

Oracle® Rdb Developer Tools for Visual Studio

Developer's Guide

Release 7.3.6.0.0

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Oracle Rdb Data Provider for .NET Developer's Guide, Release 7.3.6.0.0.

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Oracle Rdb Developer Tools for Visual Studio Developer's Guide

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- Is the information clearly presented?
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Preface

This document is your primary source of introductory and usage information for *Oracle Rdb Developer Tools for Visual Studio*.

This preface contains these topics:

- Audience
- Access to Oracle Support
- Organization
- Related Documentation
- Conventions

Audience

Oracle Rdb Developer Tools for Visual Studio Developer's Guide is intended for developers who are developing applications to access an Oracle Rdb database using Oracle Rdb Data Provider for .NET. This documentation is also valuable to systems analysts, project managers, and others interested in the development of database applications.

To use this document, you must be familiar with Microsoft .NET Framework classes and ADO.NET and have a working knowledge of application programming using Microsoft C#, Visual Basic, or C++.

Users should also be familiar with the use of Structured Query Language (SQL) to access information in relational database systems.

Access to Oracle Support

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Organization

This document contains:

- [**Chapter 1, Introducing Oracle Rdb Developer Tools for Visual Studio.**](#)
Provides an overview of Oracle Rdb Developer Tools for Visual Studio.
- [**Chapter 2, Installing Oracle Rdb .NET Products**](#)
Describes how to install Oracle Rdb Data Provider for .NET and provides system requirements. Read this chapter *before* installing or using Oracle Rdb Developer Tools for Visual Studio.
- [**Chapter 3, Using Oracle Rdb Developer Tools for Visual Studio**](#)
Describes how to create a database connection using ORDP.NET within Visual Studio.
- [**Chapter 4, Building a Simple .NET Application Using ORDP.NET**](#)
Provides an example on how you may build a simple application with database access using ORDP.NET.
- [**Chapter 5, Retrieving and Updating with ORDP.NET**](#)
Provides an example of data retrieval and update using the features of Visual Studio and data access using ORDP.NET.
- [**Chapter 6, ORDP.NET and Visual Studio Wizards**](#)
Provides an example on using standard Visual Studio wizards to automatically generate the code to access data from your Rdb database.
- [**Chapter 7, ORDP.NET and drag and drop**](#)
Provides an example of using the drag and drop features of Visual Studio to generate code for your application.
- [**Chapter 8, Configuration wizard and generating queries**](#)
Provides an example of using Table Adapter Query Configuration Wizard to generate queries on your database.
- [**Chapter 9, Copying a Form**](#)
Describes how to copy a form as required when following the examples provided in this document.
- [**Chapter 10, Oracle Rdb Entity Framework Provider**](#)
Describes how to use ORDP.NET within the Entity Framework using standard Entity Framework tools and features of Visual Studio.
- [**Chapter 11, Unsupported features**](#)
Specifies what Visual Studio features are currently not supported by ORDT.
- [**Glossary**](#)
Defines terms used in this document.

Related Documentation

For more information, see these Oracle Rdb resources:

- *Oracle Rdb7 Guide to Database Design and Definition*
- *Oracle Rdb7 Guide to Database Performance and Tuning*
- *Oracle Rdb Introduction to SQL*
- *Oracle Rdb SQL Reference Manual*
- *Oracle Rdb Guide to SQL Programming*
- *Oracle SQL/Services Server Configuration Guide*
- *Guide to Using the Oracle Rdb Oracle SQL/Services (tm) Client API*

- *Oracle Rdb JDBC Driver Users Guide*

To download free release notes, installation documentation, white papers, or other collateral, please visit the Oracle Rdb web site:

<http://www.oracle.com/technetwork/database/rdb>

For additional information, see:

<http://msdn.microsoft.com/netframework>

Conventions

Oracle Rdb Data Provider for .NET is often referred to as ORDP.NET.

Oracle Rdb is often referred to as Rdb.

Hewlett-Packard Company is often referred to as HP.

The following conventions are used in this document:

word	A lowercase word in a format example indicates a syntax element that you supply.
[]	Brackets enclose optional clauses from which you can choose one or none.
{ }	Braces enclose clauses from which you must choose one alternative.
...	A horizontal ellipsis means you can repeat the previous item
• • •	A vertical ellipsis in an example means that information not directly related to the example has been omitted.

