



Simba SDK

Build a C# ODBC Driver for NON SQL-Capable Data Sources in 5 Days

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About this Guide

Purpose

This guide explains how to use the Simba SDK to create a custom ODBC connector for a data store that is not SQL-capable. It explains how to customize the QuickStart sample connector, which is included with the Product.

Using this sample connector is the quickest and easiest way to create a custom ODBC connector. At the end of five days, you will have a read-only connector that connects to your data store. This custom ODBC connector can be used as the foundation for a commercial DSI implementation.

Note:

An online version of this guide is located at [Simba SDK - Driver Development](#).

Advantages of Using the Product

The ODBC specification defines a rich interface that allows any ODBC-enabled application to connect to a data store. In order to implement a connector that supports this specification, developers have to understand all the complexities of error checking, session management, and data conversion, then design their code in a robust and efficient manner. Developers must also understand how to optimize data retrieval in order to get maximum performance when connecting to large and complex data stores.

For data stores that do not support SQL, the Product provides an SQL parser and an execution engine. Developers can use these features to translate SQL queries to a custom API that the data store understands.

The Product, developed by experts in the field, is a complete implementation of the ODBC specification. It exposes an easy-to-use SDK that allows you to create a robust and efficient connector for your data store.

Build a Custom ODBC Connector in Five Days

Over the course of five days, this guide explains how to accomplish the following tasks:

1. Set up the development environment and build the sample connector.
2. Use the sample connector as a template to create a custom ODBC connector.
3. Make a connection to the data store.
4. Retrieve metadata.
5. Work with columns.
6. Retrieve data.
7. Rename and rebrand the custom ODBC connector.

In the QuickStart connector, the areas of code that require modification are marked with “TODO” messages and a short explanation. Some of these changes customize the connector for your specific data store, while other changes rename the connector for your company or product.

Audience

The guide is intended for developers who want to use the Product to build a connector for a data store that is not SQL-capable.

Document Conventions

Italics are used when referring to book and document titles.

Bold is used in procedures for graphical user interface elements that a user clicks and text that a user types.

Monospace font indicates commands, source code or contents of text files.

NOTE:

Indicates a short note appended to a paragraph.

**Important:**
Indicates an important comment related to the preceding paragraph.

Knowledge Prerequisites

To use the Product to build a custom ODBC connector, the following knowledge is helpful:

- Familiarity with the C# programming language.
- Ability to use the data store to which the connector you are developing will connect.
- An understanding of the role of ODBC technologies and driver managers in connecting to a data store.
- Exposure to SQL.

Variables Used in this Document

The following variables are used in this document:

Variable	Description
<code>[INSTALL_DIR]</code>	Installation directory for the Simba SDK Default value on Windows platforms: C:\Simba Technologies\SimbaEngineSDK\10.4 Default value on Linux, Unix, and macOS platforms: <code>[UNTAR_DIR]/SimbaEngineSDK/10.4</code>
<code>[PROJ_NAME]</code>	The name of your own sample project (which is also the name of your project directory).
<code>[DRIVER_NAME]</code>	The name of your own driver.
<code>[UNTAR_DIR]</code>	Directory where the Simba SDK distributable was untarred.

Introduction

This guide will show you how to create your own, custom ODBC driver using the SimbaEngine SDK. It will walk you through the steps to modify and customize the included DotNetQuickstart sample driver. At the end of five days, you will have a read-only driver that connects to your data store.

About the SimbaEngine SDK

The SimbaEngine SDK is a complete implementation of the ODBC 3.80 specification, which provides a standard interface to which any ODBC-enabled application can connect. ODBC is one of the most established and widely supported APIs for connecting to and working with databases. At the heart of the technology is the ODBC driver, which connects an application to the database. For more information about ODBC, see <http://www.simba.com/odbc.htm>. For complete information on the ODBC specification, see the MSDN ODBC Programmer's Reference, available from the Microsoft web site at [http://msdn.microsoft.com/en-us/library/ms714562\(VS.85\).aspx](http://msdn.microsoft.com/en-us/library/ms714562(VS.85).aspx)

The libraries of the SimbaEngine SDK hide the complexity of error checking, session management, data conversions and other low-level implementation details. They expose a simple API, called the Data Store Interface API or DSI API, which defines the operations needed to access a data store. Full documentation for the SimbaEngine SDK is available on the Simba website at <http://www.simba.com/odbc-sdk-documents.htm>.

You use the SimbaEngine SDK to create a file that will be accessed by common reporting applications and to access your data store when SimbaEngine executes an SQL statement. You create a custom-designed DSI implementation (DSII) that connects directly to your data source. Then, you create the executable by linking libraries from SimbaEngine SDK with the DSI implementation that you have written. In the process, the project files or make files will link in the appropriate SimbaODBC and SimbaEngine libraries to complete the driver. In the final executable, the components from SimbaEngine SDK take responsibility for meeting the data access standards while your custom DSI implementation takes responsibility for accessing your data store and translating it to the DSI API.

About the QuickStart sample driver

The QuickStart driver is a sample DSI implementation of an ODBC driver, written in C#, which reads files that are in tabbed Unicode text format.

The QuickStart driver helps you to prototype a DSI implementation for your own data store so you can learn how the Simba SDK works. You can also use it as the foundation for your commercial DSI implementation if you are careful to remove the shortcuts and simplifications that it contains. This is a fast and effective way to get a data access solution to your customers.

A typical design pattern for a DSI implementation is shown in the following UML diagram.

