yyyy>\Temp. This file, which contains the contents of the TB_TOPIC table, is displayed in an instance of the *Notepad* application.

TIP The sample code source contains many commented lines that can be used to modify the SQL export command.

4 Verify that the insert occurred. In an Oracle SQL*Plus session, do the following:

1 `connect tbsample/avs`

2 `select caption,id,name from tb_topic where id = 1;`

Sample 77 - Menu Control

Purpose

This sample shows how to add a menu and menu items to a dialog box using the `Topobase.Forms.MenuControl` control.

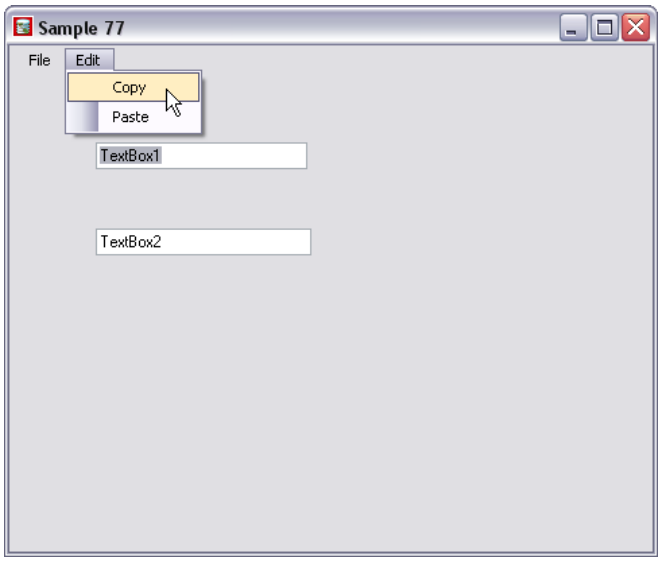
Procedure

To use this sample:

1 Build the sample. The plugin (*VBSample77.dll* or *CSSample77.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Start Autodesk Topobase.

3 Click the application toolbar button with the Sample 77 - MenuControl caption. A plugin dialog box is displayed that demonstrates various menu functionality.



Sample 78 - Web Browser

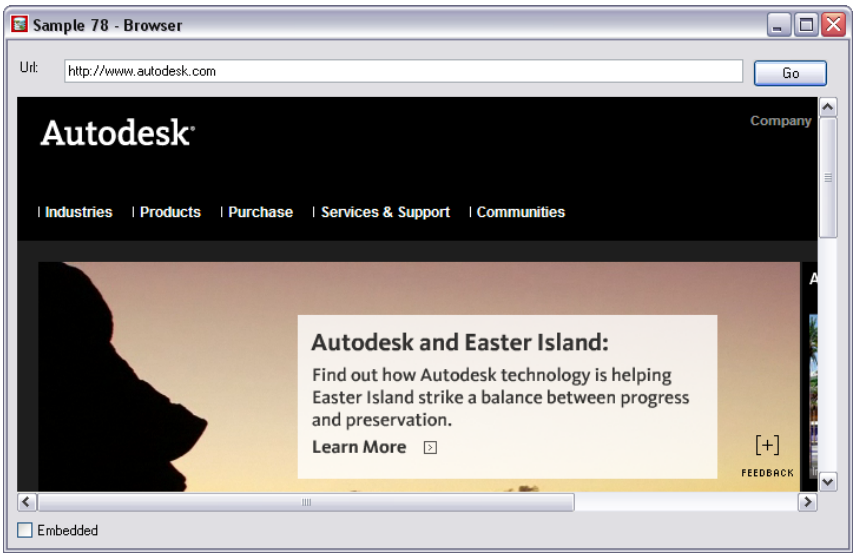
Purpose

This sample shows how to use a web browser control. Any document that can be opened by Internet Explorer can be opened by this control and shown in your form.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample78.dll* or *CSSample78.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 78 - Browser caption. The plugin form is displayed. To display a web site, type a web address in the text box at the top of the form and click Go.



Sample 79 - Tab Control

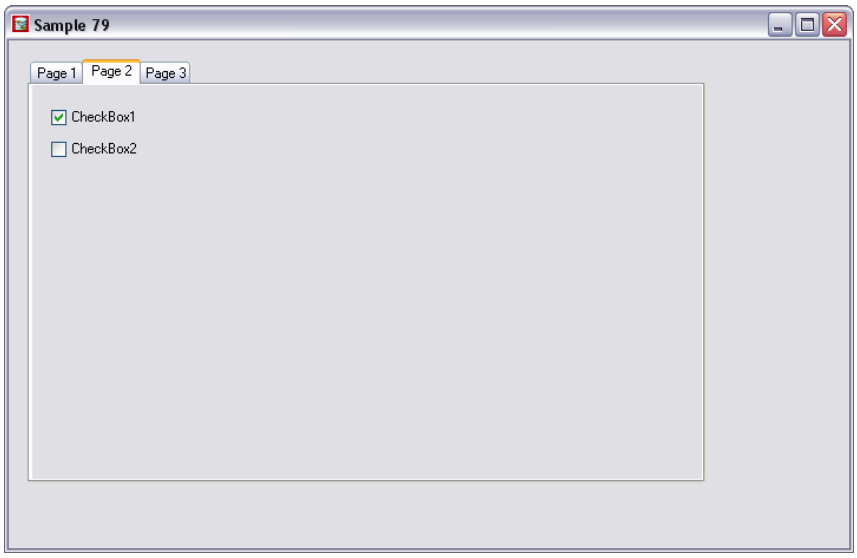
Purpose

This sample shows how to use a tab control and add tab pages.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample79.dll* or *CSSample79.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 79 - TabControl caption. A plugin form is displayed that demonstrates the tab functionality.



Sample 80 - Canvas Control

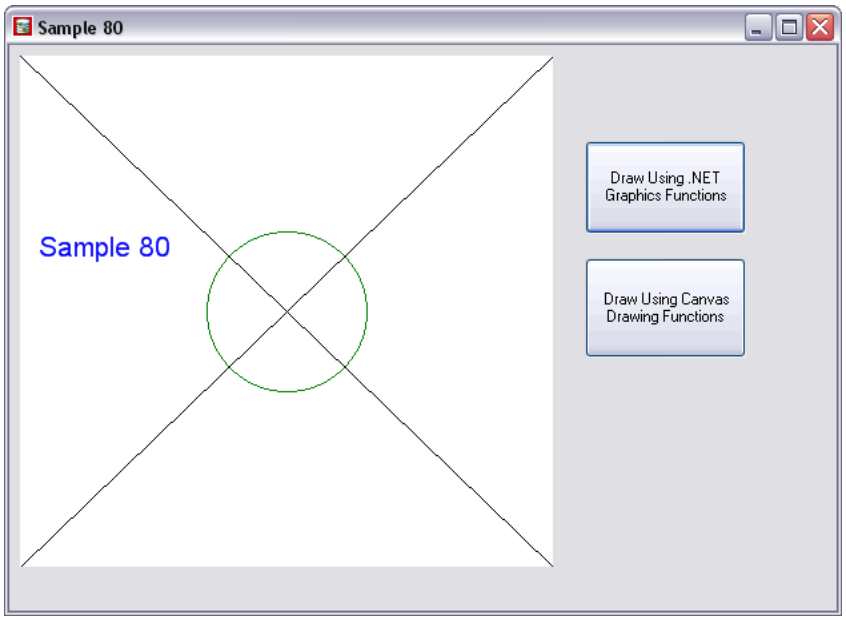
Purpose

This sample shows how to use a canvas control to draw lines, circles, etc.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample80.dll* or *CSSample80.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 80 - Canvas Control caption. The plugin form is displayed that demonstrates the canvas control functionality.



Sample 81 - Dialog Box Control Update

Purpose

This sample shows how to add a control to a dialog box. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

For more information about modifying a dialog box with user controls, see Sample 61 - Dialog Box User Controls (page 247).

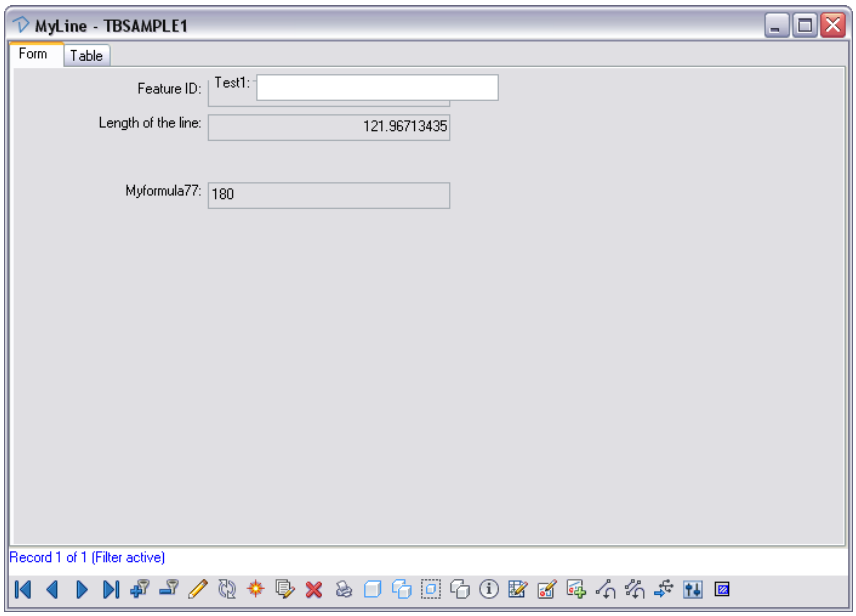
Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample81.dll* or *CSSample81.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.

3 In the Autodesk Topobase pane, right-click MyLine and select Show Form. A new control is added to the form.

NOTE You cannot manage where the new control is placed through code. You can make room for the new control by moving the existing controls using the Form Designer in Autodesk Topobase Administrator.



To restore the dialog box to its default state:

1 Remove the sample's *.dll* and *.tbp* files from the Autodesk Topobase *bin* directory.

2 Start Autodesk Topobase Administrator and open the TBSAMPLE workspace.

3 Select the Form Designer in the left tree, and select the MyLine topic on the right.

4 Click Designer. The form designer opens.

5 Select the Test1 control and click Edit ➤ Delete Control.

The changes take effect next time Autodesk Topobase is restarted.

Sample 83 - Remote Control

Purpose

This sample shows how to control Autodesk Topobase from another .Net application. It can be used in both the Autodesk Topobase Client (desktop) and Autodesk Topobase Web Client. This sample features the use of the `Topobase.Forms.Remote.Client` class.

Procedure

This procedure assumes that you have added points to the TBSAMPLE workspace by either using the Sample 02 - Read/Write Features (page 191) executable or digitizing point manually.

To use this sample:

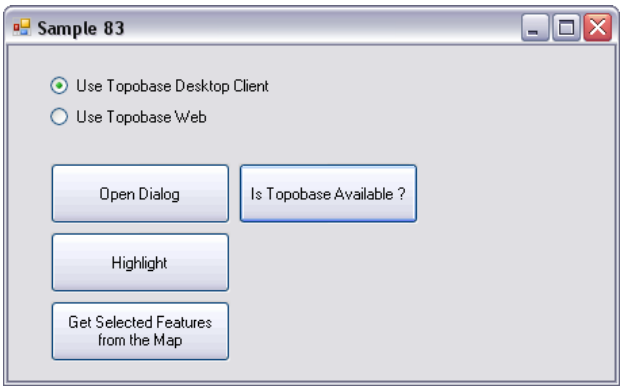
1. Modify *Form1.cs* as follows:
   - In the `ButtonOpenDialog_Click` method, replace the first argument to the `OpenDialog` call with `"MYPOINT"`.
   - In the `ButtonHighlight_Click` method, replace the argument to the `Add` call with a FID value from the MYPOINT table. To determine a FID value, in an Oracle SQL*Plus session, do the following:

     ```
     connect tbsample/avs

     select fid from mypoint;
     ```

2. Build the sample. The executable (*VBSample83.exe* or *CSSample83.exe*) is copied to the Autodesk Topobase Client *bin* directory.
3. Ensure Autodesk Topobase is closed.
4. Run the program by either selecting Debug ➤ Start Debugging in Visual Studio or by directly running the samples *.exe* file in the Autodesk Topobase *bin* directory.

   The sample's main form is displayed.



5 Click Is Topobase Available?. A message box is displayed with the text False, which indicates that Autodesk Topobase is not available.

6 Start Autodesk Topobase Client and open the TBSAMPLE workspace.

NOTE If using the web client, start Autodesk Topobase Web Client and switch the page to Feature Explore. If using the desktop client, start Autodesk Topobase Client and open the workspace.

7 In sample Form1, click Is Topobase Available?. A message box is displayed with the text True, which indicates that Autodesk Topobase is available.

8 Click Generate Graphic.

9 In sample Form1, click Open Dialog. The Autodesk Topobase form for the MyPoint feature class is displayed, listing the points in the MYPOINT table.

10 In sample Form1, click Highlight. In the Autodesk Topobase graphics pane, the point whose FID you specified when you modified the `ButtonHighlight_Click` method is highlighted.

11 In sample Form1, click Get Selected Features From The Map. Select features in the Autodesk Topobase graphics pane and press the Enter key when done. A message box with the FID number is displayed for each selected feature.

Sample 85 - Workflows

Purpose

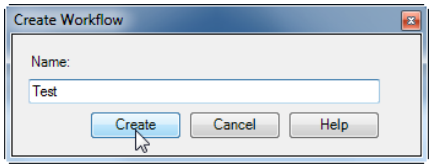
This sample shows how to create simple workflows. This sample features the use of the `Topobase.Workflows.WorkflowScriptSupport` and `Topobase.Workflows.WorkflowPlugIn` classes. These workflows can be added to any workspace, including the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

For more information about advanced workflows, see Sample 116 - Advanced Workflows (page 300).

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample85.dll* or *CSSample85.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open a workspace. You may wish to use the TBSAMPLE workspace created by Sample 01 - Create Structure (page 182).
3. In the Autodesk Topobase task pane, click Setup ➤ Administrator.
4. In the Autodesk Topobase Administrator, select the Workflows folder in the left pane.
5. Click Create.
6. In the Create Workflow dialog box, enter a name for the workspace and click Create.

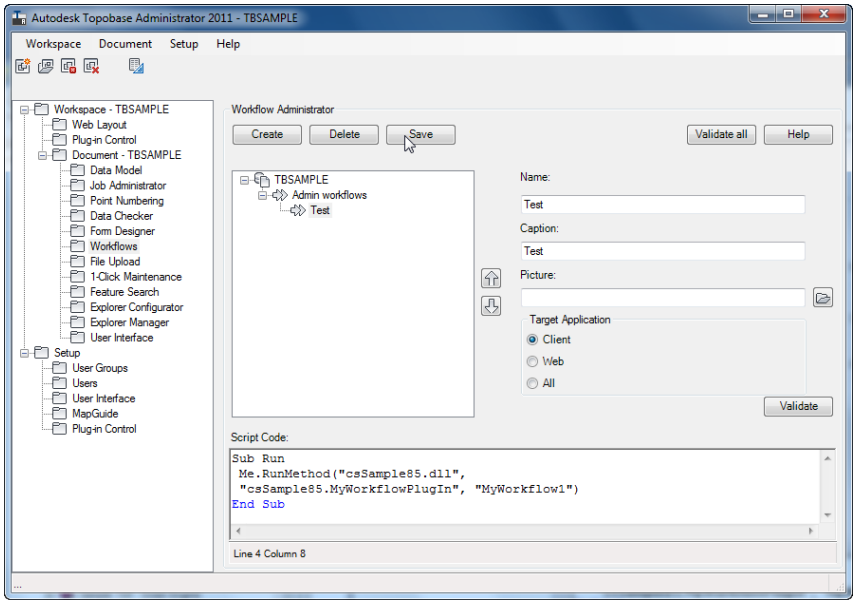


7. Select the workflow you just created, and copy this code into the Script Code edit field.
   - If you are using C#, use this:

```
Sub Run
 Me.RunMethod("csSample85.dll",
 "csSample85.MyWorkflowPlugIn", "MyWorkflow1")
End Sub
```

- If you are using Visual Basic, use this:

```
Sub Run
 Me.RunMethod("VBSample85.dll",
 "VBSample85.MyWorkflowPlugIn", "MyWorkflow1")
End Sub
```



8 Click Save.

9 Click Test. An information dialog box is displayed with the text Hello. Click OK. A Topobase Workflows dialog box is displayed with the text The Workflow Has Been Executed.

10 Create and save another workflow.

- If you are using C#, use this for the code:

```
Sub Run
 Me.RunMethod("csSample85.dll",
 "csSample85.MyWorkflowPlugIn", "MyWorkflow2")
End Sub
```

- If you are using Visual Basic, use this for the code:

```
Sub Run
 Me.RunMethod("VBSample85.dll",
 "VBSample85.MyWorkflowPlugIn", "MyWorkflow2")
End Sub
```

11 (Re-)Start Autodesk Topobase and open the workspace

12 Click Generate Graphic.

13 In the Autodesk Topobase task pane, click the Workflow Explorer icon. The Workflow Explorer is displayed with three nodes representing the three workflows added by Sample 85.

14 Start the first workflow by highlighting the node and pressing Execute or by selecting Execute from the context menu of the node. This sample simply displays a message box and then ends.

15 Start the second workflow. The Workflow Explorer contents are replaced with the text Please Digitize a Point.

16 Move the cursor into the graphics pane and click on a point. The Please Digitize a Point message is replaced with a Coordinates text box, whose content is the digitized point values. Click OK. The text box is replaced with the contents of the Workflow Explorer.

Sample 86 - Update Plugin

Purpose

This sample shows how to update the data model of a workspace document. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

Procedure

To use this sample:

1 Build the sample. The plugin (*VBSample86.dll* or *CSSample86.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Start Autodesk Topobase Administrator and open the TBSAMPLE workspace.

NOTE Make sure you start the Autodesk Topobase Administrator, not the Autodesk Topobase Client.

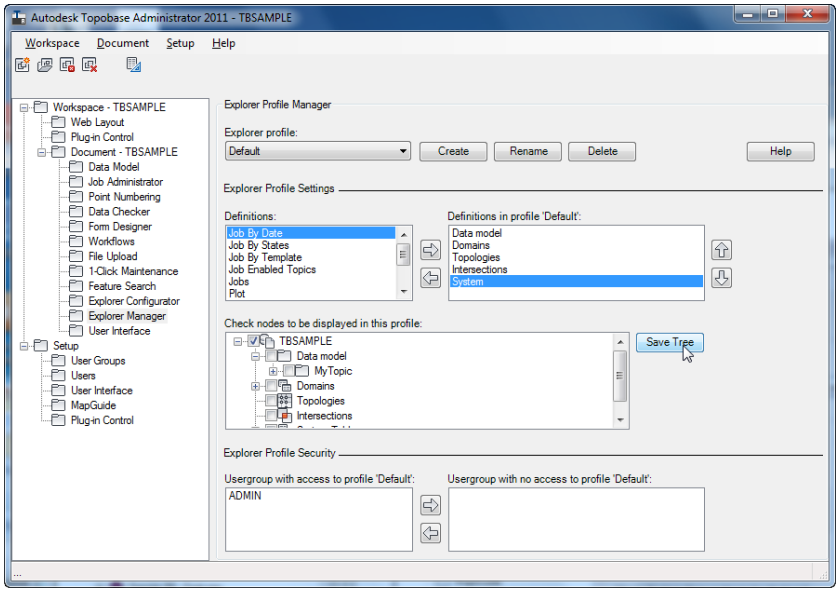
3 In the left tree, select Document - TBSAMPLE ➤ Explorer Manager.

4 In the Definitions area, select System.

5 Click the right-arrow icon to move System to the Definitions in Default pane.

6 In the Check Nodes To Be Displayed In This Profile pane, select the System Tables check box.

7 Click Save Tree.



8 Close Autodesk Topobase Administrator.

9 Start Autodesk Topobase Client and open the TBSAMPLE workspace.

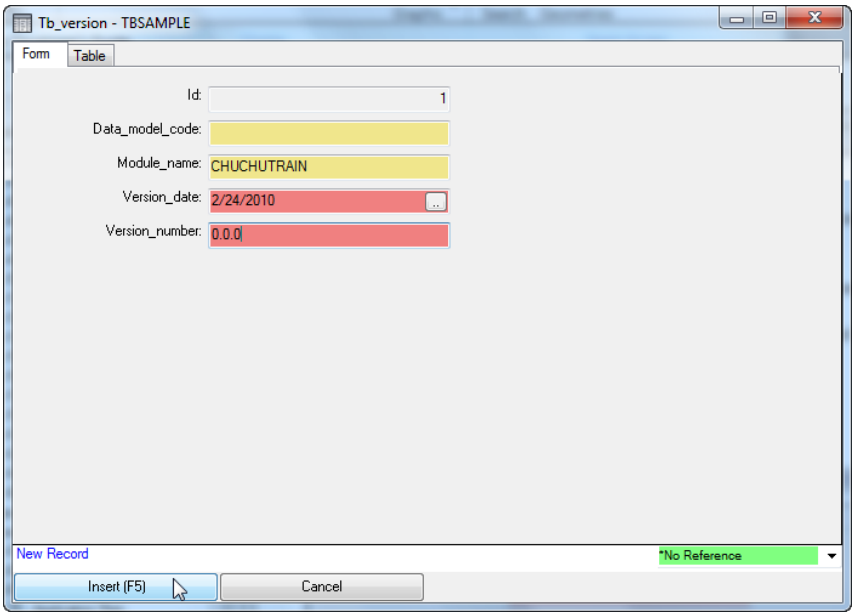
10 In the Document Explorer, expand the System Tables tree.

11 Under System Tables, right-click TB_VERSION and select Show Form from the context menu.

12 Select the New Record  toolbar button and create a new record with these values:

- Version = 0.0.0
- Module Name = CHUCHUTRAIN

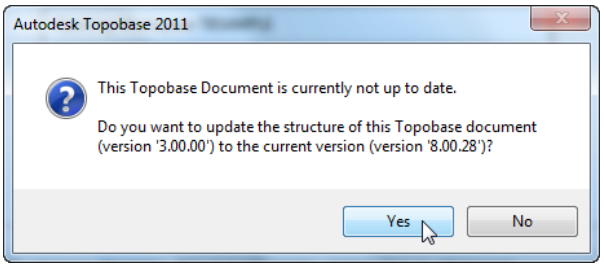
Set the Version_date to some date in the past.