Conventions in Code Examples

Code examples illustrate SQL or other command-line statements. They are displayed in a monospace (fixed-width) font and separated from normal text as shown in this example:

```
SELECT last_name FROM employees WHERE last_name = 'TOLIVER';
```

Example Screen Shots

Unless otherwise stated, examples and screen shots found within this document relate to Visual Studio 2012.

As the user interface for Visual Studio may change between versions, if you are using another version of Visual Studio, please consult your Visual Studio documentation to determine how to carry out the same operations described in the provided example.

Show Navigation

Chapter 1

Introducing Oracle Rdb Developer Tools for Visual Studio.

Oracle Rdb Developer Tools for Visual Studio (ORDT) is a set of application tools that integrate with the Visual Studio environment. These tools provide graphical user interface access to Oracle Rdb functionality, enable the user to perform a wide range of application development tasks, and improve development productivity and ease of use.

ORDT includes:

- Oracle Rdb Data Provider for .NET (ORDP.NET).

A standard .NET Data Provider that allows access to Oracle Rdb databases from the .NET environment

- Oracle Rdb DDEX Provider.

A standard .NET DDEX provider that integrates ORDP.NET functionality into Visual Studio.

- Oracle Rdb Entity Framework Provider.

A standard .NET Entity Framework provider that integrates ORDP.NET functionality into Entity Framework.

Chapter 2 Installing Oracle Rdb .NET Products

See the Oracle Rdb Developer Tools for Visual Studio Release Notes for information on how to install Oracle Rdb .NET products.

Show Navigation

Chapter 3 Using Oracle Rdb Developer Tools for Visual Studio

This chapter contains:

- [Using Oracle Rdb Developer Tools](#)
- [Connecting to the Oracle Rdb Database](#)

3.1 Using Oracle Rdb Developer Tools

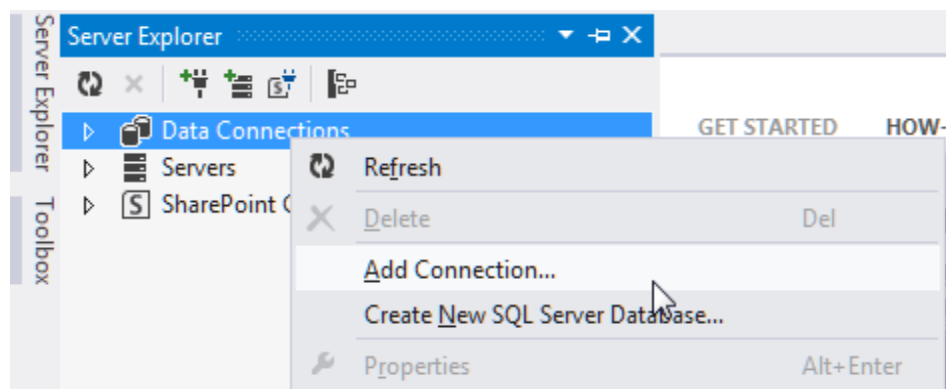
Oracle Rdb Developer Tools for Visual Studio (ORDT) is a tightly integrated Add-in for Visual Studio. Using enhancements that ORDT brings to the Server Explorer, you can automatically create tables, indexes, constraints, data connections and other database schema objects. Additionally you can automatically generate application code.

3.2 Connecting to the Oracle Rdb Database

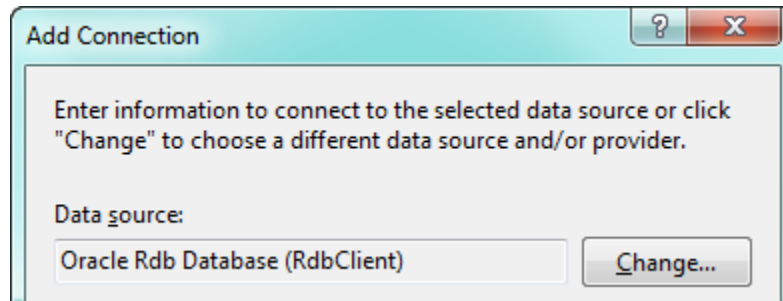
This section shows you how to use the Server Explorer to connect to the Oracle Rdb Database for the purpose of automatically creating or modifying database schema objects.

To connect to the database:

- Step1:** From the View menu, select **Server Explorer**.
Step2: In Server Explorer, right-click **Data Connections**.
Step3: Select **Add Connection**.