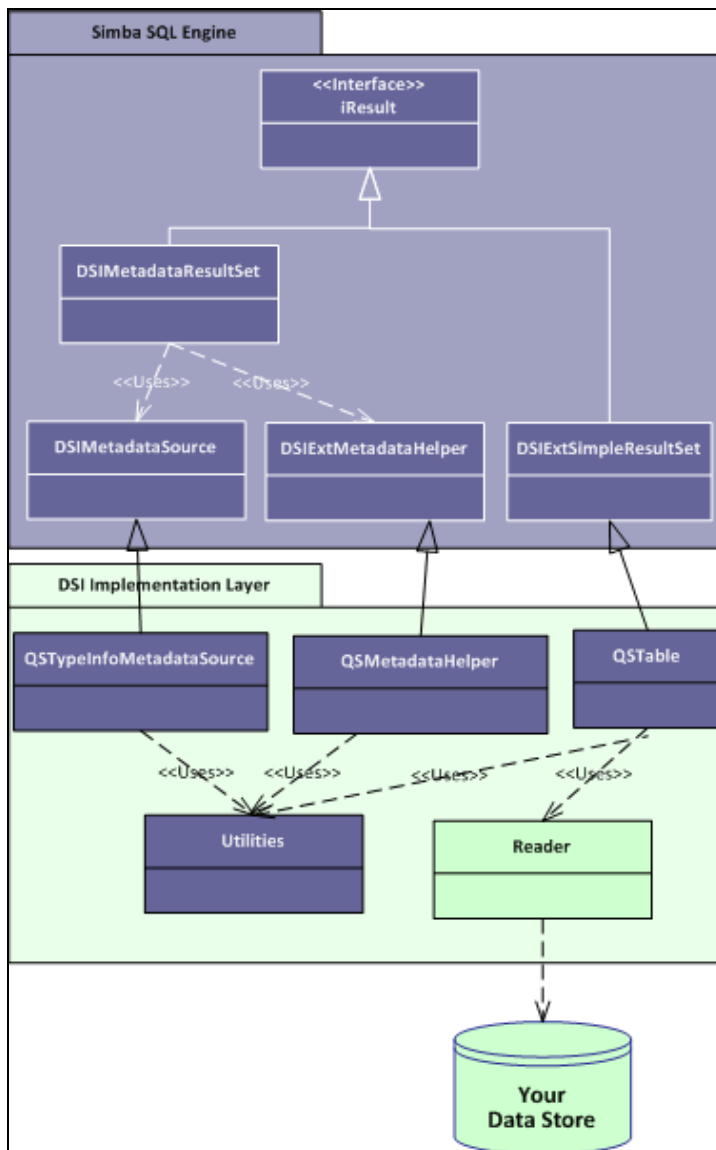


Figure 1: Design pattern for a DSI implementation.

There is a circular pattern of class relationships, headed by `IResult` and anchored by `QSUtilities`. The `IResult` class is responsible for retrieving column data and maintaining a cursor across result rows and the `QSUtilities` class contains a collection of utility functions that are used by the DSI.

To implement data retrieval, your `Reader` class interacts directly with your data store to retrieve the data and deliver it to the `QSTable` class on demand. The `Reader` class should take care of caching, buffering, paging, and all the other techniques that speed data access.

Overview

The series of steps to take to get a prototype DSI implementation working with your data store is as follows:

1. Set up the development environment
2. Make a connection to the data store
3. Retrieve metadata
4. Work with columns
5. Retrieve data

In the QuickStartdriver, the areas of the code that you need to change are marked with “TODO” messages along with a short explanatory message. Most of the areas of the code that you need to modify are for driver customization. These are tasks such as naming the driver, setting the properties that configure the driver, and naming the log files. The other areas of the code that you will modify are related to getting the data and metadata from your data store. Since the QuickStartdriver already has the classes and code to do this against the example data store, all you have to do is modify the existing code to make your driver work against your own data store.

Day One

Today's task is to set up the development environment and project files for your driver. By the end of the day, you will have compiled and tested your first ODBC driver.

Install the SimbaEngine SDK

NOTE: If you have a previous version of the SimbaEngine SDK installed, uninstall it before installing the new one.

1. If Visual Studio is running, close it.
2. Run the SimbaEngine SDK setup executable that corresponds to your version of Visual Studio and follow the installer's instructions.



Important:

IMPORTANT: The SimbaEngine SDK environment variables are defined only for the user that ran the installation. If you install the SDK as a regular user and then run Visual Studio as an administrator, the SDK will not work properly.

Build the QuickStart example driver

NOTE: Visual Studio 2013 is used for the examples, but Visual Studio 2015 is also supported.

1. Launch **Microsoft Visual Studio**.
2. Click **File > Open > Project/Solution**.
3. Navigate to
`[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Source\DotNetquickstart\Source`
and then open the `quickstart_Driver_vs2013.sln` file.
The default `[INSTALLDIR]` is `C:\Simba Technologies`.

The solution contains two projects: **Quickstart**, which is the C# driver implementation, and **QuickstartCLIDS**, which is the driver's native component (C++ CLI) and is the ODBC driver. Every .NET ODBC driver built using the Simba SDK will have these two components, one managed and one native. The native component (in this case QuickstartCLIDS) has only one function, to create an instance of the .NET driver object from the implementation.

4. Click **Build > Configuration Manager** and make sure that the active solution configuration is `Debug_MTDLL` and then click **Close**.
5. Click **Build > Build Solution** or press **F7** to build the driver.

Install the assembly into the Global Assembly Cache

Each time you build the DLL, it must be installed to the Global Assembly Cache (GAC) before it can be used. To run the Global Assembly Cache tool, use the Visual Studio Command Prompt. You must run this command as an administrator.

1. On the taskbar, click **Start > All Programs > Microsoft Visual Studio > Visual Studio Tools**.
2. Right-click **Visual Studio Command Prompt** and select **Run as administrator**.

NOTE: Visual Studio 2013 has different command prompts for different targets which are named accordingly (e.g. VS2013 x64 Cross Tools Command Prompt). Choose the command prompt which corresponds to your target.

3. Change to the directory that contains the DLL file. Enter a command using the following examples:

- For 32-bit drivers: `cd [INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Source\DotNetquickstart\Bin\Win32\Debug_MTDLL`
- Or for 64-bit drivers: `cd [INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Source\DotNetquickstart\Bin\x64\Debug_MTDLL`

4. Type the following command to install the assembly into the GAC:

```
gacutil.exe /i Simba.UltraLight.Driver.dll
```

```
gacutil.exe /i QuickstartConfigDialog.dll
```

You will see the message, **Assembly successfully added to the cache** if the operation was successful.

5. In addition to the DLL of your driver, `Simba.DotNetDSI.dll` and `Simba.DotNetDSIExt.dll` have to be installed in the GAC. These files were installed in the GAC during SDK installation. In order to check for these assemblies in the GAC run the following commands:

```
gacutil.exe /l Simba.DotNetDSI
```

```
gacutil.exe /l Simba.DotNetDSIExt
```

NOTE: If an assembly is already installed in the GAC, then it must be uninstalled from GAC before installing it again. To remove an assembly, run the following command (as administrator):

```
gacutil.exe /u <assembly_display_name>
```

Examine the registry keys added by the Simba SDK installer

The Simba SDK installer automatically added or updated the following registry keys that define Data Source Names (DSNs) and driver locations:

- **ODBC Data Sources** - lists each DSN/driver pair
- **QuickStartDSII** - defines the Data Source Name (DSN). Used by the ODBC Driver Manager to connect your driver to your database.
- **ODBC Drivers** - lists the drivers that are installed
- **QuickStartDSIIDriver** - defines the driver and its setup location. The ODBC Driver Manager uses this key.

To view the registry keys, do the following:

1. Run **regedit.exe**.
2. To view the registry keys that are related to Data Source Names, expand the folders in the Registry Editor to the following location:
 - For 32-bit drivers on 32-bit Windows and 64-bit drivers on 64-bit Windows: `HKEY_LOCAL_MACHINE\SOFTWARE\ODBC\ODBC.INI`
 - Or for 32-bit drivers on 64-bit Windows: `HKEY_LOCAL_MACHINE\SOFTWARE\WOW6432NODE\ODBC\ODBC.INI`
3. To view the registry keys that are related to ODBC drivers, expand the folders in the Registry Editor to the following location:
 - For 32-bit drivers on 32-bit Windows and 64-bit drivers on 64-bit Windows: `HKEY_LOCAL_MACHINE\SOFTWARE\ODBC\ODBCINST.INI`
 - Or for 32-bit drivers on 64-bit Windows: `HKEY_LOCAL_MACHINE\SOFTWARE\WOW6432NODE\ODBC\ODBCINST.INI`

Your custom driver installer will eventually have to create similar registry keys.