13 Click Insert (F5).

14 Close the form. Close Autodesk Topobase Client.

15 Open Autodesk Topobase Administrator and re-open the TBSAMPLE workspace.



Sample 87 - Jobs

Purpose

This sample shows how to create a new job and how to change the state of a job. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

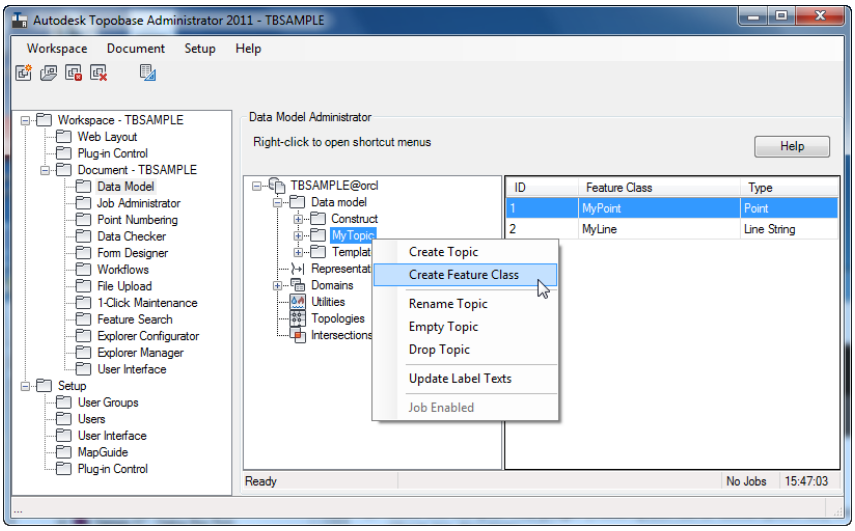
Procedure

To use this sample:

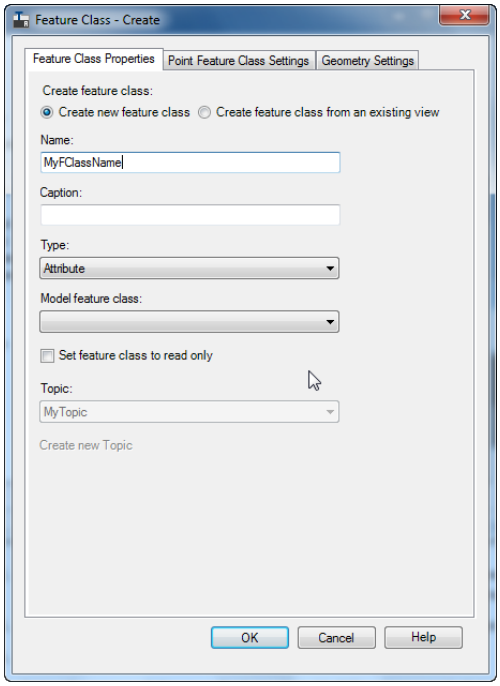
1. Build the sample. The plugin (*VBSample87.dll* or *CSSample87.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase Administrator and open the TBSAMPLE workspace.

   NOTE Make sure you start the Autodesk Topobase Administrator, not the Autodesk Topobase Client.

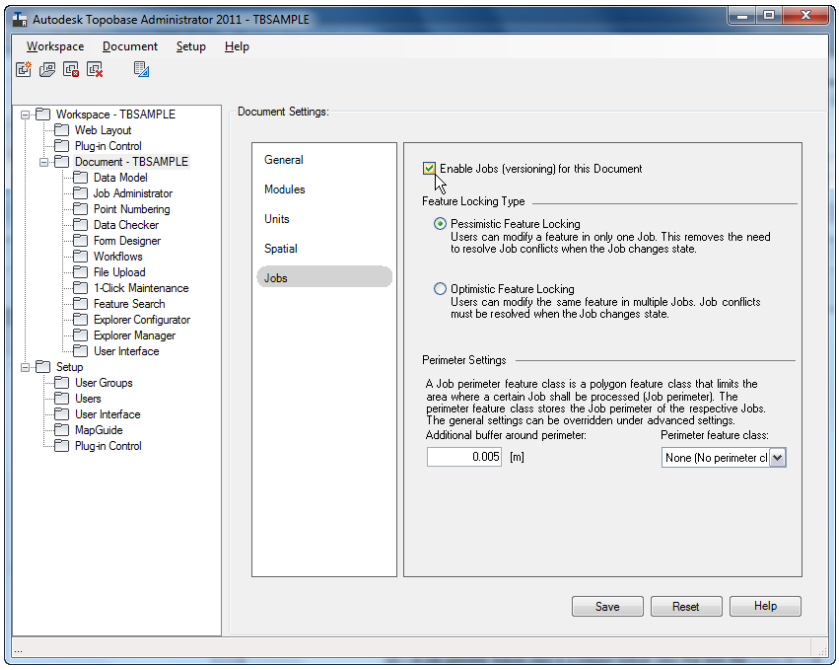
3. In the tree view on the left-hand side, select Data Model and then create a new feature class called `MyFClassName`.
4. Right-click MyTopic on the right and select Create FeatureClass.



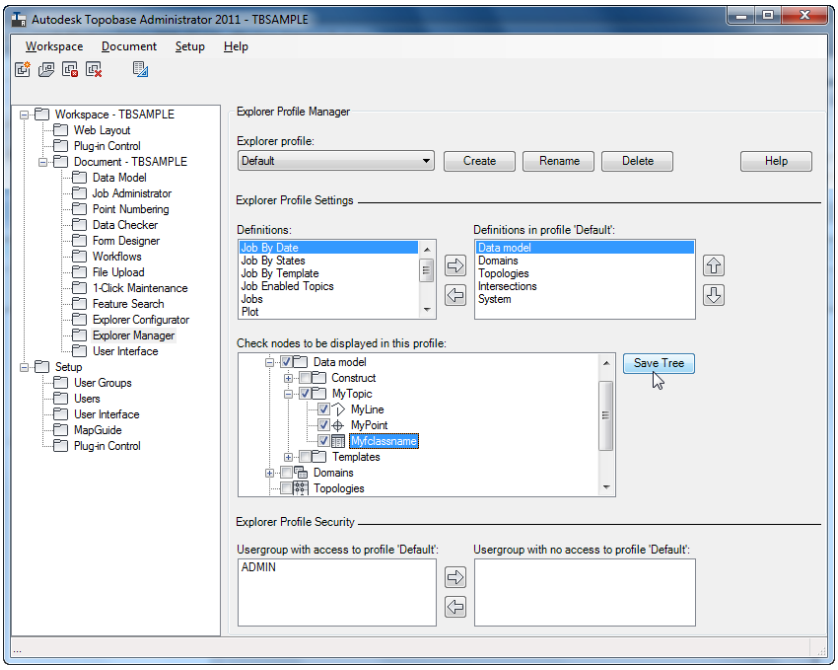
5 Enter the name of the new feature class MyFClassName and click OK.



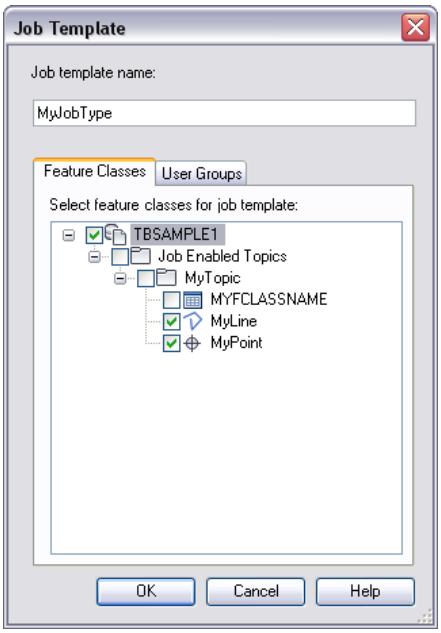
6 Enable jobs for this new feature class. Select Document - TBSAMPLE from the tree view. In the Document Settings page, select Jobs from the list. Select the Enable Jobs (versioning) for this Document check box.



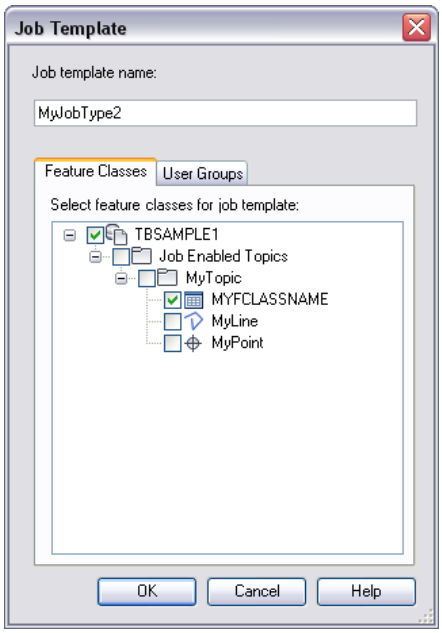
7 Set the new feature class to be shown in the Autodesk Topobase document explorer. Select Explorer Manager in the tree view. Select the MyFClassName check box and click Save Tree.



8 Create a new job type. Select Job Administrator in the tree view. Expand the tree in the Job Templates and job transition passwords page. Click Create to display the Job Template dialog box. Use the template name MyJobType and select the MyLine and MyPoint check boxes. Click Ok.



9 Create another job type with the name MyJobType2 and select the MyFClassName check box.



10 Start Autodesk Topobase and open the TBSAMPLE workspace.

11 From the document toolbar, click the Sample 87 - Job Demo button.

The sample creates a new job, called My Job, that uses the feature class `MyFClassName`.

Sample 88 - Features

Purpose

This sample shows how to add a new feature class. This sample features the use of the `Topobase.Data.FeatureClasses` and `Topobase.Data.FeatureClass` classes. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

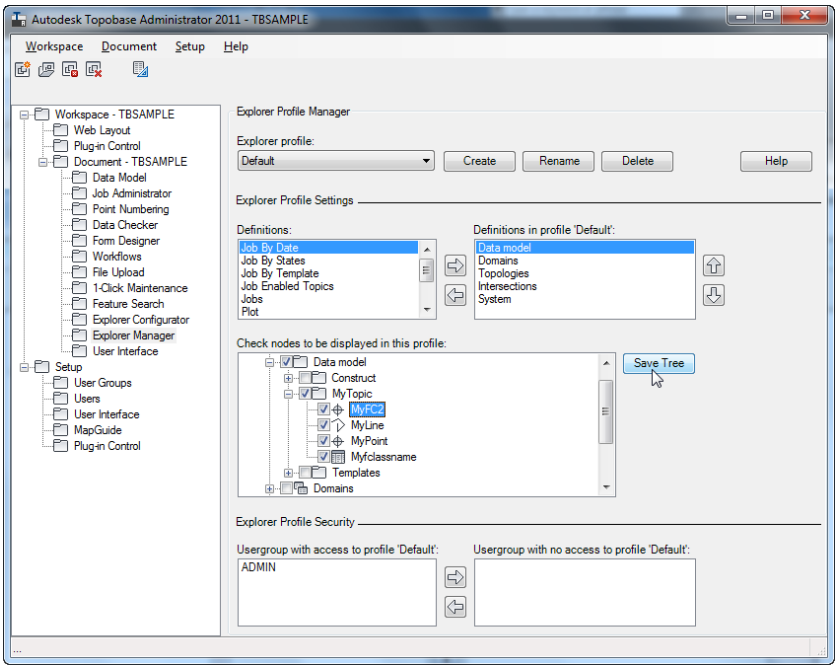
Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample88.dll* or *CSSample88.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Select the document toolbar Sample 88 - Features button.

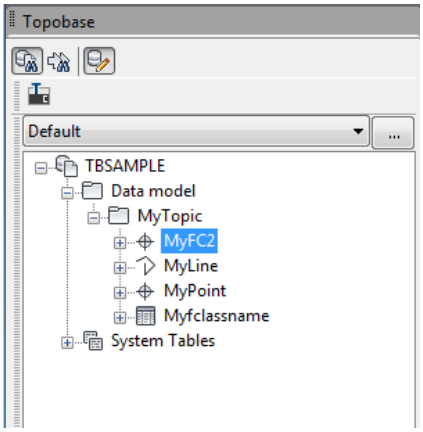
This action adds a feature class named MyFC2 to a topic named MyTopic in the TBSAMPLE workspace. However, the MyFC2 feature class is not yet displayed in the Document Explorer because it needs to be made visible using the Autodesk Topobase Administrator first. To make the feature class visible, do the following:

1. Start Autodesk Topobase Administrator and open the TBSAMPLE workspace.
2. In the tree view on the left-hand side, select Document - TBSAMPLE ➤ Explorer Manager.
3. Select the MyFC2 check box.



4 Click Save Tree.

5 In Autodesk Topobase Client, close and re-open the TBSAMPLE workspace.



The new MyFC2 feature class is now visible under the MyTopic topic.

Sample 100 - Map Functions

Purpose

This sample shows how to interact with Autodesk Map 3D. This sample features the use of the `Topobase.Data.FeatureClass`, `Topobase.Data.FeatureList`, and `Topobase.Map.MapLogic` classes. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

Procedure

To use this sample:

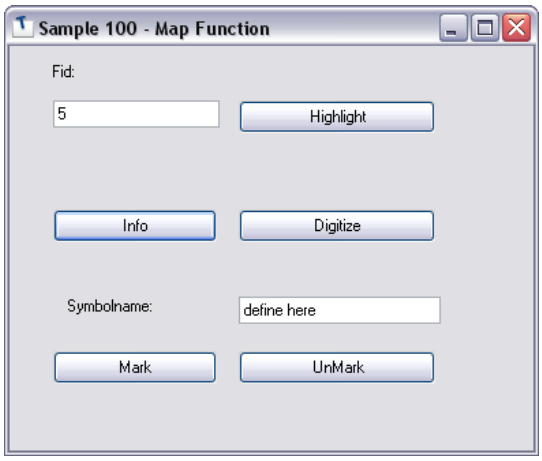
1. Build the sample. The plugin (*VBSample100.dll* or *CSSample100.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace
3. Click Generate Graphic.
4. Record some of the FIDs in the MyPoint and MyLine tables. You can do this by displaying the forms for the MyPoint and MyLine feature classes. Alternatively, in an Oracle SQL*Plus session, do the `following`:

   ```
   connect tbsample/avs

   select fid from mypoint;

   select fid from myline;
   ```

5. Select the application toolbar Sample 100 - Map Function button. The sample's dialog box is displayed.



6 In the sample's dialog box, type one of the MyPoint FIDs in the Fid: text box. Click Highlight. The point in the graphics pane with that FID is highlighted.

7 In the sample's dialog box, type one of the MyLine FIDs in the Fid: text box. Click Highlight. The line in the graphics pane with that FID is highlighted.

8 In the sample's dialog box, click Info. Move the cursor to the graphics pane and select some features by clicking, dragging, and clicking the cursor and the pressing the Enter key. An information dialog box is displayed with the text FID: <number>. Click OK. For every feature an information dialog box is displayed with its FID number.

9 In the sample's dialog box, click Digitize. Move the cursor to the graphics pane. Click a point. Move the cursor around. Note that the text attached to the cursor changes. Click again. An information dialog box is displayed with the FID of a point that has been added to the MyPoint table in the Oracle database. Click OK.

In an Oracle SQL*Plus session, do the following:

```
connect tbsample/avs

select fid,geom from mypoint;
```

NOTE Sometimes the coordinates of the point added are integral and are the same as the point you first clicked, and sometimes the coordinates have fractional parts.

Sample 102 - Picture Combobox

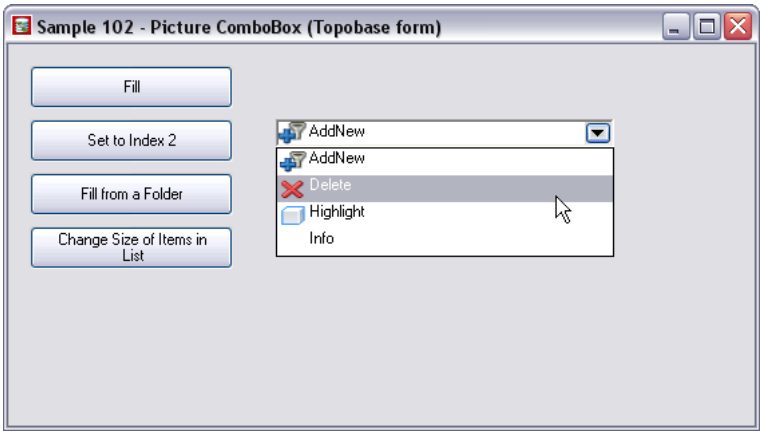
Purpose

This sample shows how to use the picture combobox control.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample102.dll* or *CSSample102.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 102 - Picture ComboBox caption. The sample's dialog box is displayed.



4. Click Fill. The dropdown box is populated with four entries as follows: AddNew, Delete, Highlight, and Info.
5. Click Set To Index 2. The dropdown box shows the Highlight entry. An information dialog box is displayed with the text Highlight. Click OK.
6. Click Fill From A Folder. The dropdown box is populated with the list of files in the *C:\Program Files\Autodesk Topobase Client <yyyy>\Pics* folder.

7 Click Change Size Of Items In List. Click the control on the dropdown box. The graphic entries in the list have increased in size.

Sample 103 - Call Class Via Batch File

Purpose

This sample shows how to use a batch file to get information about feature classes.

Procedure

To use this sample:

1 Build the sample. The batch client (*VBSample103.dll* or *CSSample103.dll*) are copied to the Autodesk Topobase Client *bin* directory.

NOTE Since this DLL is called by *TBBatch.exe*, and not by the main Autodesk Topobase application, there is no *.tbp* file for this sample.

2 Copy the *Config103.xml* file, which is supplied with the sample, to the Autodesk Topobase Client *bin* directory.

3 If necessary, edit the passwords and any other parameters in *Config103.xml*.

```
<?xml version="1.0" encoding="utf-8"?>
<Batch>
 <Assembly
 AssemblyName="CSSample103.dll"
 Namespace="CSSample103"
 ClassName="Export"
 />
 <Connection
 Username="TBSAMPLE"
 PassWord="AVS"
 Datasource="ORCL"
 tbsysUsername="TBSYS"
 tbsysPassword="TBSYS"
 tbsysDataSource="ORCL"
 />
```

```
<Data
OutputFilename="C:\Test.txt"
SeparatorSign=";"
>
<FeatureClassNames>
<FeatureClassName Value="MyPoint"/>
<FeatureClassName Value="MyLine"/>
</FeatureClassNames>
<Colors>
<Color Key="A" Value="Red"/>
<Color Key="B" Value="Green"/>
<Color Key="C" Value="Blue"/>
</Colors>
</Data>
</Batch>
```

4 At the DOS command line, enter the following commands:

```
cd /d "C:\Program Files\Autodesk Topobase Client <yyyy>\Bin"
TBBatch.exe ConfigFile=Config103.xml
```

where <yyyy> is the current Autodesk Topobase Client version number.

The file specified in the configuration file, *C:\test.txt*, now reads:

```
FeatureClass:MyPoint
FeatureClass:MyLine
A - Red
B - Green
C - Blue
```

Sample 104 - Script Engine

Purpose

This sample shows how to run short scripts, such as VB.NET scripts, at runtime.

NOTE The code that defines the scripts does not need to be written in Visual Basic. It can be written in C#. For example, see the *MyApplication.cs* file for this sample.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample104.dll* or *CSSample104.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase.
3. Click the application toolbar button with the Sample 104 - Script Engine caption. The scripts defined within the sample are executed and a series of message boxes are displayed with the results.

Sample 105 - Create Autodesk Topobase User (Document)

Purpose

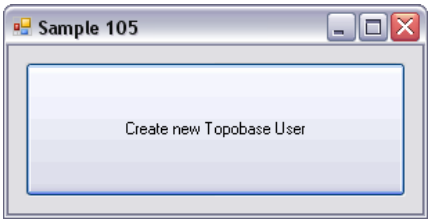
This sample shows how to create a new Autodesk Topobase user, or document. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application.

Procedure

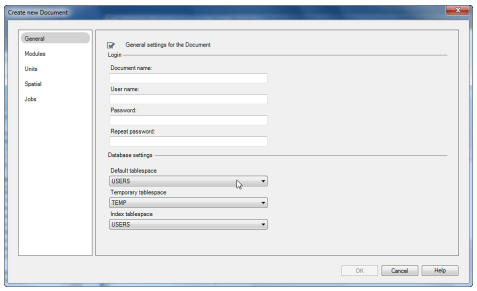
To use this sample:

1. Build the sample. The plugin (*VBSample105.dll* or *CSSample105.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.

3 Click the application toolbar Sample 105 - Create User button. The sample's dialog box is displayed.



4 Click the button. The Create New Document dialog box is displayed.



5 You can then fill in the parameters to create the new document.

Sample 106 - Unit Support

Purpose

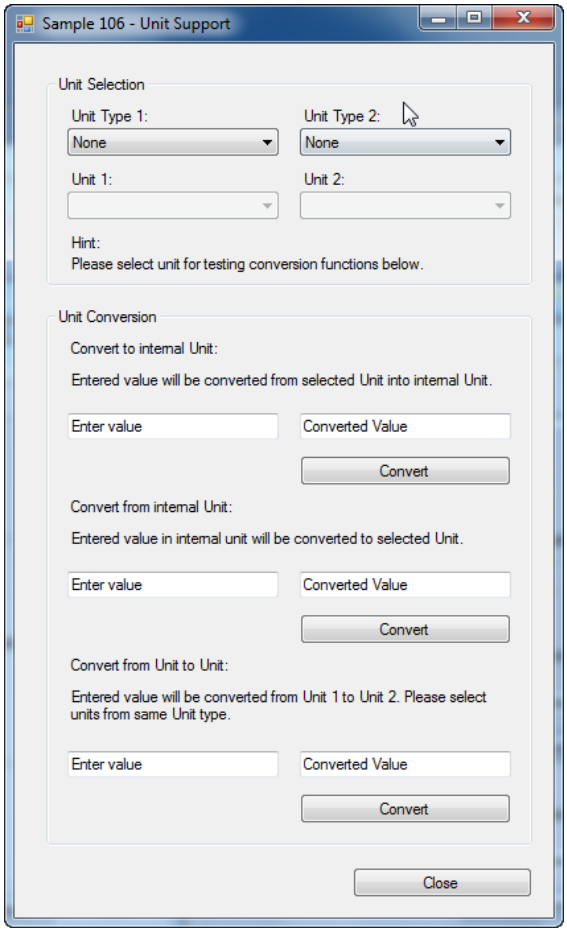
This sample shows how to use the unit framework. This contains all the supported unit types with corresponding units and conversion functions.