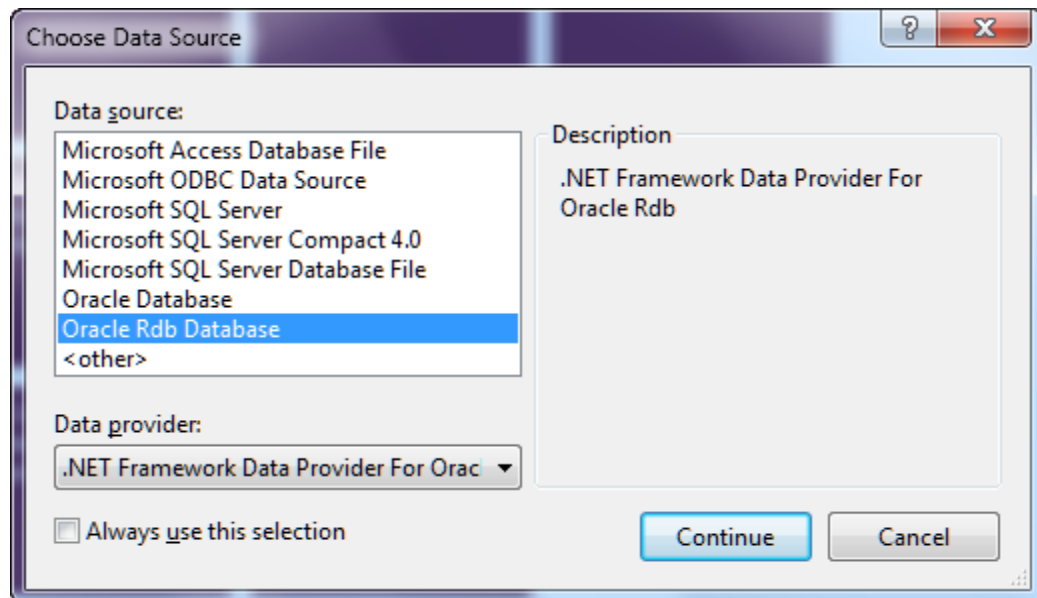


Step4: If you have selected any Data Source in the past, the **Add Connection** window appears, determine if the Data source says "**Oracle Rdb Database (RdbClient)**". If it does, skip to Step [6](#).



If Data source does not say "**Oracle Rdb Database (RdbClient)**", select **Change**.

If you have not already selected a Data source previously, or you have selected **Change**, the Choose Data Source window will appear.



Step5: Choose Oracle Rdb Database and then select .NET Framework Data Provider For Oracle Rdb.

Step6: On the Connection Details tab, in the Add Connection window, enter the following information:

To connect to a database using a SQL/Services universal service:

For **Server**, enter the node address and a valid SQL/Services service that will be running on the selected node. Remember to separate the node address and service name with a colon (:). In this example we assume that a universal service called GENERIC is running on the selected node.

The node address must be valid TCP/IP node specification.

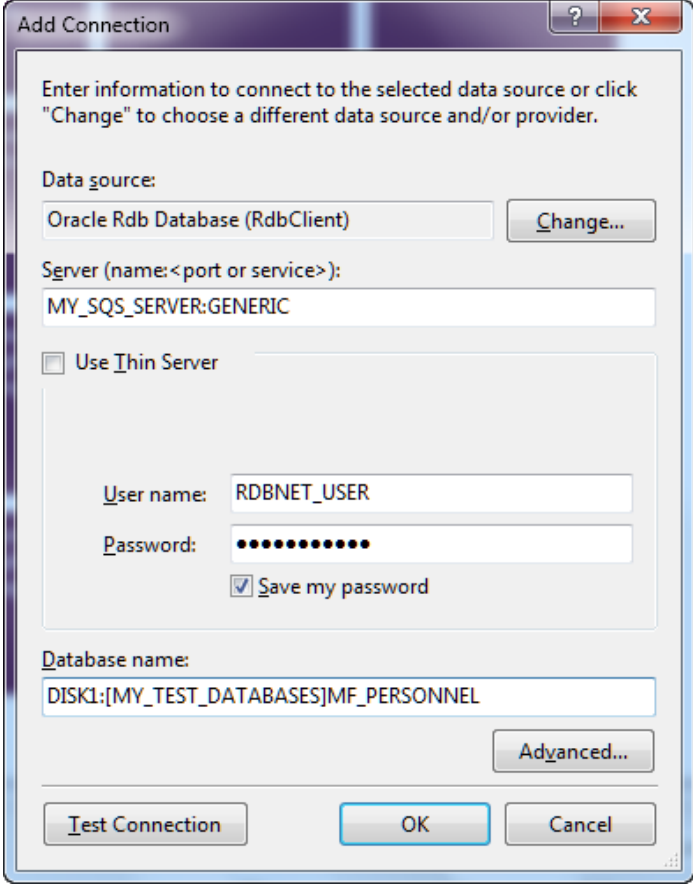
For **User name**, enter a valid username for the database you will select.