NOTE: Registry keys for 32-bit and 64-bit ODBC drivers are installed in different areas of the Windows registry. See [Windows Registry 32-Bit vs. 64-Bit](#).

View the data source in the ODBC Data Source Administrator

1. Run the Windows **ODBC Data Source Administrator**:

For 32-bit drivers on 32-bit Windows and 64-bit drivers on 64-bit Windows, click **Start > Control Panel > Administrative Tools > Data Sources (ODBC)**. If your Control Panel is set to view by category, then **Administrative Tools** is located under **System and Security**.

For 32-bit drivers on 64-bit Windows (other than Windows 8), you must use the 32-bit ODBC Data Source Administrator. You cannot access the 32-bit ODBC Data Source Administrator from the start menu or control panel on 64-bit Windows. Only the 64-bit ODBC Data Source Administrator is accessible from the start menu or control panel. On 64-bit Windows, to launch the 32-bit ODBC Data Source Administrator you must run **%WINDIR%\SysWOW64\odbcad32.exe**. See [32-Bit Drivers on 64-Bit Windows](#).

2. In the ODBC Data Source Administrator, click the **System DSN** tab.
3. Scroll through the list of System Data Sources, select **DotNetUltraLightDSII** and then click **Configure**.

The Data Source Configuration window opens and displays the data source name, description and the data directory.

4. Now that you have looked at the configuration information for the driver, click **Cancel** to close the Data Source Configuration window.

Test the data source

To test the data source that we have created, you can use any ODBC application, such as, for example, Microsoft Excel, Microsoft Access or ODBCTest. In this section, we will use the ODBC Test tool, which is available in the Microsoft Data Access (MDAC) 2.8 Software Development Kit (SDK). To download the SDK, visit the following Microsoft Web site:

<http://www.microsoft.com/downloads/details.aspx?FamilyID=5067faf8-0db4-429a-b502-de4329c8c850&displaylang=en>

1. Start the **ODBC Test tool**. By default, the ODBC Test application is installed in the following folder:
C:\Program Files (x86)\Microsoft Data Access SDK 2.8\Tools\
 - To launch the ANSI version click **odbcte32.exe**, or
 - Or to launch the Unicode version, click **odbct32w.exe**.
2. Navigate to the folder that corresponds to your driver's architecture (amd64, ia64 or x86).
3. Choose one of the following:

NOTE: It is important to run the correct version of the ODBC Test tool for ANSI or Unicode and 32-bit or 64-bit.

4. In the ODBC Test tool, select **Conn > Full Connect**.
The Full Connect window opens.
5. Select the **QuickStartDSII Data Source** from the list of data sources and then click **OK**.
If you do not see your data source in the list, make sure that you are running the version of the ODBC Test tool that corresponds to the version of the data source that you created. In other words, if you created a 32-bit data source then you should be using the 32-bit version of the ODBC Test tool.
6. When the tool connects to the data source, you will see the message, **Successfully connected to DSN 'DotNetquickstartDSII'**.

Set up a new project to build your own ODBC driver

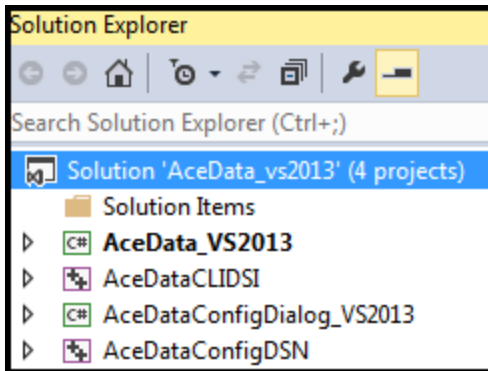
Now that you have built the example driver, you are ready to set up a development project to build your own ODBC driver.

NOTE: It is very important that you create your own project directory. You might be tempted to just modify the sample project files but we strongly recommend against this, because when you install a new release of the SDK, changes you make will be lost and there may be times, for debugging purposes, that you will need to see if the same error occurs using the sample drivers. If you have modified the sample drivers, this will not be possible.

To rename the project:

1. In your Windows Explorer window, copy the `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Source\DotNetquickstart` directory and paste it to the same location. This will create a new directory called DotNetUltraLight - Copy. Rename the directory to something that is meaningful to you. This will be the top-level directory for your new project and DSI implementation files. For the rest of this tutorial, when you see **<YourProjectName>** in the instructions, replace this with the name you choose for this directory which is also the name of your project.
2. Open the Source directory and then right-click the **quickstart_Driver_vs2013.sln** file.
3. Select **Open with > Microsoft Visual Studio Version Selector**.
4. In the **Microsoft Visual Studio** menu, click **View > Solution Explorer**.
5. Using the **Solution Explorer**, rename the following items:
 - Rename the **DotNetQuickstart_Driver_vs2013** solution to **<YourProjectName>_Driver_VS2013**.
 - Rename the **C# project quickstart_Driver_vs2013** to **<YourProjectName>_Driver_VS2013**.
 - Rename **quickstartCLIDSI** to **<YourProjectName>CLIDSI**.
 - Rename **QuickstartConfigDialog_VS2013** to **<YourProjectName>ConfigDialog_VS2013**.
 - Rename **QuickstartConfigDSN** to **<YourProjectName>ConfigDSN**.

For example, if your project name was AceData, your solution might look like this:



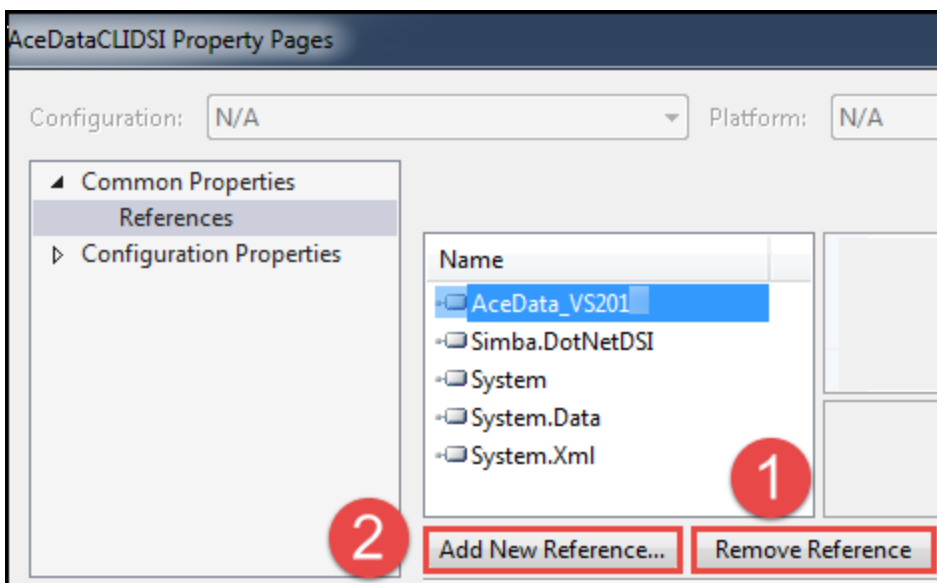
6. Right click on **<YourProjectName>_Driver_VS2013** and select properties.
7. In the Assembly name text box, replace **DotNetQuickstartDSII** with **<YourProjectName>DSII**.
8. Click **File > Save All**.