Procedure

To use this sample:

1 Run the program by either selecting Debug ➤ Start Debugging in Visual Studio or by directly running the samples *.exe* file (by default, this is placed in the Autodesk Topobase Client *bin* directory after building the solution). You do not need to run Autodesk Topobase to run this sample.

The following form is displayed.



2 You can now use the form to convert various unit types and values.

Sample 111 - Feature Explorer

Purpose

This sample shows how to create a Feature Explorer flyin. It works in both the Autodesk Topobase Client and Autodesk Topobase Web Client. This sample

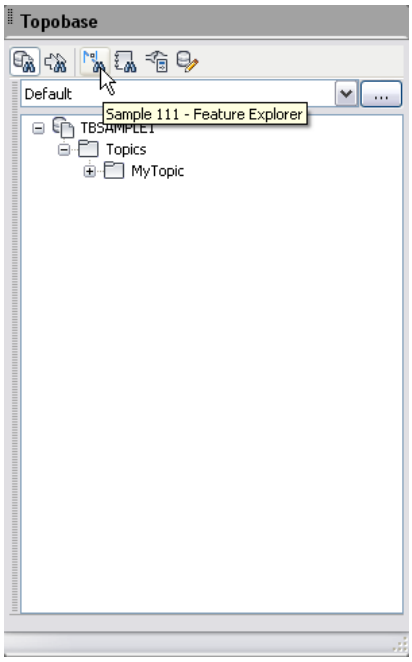
uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application. It features the use of the following classes:

- `Topobase.Forms.Desktop.DocumentFlyIn`
- `Topobase.Forms.UserControls.FeatureExplorer.FeatureExplorerData`
- `Topobase.Forms.UserControls.FeatureExplorer.AbstractDesktopFeatureExplorerController`
- `Topobase.Forms.UserControls.FeatureExplorer.Action`
- `Topobase.Forms.UserControls.FeatureExplorer.Category`
- `Topobase.Data.FeatureClass`
- `Topobase.Data.Feature`
- `Topobase.Graphic.LineString`

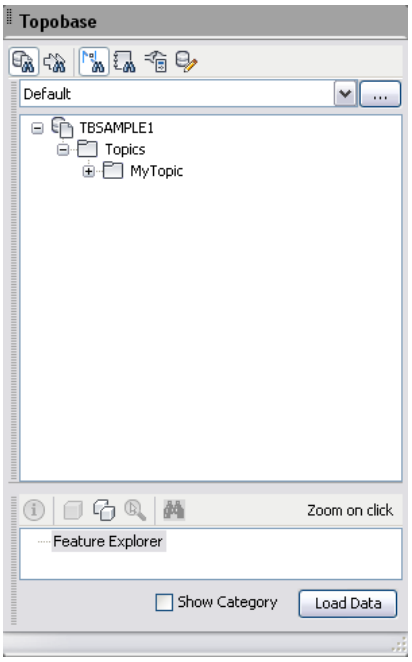
Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample111.dll* or *CSSample111.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace. The main toolbar of the Autodesk Topobase task pane has an additional Sample 111 - Feature Explorer button next to the buttons for the Document Explorer and Workflow Explorer.
3. Click Generate Graphic.
4. Click the explorer toolbar Sample 111 - Feature Explorer button. This displays the Feature Explorer flyin at the bottom of the Autodesk Topobase task pane.



5 In the Feature Explorer flyin, click Load Data. The MyLine and MyPoint subnodes are displayed under the Feature Explorer node. Expand these nodes to display the FIDs for the MyPoint and MyLine features.



Sample 112 - Client-Side Feature Rules

Purpose

This sample shows how to create a client-side feature rule. This sample uses the TBSAMPLE workspace created by the Sample 01 - Create Structure (page 182) application. It features the use of the `Topobase.Data.FeatureRules.FeatureRulePlugIn` and `Topobase.Data.FeatureRules.FeatureRuleDef` classes.

For more information about feature rules, see *Autodesk Topobase Feature Rules*.

Procedure

To use this sample:

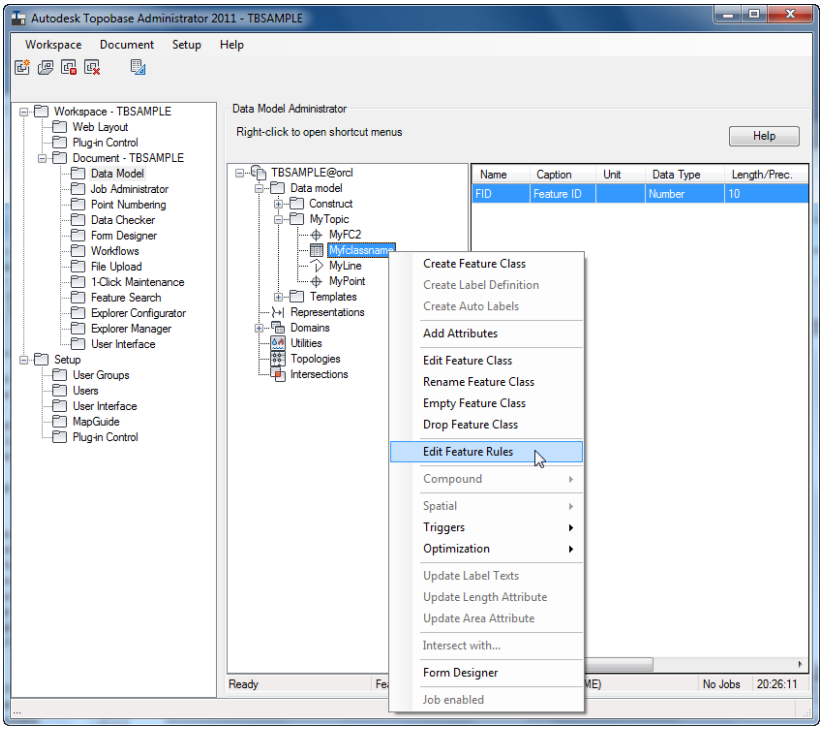
1 Build the sample. The plugin (*VBSample112.dll* or *CSSample112.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Start Autodesk Topobase Administrator and open the TBSAMPLE workspace.

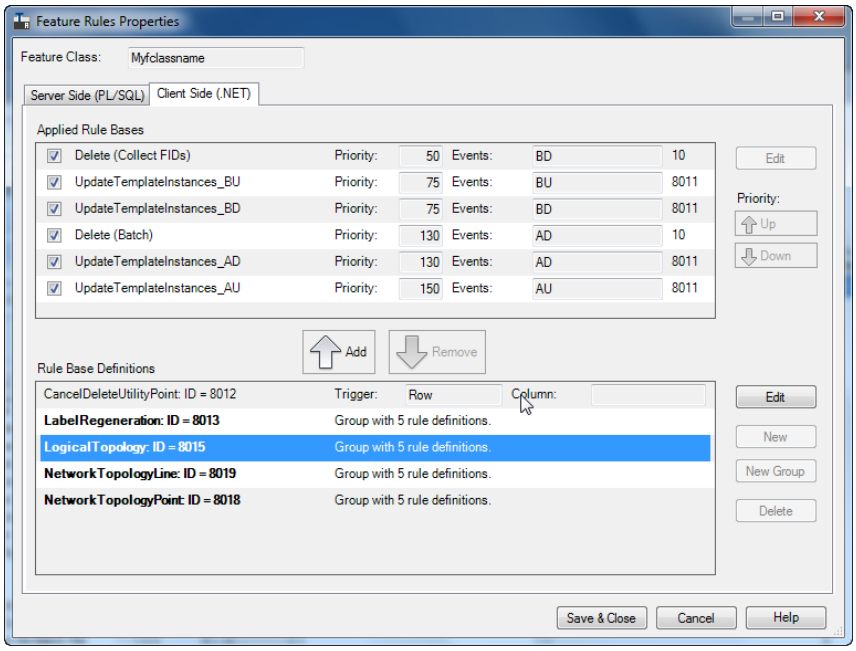
NOTE Make sure you start the Autodesk Topobase Administrator, not the Autodesk Topobase Client.

3 In the tree view on the left-hand side, select Data Model.

4 Right-click a feature and select Edit Feature Rules.



The Feature Rules Properties dialog box is displayed. Select the Client Side (.NET) tab.



NOTE For more information about feature rules, click Help in the Feature Rules Properties dialog box.

Sample 116 - Advanced Workflows

Purpose

This sample shows how to create a more complicated workflow than those found in Sample 85 - Workflows (page 275), the first workflow sample. This workflow digitizes a new pipe between a point and the selected pipe main.

This sample requires a workspace using a compatible water utility data model.

Installing the Workflow

To install the workflow:

1. Build the sample. The plugin (*VBSample116.dll* or *CSSample116.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start the Autodesk Topobase Administrator and open the water utility workspace.

   NOTE Make sure you start the Autodesk Topobase Administrator, not the Autodesk Topobase Client.

3. In the Autodesk Topobase Administrator, select the Workflows folder in the left pane.
4. Click Create.
5. In the Create Workflow dialog box, enter a name for the workspace (such as "Sample116: House Connection Creation") and click Create.
6. Select the workflow you just created.
7. Copy the following code into the Script Code edit field:
   - If you are using C#:

     ```
     Sub Run
      Me.RunMethod("csSample116.dll", _
      "csSample116.MyWorkflowPlugIn", "HouseConnectionCreation")
     End Sub
     ```

   - If you are using Visual Basic:

     ```
     Sub Run
      Me.RunMethod("VBSample116.dll", _
      "VBSample116.MyWorkflowPlugIn", "HouseConnectionCreation")
     End Sub
     ```

8. Click Validate to make sure you entered the code correctly.
9. Under Target Application, Select All .
10. Click Save and exit Autodesk Topobase Administrator.

Procedure

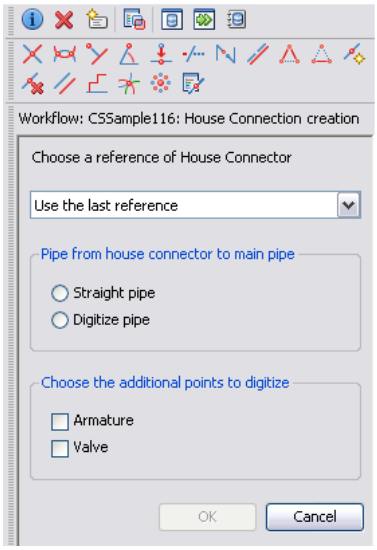
To use this sample workflow:

1. Start Autodesk Topobase Client and open the TBSAMPLE workspace.

2 Click Generate Graphic.

3 Click the Workflow Explorer icon.

4 Right-click your workflow node that you created and click Execute. The workflow starts and the Workflow Explorer contents are replaced with the following workflow form:



Sample 117 - Simple Water Module

Purpose

Sample 117 is a simple vertical application module that contains the minimum requirements for a functional module. It contains the following features:

- A **structure update plugin** that creates a basic data model for a water utility and modifies it in a series of four version updates. This plugin is located in the files *StructureUpdatePlugIn.cs*, *Version10000.cs*, *Version10001.cs*, *Version10002.cs*, *Version10003.cs*, and *Version10004.cs*.
- An acquisition **workflow** for the creation of new network pipes. This plugin is located in the *AcquisitionWorkflows.cs* file. The sample also adds three

categories of workflows using the `AddOrUpdateWorkflow` API method during the version update in the *Version10003.cs* file.

- A **feature rules plugin** enforcing the module's business rules - in this case, filling in attributes whenever a feature is created or modified. This plugin is located in the *FeatureRules.cs* file.
- A **document plugin** that creates a new menu item that links to the pipe creation workflow. This plugin is located in the *DocumentPlugIn.cs* file.

For more information about defining and manipulating the data model and a more complete description of vertical application modules, see Creating Application Modules (page 87).

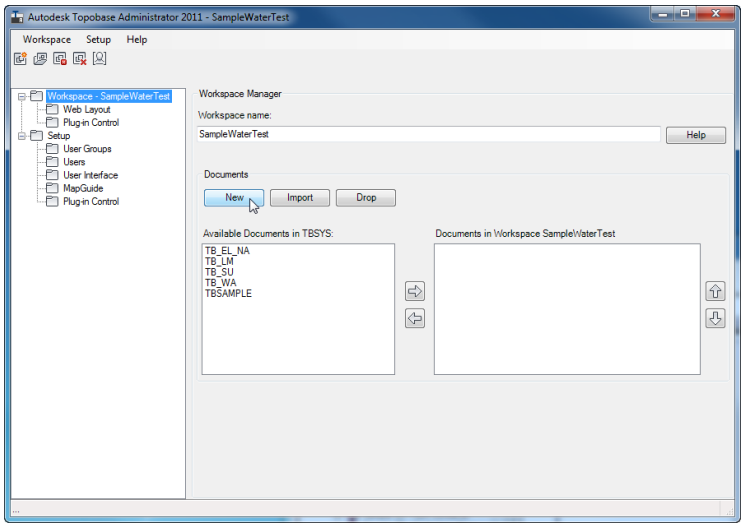
Procedure

Building and Installing

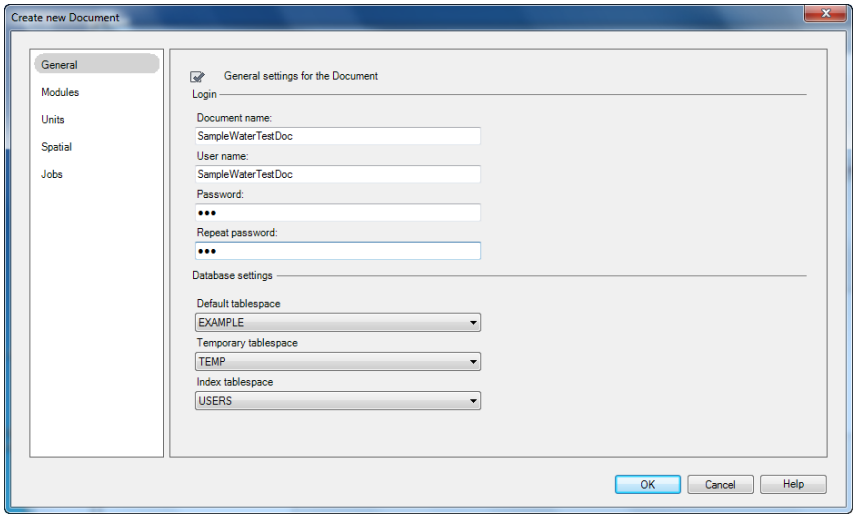
Build the sample project. The library (*VBSample117.dll* or *CSSample117.dll*) is automatically copied to the Autodesk Topobase Client *bin* directory. This library and the associated *.tbp* file need to be manually copied into the Autodesk Topobase Administrator *bin* directory as well.

Creating a Document Using the Module

1. Launch the Autodesk Topobase Administrator application.
2. Load an existing workspace or create a new workspace (see Create a Workspace (page 185) for more information).
3. Select the New button in the Document box to create a new document.

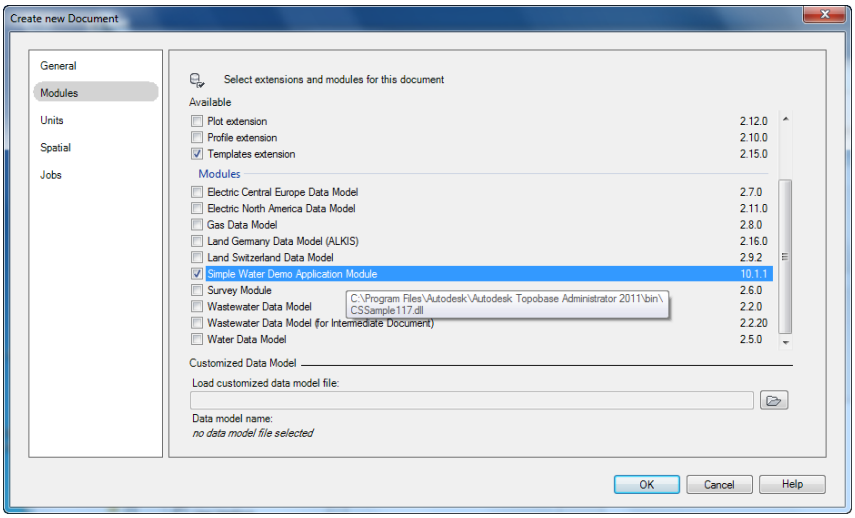


4 Enter a valid password in the Document tab of the Create New Document dialog box.



5 Select the Module tab on the left side of the Create New Document dialog box.

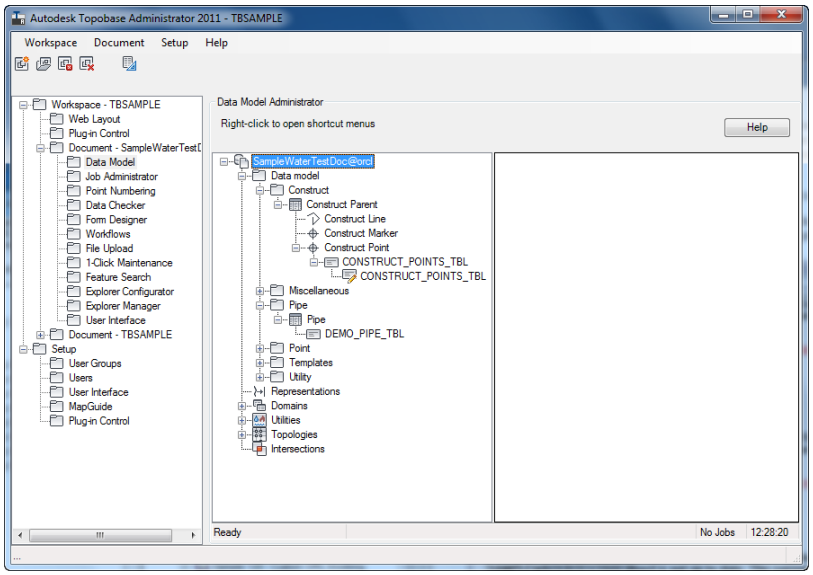
6 Select the Simple Water Demo Application Module check box from the list of available modules.



NOTE If Simple Water Demo Application Module is not in the list, it means the Sample 117 *.dll* and *.tbp* files are not in the Autodesk Topobase Administrator *\bin* directory. Close the Administrator, copy the files from the Autodesk Topobase Client *\bin* directory, restart the Autodesk Topobase Administrator, and try again.

7 Press OK. This begins the process of creating a new document.

8 After a series of status message boxes, the Update Modules and DataModels dialog box lists all the updates specified in the structure update plugin of Sample 117. Press Update.



9 This creates the data model and applies all the updates specified in the structure update plugin. When the process is complete, press Close.

10 The document based on the simple water module has now been created in the workspace. Select the Data Model and Workflows tree elements to see the data model and workflows provided by the module.

Sample 118 - Electric Templates

Purpose

This sample shows how to use API methods in the Electric Module to create and use electric templates.

NOTE This sample requires a workspace that includes electric components.

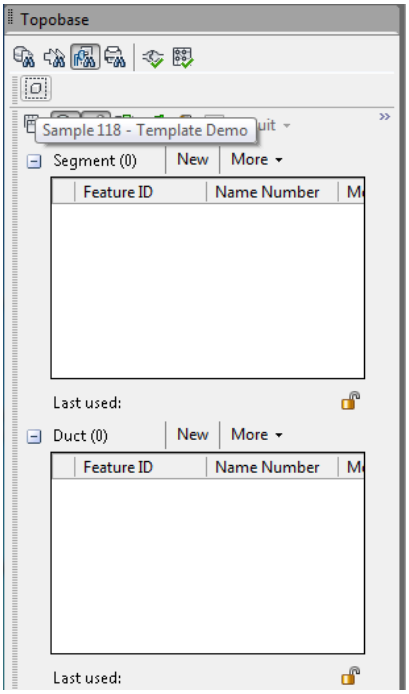
For more information about the Electric Module, see *Autodesk Topobase Electric User Guide*.

Procedure

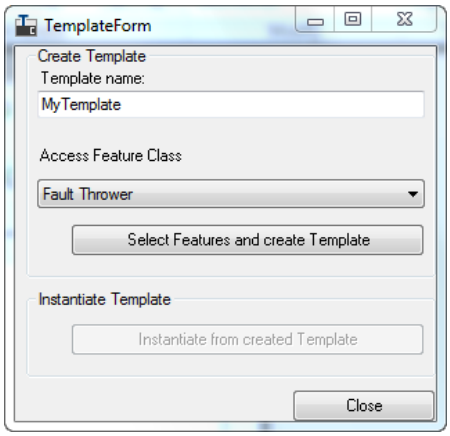
To use this sample:

1. Build the sample. The plugin (*VBSample118.dll* or *CSSample118.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open a workspace *with electric components*.
3. Click Generate Graphic.
4. Click the document toolbar button with the Sample 118 - Template Demo caption.

NOTE The button is only displayed when the tab for the document containing electric components has focus.



This displays the Sample 118 form:



5 In the upper text box, type in the name of the new template.

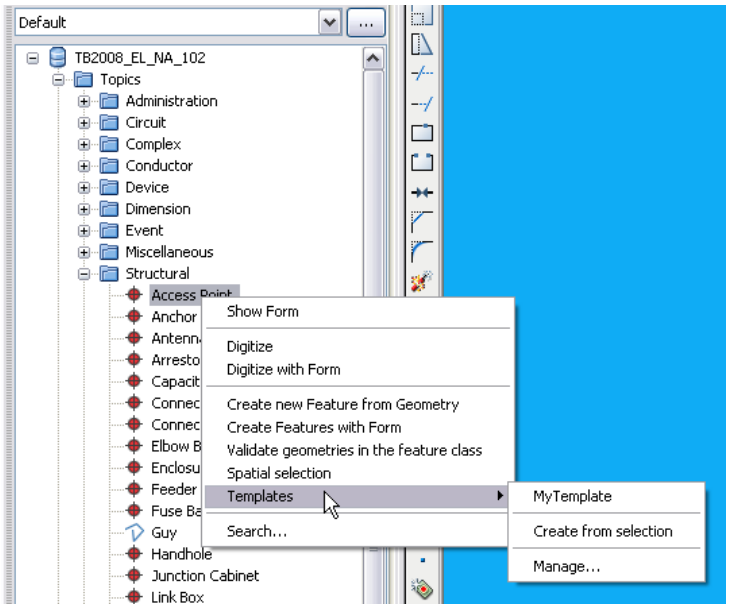
6 From the Access Feature Class combo box, select the feature class that the template is attached to.