For **Password**, enter the password for that user

To save the password for future sessions, check the **Save password** box.

For **Database name**, Enter a valid database file specification. Depending on the setup of SQL/Services on the server node, this database specification may include device and directory information as well as the database filename and may use OpenVMS logical names.

The **Connection name** should be generated automatically from the **Database name**.



To connect to a database using a SQL/Services database service:

For **Server**, enter the node address and a valid SQL/Services database service that will be running on the selected node. Remember to separate the node address and service name with a colon (:).

In this example we assume that a database service called MF_PERS is running on the selected node. The node address must be valid TCP/IP node specification.

For **User name**, enter a valid username for the database you will select.

For **Password**, enter the password for that user

To save the password for future sessions, check the **Save** password box.

Leave the **Database name** blank as this is not required when a database service is used.

The Connection name should be generated automatically from the Database name.

The screenshot shows the 'Add Connection' dialog box with the following fields and values:

- Data source:** Oracle Rdb Database (RdbClient)
- Server (name: <port or service>):** MY_SQS_SERVER:MF_PERS
- Use Thin Server
- User name:** RDBNET_USER
- Password:** [masked with dots]
- Save my password
- Database name:** [empty]

Buttons at the bottom include 'Test Connection', 'OK', 'Cancel', and 'Advanced...'.

To connect to a database using a JDBC Thin Server:

For **Server**, enter the node address and port for a valid JDBC server that will be running on the selected node. Remember to separate the node address and port with a colon (:). The node address must be valid TCP/IP node specification.

Click the **Use Thin Server** box.

For **User name**, enter a valid username for the database you will select.

For **Password**, enter the password for that user

To save the password for future sessions, check the **Save password** box.

For **Database name**, Enter a valid database file specification. This database specification may include device and directory information as well as the database filename and may use OpenVMS logical names.

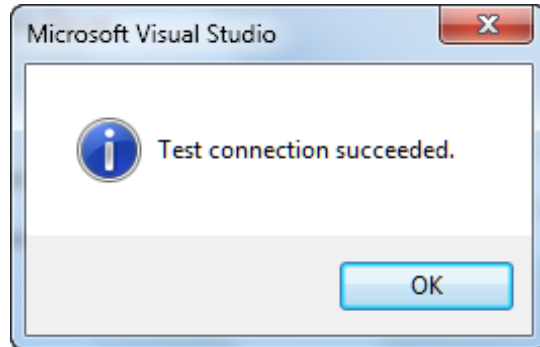
The **Connection name** should be generated automatically from the **Database name**.

The screenshot shows a dialog box titled "Add Connection". At the top, it says "Enter information to connect to the selected data source or click 'Change' to choose a different data source and/or provider." Below this, there are several fields and checkboxes:

- Data source:** A text box containing "Oracle Rdb Database (RdbClient)" and a "Change..." button.
- Server (name:<port or service>):** A text box containing "MY_TEST_NODE:1701".
- Use Thin Server:** A checked checkbox.
- User name:** A text box containing "RDBNET_USER".
- Password:** A text box with masked characters (dots).
- Save my password:** A checked checkbox.
- Database name:** A text box containing "DISK1:[MY_TEST_DATABASES]MF_PERSONNEL".

At the bottom, there are buttons for "Test Connection", "OK", and "Cancel". There is also an "Advanced..." button near the database name field.

Step7: Click Test connection.



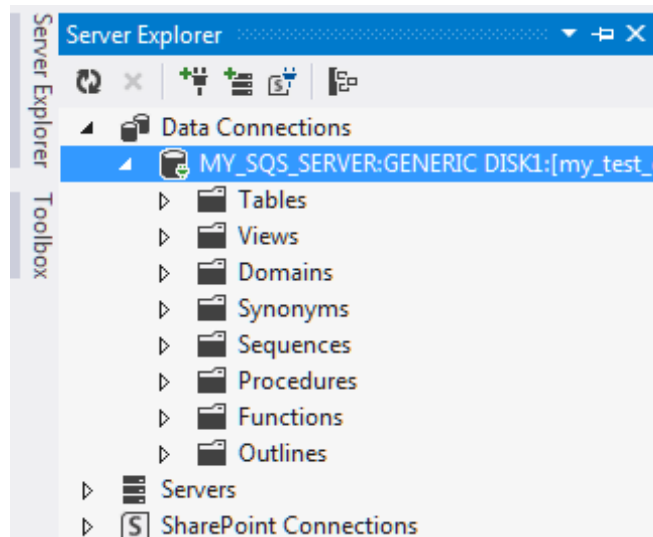
The test should succeed. Click OK.