Your project is renamed, but you still need to update the namespaces.

To update the namespaces:

To update the namespaces you must remove and re-add the references, because the references are not automatically updated when the projects are renamed.

1. Right click on **<YourProjectName>_CLIDSI** and select **Properties**.
2. Select **Common Properties > References**, select **<YourProjectName>_Driver_VS2013**, then select **Remove Reference**.
3. Select **Add New Reference**, select the reference you just removed, (**<YourProjectName>_Driver_VS2013**), and select **OK**. For example, if your project was named **AceData**, you would do the following steps:



4. Select **OK** to return to the Solution Explorer.

5. For the **<YourProjectName>ConfigDSN** project, repeat the above procedure to remove and re-add the reference to the **<YourProjectName>ConfigDialog_VS2013** project.
6. Click **File > Save All**.

You can now rebuild your renamed project.

Build your new driver

1. Click **Build > Configuration Manager** and make sure that the active solution configuration is `Debug_MTDLL` and then click **Close**.
2. Click **Build > Build Solution** or press **F7** to build the driver.

Update the Global Assembly Cache

Each time you build the DLL, it must be installed to the Global Assembly Cache (GAC).

1. On the taskbar, click **Start > All Programs > Microsoft Visual Studio > Visual Studio Tools**.
2. Right-click **Visual Studio Command Prompt** and select **Run as administrator**.

NOTE: Visual Studio 2013 has different command prompts for different targets which are named accordingly (e.g. VS2013 x64 Cross Tools Command Prompt). Choose the command prompt which corresponds to your target.

3. Change to the directory that contains the DLL file. Type a command using one of the following examples:
 - For 32-bit drivers: `cd [INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Source\<YourProjectName>\Bin\Win32\Debug_MTDLL`
 - Or for 64-bit drivers: `cd [INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Source\<YourProjectName>\Bin\x64\Debug_MTDLL`
4. Type the following commands to install the assemblies into the GAC:

```
gacutil.exe /i <YourProjectName>.Driver.dll
```

```
gacutil.exe /i <YourProjectName>ConfigDialog.dll
```

NOTE: If you have renamed this DLL, you need to reinstall it.

You will see the message, Assembly successfully added to the cache if the operation was successful.

NOTE: If your driver is already installed in the GAC, then it must be uninstalled from GAC before installing it again. Run the following command (as administrator):

```
gacutil.exe /u <YourProjectName>DSII
```

Update the registry

To update the registry keys, do the following:

1. In Microsoft Visual Studio, click **File > Open > File** and navigate to
`[INSTALLDIR]\SimbaEngineSDK\10.4`
`\Examples\Source\<YourProjectName>\Source.`
2. Choose one of the following:
 - For 32-bit Windows, open **SetupMyDotNetUltraLightDSII_32on32.reg**.
 - For a 32-bit ODBC driver on 64-bit Windows, open **SetupMyDotNetUltraLightDSII_32on64.reg**.
 - For a 64-bit ODBC driver on 64-bit Windows, open **SetupMyDotNetUltraLightDSII_64on64.reg**.
3. In the file, replace [INSTALLDIR] with the path to the installation directory. In the path, you must enter double backslashes. For example, by default, the samples are installed to `C:\SimbaTechnologies` so in that case, you would replace all instances of [INSTALLDIR] with `C:\\SimbaTechnologies`.
4. Update the ODBC Data Sources section to add your new data source. Under the [HKEY_LOCAL_MACHINE\...\ODBC Data Sources] section, change
"MyDotNetquickstartDSII"="MyDotNetquickstartDSIIDriver" to the name of your new data source and new driver. For example, **"<YourProjectName>DSII"="<YourProjectName>DSIIDriver"**
5. Modify the data source definition for that data source. Change the line that says [HKEY_LOCAL_MACHINE\...\ODBC.INI\MyDotNetquickstarttDSII] so that it contains your new data source name. For example, [HKEY_LOCAL_MACHINE\...\ODBC.INI\<YourProjectName>DSII]
6. Beside the line that starts with **"Driver"**= enter the path to the driver dll file.
7. Update the ODBC Drivers section to add your new driver. Under the [HKEY_LOCAL_MACHINE\...\ODBCINST.INI\ODBC Drivers] section, change
"MyDotNetquickstartDSIIDriver"="Installed" to match the name of your new driver. For example, **"<YourProjectName>DSIIDriver"="Installed"**
8. Modify the driver definition for that driver. Change the line that says [HKEY_LOCAL_MACHINE\...\ODBCINST.INI\MyDotNetquickstartDSIIDriver] so that it contains your new driver name. For example, [HKEY_LOCAL_MACHINE\...\ODBCINST.INI\<YourProjectName>DSIIDriver]
9. Beside the line that starts with **Driver**, update the path to the DLL file.
10. Click **Edit > Find and Replace > Quick Replace**. Then, replace **DotNetquickstart** in the whole file with the name of your new ODBC driver.
11. Click **Save** and then close the file.
12. In the **Registry Editor (regedit.exe)**, click **File > Import**, navigate to the registry file that you just modified and then click **Open**.
 A message is displayed that says that the keys and values have been successfully added to the registry.

View your new data source in the ODBC Data Source Administrator

1. Run the Windows **ODBC Data Source Administrator**.

For 32-bit drivers on 32-bit Windows and 64-bit drivers on 64-bit Windows, click **Control Panel > Administrative Tools > Data Sources (ODBC)**. If your **Control Panel** is set to view by category, then **Administrative Tools** is located under **System and Security**.

For 32-bit drivers on 64-bit Windows (other than Windows 8), you must use the 32-bit ODBC Data Source Administrator. You cannot access the 32-bit ODBC Data Source Administrator from the start menu or control panel on 64-bit Windows. Only the 64-bit ODBC Data Source Administrator is accessible from the start menu or control panel. On 64-bit Windows, to launch the 32-bit ODBC Data Source Administrator you must run %WINDIR%\SysWOW64\odbcad32.exe. See [32-Bit Drivers on 32-Bit Windows](#).

2. In the ODBC Data Source Administrator, click the **System DSN** tab.
3. Scroll through the list of System Data Sources, select **<YourProjectName>DSII** and then click **Configure**.

The Data Source Configuration window opens and displays the data source name, description and the data directory.