7 Click the Select Features And Create Template button. This begins the process of creating a template.

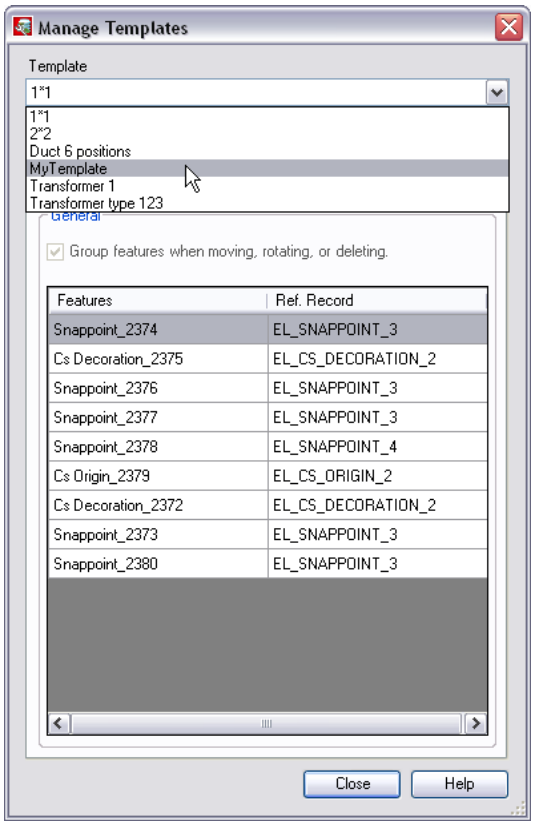
8 Select the electrical components to be added to the template. When you are done, press the Enter key.

9 Select the origin point and the orientation point for the template. This forms a reference for the placement and orientation of instances created from this template.

10 The template is now created and is assigned to the specified feature class. You can see this template by accessing the template explorer for the feature class. For example, if you created a template called "MyTemplate" assigned to the feature class "Access Point" (the default settings), right-click to display the context menu for the Access Point feature class and select Templates ➤ Manage... .



In the Manage Templates dialog box, the MyTemplate template is listed among the templates.



11 To create new elements based on this template, press the Instantiate from Created Template button on Sample 118's form.

12 Select the origin point and orientation point for the new instance. The locations of the origin and orientation points define how the template components are positioned, scaled, and rotated for the new instance.

Sample 119 - Survey Import Plugin

Purpose

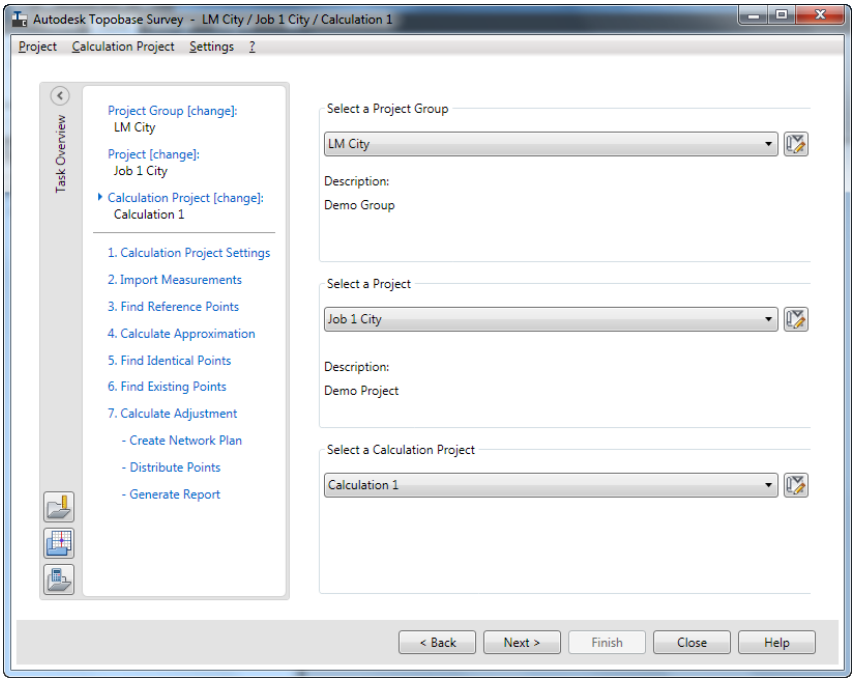
This sample shows how to create a FileFormatPlugIn component, which is used to load custom formatted files in the Autodesk Topobase Survey wizard.

NOTE This sample requires a workspace with a survey document.

Procedure

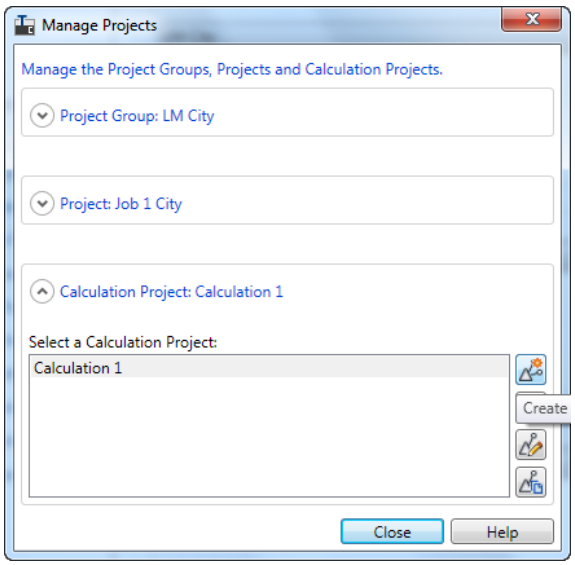
To use this sample:

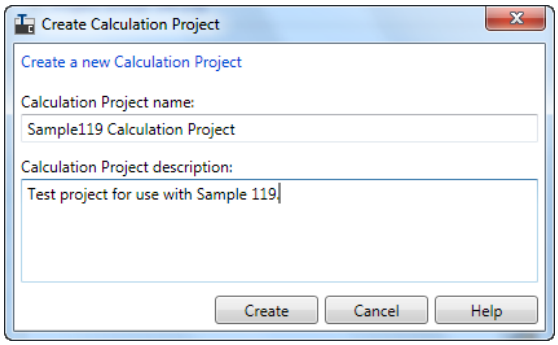
1. Build the sample. The plugin (*VBSample119.dll* or *CSSample119.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the workspace.
3. Click Survey in the ribbon. This displays the Autodesk Topobase Survey wizard.



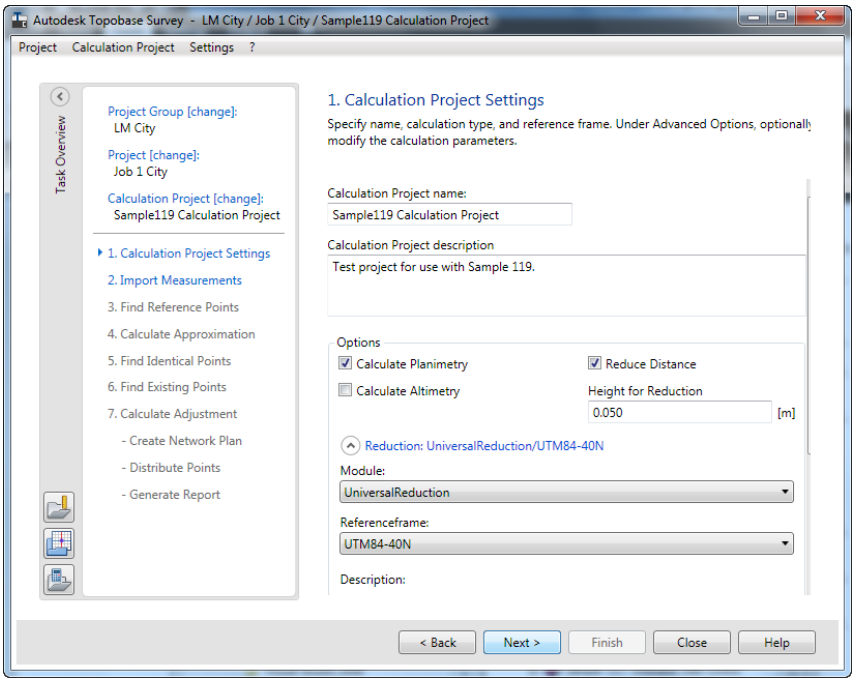
4. In the first page of the wizard, in the Select a Calculation Project section, create a new calculation project. First, select the Manage Calculation Projects button by the combo box. This displays the Manage Projects dialog box. Select the Create button and enter the new project's name.

Select the new project in the Manage Projects list and select the Close button.



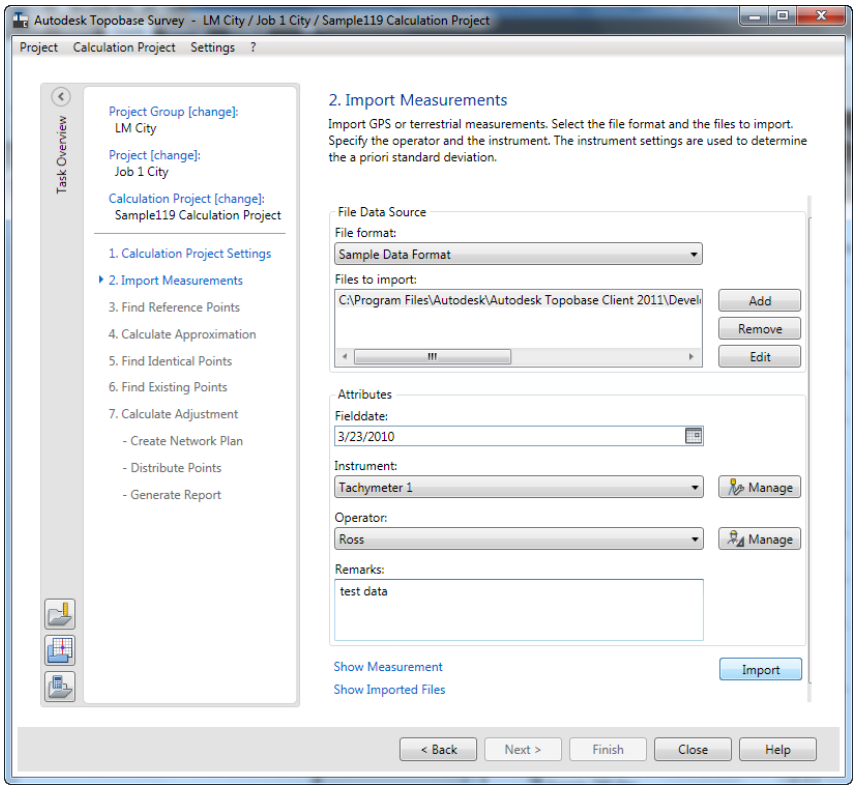


5 Select the Next button or “1. Calculation Project Settings” on the left of the dialog to go to the next page of the wizard.



6 Select the Next button or “2. Import Measurements” on the left of the dialog to go to the next page of the wizard.

7 In the Import Measurements page of the wizard, select “Sample Data Format” from the File Format combo box. This indicates that Sample 119 is used to load the data file.



8 Load one of the Sample 119 data files by selecting the Add button by the Files to import listbox. In the file dialog box, select either *Test1.demo* or *Test2.demo* from the *TestData* folder in the *119_SurveyImportPlugin* directory where the sample source code is located. *Test1.demo* contains simulated data from traditional survey techniques and *Test2.demo* contains simulated GPS coordinates.

9 In the Instrument combo box, select “Tachymeter 1” if you are loading *Test1.demo* or “GPS 1” if you are loading *Test2.demo* and click Import.

10 Select the Next button or “3. Find Reference Points” on the left of the dialog. The simulated data is loaded into your document. Click Close.

Sample 120 - Custom URL Invoking

Purpose

This sample shows how to use an ApplicationPlugin to create a new command that can be run using URL invoking.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample120.dll* or *CSSample120.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open a workspace.
3. Click Generate Graphic.

Sample 121 - Web Service

Purpose

This sample contains both a web service that communicates with a local installation of Autodesk Topobase and a web client that allows remote users to perform Autodesk Topobase actions on the server.

Web services require the installation of IIS (Internet Information Services) on the machine. This can be done in the "Add/Remove Windows Components" section of the "Add or Remove Programs" Control Panel applet.

Procedure

To use this sample:

1. Load the solution for Sample 121 into Visual Studio. Two projects are displayed: *CSSample121_Server* and *CSSample121_Client*.

2 Build the server project. This creates the files needed for the web service in the *\CSSample121_Server\Bin* directory.

3 Copy the following directories from *\CSSample121_Server\Bin* into the *C:\Inetpub\wwwroot* directory:

- *App_Code*
- *App_GlobalResources*
- *App_WebReferences*
- *bin*

(Some of these folders may already exist. In those cases, copy the files into the folders of the same name.)

Copy the *Service.asmx* file to the *C:\Inetpub\wwwroot* directory. If you have no other web services on this machine, copy the *Web.Config* file to the *C:\Inetpub\wwwroot* directory as well. If you have other web services on this machine, then only copy the item within the <appSettings> key within the *Web.Config* file to the existing Web.Config file in the *C:\Inetpub\wwwroot* directory.

Sample 122 - Custom Point Numbering

Purpose

This sample demonstrates both adding a page in the Autodesk Topobase Administrator using the new PointNumberGroupTreeView control, and how to add feature rules in the Autodesk Topobase Client to insert custom point numbers.

NOTE This sample requires a workspace that includes feature classes with a TB_POINTNUMBER property.

Procedure

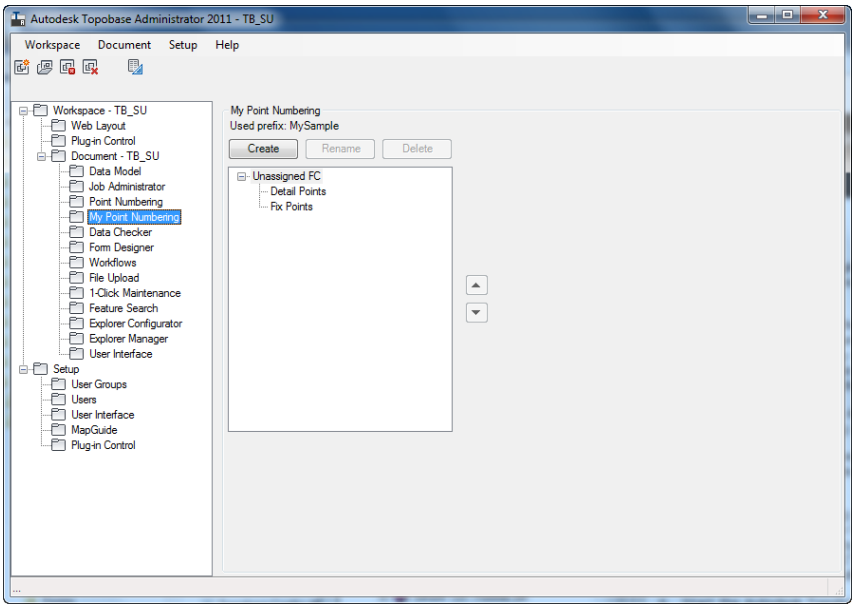
To use this sample:

1 Build the sample. The plugin (*VBSample122.dll* or *CSSample122.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

2 Copy all of these files (either *VBSample122.dll* and *VBSample122.tbp*, or *CSSample122.dll* and *CSSample122.tbp*) to the Autodesk Topobase Administrator *bin* directory as well. This sample contains both a DocumentAdminPage plugin for the Autodesk Topobase Administrator and a Feature Rule plugin for the Autodesk Topobase Client.

3 Start Autodesk Topobase Administrator and load a workspace that has feature classes containing a property named TB_POINTNUMBER (for example, Survey demo data).

4 In the workspace tree view, under the nodes for each document, a new "My Point Numbering" node is present. Select this node to display the My Point Numbering page.



5 In the My Point Numbering page, click New and create a new numbering group. Select one or more feature classes that contains a TB_POINTNUMBER property (such classes are in black, not red) and drag it from the "Unassigned FC" section of the tree to the new group. Exit the Autodesk Topobase Administrator.

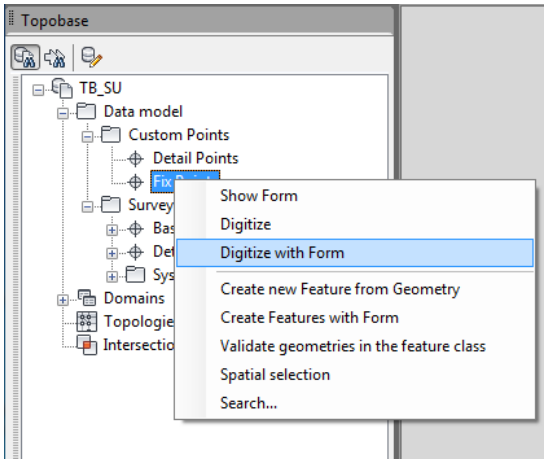
6 Start the Autodesk Topobase Client and open the same workspace.

7 Select Generate Graphic and generate the graphics for the workspace.

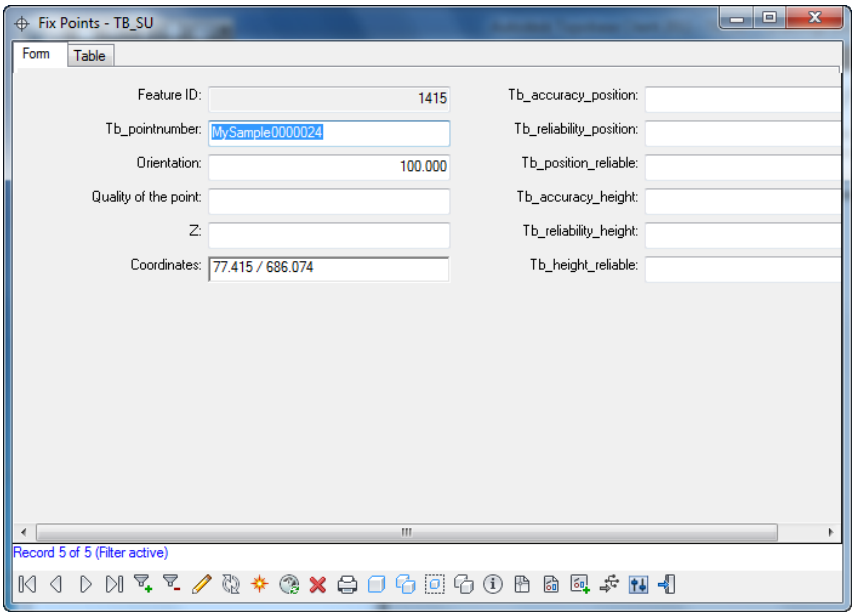
8 Make sure that the selected document in the task pane is the same as the document you modified using the My Point Numbering page in Autodesk Topobase Administrator.

9 Using the Document Explorer, expand the data model until you find a feature class you added to the new numbering group above.

10 Digitize new points for this feature class.



11 Select the new points and view their attributes. In the table, the new points have been assigned new point numbers starting with the value “MySample0000001” and automatically incrementing for each new point.



Sample 123 - Wizard Using WPF

Purpose

This sample shows how to use the Windows Presentation Foundation (WPF) to design a Autodesk Topobase Wizard.

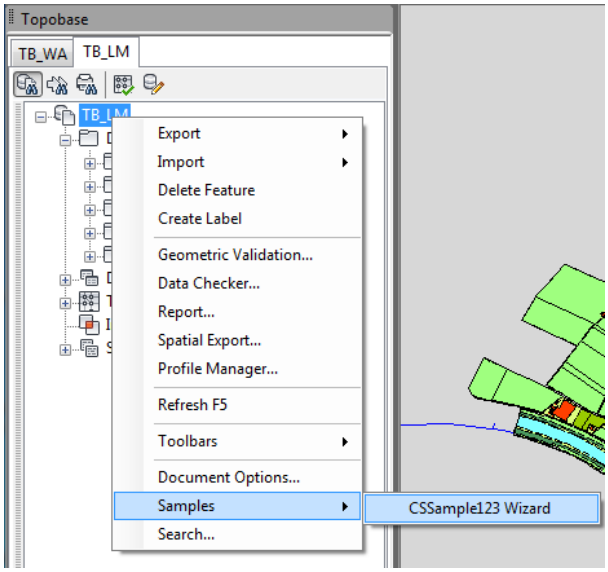
Procedure

To use this sample:

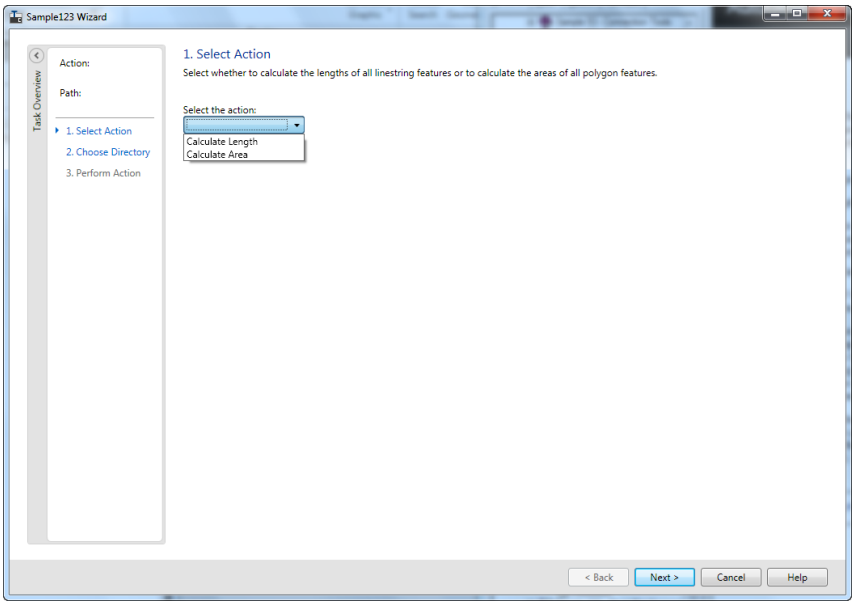
1. Build the sample. The plugin (*VBSample123.dll* or *CSSample123.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open a workspace.
3. Click Generate Graphic.

4 In the task pane, in the Document Explorer, right-click on the root node and select Samples ➤ Sample123 Wizard.

This displays the Sample123 Wizard form.