If the test fails, it may be due to one or more of the following issues that you must address before proceeding with further steps:

- The database listener or server is not started.
- The database connectivity is not properly configured.
- You do not have the correct user name, or password.

Step8: In the Add Connection window, click OK.

Step9: In the Server Explorer, expand the database connection to show the contents of the database . You should see Tables, Views, Procedures, Functions, Packages, Synonyms, Sequences, and so on.



Chapter 4 Building a Simple .NET Application Using ORDP.NET

This chapter contains:

- [Creating a New Project](#)
- [Adding a Reference](#)
- [Adding Namespace Directives](#)
- [Designing the User Interface](#)
- [Writing the Connection Code](#)
- [Compiling and Running the Application](#)
- [Error Handling](#)

4.1 Creating a New Project

Visual Studio groups all development code that you create into containers known as projects. Simpler projects often contain only one file. In this section, you will learn how to create a new development project.

The application you build in this chapter serves as a starting point for work in subsequent chapters, so it is important to follow the order of this guide.

Note:

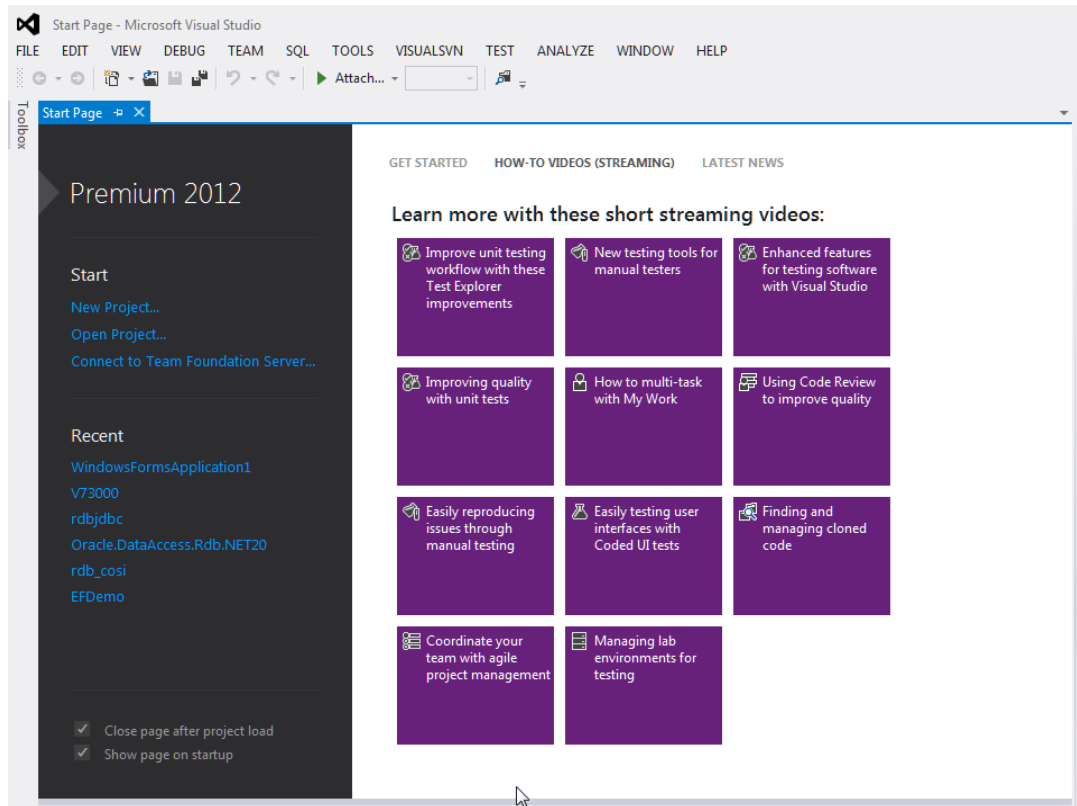
When necessary, instructions specify **Visual C#** or **Visual Basic**.

To start a new project:

Step1: Start Visual Studio.

Open the **Start menu**, select **All Programs**, and then select **Microsoft Visual Studio 2012**.

The Microsoft Visual Studio IDE environment appears.