4. Now that you have located your new driver, click **Cancel** to close the Data Source Configuration window.

Test your new data source

1. Start the ODBC Test tool. By default, the ODBC Test application is installed in the following folder:
`C:\Program Files (x86)\Microsoft Data Access SDK 2.8\Tools\`
2. Navigate to the folder that corresponds to your driver's architecture (amd64, ia64 or x86) and then click **odbcte32.exe** to launch the ANSI version or click **odbct32w.exe** to launch the Unicode version. It is important to run the correct version of the ODBC Test tool for ANSI or Unicode and 32-bit or 64-bit.
3. Attach **Visual Studio** to the **ODBC Test** process. To do this, go to **Microsoft Visual Studio** and then click **Debug > Attach to Process**
4. In the Attach to Process window, verify that the **Attach to** field is set to **Managed Code**. In the list of available processes, select the **ODBC Test** process and then click **Attach**. The process name will be either **odbct32.exe** or **odbct32w.exe**.
5. Add a breakpoint on the **ULConnection.cs** constructor. This code runs as soon as the **Driver Manager** loads the ODBC driver.
6. In the **ODBC Test** tool, select **Conn > Full Connect**.
The **Full Connect** window opens.
7. Select your **Data Source** from the list of data sources and then click **OK**.
If you do not see your data source in the list, make sure that you are running the version of the **ODBC Test** tool that corresponds to the version of the data source that you created. In other words, if you created a 32-bit data source then you should be using the 32-bit version of the **ODBC Test** tool.
8. You should hit the breakpoint you created and focus should switch to **Visual Studio**.
9. To continue running the program, select **Debug > Continue**.
The focus returns to the **ODBC Test** window.

Day Two

Today's goal is to customize your driver, enable logging and establish a connection to your data store. Several "TODO" comments appear in the source code. They instruct you how to modify the sample driver.

View the list of TODO messages

1. Go to **Microsoft Visual Studio** and then click **Edit > Find and Replace > Find in Files**.
2. In the **Find and Replace** window, in the Find what text box, type **TODO** and then click **Find All**. The results are displayed in the **Find Results** output window.
3. Double-click the entry in the **Find Results** window to jump to that line in the code. The list of TODO messages is as follows:
 - TODO #1: Construct driver singleton (quickstartCLIDS1.cpp).
 - TODO #2: Set the driver properties (QSDriver.cs).
 - TODO #3: Check connection settings (QSConnection.cs).
 - TODO #4: Establish a connection (QSConnection.cs).
 - TODO #5: Create and return your Metadata Sources (QSDataEngine.cs).
 - TODO#6: Create and return your Metadata Helper (QSDataEngine.cs).
 - TODO #7: Open A Table. (QSDataEngine.cs).
 - TODO#8: Set the vendor name, which will be prepended to error messages. (QSDriver.cs).

Construct a driver singleton

TODO #1: Construct driver singleton

The `LoadDriver()` implementation in `quickstartCLIDSI.cpp` in the `quickstartCLIDSI` project is the main hook that is called from Simba's ODBC layer to create an instance of your DSI implementation. Note that the `UltraLightCLIDSI` library is a C++ CLI library and is therefore able to construct an instance of a managed class. This method is called as soon as the Driver Manager calls `LoadLibrary()` on your ODBC driver.

1. In Microsoft Visual Studio, open the file that contains the TODO #1 message.
2. Look at the `LoadDriver()` implementation and replace Simba with your company name and change `QuickStart` to the name of your driver in the following line:

```
SimbaSettingReader.SetConfigurationBranding("Simba\\DotNetquickstart");
```

`SetConfigurationBranding()` changes the registry location that will be used when reading driver settings from the registry. By default, it looks in `HKLM\SOFTWARE[\Wow6432Node]\Simba\Driver` for a driver, where the `Wow6432Node` section is used for a 32-bit driver on a 64-bit windows machine. When you change the branding by using a string such as `Company\Driver`, then it will look in `HKLM\SOFTWARE[\Wow6432Node]\Company\Driver`. This is where the `ErrorMessagePath` and other required registry settings will be placed.

3. If the driver is running as a server (`SERVERTARGET` is defined) then you can update the service name from `SimbaDotNetquickstartService` to the name of your new service.
4. You may want to add processing at this point if you are building a commercial driver.
5. Click **Save**.

Set the driver properties

TODO #2: Set the driver properties

1. Double click the TODO #2 message to jump to the relevant section of code.
The `QSDriver.cs` file opens. Look at `SetDriverPropertyValues()` where you will set up the general properties for your driver. The available driver properties are defined in the `DriverPropertyKey` enum.
2. Change the `DSI_DRIVER_DRIVER_NAME` setting. Set this to the name of your driver.

NOTE: You may want to revisit this section when fully productizing your driver.

Check the connection settings

TODO #3: Check Connection Settings

When the Simba ODBC layer is given a connection string from an ODBC-enabled application, the Simba ODBC layer parses the connection string into key-value pairs. Then, the entries in the connection string and the DSN are sent to the `QSCConnection.UpdateConnectionSettings()` method which is responsible for verifying that all of the required, and any optional, connection settings are present.

The entries from the DSN are only included if a DSN is specified in the connection string instead of a Driver or if the ODBC connection method explicitly uses the DSN.

1. Double click the **TODO #3** message to jump to the relevant section of code.
2. The `UpdateConnectionSettings()` method should validate that the key-value pairs in `requestSettings` are sufficient to create a connection. Use the `VerifyRequiredSetting()` or `VerifyOptionalSetting()` utility methods to do this.

For example, the driver verifies that the entries within `requestSettings` are sufficient to create a connection, by using the following code:

```
VerifyRequiredSetting(DBF_KEY, requestSettings, responseSettings);
```

The example driver requires a single connection key, called “DBF_KEY”, which represents the file location to be searched. It is used to look up the DBF path in the connection string.

If the entries within `requestSettings` are not sufficient to create a connection, then you can ask for additional information from the ODBC-enabled application by specifying, in the `responseSettings` return value, the additional information required.

Use the DriverPrompt Dialog to get settings

Depending on how the connection was initiated by the application, the SDK may call `QSConnection.PromptDialog()` to allow the user to specify more information. In general, if there are any required settings present in `responseSettings`, then `PromptDialog()` will be called. Note that, if the application requests, `PromptDialog()` may not be called in this case or may be called even if there are no settings in `responseSettings`.

`QSConnection.PromptDialog()` displays a configuration dialog box which is displayed by the **Windows ODBC Data Source Administrator** when configuring the driver.

The method takes in the following:

- **connResponseMap**: a connection response map which can be populated with settings which haven't been entered by the user. This is then used by the driver to notify the user that information is missing. Currently this variable is unused in the sample.
- **connectionSettings**: a connection settings map which is populated by the dialog with settings entered by the user.
- **parentWindow**: the handle to the parent Window to make the prompt window a child of.
- **promptType**: an enum specifying if only required fields are to be available, or if optional fields should be available as well.

The dialog and the related code in this method can be modified to take in different parameters as required by your driver.