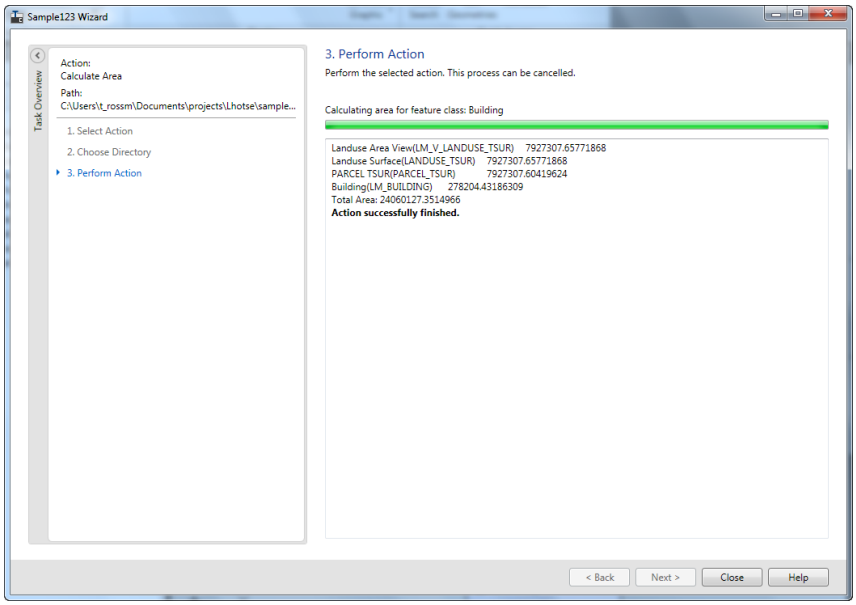


5 In the first page of the wizard, select either line measurement or area measurement. Select Next.



6 Type in the directory and filename where you wish to save the text report, or select the browse button and choose the directory and filename using the Open File dialog box. You can chose an existing text file, or use the name of a file that does not yet exist. Select Next.

7 The final page of the wizard shows the result of the computation in a text box. The information is also appended to the text file chosen in the second page of the wizard. Select Close to exit the wizard.



Sample 124 - Client Plot Commands

Purpose

This sample shows how to modify the context menus shown in the Plot Explorer. Specifically, it shows how to add two new Quick Edit menu items to the right-click context menu available for plot instances.

Procedure

To use this sample:

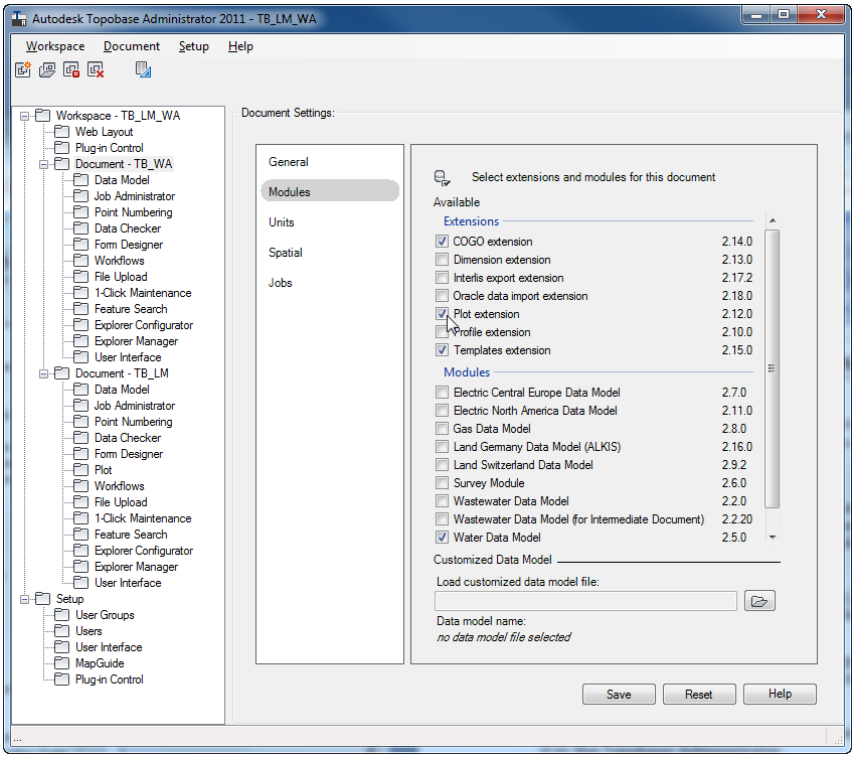
1. In Visual Studio, open the appropriate Sample 124 solution file (*VBSample124.sln* or *CSSample124.sln*) and re-set the correct paths for the referenced assemblies *acmdg.dll* and *acdbmgd.dll*. Remove the existing entries and re-add the same assemblies by browsing to the installation folder of Autodesk Topobase Client (for example, *C:\Program Files\Autodesk\Autodesk Topobase Client <yyyy>*, where <yyyy> is the current Autodesk Topobase version number).

Set the Copy Local property to False for each.

2 Build the sample. The plugin (*VBSample124.dll* or *CSSample124.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

3 Start Autodesk Topobase and open the land management demonstration workspace (for example, TB_LM_WA). The creation of this demo workspace is described in the Setting up the Demo Data topic in the *Autodesk Topobase Administrator Guide*.

NOTE The default Oracle dump file used to create this demo workspace already has the Plot Extension enabled. If not, enable it in the Autodesk Topobase Administrator.



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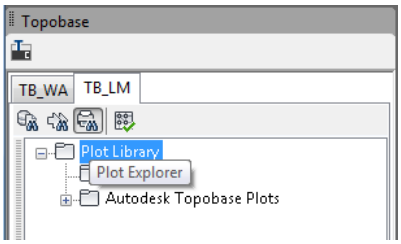
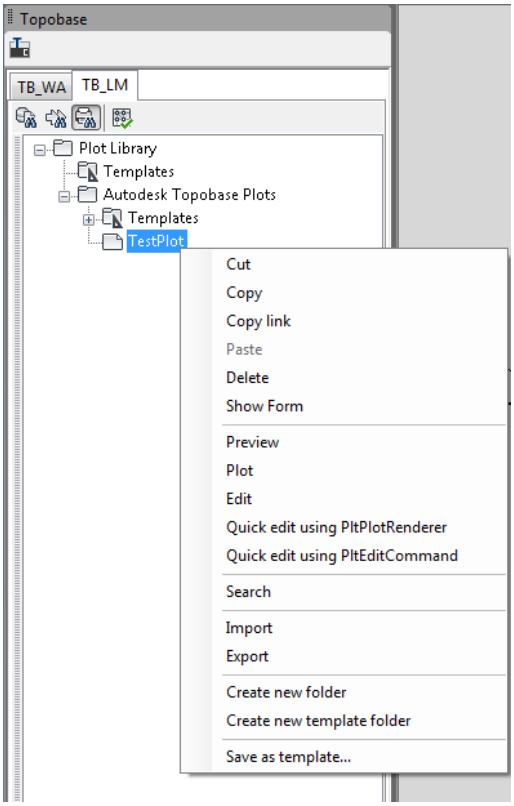
4 Activate the Plot Explorer.



5 Right-click on an existing plot to display the context menu (do not select a template). Two new entries are shown below the Edit menu item: Quick Edit Using PltPlotRenderer and Quick Edit Using PltPlotCommand.



6 Click Quick Edit using PltPlotRenderer, which loads the required display model, applies attributive and spatial filters where required, and prepares an AutoCAD paperspace layout so it can be sent to the plotter.

or

Click Quick Edit using PltPlotCommand, which takes the current selected plot node, creates an AutoCAD layout, and finally opens AutoCAD's plot dialog.

NOTE Opening a plot for editing from one of the two new menu entries prevents any display model from being loaded. Depending on the number of map placeholders available on the plot and the complexity of the referenced display models, rendering time can significantly improve. However, the user no longer sees a preview of the content shown by each map placeholder.

Sample 125 - Profile

Purpose

This sample shows how to create a simple profile manager using the provided Autodesk Topobase Profile-related APIs, which include the following functions:

- load existing profiles
- update any specified profile
- delete any specified profile
- create a new profile with a specified profile definition

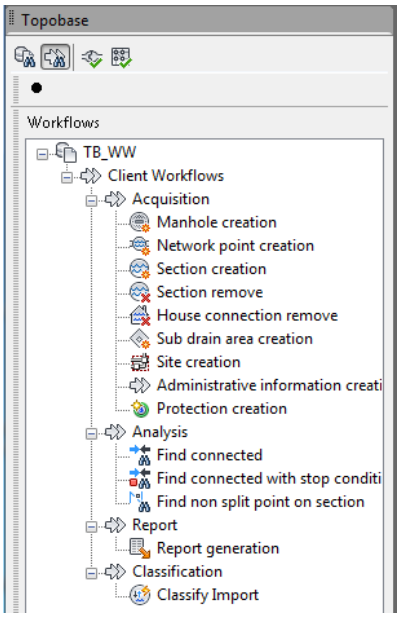
Procedure

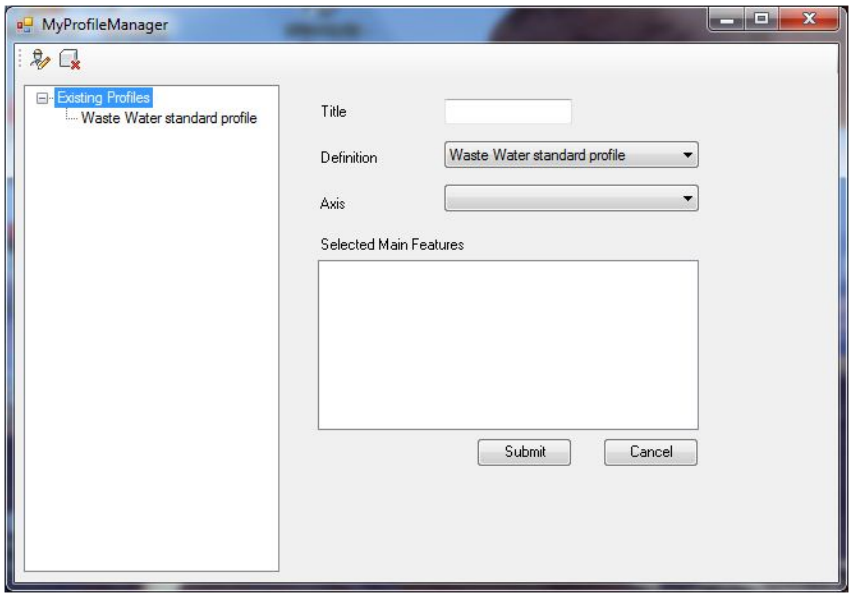
To use this sample:

1. Build the sample. The plugin (*VBSample125.dll* or *CSSample125.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open a workspace that contains a document configured with Autodesk Topobase Profile Extensions (for example, TB_WW, the wastewater demonstration workspace). The creation of demo workspaces is described in the Setting up the Demo Data topic in the *Autodesk Topobase Administrator Guide*.

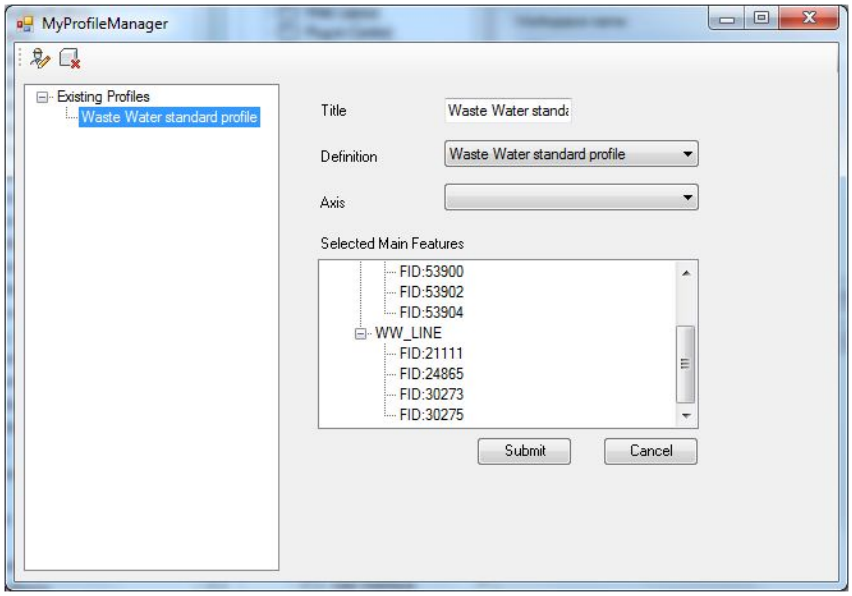
NOTE The default Oracle dump file used to create this demo workspace already has the Profile Extension enabled. If not, enable it in the Autodesk Topobase Administrator.

3 Switch to the document configured with Topobase Profile Extension. A new button with the Sample 125 - Profile Demo caption is displayed in an application-level toolbar in the Autodesk Topobase task pane. To display the MyProfileManager dialog box, click the Sample 125 button.





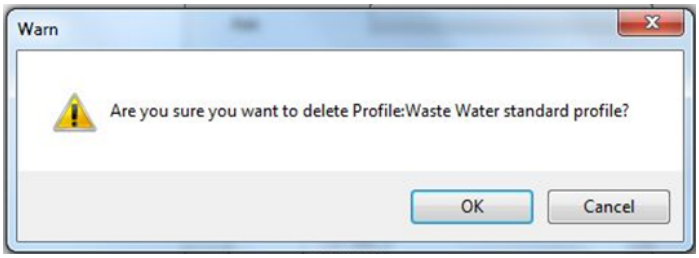
4 In the MyProfileManager dialog box, the left tree view lists all existing profiles. To display detailed information in the right panel, double-click a profile.



5 To change values, alter the Title, Definition, or Axis information to suit your needs, then click the top left  button to submit your changes.

6 To delete the currently selected profile, click the top left  button, then click OK at the prompt.

WARNING If you click OK at the prompt, your real data is deleted.



NOTE MyProfileManager also has a function to create a new Profile. To create a profile, however, selected main features are needed as input, which requires some complex UI interactions. Therefore, the MyProfileManager that is provided with this sample does not include this capability in the UI. Instead, there is a sketch implementation for the CreateProfile function in the source code. Following the source code, you can implement the rest of the UI-related functions to complete the create profile operation.

Sample 126 - Different Implementations For Different Databases

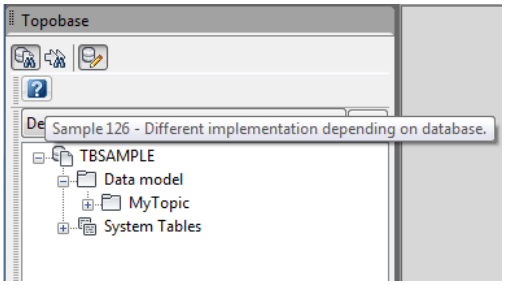
Purpose

This sample shows information about the database currently in use by Autodesk Topobase.

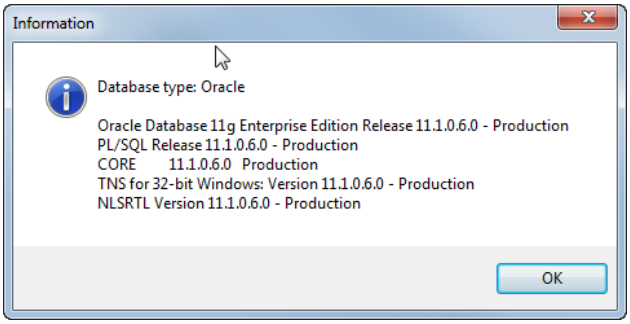
Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample126.dll* or *CSSample126.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open a workspace.
3. A new button with the Sample 126 - Different Implementations... caption is displayed in an application-level toolbar in the Autodesk Topobase task pane. To display the information dialog box, click the Sample 126 button.



An information dialog box is displayed that lists the details of the database currently in use by Autodesk Topobase.



Sample 127 - Login Plugin

Purpose

This sample shows how to create a login plugin that enables integration with LDAP (Lightweight Directory Assistance Protocol) or Active Directory to retrieve user credentials and bypass the Autodesk Topobase login dialog box while maintaining Oracle security.

Procedure

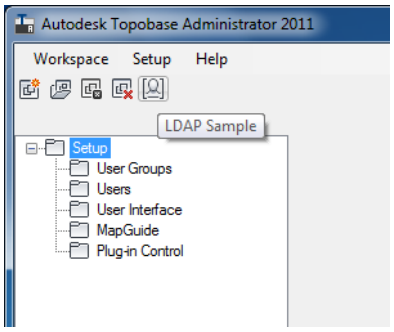
To use this sample:

1. In Visual Studio, open the solution (*VBSample127.sln* or *CSSample127.sln*) and **first** build the LDAPSample project (*VBSample127_LDAPSample* or *CSSample127_LDAPSample*), and then close the solution. The plugin (*VBSample127_LDAPSample.dll* or *CSSample127_LDAPSample.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

   NOTE This solution contains two projects: LDAPSample127 and Sample127. Ensure you build LDAPSample127 first. The other project is used later.

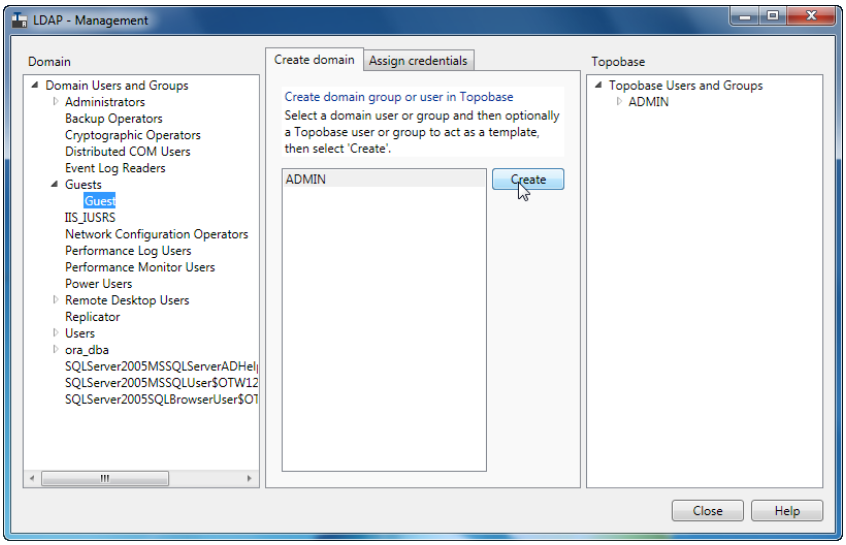
2. Copy the sample's *.dll* and *.tbp* files from the Autodesk Topobase Client */bin* directory to the Autodesk Topobase Administrator */bin* directory.

3. Start Autodesk Topobase Administrator, open any workspace, and click the LDAP Sample toolbar button.



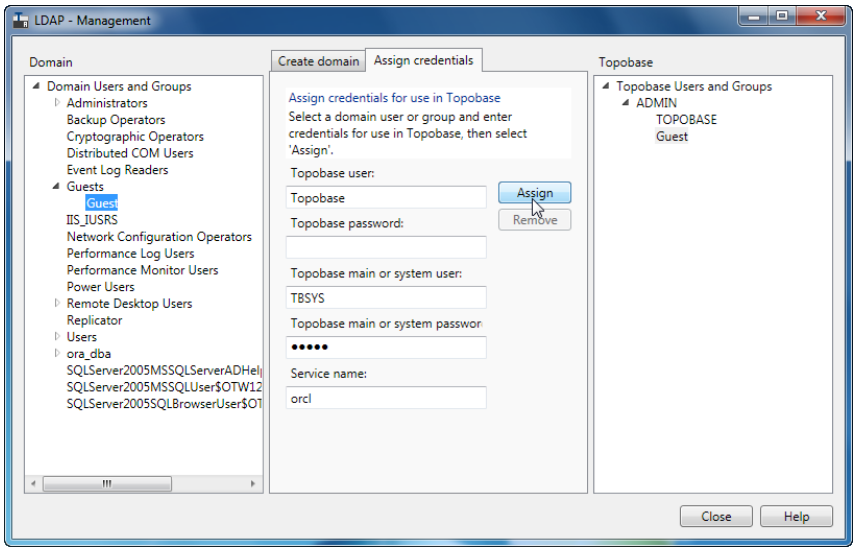
4. To create a user:

In the LDAP - Management dialog box, select the Create Domain tab, select a user from the Domain list on the left (for example, Guest), choose a group the user will belong to from the center panel, and click Create.



5 To assign the user Autodesk Topobase login credentials:

Select a user from the Domain list on the left, select the Assign credentials tab, enter the Autodesk Topobase credentials (which is the same information as the normal Autodesk Topobase login dialog box), and click Select.



6 To create a group:

In the LDAP - Management dialog box, select the Create domain tab, select a group from the Domain list on the left, and click Create.

7 To assign the same credentials to each member of a group:

Select a group from the Domain list on the left, select the Assign credentials tab, enter the Autodesk Topobase credentials (which is the same information as the normal Autodesk Topobase login dialog box), and click Assign.

8 Login Windows with the user is assigned Autodesk Topobase credentials. (Ignore this step if the current Windows user is assigned Autodesk Topobase credentials).

9 In Visual Studio, open the solution (*VBSample127.sln* or *CSSample127.sln*) and build the **other** Sample project (*VBSample127* or *CSSample127*), and then close the solution. The plugin (*VBSample127.dll* or *CSSample127*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.

10 Start Autodesk Topobase Client. Autodesk Topobase will login automatically.

Sample 128 - Database Independent

Purpose

This sample shows how to develop in a database-independet way to enable the same code to run with databases other than Oracle (for example, SQLite).