Step2: In the Start Page, under the Start heading, click **New Project....**

Alternatively, from the **File** menu, select **New**, and then select **Project**.

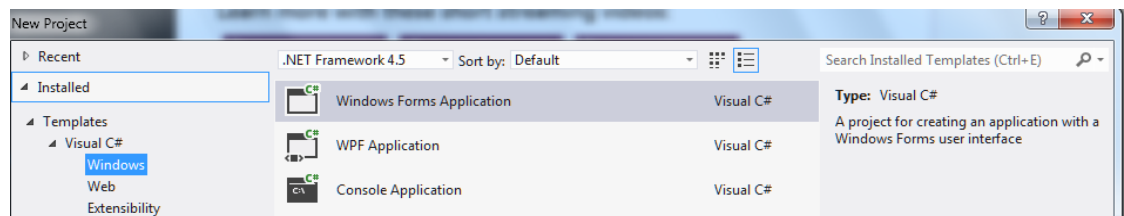
A **New Project** dialog box appears.

Step3: In the Installed Templates tree at the left of the screen, select the type of project you are creating:

Visual C#:

Visual C#: Windows

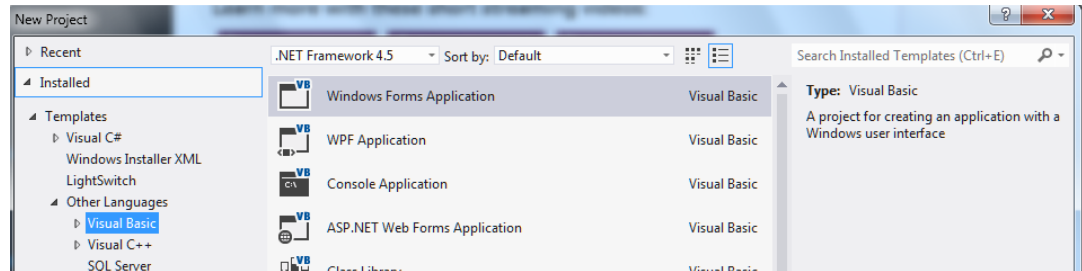
Select **Windows Forms Application**.



Visual Basic:

Other Languages: Visual Basic: Windows

Select **Windows Forms Application**.



Step4: In the Name field, enter the appropriate name.

Visual C#:

```
PERS_Connect_CS
```

Visual Basic:

```
PERS_Connect_VB
```

The abbreviation **CS** indicates C# projects and **VB** indicates Visual Basic projects.

Step5: In Location, enter the directory where you want to save the files.