Establish a connection

TODO #4: Establish A Connection

Once `QSCConnection.UpdateConnectionSettings()` returns a `Dictionary<string, ConnectionSetting>` object without any required settings (if there are only optional settings, a connection can still occur), the Simba ODBC layer will call `QSCConnection.Connect()` passing in all the connection settings received from the application.

1. Double click the **TODO #4** message to jump to the relevant section of code.
2. Modify the code to authenticate the user against your data store using the information provided within the `requestSettings` parameter. The sample code uses the utility method `GetRequiredSetting()` to retrieve the appropriate settings. `GetRequiredSetting()` fetches a required setting from the passed in settings, and will throw an authorization exception if the setting is not present. Another method that can be used is `GetOptionalSetting()` will fetch an optional setting from the passed in settings and will not throw an exception if the setting is not present. These can be used to fetch the settings passed in to create a full connection to the underlying data-source.

You have now authenticated the user against your data store.

Day Three

Today's goal is to return the data used to pass catalog information back to the ODBC-enabled application. Almost all ODBC-enabled applications require at least the following ODBC catalog functions:

- SQLGetTypeInfo
- SQLTables (CATALOG_ONLY)
- SQLTables (TABLE_TYPE_ONLY)
- SQLTables
- SQLColumns

These catalog functions are represented in the DSI by metadata sources, one for each of the catalog functions.

Create and return metadata sources

TODO #5: Create and return your Metadata Sources.

QSDatabase::MakeNewMetadataSource() is responsible for creating the sources to be used to return data to the ODBC-enabled application for the various ODBC catalog functions. Each ODBC catalog function is mapped to a unique DSIMetadataTableId, which is then mapped to an underlying MetadataSource that you will implement and return. Each MetadataSource instance is responsible for the following:

- Creating a data structure that holds the data relevant for your data store: Constructor
- Navigating the structure on a row-by-row basis: Move()
- Retrieving data: GetData() (See the section, [Data Retrieval](#), for a brief overview of data retrieval).

Handle DSI_TYPE_INFO_METADATA

The underlying ODBC catalog function SQLGetTypeInfo is handled as follows:

1. When called with DSI_TYPE_INFO_METADATA, QSDatabase::MakeNewMetadataSource() will return an instance of QSTypeInfoMetadataSource().
2. The example driver exposes support for all data types, but due to its underlying file format, it is constrained to support only the following types:

SQL_BIGINT	SQL_BIT	SQL_CHAR
SQL_DECIMAL	SQL_DOUBLE	SQL_INTEGER
SQL_LONGVARCHAR	SQL_LONGWVARCHAR	SQL_NUMERIC
SQL_REAL	SQL_SMALLINT	SQL_TINYINT
SQL_TYPE_DATE	SQL_TYPE_TIME	SQL_TYPE_TIMESTAMP
SQL_VARCHAR	SQL_WCHAR	SQL_WVARCHAR

3. For your driver, you may need to change the types returned and the parameters for the types in QSTypeInfoMetadataSource::InitializeDataTypes(). You change the passed in SqlTypeInfo object to modify the parameters of the types that are supported.

Handle the other MetadataSources

TODO #6: Create and return your Metadata Helper.

The other ODBC catalog functions (including SQLTables (CATALOG_ONLY), SQLTables (TABLE_TYPE_ONLY), SQLTables (SCHEMA_ONLY), SQLTables and SQLColumns) are handled automatically by the metadata helper class, as follows:

1. When called with any other DSIMetadataTableId, QSDatabase::MakeNewMetadataSource() should return null. Returning null will signal Simba SDK that it should use the metadata helper class returned via QSDatabase::CreateMetadataHelper() along with some default MetadataSources to create the data source metadata. You can also choose to return a DSIMetadataSource if you do not want to use the metadata helper.

2. You will need to change:

- `QSMetadataHelper::QSMetadataHelper()`
The example constructor retrieves a list of the tables in the data source. You should modify this method to load the tables defined within your data store.
- `QSMetadataHelper::GetNextTable()`
In the SimbaEngine DotNetQuickstart Driver, this method returns the next table in the data source. You should modify this method to retrieve the next table from your data store.
- The `DSIExtMetadataHelper` class works by retrieving the identifying information for each table and then opening the table via `QSDataEngine::OpenTable()`. Once you have implemented `QSTable` (which you will do in the next section), the correct metadata will be returned for all of the tables and columns in your data source.

You can now retrieve type metadata from within your data store.

Day Four

Today's goal is to enable data retrieval from within the driver. We will cover the process of opening a table defined within your data store, retrieving the column information for the table, and finally retrieving data.

Open a table

TODO #7: Open A Table

1. Modify the `QSDatabase::OpenTable()` method to check that the supplied catalog, schema and table names are valid and correspond to a table defined in your data store. If they are not, you should return null to indicate that the table does not exist. If the inputs are valid, a new instance of `QSTable` is returned.

`QSDatabase::OpenTable()` is the entry point where Simba SQL Engine requests that tables involved in the query be opened.

`QSTable` is an implementation of `DSIExtSimpleResultSet`, an abstract class provided by Simba that provides for basic forward-only result set traversal. The main role of `QSTable` is to translate the stored data from your native data format into SQL Data types.

The DotNetQuickstart Driver has been implemented for Tabbed Unicode Files. It translates the text from UTF16-LE strings into the SQL Data types defined for each column.

2. Make the following changes to `QSTable` for it to work with your data store:

- Return the catalog, schema and table names for your table
- `QSTable::QSTable()`: The constructor must be modified to take in the catalog, schema and table names and save them in member variables.
- `QSTable::CatalogName (Property)`: Returns `Quickstart.CATALOG`;
- `QSTable::SchemaName (Property)`: Returns null (because it does not support schemas);
- `QSTable::TableName (Property)`: Returns `m_Name`;
- Return the columns defined for your table
- `QSTable::InitializeColumns()`: This method must be modified so that, for each column defined in the table, you define a `DSIColumn` in terms of SQL types.

Here is an example of pseudo code for the new method:

```
private IList<IColumn> m_Columns = new List<IColumn>();
```

Get all column information from your data store for the table

For Each Defined Column

```
{
    // Change the first parameter of this method to the SQL
```

```
// type that maps to your data store type.
TypeMetadata typeMetadata = TypeMetadata.CreateTypeMetadata
(SqlType sqlType);
DSIColumn column = new DSIColumn(typeMetadata, name, TableName,
SchemaName, CatalogName);
m_Columns.Add(column);
}
```

■ Data Retrieval

- `QSTable::MoveToBeforeFirstRow()`
- `QSTable::MoveToNextRow()`
- `TabbedUnicodeFileReader::GetData()`

These three methods are responsible for navigating a data structure containing information about one table in your data store, and retrieving data from that table.

It is best to implement a class that provides a streaming interface for the data in the table within your data store. It should also provide the ability to navigate forward from one table row to the next. The class should be able to navigate across columns within the row and to read the data associated with the current row and column combination.