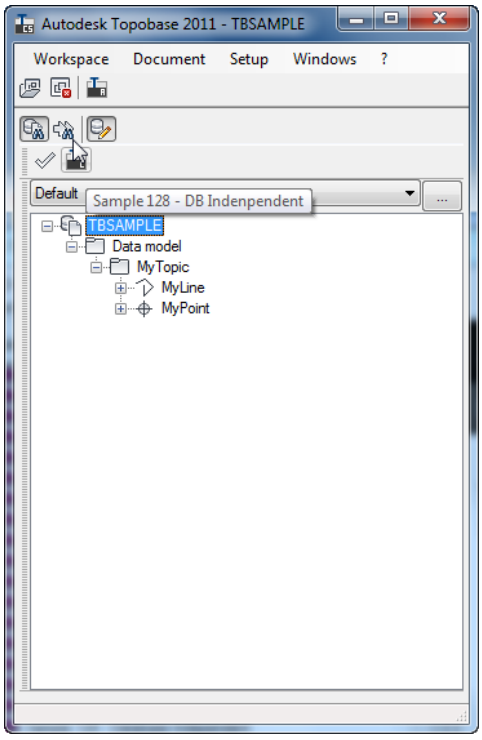
Specifically, the sample details how to:

- Get datastructure information about a database (Tables/Views/Synonyms)
- Create datastructure (Tables, Attributes, Indexes, Sequences)
- Drop a Table
- Create different SQL calls for each database type
- Use the database-independent Query Class, which is a way to write queries without using plain SQL
- Connect to databases
- Insert data into a Table

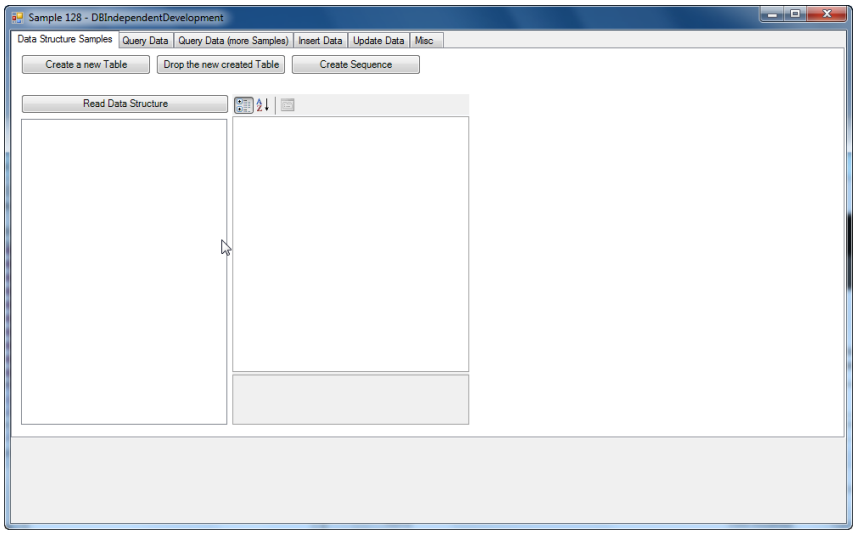
Procedure

To use this sample:

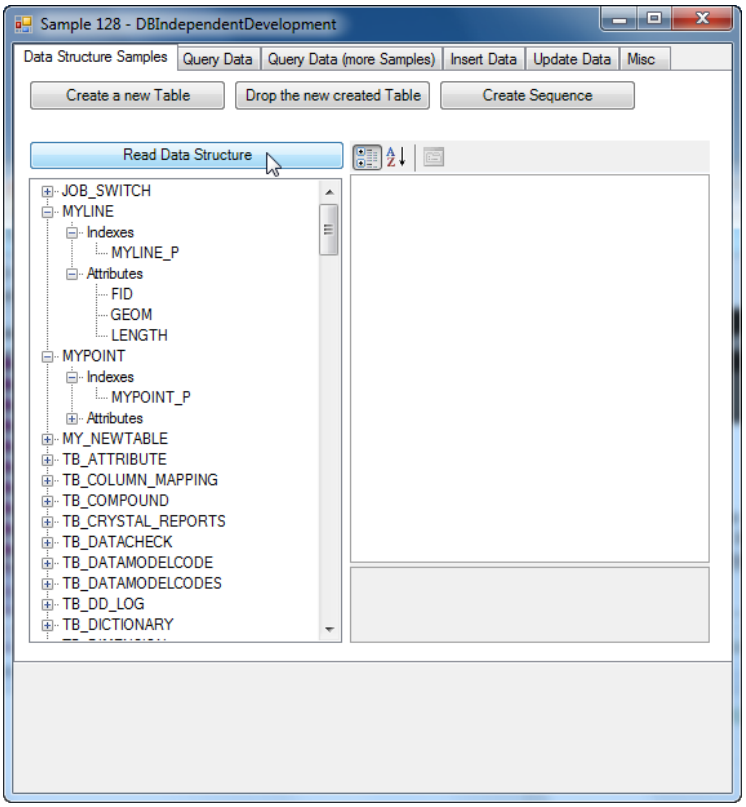
1. Build the sample. The plugin *CSSample128.dll* and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Click the Sample 128 - DBIndependent toolbar button.



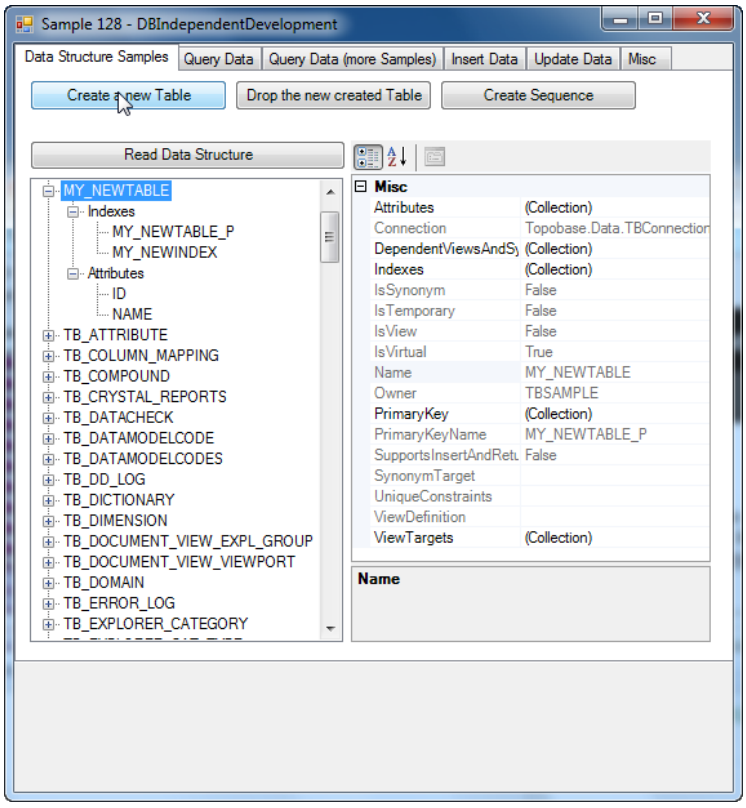
The sample's dialog box is displayed:



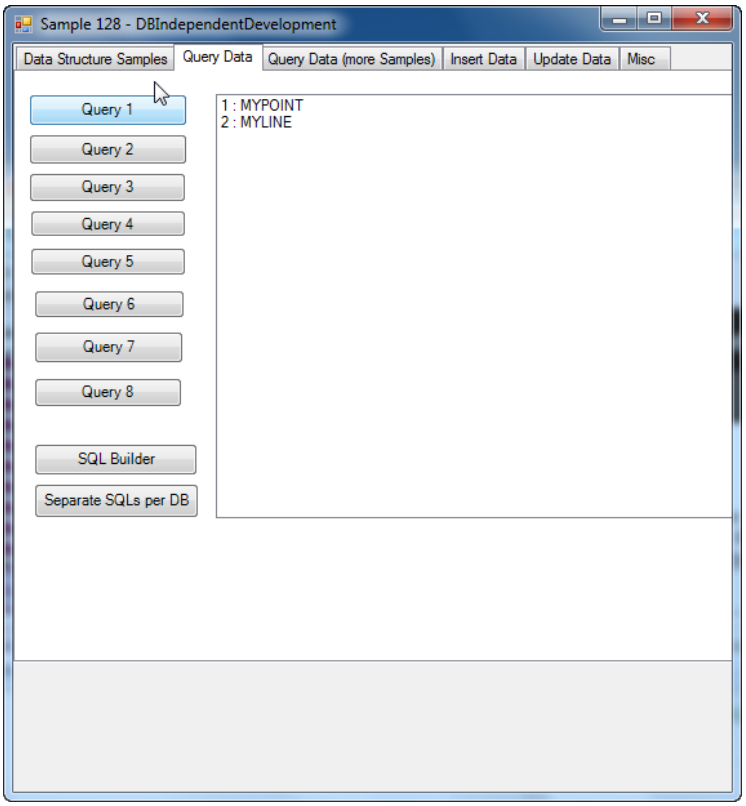
4 Use the sample's interface to read data structure, create and drop tables, create a sequence, query, insert, and update data, and perform other miscellaneous functions (such as connect to database or get username). The following shows some of the available features in this sample:



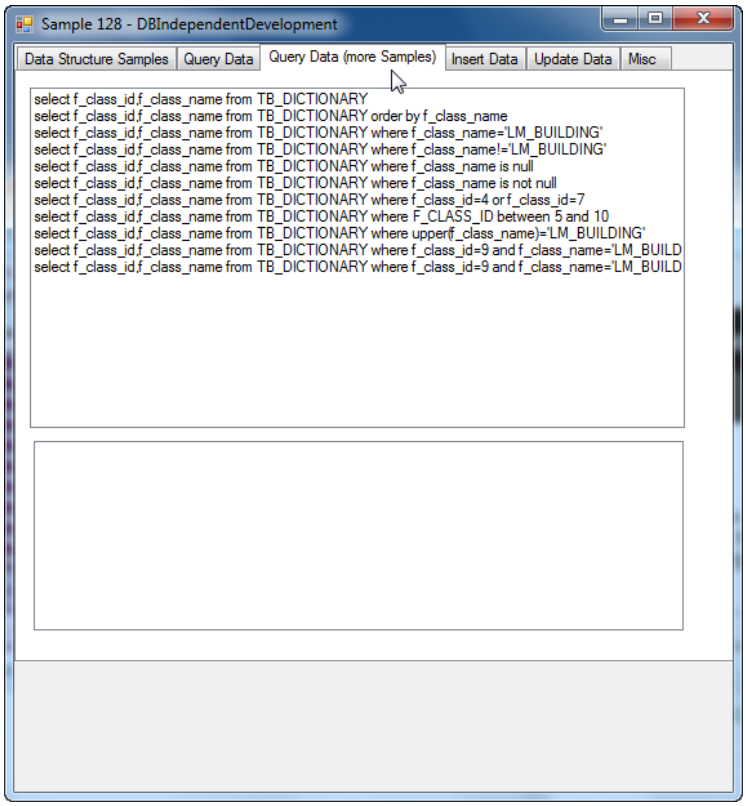
Read Data Structure



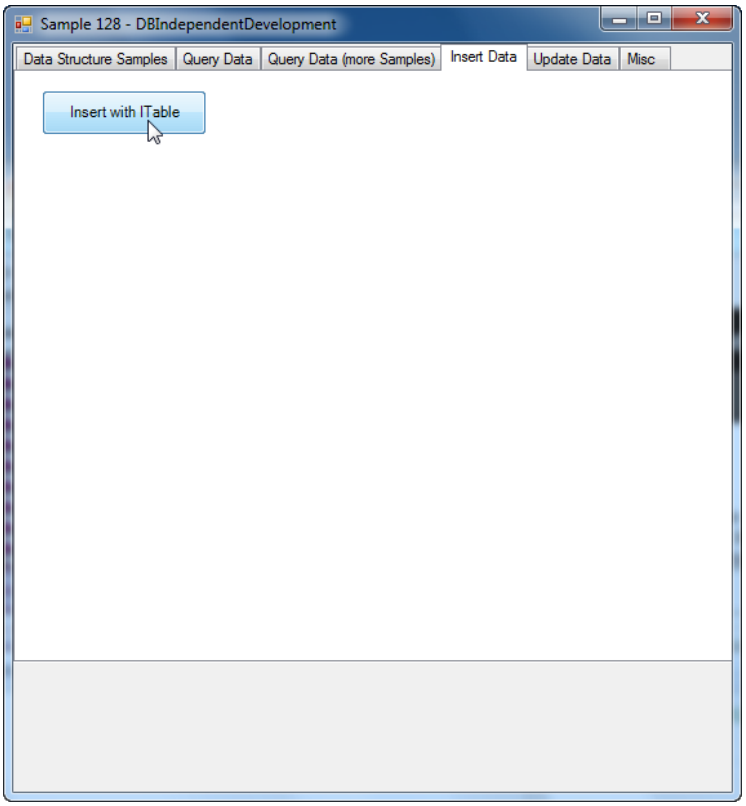
Create a New Table



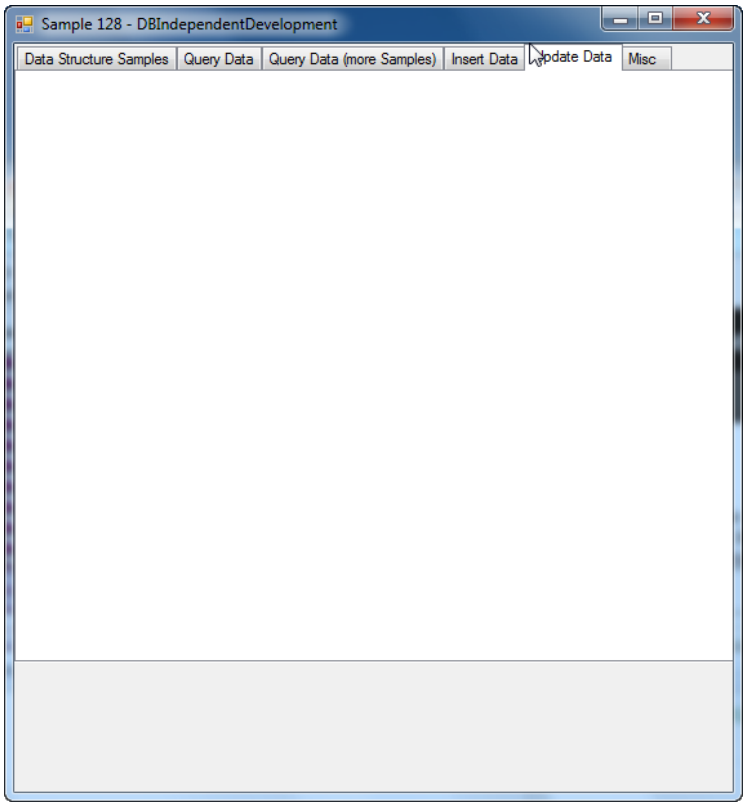
Query Data - Query 1



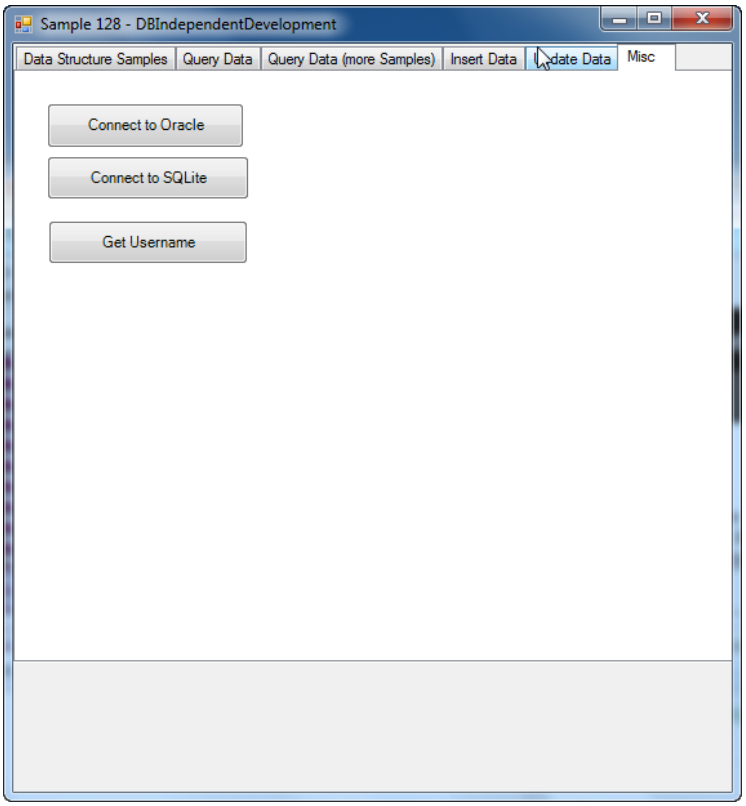
Query Data (more Samples)



Insert Data - with Itable


Sample 128 - DBIndependentDevelopment
Data Structure Samples
Query Data
Query Data (more Samples)
Insert Data
Update Data
Misc

Update Data



Miscellaneous - Connct to Database or Get Username

Sample 129 - Pickfirst Set

Purpose

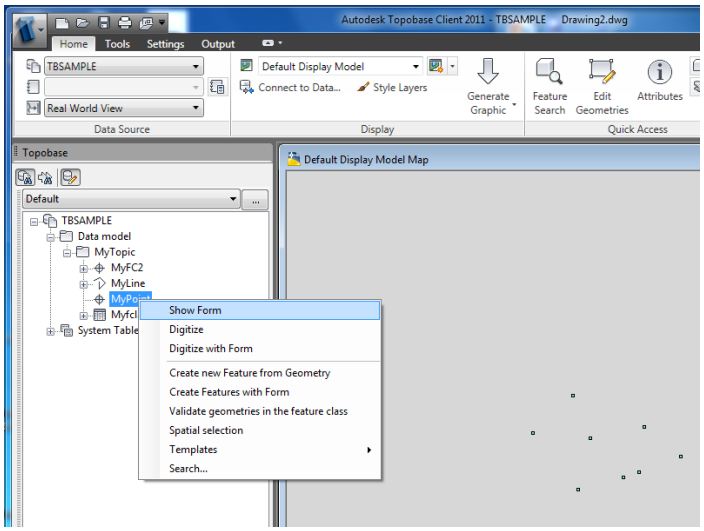
This sample shows how to create an AutoCAD SelectionSet using the Autodesk Topobase Map API. This sample uses the TBSAMPLE workspace create by the Sample 01 - Create Structure (page 182) application.

NOTE This sample only works in the Autodesk Topobase Client.

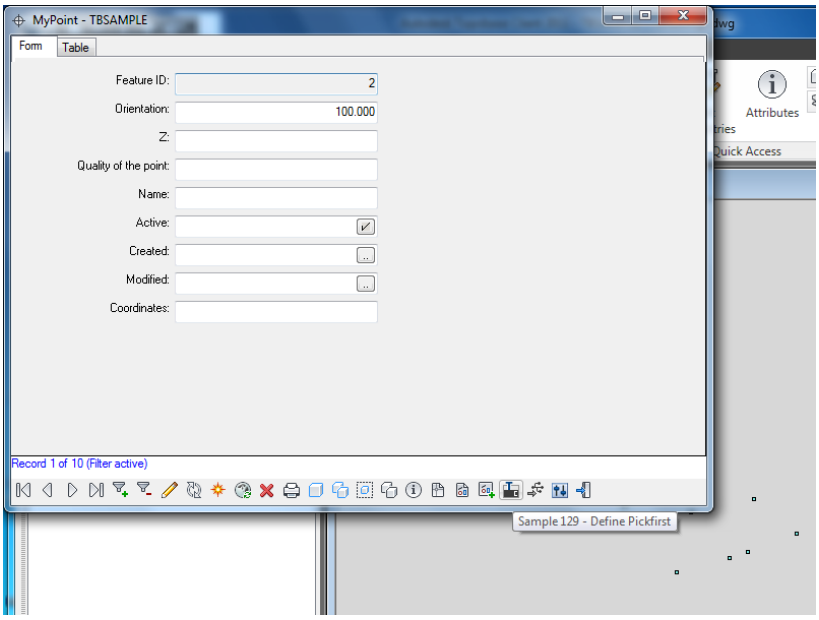
Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample129.dll* or *CSSample129.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the TBSAMPLE workspace.
3. Display graphics (click Generate Graphics) for the MyPoint feature class. If there are no features in the database yet, then digitize some points.
4. Ensure that you have graphics for the MyPoint feature class on the screen and right-click on MyPoint and click Show Form.



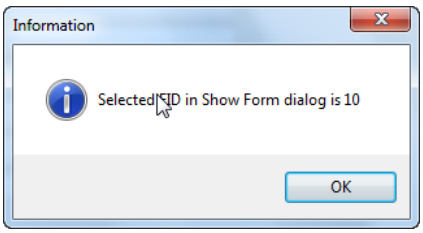
The sample's dialog box is displayed, which allows you to navigate throught the MyPoint features:



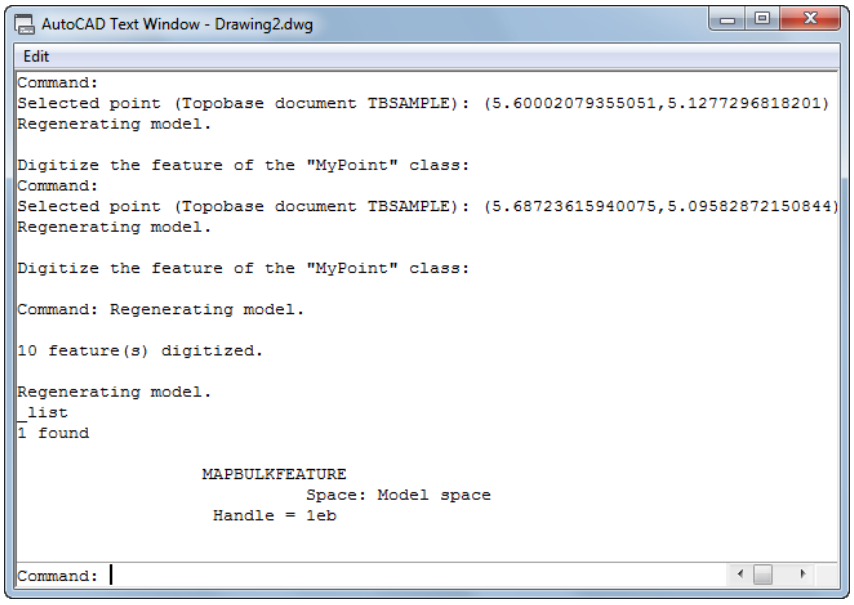
5 The My Point - TBSAMPLE dialog box contains a new Sample 129 - Define Pickfirst icon that allows you to define an AutoCAD selection set based on the current feature.

Click the  button.

An information dialog box similar to the following is displayed:



6 The current feature is part of an AutoCAD selection. Type in the AutoCAD command `_list`, which results in an output display similar to the following:



Sample 130 - Schematics

Purpose

This sample shows how to create the metadata for an electric geo schematic via code. A schematic is based on a topology and creates a schematic representation of the existing features. This sample introduces a new page in the Autodesk Topobase Administrator that will be used to create the geo schematic.