For this guide, enter this directory

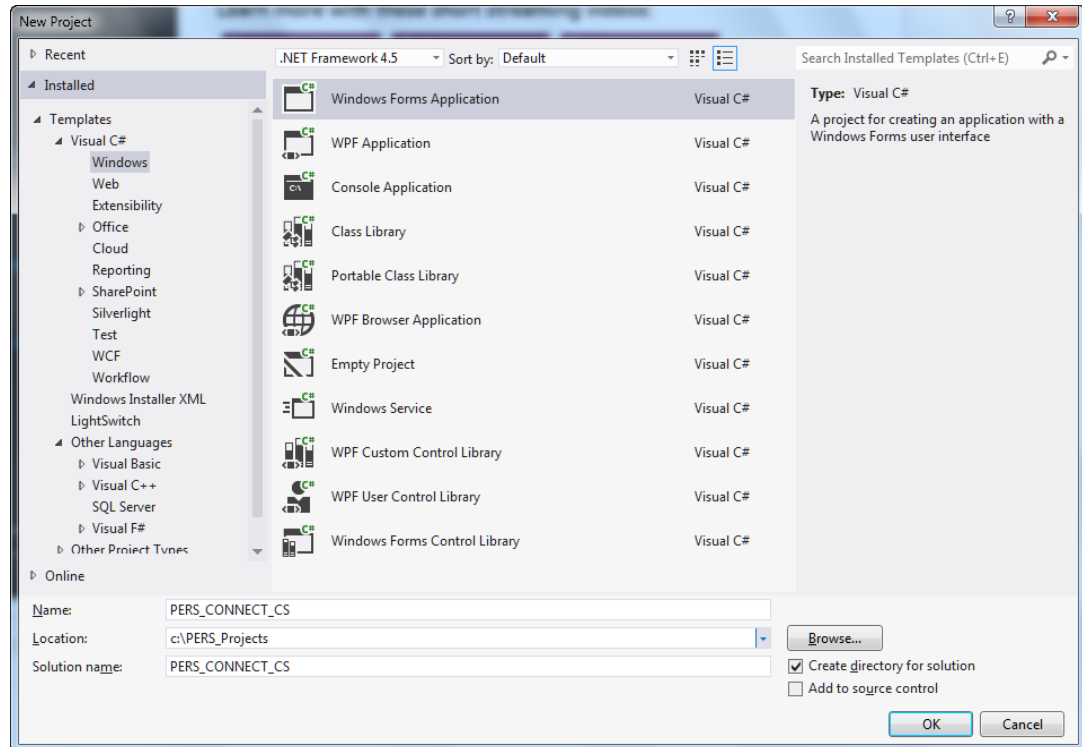
```
C:\PERS_Projects
```

Step6: In Solution Name, the appropriate name, **PERS_Connect_CS** or **PERS_Connect_VB** should appear.

A solution can contain several projects; when it contains only one project, you can use the same name for both.

Step7: Check **Create directory for solution**.

Step8: Click **OK**.

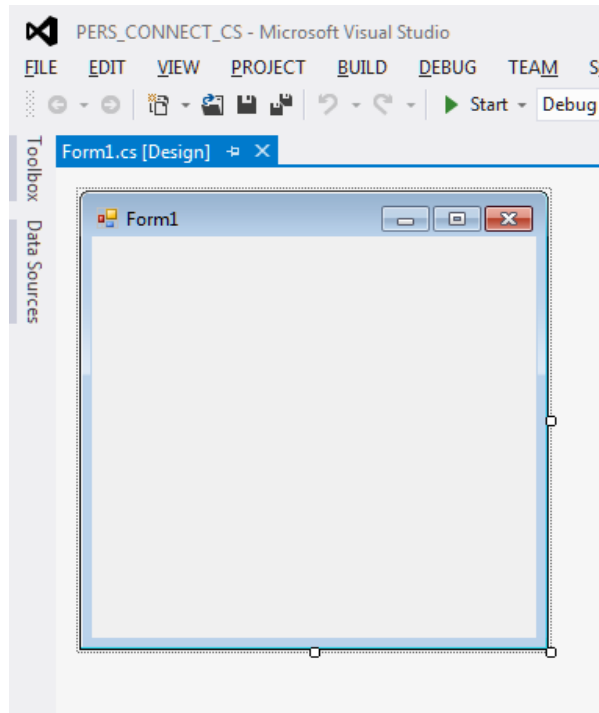


The project is created.

The main window now displays a new title, either **PERS_Connect_CS - Microsoft Visual Studio** or **PERS_Connect_VB - Microsoft Visual Studio**, depending on the language, and contains Form1 shown below.

It is important to remember that many projects automatically name the first form Form1. This is the name of the form control. Do not confuse this with the actual name given to the code file, which is typically `Form1.cs` or `Form1.vb`.

Both Form1 and `Form1.xx` can be renamed. For the purposes of this guide, we will rename `Form1.xx` several times.

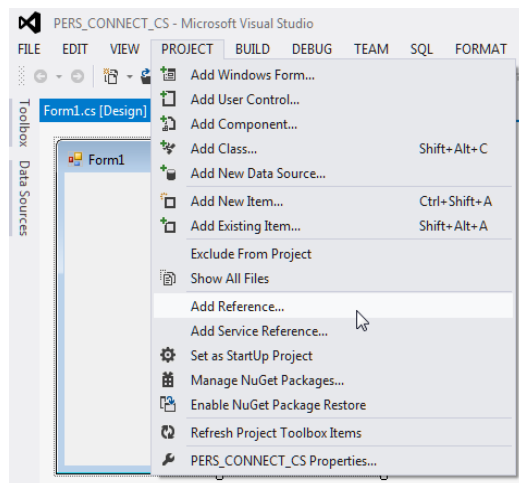


4.2 Adding a Reference

This section shows you how to add a reference to the `Oracle.DataAccess.Rdb.dll` file, which contains the data provider, Oracle Rdb Data Provider for .NET.