In the DotNetQuickstart Driver, `QSTable` uses a `TabbedFileReader`, which provides an interface to navigate between lines within a Unicode text file. This class preprocesses each row in the file to determine the starting file offset of each column in the row. Its `GetData` method takes a `columnIndex` and uses it to calculate the exact position in the file where the column's data resides. The method repositions the file and retrieves the data as if from a byte-buffer. See Appendix C: [Data Retrieval](#), for a brief overview of data retrieval.

- `QSTable::DoCloseCursor()`

This is a callback method called from Simba SQL Engine to indicate that data retrieval has completed and that you may now do any tasks related to closing the resources associated with the data retrieval.

You can now retrieve data and see the rest of the metadata from your data store. You should be able to run `SQLTables()` and `SQLColumns()` from within `ODBCTest32.exe` (Unicode) and see the correct metadata returned. You also should be able to execute queries from any ODBC-enabled application such as Microsoft Excel, Microsoft Access, Microsoft SQL Server or Crystal Reports and see the results returned from your data store.

Day Five

Today's goal is to start productizing your driver.

Configure error messages

All the error messages used within your DSI implementation are stored in the resource file called `Resource.resx`.

1. Open the `Resource.resx` file. It is located within the **Properties** folder in **Solution Explorer**.
2. Update the error messages. Then save and close the file.

Set the vendor name

TODO #8: Set the vendor name, which will be prepended to error messages.

The vendor name is prepended to all error messages that are visible to applications. The default vendor name is Simba. To set the vendor name:

1. Double click the **TODO #8** message to jump to the relevant section of code.
2. Set the vendor name as shown in the commented code.

Finishing Touches

Create a driver configuration dialog

The driver configuration dialog is displayed to the user when they use the ODBC Data Source Administrator to create a new ODBC DSN or configure an existing one. The project contains an example ODBC configuration dialog.

If you create your own configuration dialog, then the Setup key in the driver registry entry under `odbcinst.ini` needs to point to the binary containing the dialog and you need to put the C# assembly into the GAC.

To see the driver configuration dialog that you created, run the ODBC Data Source Administrator. **Control Panel > Administrative Tools > Data Sources (ODBC)**. If your Control Panel is set to view by category, then **Administrative Tools** is located under **System and Security**.

**Important:**

IMPORTANT: If you are using 64-bit Windows with 32-bit applications, you must use the 32-bit ODBC Data Source Administrator. You cannot access the 32-bit ODBC Data Source Administrator from the start menu or control panel in 64-bit Windows (other than on Windows 8). Only the 64-bit ODBC Data Source Administrator is accessible from the start menu or control panel. On 64-bit Windows, to launch the 32-bit ODBC Data Source Administrator you must run `%WINDIR%\SysWOW64\odbcad32.exe`. See [ODBC Data Source Administrator on Windows 32-Bit vs. 64-Bit](#) for details.

You are now done with all of the TODO's in the project. You have created your own, custom ODBC driver using the Simba SDK by modifying and customizing the DotNetQuickstart sample driver. Now, you have a read-only driver that connects to your data store.

ODBC Data Source Administrator on Windows 32-Bit vs. 64-Bit

On a 64-bit Windows system, you can execute 64-bit and 32-bit applications transparently. Microsoft Excel 2010 is one of the few applications to be available in both 64-bit and 32-bit versions, so it is highly likely that you will encounter 32-bit applications running on 64-bit systems.

It is important to understand that 64-bit applications can only load 64-bit drivers and 32-bit applications can only load 32-bit drivers. In a single running process, all of the code must be either 64-bit or 32-bit.

On a 64-bit Windows system, the ODBC Data Source Administrator that you access through the Control Panel can only be used to configure data sources for 64-bit applications. However, the 32-bit version of the ODBC Data Source Administrator must be used to configure data sources for 32-bit applications. This is the source of many confusing problems where what appears to be a perfectly configured ODBC DSN does not work because it is loading the wrong kind of driver.

To create new or modify existing 32-bit data sources on 64-bit Windows you must run `C:\WINDOWS\SysWOW64\odbcad32.exe` (you may find it useful to put a shortcut to this on your desktop or Start menu if you access it frequently).

Because of this, it is very important, when using 64-bit Windows, that you configure 32-bit and 64-bit drivers using the correct version of the ODBC Data Source Administrator for each.

Windows Registry 32-Bit vs. 64-Bit

As noted previously, the 32-bit and 64-bit drivers must remain clearly separated because they must match the architecture of the applications that are using them. The 32-bit and 64-bit ODBC drivers are installed and data source names are created in different areas of the registry.

32-Bit Drivers on 32-Bit Windows

The Data Source Names and Driver Locations that are relevant to the C# examples for this document are detailed below.

Data Source Names

To connect your driver to your database, the 32-bit ODBC Driver Manager on 32-bit Windows uses Data Source Name registry keys in `HKEY_LOCAL_MACHINE/SOFTWARE/ODBC/ODBC.INI`. The default `[INSTALLEDIR]` is `C:\Simba Technologies`.

The keys that are relevant to the C# examples discussed in this document are:

- DotNetQuickstartDSII which includes the following key names and values:
 - **Driver:** `[INSTALLEDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\Win32\Release_MTDLL\QuickstartCLIDSI_MTDLL.dll`
 - **DBF:** `[INSTALLEDIR]\SimbaEngineSDK\10.4\Examples\Databases\Quickstart`
 - **Description:** Sample 32-bit SimbaEngine DotNetQuickstart DSII
- DotNetUltraLightDSII which includes the following key names and values:
 - **Driver:** `[INSTALLEDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\Win32\Release_MTDLL\UltraLightCLIDSI_MTDLL.dll`
 - **Description:** Sample 32-bit SimbaEngine DotNetUltraLight DSII

There is another registry key at the same location called ODBC Data Sources. String values that correspond to each DSN/driver pair must also be added to it:

- ODBC Data Sources which includes the following key names and values:
 - **DotNetQuickstartDSII:** `DotNetQuickstartDSIIDriver`
 - **DotNetUltraLightDSII:** `DotNetUltraLightDSIIDriver`

Driver Locations

To define each driver and its setup location, the 32-bit ODBC Driver Manager on 32-bit Windows uses registry keys created in `HKEY_LOCAL_MACHINE/SOFTWARE/ODBC/ODBCINST.INI`. Each key includes three string values to define the location of the **Driver**, its **Setup** location and the **Description** to help you clearly identify each registry key. The keys that are relevant to the C# examples discussed in this document are:

- DotNetQuickstartDSIIDriver which includes the following key names and values:
 - **Driver:**
`[INSTALLEDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\Win32\Release_MTDLL\QuickstartCLIDSI_MTDLL.dll`

- **Setup:**
`[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\Win32\Release_MTDLL\QuickstartCLIDSI_MTDLL.dll`
- **Description:** Sample 32-bit SimbaEngine DotNetQuickstart DSII
 - DotNetUltraLightDSIIDriver which includes the following key names and values:
- **Driver:**
`[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\Win32\Release_MTDLL\UltraLightCLIDSI_MTDLL.dll`
- **Description:** Sample 32-bit SimbaEngine DotNetUltraLight DSII

There is another registry key at the same location called ODBC Drivers, indicating which drivers are installed. String values that correspond to each driver must also be added to it:

- ODBC Drivers which includes the following key names and values:
- DotNetQuickstartDSIIDriver: Installed
- DotNetUltraLightDSIIDriver: Installed

32-Bit Drivers on 64-Bit Windows

The 32-bit applications and drivers use a section of the registry that is separate from the 64-bit applications and drivers. Note that from the point of view of a 32-bit application on a 64-bit machine, 32-bit data sources look exactly like they do on a 32-bit machine.