Procedure

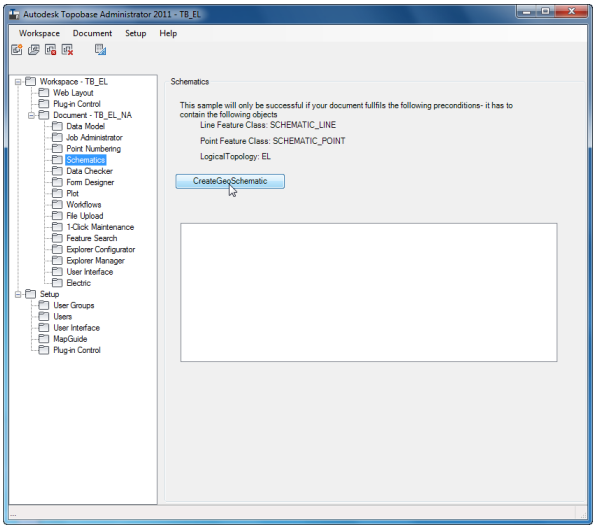
To use this sample:

1. Build the sample. The plugin (*VBSample130.dll* or *CSSample130.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory

The plugin *.dll* and the associated *.tbp* file must be manually copied to the Autodesk Topobase Administrator *bin* directory.

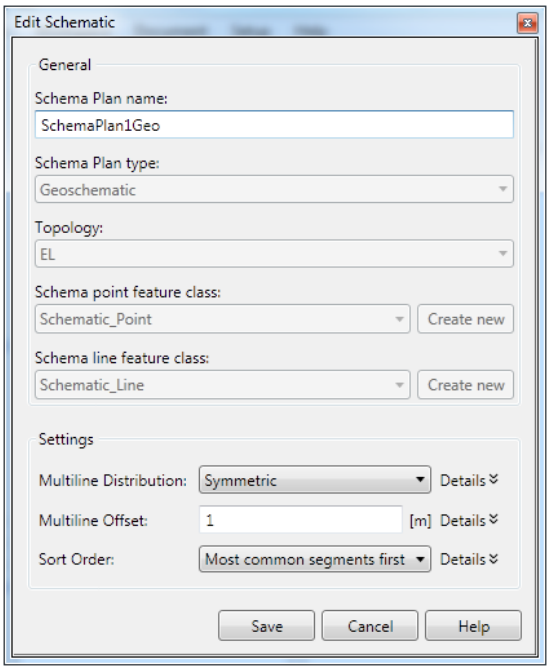
2 Start Autodesk Topobase Administrator and open an Electric document (for example, TB_EL_CE).

3 The plugin creates a new Schematics Admin page.



4 Ensure that you have a logical topology with the name `EL` and that you have a point feature class with the name `SCHEMATIC_POINT` and a line feature class with the name `SCHEMATIC_LINE`. Both of these feature classes will be used for your new schematic.

5 To create a new schematic, click CreateGeoSchematic and edit the SchemaPlan1Geo schematic with the following settings:



6 Click Save.

Sample 131 - Web-able User Control

Purpose

This sample how to create your own Web-able user control (that is, a control that runs in both the desktop and Web) that can be used as and APIControl in the Autodesk Topobase Form Designer.

Procedure

To use this sample:

1 In Autodesk Topobase Administrator, use the Form Designer to add an API Control in the form, and specify its type as MyControl.

2 Open the *.tbp* file and replace the DialogPlugIn's name attribute with the table's name.

3 Replace $APICONTROL1 in MyDialog_Load function codes with your new API Control name.

Sample 133 - Start Client Via Batch

Purpose

This sample how to call Autodesk Topobase Client (*Topobase.exe*) via batch.

Procedure

To use this sample:

1 Autodesk Topobase can be started using a command-line call to *Topobase.exe* (which is located in the Autodesk Topobase Client *bin* directory). Parameters can also be used to define users, passwords, workspaces, and other variables. For example, if you execute (all on one line):

```
Topobase.exe Username=TOPOBASE;Password=TOPOBASE;tbsysusername=TB
SYS;tbsyspassword=tbsys;tbsysservice=orcl;Workspace=TB
SAMPLE;ShowReport=Test
```

No login dialog box is displayed and the workspace opens automatically.

2 The user-defined parameter `ShowReport` defines the name of the report to be created. If the parameter exists, then we know that Autodesk Topobase is called via batch mode so it must be closed after processing is completed.

NOTE Any parameters can be added and read using `this.Application.Desktop.GetCommandLineArg`.

Sample 135 - Generate Graphics

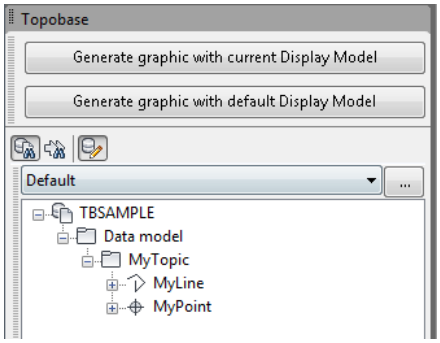
Purpose

This sample, which is an application flyin, shows how to generate graphics from code using the Autodesk Topobase Display Model API.

Procedure

To use this sample:

1. Build the sample. The plugin (*VBSample135.dll* or *CSSample135.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open a workspace.
3. To start a graphics generation, click either the Generate Graphic With Current Display Model, or the Generate Graphic With Default Display Model button.



The graphics generation operation is executed based on the input selected.

Sample 136 - Extend Plot Editor

Purpose

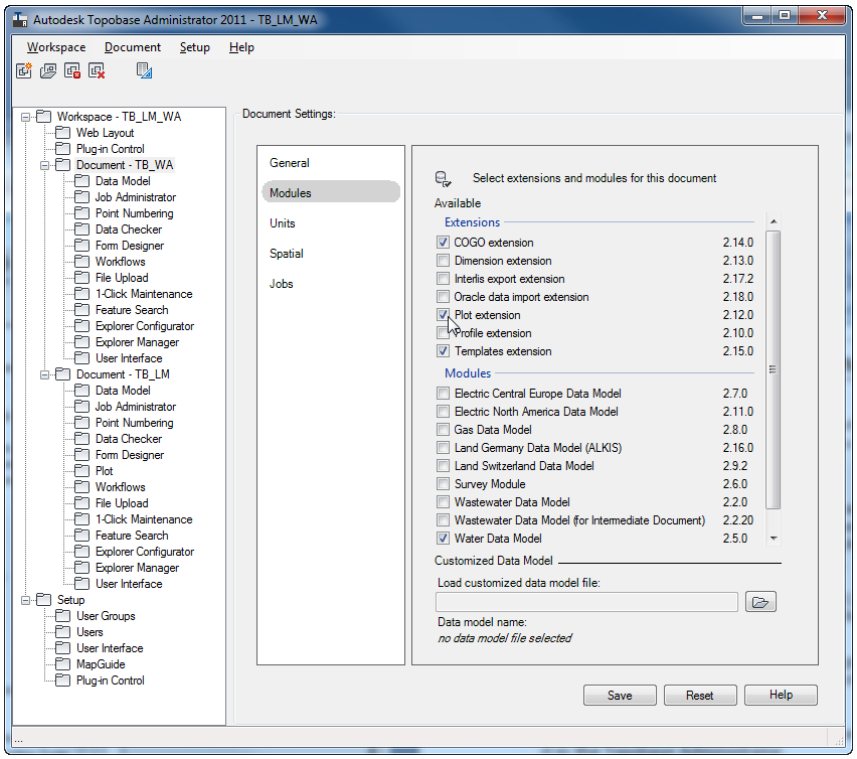
This sample shows how to modify the right-click context menus shown in the Plot Editor. Specifically, it shows how to add, modify, and remove items from the context menus that are available on the various nodes of the tree view shown in the plot editor.

Procedure

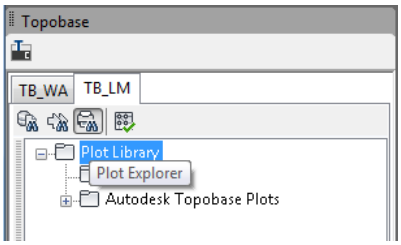
To use this sample:

1. Build the sample. The plugin (*VBSample136.dll* or *CSSample136.dll*) and the associated *.tbp* file are copied to the Autodesk Topobase Client *bin* directory.
2. Start Autodesk Topobase and open the land management demonstration workspace (for example, TB_LM_WA). The creation of this demo workspace is described in the Setting up the Demo Data topic in the *Autodesk Topobase Administrator Guide*).
3. Start Autodesk Topobase and open the land management demonstration workspace (for example, TB_LM_WA). The creation of this demo workspace is described in the Setting up the Demo Data topic in the *Autodesk Topobase Administrator Guide*.

NOTE The default Oracle dump file used to create this demo workspace already has the Plot Extension enabled. If not, enable it in the Autodesk Topobase Administrator.

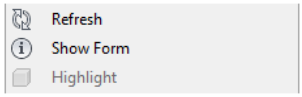


4 Activate the Plot Explorer.

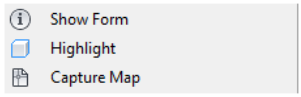


5 Right-click on an existing plot or template to display the context menu and select Edit.

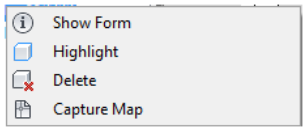
6 In the Plot Editor, right-click to open the context menu for the root node. The Highlight context menu entry is always disabled, the Unhighlight entry has been removed and a new entry Refresh has been added (which re-loads the current plot or template into the editor).



7 Right-click to open the context menu for a map placeholder node. If all values have already been captured for the current map placeholder, then no Delete entry is displayed.



If, however, at least one such 'capture attribute' is missing (for example, the insertion point or display model), then the Delete entry is available.



Sample 140 - Call Report Via URL

Purpose

This sample shows how a simple Report can be called via a Web Page.

NOTE This sample does not load the full Autodesk Topobase Framework. Thus, if your Report uses custom API function calls, which cannot be used without the full Framework, errors will occur.

Procedure

To use this sample:

1 In Visual Studio, open the solution (it is an *aspx.net* web project).

2 Copy the *.dll*'s from the Autodesk Topobase Client *bin* directory to the *bin* directory of the web project.

3 Compile and run the project.

A webpage is opened that displays the Report as HTML content.

TBP File Format

A

Introduction

Autodesk® Topobase is based on a plugin concept that allows developers to extend Autodesk Topobase Topobase for their own needs.

The Autodesk Topobase plugin (TBP) model serves as the basis for adding features to the user interface, creating workflows, setting business rules, updating the data model, and more. Many of the standard Autodesk Topobase components are built using plugins.

If you want to create your own plugin, you have to create a *.dll* with one or more plugin classes in it and a *.tbp* file that tells Autodesk Topobase which plugin classes are implemented and where to find them. For more information about creating a plugin, see Quick Guide: Creating a Topobase Plugin (page 75).

You can also create one *.tbp* file for two or more *.dll*'s.

Example TBP Files

This example shows the contents of a *.tbp* file exposing three different plugin classes from the library *VbSample.dll*:

```
<?xml version="1.0" encoding="utf-8"?>
<PlugIn>

<ApplicationPlugIn ClassName="MyApplication1"
 AssemblyName="VbSample.dll" Namespace="VbSample"
 DocumentKey="" MapName="" Priority="100"
 ExecutionTargetWeb="True" ExecutionTargetDesktop="True"
 Company="" Author="Michael Ross"/>
<ApplicationPlugIn ClassName="MyApplication2"
 DocumentKey="" MapName="" Priority="100"
 AssemblyName="VbSample.dll" Namespace="VbSample"
 ExecutionTargetWeb="True" ExecutionTargetDesktop="True"
 Company="My SAmple Company" Author="Michael Ross"/>
<DocumentPlugIn ClassName="MyDocument"
 AssemblyName="VbSample.dll" Namespace="VbSample"
 DocumentKey="" MapName="" Priority="100"
 ExecutionTargetWeb="True" ExecutionTargetDesktop="True"
 Company="My Sample Company" Author="Michael Ross"/>

</PlugIn>
```

```
<?xml version="1.0" encoding="utf-8"?>
<PlugIn>

<ApplicationPlugIn ClassName="MyApplication1"/>
<ApplicationPlugIn ClassName="MyApplication2"/>
<DocumentPlugIn ClassName="MyDocument"/>

</PlugIn>
```

You can use the `Default` tag to define properties used by all plugin classes in the library. To overwrite a single property, include the correct attribute within the plugin tag.

The following example is the same *.tbp* file rewritten to use the `Default` tag:

```
<?xml version="1.0" encoding="utf-8"?>
<PlugIn>

<Default
 AssemblyName="VbSample.dll"
 Namespace="VbSample"
 DocumentKey=""
 MapName=""
 Priority="100"
 ExecutionTargetWeb="True"
 ExecutionTargetDesktop="True"
 Company="My Sample Company"
 Author="Michael Ross"
/>

<ApplicationPlugIn ClassName="MyApplication1"/>
<ApplicationPlugIn ClassName="MyApplication2" Author="Peter Puck"/>
<DocumentPlugIn ClassName="MyDocument"/>

</PlugIn>
```

Plugin Tag Details

The following table lists all plugin tags:

<ApplicationPlugIn>	Adds a menu item or toolbar item to the workspace area of the task pane; derived from the `Topobase.Forms.ApplicationPlugIn` abstract class.
<DocumentPlugIn>	Adds a context menu item or toolbar item to a document tab in the task pane; derived from the `Topobase.Forms.DocumentPlugIn` abstract class.
<DialogPlugIn>	Adds user interface components to forms; derived from the `Topobase.Forms.DialogPlugIn` abstract class.
<ApplicationOptionPage>	Creates an option page for the application options; derived from the `Topobase.Forms.OptionPages.ApplicationOptionPage` abstract class.

<DocumentOptionPage>	Creates an option page for the document options; derived from the `Topobase.Forms.OptionPages.DocumentOptionPage` abstract class.
<ApplicationFlyIn>	Adds a moveable, dockable window to the task pane; derived from the `Topobase.Forms.Desktop.ApplicationFlyIn` or `Topobase.Forms.FlyIns.ApplicationFlyIn` abstract class.
<DocumentFlyIn>	Adds a moveable, dockable window to a document tab within the task pane; derived from the `Topobase.Forms.Desktop.DocumentFlyIn` or `Topobase.Forms.FlyIns.DocumentFlyIn` abstract class.
<DialogFlyIn>	Adds a docked, unmovable window to forms; derived from the `Topobase.Forms.Desktop.DialogFlyIn` or `Topobase.Forms.FlyIns.DialogFlyIn` abstract class.
<WorkflowPlugIn>	Plugin for a workflow, which may include user-interface elements shown in the task pane; derived from the `Topobase.Workflows.WorkflowPlugIn` abstract class.
<FeatureRulePlugIn	Defines business rules; derived from the `Topobase.FeatureRules.FeatureRulePlugIn` abstract class.
<DocumentStructureUpdatePlugIn>	Modifies the data model; derived from the `Topobase.Update.DocumentStructureUpdatePlugin` abstract class.
<ReportPlugIn>	Adds a report generator; derived from the `Topobase.Forms.ReportPlugIn` abstract class.

Property Details

The following table details all possible properties:

AssemblyName	Name of the *.dll* file, not including the path.
Namespace	The Namespace name of your *.dll* (as defined in the C# or VB project). Usually the same as the AssemblyName property.
ClassName	Name of the plugin class.

MapName	Name of the map interface. The default is "" (empty quotation), which means the plugin runs with the default Autodesk connection (that is, Autodesk Map 3D or Autodesk MapGuide Enterprise.) **TIP** If you want to use your own application for the map interface, specify the name for this property.
Priority	Defines the order in which the plugins are loaded. For example, a plugin class with a priority of 50 is loaded before a class with a priority of 100. The recommended value is 100. If you require a range, use values between 50 and 150.
ExecutionTargetWeb	If your plugin is designed to work in Autodesk Topobase Web, set this property to “true”, otherwise set this property to “false”. **NOTE** Plugins that use standard Windows Forms and controls cannot be used in Autodesk Topobase Web.
ExecutionTargetDesktop	If your plugin is designed to work in Autodesk Topobase Client, set this property to “true”, otherwise set this property to “false”.
Company	Name of the company that built the plugin.
Author	Name of the plugin developer. The Company and Author properties are shown in the list of plugins and also displayed if an error occurs in the application.
DocumentKey	(Obsolete - use the DMCode property instead.) Specifies the documents that cause the plugin to load. Default is "" (empty quotation), which indicates that your plugin is loaded with every Autodesk Topobase document. If you want the plugin to only load with a specific Autodesk Topobase document, set this property and add the same key to the TB_GN_DOCUMENT_KEY table.
ApplicationKey	(Obsolete - use the DMCode property instead.) Similar to the DocumentKey but is an application-wide setting. Add the application key to the TB_GN_APPLICATION_KEY table in TBSYS User.
DeactivationKey	Enables you to “switch off” a plugin or group of plugins. Use the "Options-License" property. Use the same DeactivationKey name for all plugins that belong to the same functional group.

DMCode	Data Model Code. Specifies in which modules the plugin loads. By default, the plugin loads with documents based on any kind of module. DMCodes are stored in the TB_DATAMODELCODE table. The DMCode format is "X.X.X", where the first number represents the company, the second is the module (for example, Wastewater), and the third is the submodule (for example, Wastewater Switzerland). Modules not developed by Autodesk have a value between 3 and 99 for the company code. Company codes 1, 2, and 42 are reserved by Autodesk. For more information about the Data Model Code format, see Creating the Data Model (page 87).

Other Properties

To specify that a dialog plugin is only active with a specific form, set the `Name` tag in the.*tbp* file. In the following example, the dialog plugin MyPointClass is only visible in the form/table "MyPointName":

```
<DialogPlugIn ClassName="MyPointClass" Name="MyPointName" />
```

NOTE If you set `Name=""` then the dialog plugin is started with all forms.

TBP Examples

For more information about TBP and demonstrations using sample code, see Developer Samples (page 179).

Object Models

B

Legend

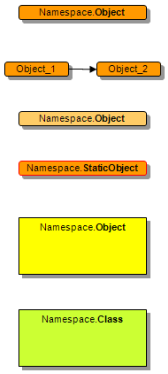
The following object model images represent the hierarchical links of the major objects and abstract classes or interfaces for most of the Autodesk Topobase APIs.

For more detailed information about the individual APIs, see the appropriate Autodesk Topobase API References located in the *<topobase>\Help* directroy:

- `Topobase_Client_API.chm`
- `Topobase_Modules_API.chm`
- `Topobase_ServerSite_API.chm`

NOTE The API reference documentaiton is also available in Microsoft Help 2 format from inside Visual Studio (F1).

Legend



An object of the type Namespace.Object.

Object_1 contains a method or property that can give you a reference to Object_2.

An object that is fully explained in another namespace's graph.

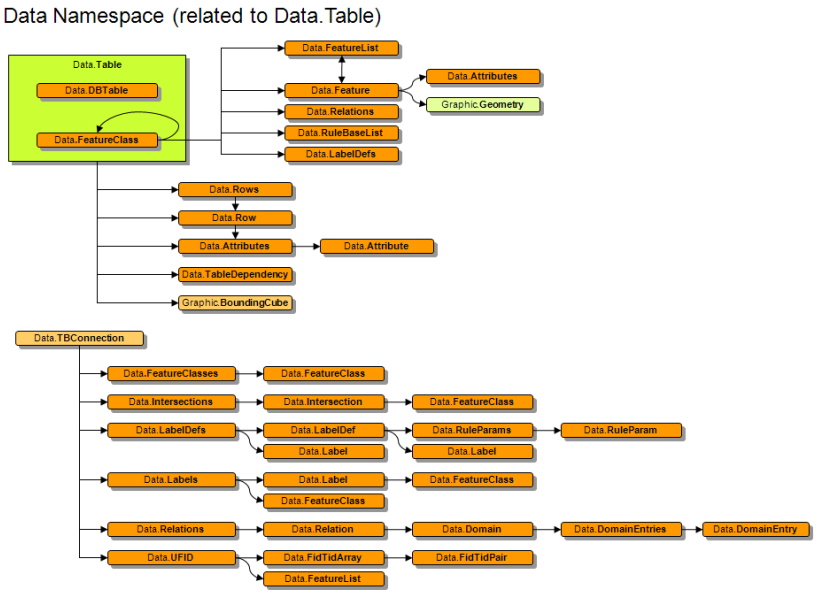
A static object. You can use this to get references to other objects without creating an instance of this object.

An object which also the parent for other objects that inherit its properties and methods.

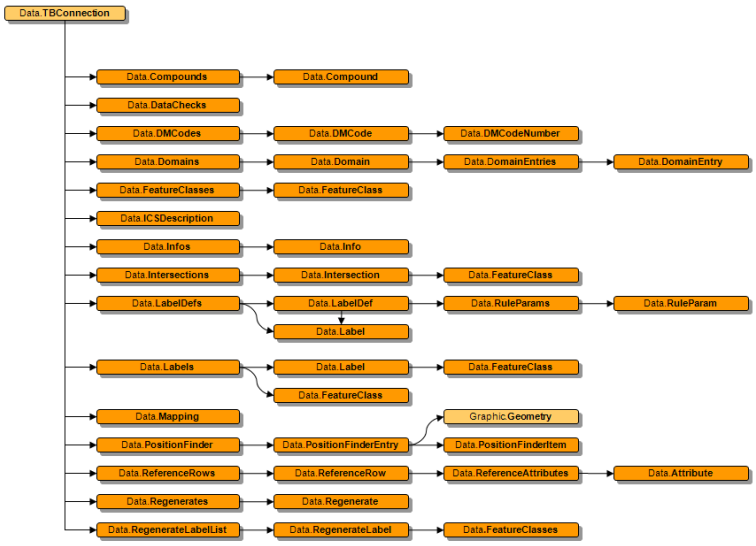
An abstract class or interface which cannot be instantiated, but serves as a parent for objects that inherit its properties and methods.