Data Source Names

To connect your driver to your database, the 32-bit ODBC Driver Manager on 64-bit Windows uses Data Source Name registry keys in HKEY_LOCAL_MACHINE/SOFTWARE/WOW6432NODE/ODBC/ODBC.INI. The keys that are relevant to the C# examples discussed in this document are:

- DotNetQuickstartDSII which includes the following key names and values:
 - Driver: `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\Win32\Release_MTDLL\QuickstartCLIDSI_MTDLL.dll`
 - DBF: `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Databases\Quickstart`
 - Description: Sample 32-bit SimbaEngine DotNetQuickstart DSII
- DotNetUltraLightDSII which includes the following key names and values:
 - Driver: `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\Win32\Release_MTDLL\UltraLightCLIDSI_MTDLL.dll`
 - Description: Sample 32-bit SimbaEngine DotNetUltraLight DSII

There is another registry key at the same location called ODBC Data Sources. String values that correspond to each DSN/driver pair must also be added to it:

- ODBC Data Sources which includes the following key names and values:
 - DotNetQuickstartDSII: DotNetQuickstartDSIIDriver
 - DotNetUltraLightDSII: DotNetUltraLightDSIIDriver

Driver Locations

To define each driver and its setup location, the 32-bit ODBC Driver Manager on 64-bit Windows uses registry keys created in HKEY_LOCAL_MACHINE/SOFTWARE/WOW6432NODE/ODBC/ODBCINST.INI. Each key includes three string values to define the location of the Driver, its Setup location and the Description to help you clearly identify each registry key. The keys that are relevant to the C# examples discussed in this document are:

- DotNetQuickstartDSIIDriver which includes the following key names and values:
 - Driver: `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\win32\Release_MTDLL\QuickstartCLIDSI_MTDLL.dll`

- **Setup:** `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\win32\Release_MTDLL\QuickstartCLIDSI_MTDLL.dll`
- **Description:** Sample 32-bit SimbaEngine DotNetQuickstart DSII
 - DotNetUltraLightDSIIDriver which includes the following key names and values:
- **Driver:** `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\Win32\Release_MTDLL\UltraLightCLIDSI_MTDLL.dll`
- **Description:** Sample 32-bit SimbaEngine DotNetUltraLight DSII

There is another registry key at the same location called ODBC Drivers, indicating which drivers are installed. String values that correspond to each driver must also be added to it:

- ODBC Drivers which includes the following key names and values:
- DotNetQuickstartDSIIDriver: Installed
- DotNetUltraLightDSIIDriver: Installed

64-Bit Drivers on 64-Bit Windows

The Data Source Names and Driver Locations that are relevant to the C# examples for this document are detailed below.

Data Source Names

To connect your driver to your database, the 64-bit ODBC Driver Manager on 64-bit Windows uses Data Source Name registry keys in `HKEY_LOCAL_MACHINE\SOFTWARE\ODBC\ODBC.INI`. The keys that are relevant to the examples discussed in this document are:

- **DotNetQuickstartDSII** which includes the following key names and values:
 - **Driver:** `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\x64\Release_MTDLL\QuickstartCLIDSI_Release_MTDLL.dll`
 - **DBF:** `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Databases\Quickstart`
 - **Description:** Sample 64-bit SimbaEngine DotNetQuickstart DSII
- **DotNetUltraLightDSII** which includes the following key names and values:
 - **Driver:** `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\x64\Release_MTDLL\UltraLightCLIDSI_Release_MTDLL.dll`
 - **Description:** Sample 64-bit SimbaEngine DotNetUltraLight DSII

There is another registry key at the same location called ODBC Data Sources. String values that correspond to each DSN/driver pair must also be added to it:

- **ODBC Data Sources** which includes the following key names and values:
 - **DotNetQuickstartDSII:** `DotNetQuickstartDSIIDriver`
 - **DotNetUltraLightDSII:** `DotNetUltraLightDSIIDriver`

Driver Locations

To define each driver and its setup location, the 64-bit ODBC Driver Manager on 64-bit Windows uses registry keys created in `HKEY_LOCAL_MACHINE\SOFTWARE\ODBC\ODBCINST.INI`. Each key includes three string values to define the location of the Driver, its Setup location and the Description to help you clearly identify each registry key. The keys that are relevant to the C# examples discussed in this document are:

- **DotNetQuickstartDSIIDriver** which includes the following key names and values:
 - **Driver:** `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\x64\Release_MTDLL\QuickstartCLIDSI_Release_MTDLL.dll`
 - **Setup:** `[INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\x64\`

Release_MTDLL\QuickstartCLIDSI_Release_MTDLL.dll

- **Description:** Sample 64-bit SimbaEngine DotNetQuickstart DSII
 - DotNetUltraLightDSIIDriver which includes the following key names and values:
- **Driver:** [INSTALLDIR]\SimbaEngineSDK\10.4\Examples\Builds\Bin\x64\Release_MTDLL\UltraLightCLIDSI_Release_MTDLL.dll
- **Description:** Sample 64-bit SimbaEngine DotNetUltraLight DSII

There is another registry key at the same location called ODBC Drivers, indicating which drivers are installed. String values that correspond to each driver must also be added to it:

- ODBC Drivers which includes the following key names and values:
 - DotNetQuickstartDSIIDriver: Installed
 - DotNetUltraLightDSIIDriver: Installed

Data Retrieval

In the Data Store Interface (DSI), the following two methods actually perform the task of retrieving data from your data store:

1. Each `MetadataSource` implementation of `GetMetadata()`
2. `TabbedUnicodeFileReader::GetData()`

These methods accept the following parameters:

- **column:** Uniquely identifies a column within the current row. For `MetadataSource`, the calling framework will pass in a unique column tag (see `MetadataSourceColumnTag`). For `ULPersonTable`, the calling framework will pass in the column index. The first column uses index 0.
- **offset:** The number of bytes in the data to skip before copying data into the `out_data` parameter. Character, wide character and binary data types can be retrieved in parts. This value specifies where, in the current column, the value should be copied from. The value is usually 0.
- **maxSize:** The maximum number of bytes of data to copy into the `out_data` parameter. For character or binary data, copying data that is greater than this size can result in a data truncation warning or a heap-violation.
- **out_data:** The data to be returned.

NOTE: **offset** and **maxSize** are only applicable to data that can be retrieved in multiple parts (for example, character or binary) and can be ignored otherwise.

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