Framework

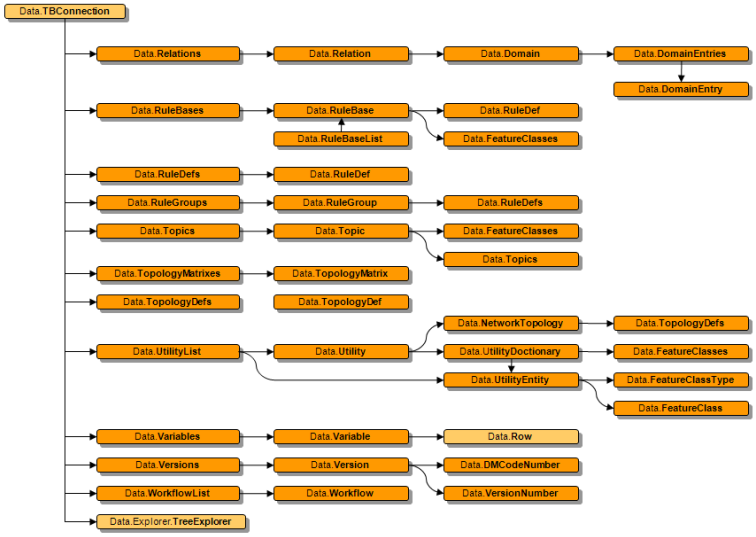
Data Namespace



Data Namespace (other connections from TBConnection 1)

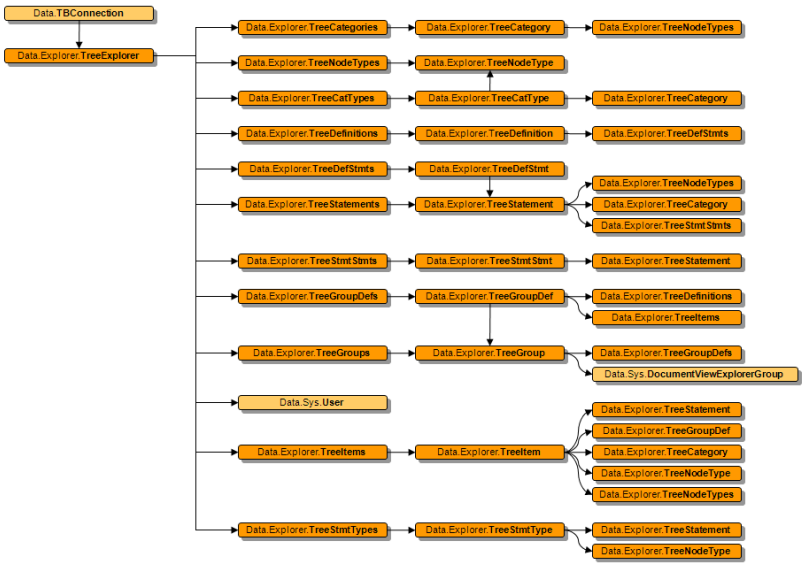


Data Namespace (other connections from TBConnection 2)

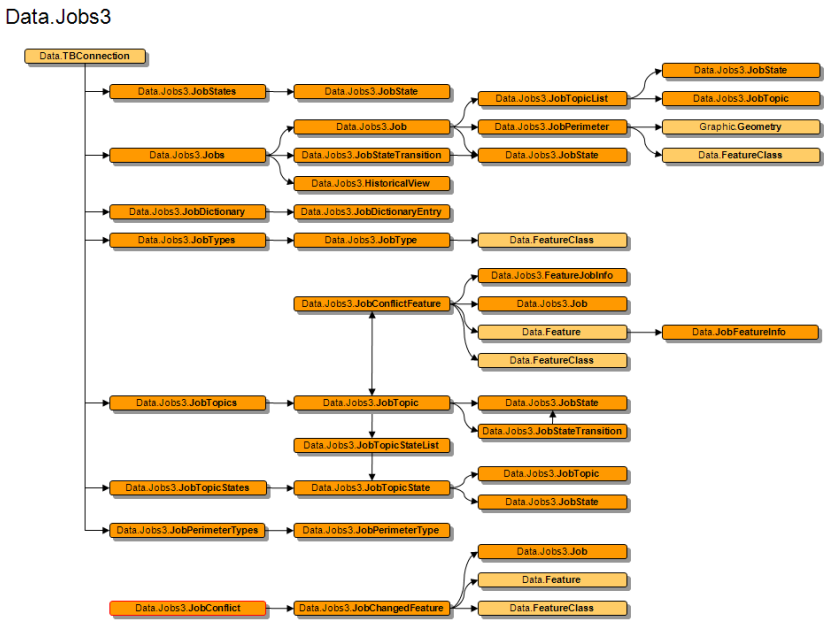


Data.Explorer Namespace

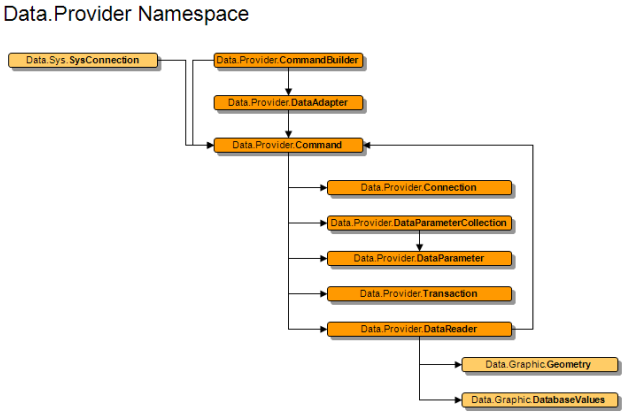
Data.Explorer Namespace



Data.Jobs3 Namespace

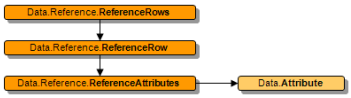


Data.Provider Namespace



Data.Reference and Data.Util.OperationLog Namespaces

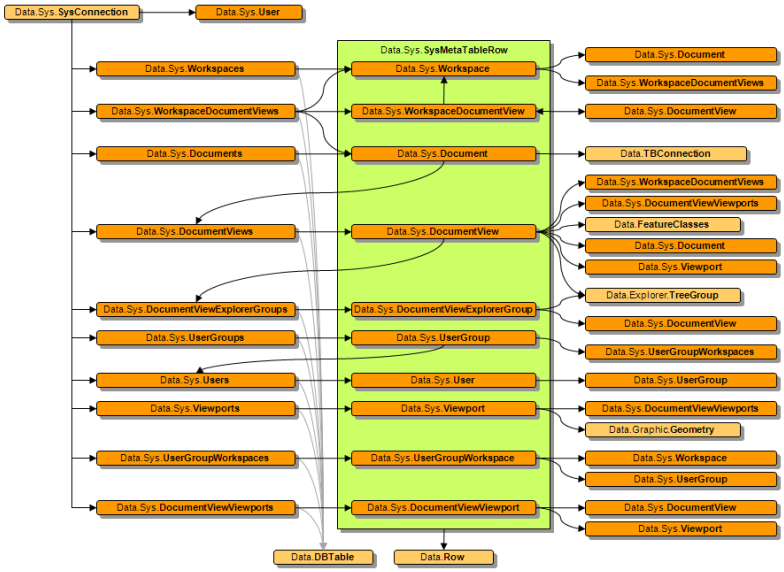
Data.Reference Namespace



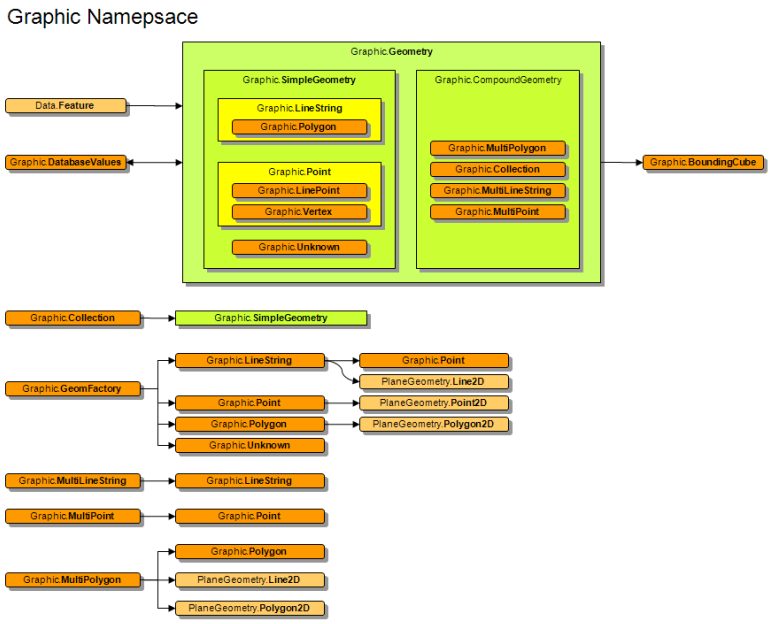
Data.Util.OperationLog Namespace

Data.Sys Namespace

Data.Sys Namespace

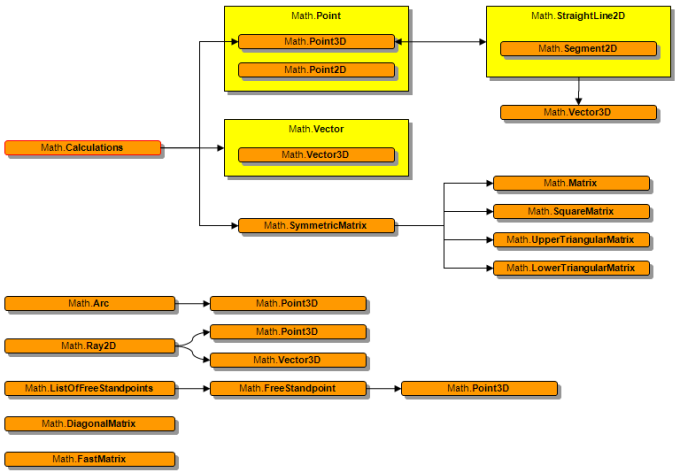


Graphic Namespace

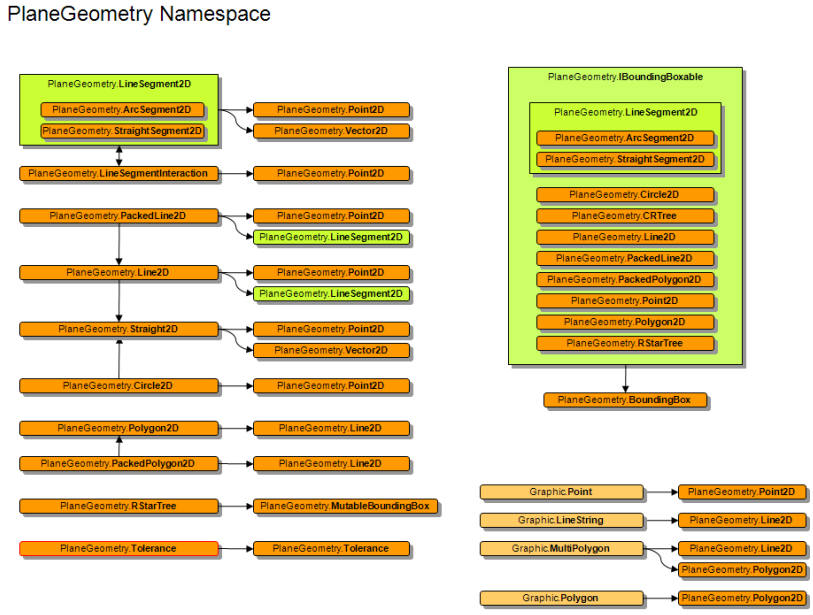


Math Namespace

Math Namespace

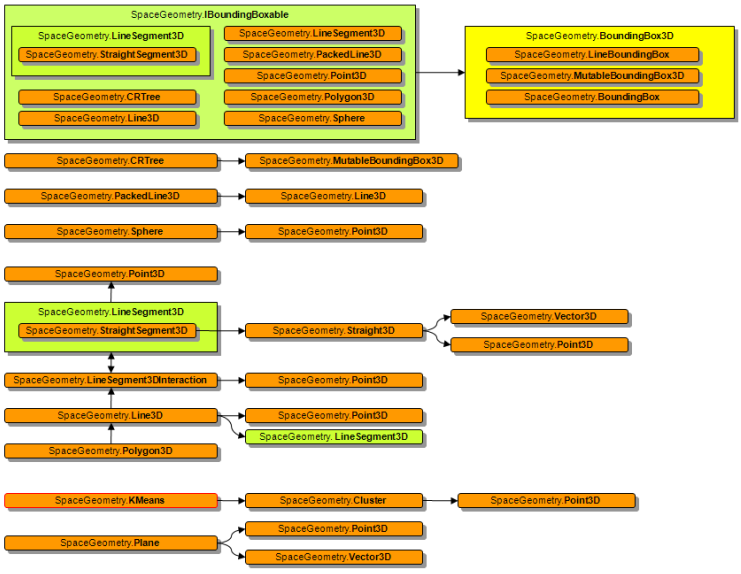


PlaneGeometry Namespace

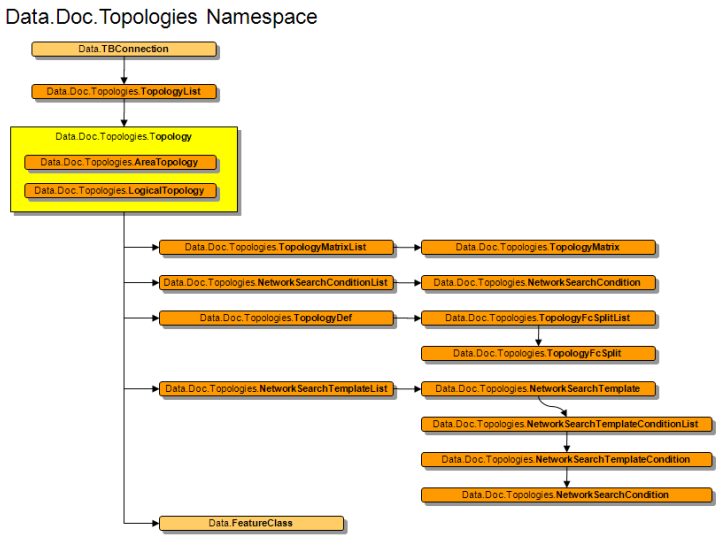


SpaceGeometry Namespace

SpaceGeometry Namespace

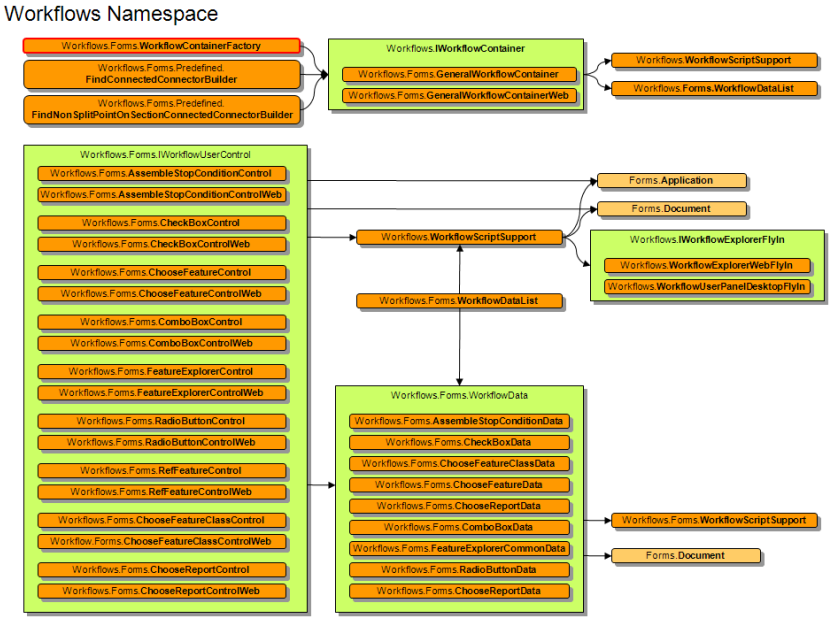


Data.Doc.Topologies Namespace



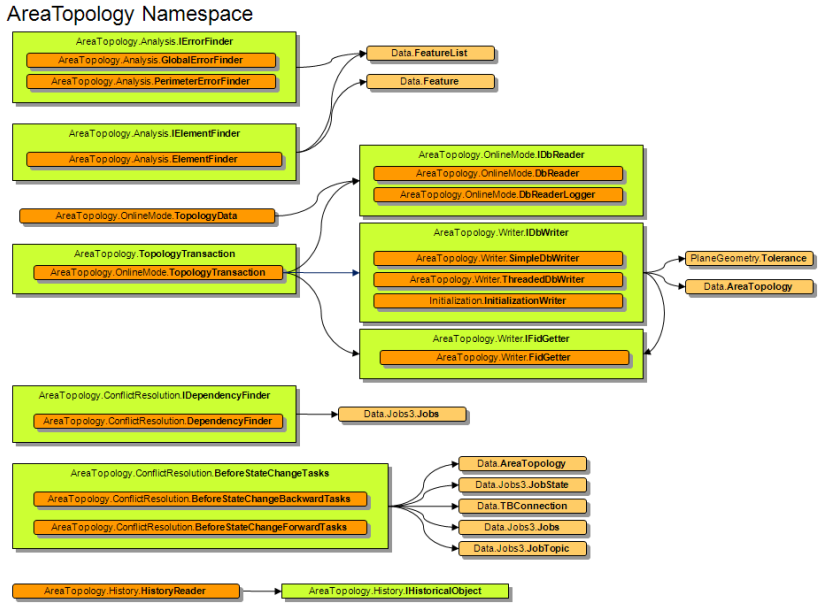
Workflows

Workflows Namespace



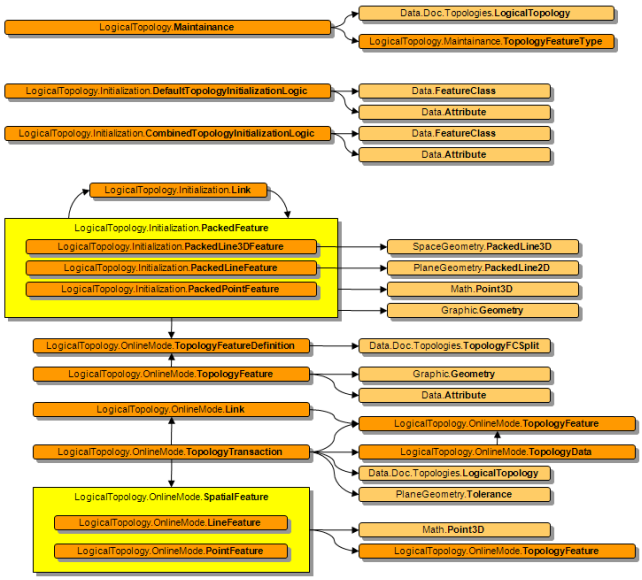
Area Topology

AreaTopology Namespace

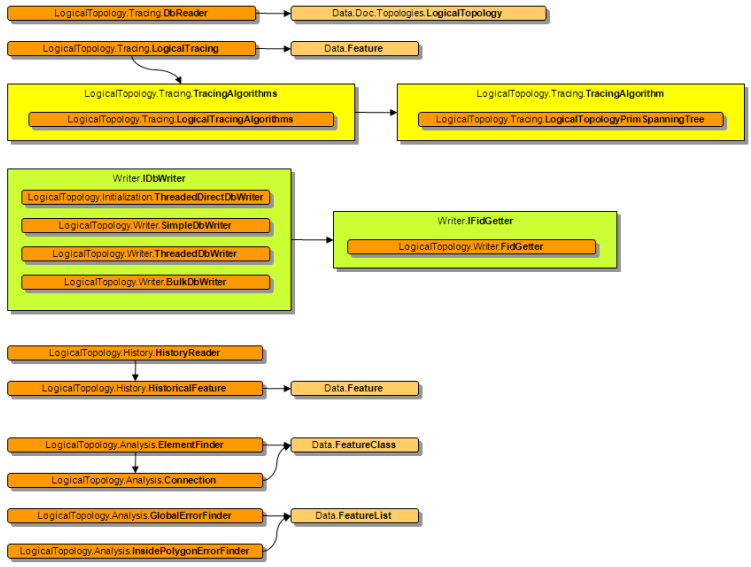


LogicalTopology Namespace

LogicalTopology Namespace 1



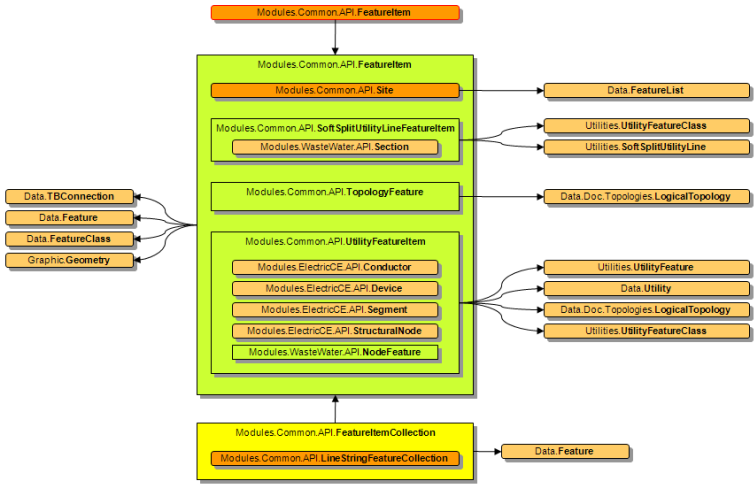
LogicalTopology Namespace 2



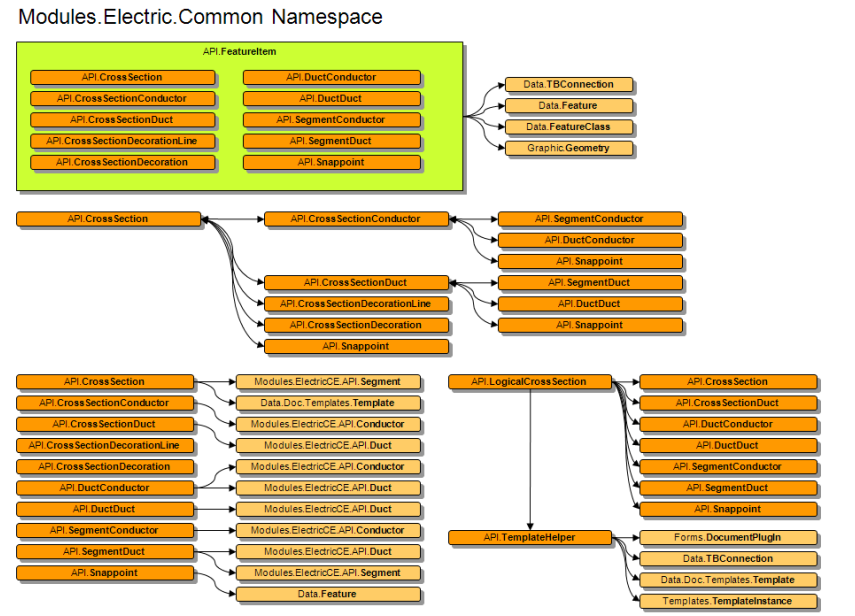
Vertical Application Modules

Common Namespace

Modules.Common Namespace



Electric.Common Namespace



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