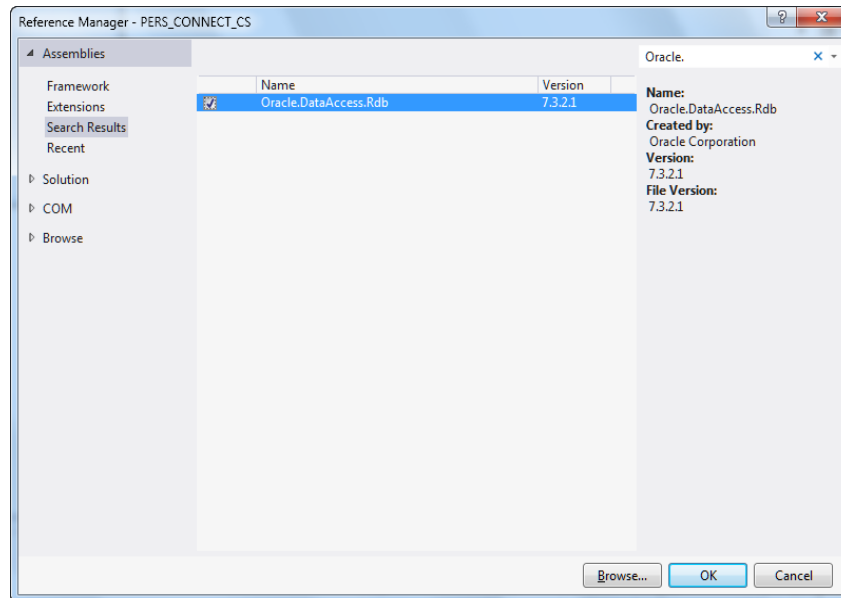
To add a reference:

Step1: From the **Project** menu, select **Add Reference**.

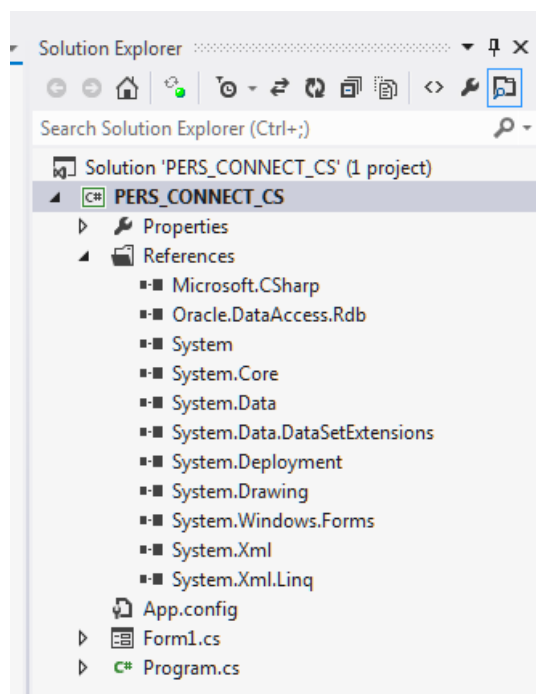


The Add Reference windows appears.

Step2: In the **Reference Manager** window, in the **Search Assemblies** field, Enter "Oracle." And select **Oracle.DataAccess.Rdb** that is displayed by clicking the box to the left of the name. Click OK.



Note that the new reference appears in the Solution Explorer.



4.3 Adding Namespace Directives

You can add Oracle namespace directives that allow you to indicate an assembly's namespaces within the module. To do this, add C# `using` statements or Visual Basic `Imports` statements, at or near the top of a code file.

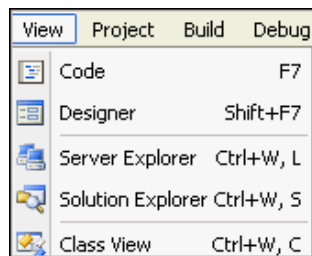
Note:

Adding a reference makes the namespace available within the application. Adding a namespace directive within the application code makes the namespace more visible and allows for additional scoping.

To add Oracle Rdb namespace directives:

Step1: With Form1 active, from the **View** menu select **Code**.

Alternatively, you can use the **F7** keyboard shortcut.



Step2: Add the following statements to the list of declarations depending on the language you are using.

Visual C#:

Add with other `using` statements, before the namespace.

```
using Oracle.DataAccess.RdbClient;
```

```

using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;
using Oracle.DataAccess.RdbClient;

namespace PERS_CONNECT_CS
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }
    }
}

```

Visual Basic:

Add to the top of the file, in the declarations section.

```
Imports Oracle.DataAccess.RdbClient
```

```

Imports Oracle.DataAccess.RdbClient
Public Class Form1
End Class

```

Step3: Save the changes by selecting **Save** from the **File** menu, or using the **Ctrl+S** keyboard shortcut.

4.4 Designing the User Interface

You can create a user interface by adding the toolbox controls to the design form. This interface accepts connection information from the user. To add toolbox controls:

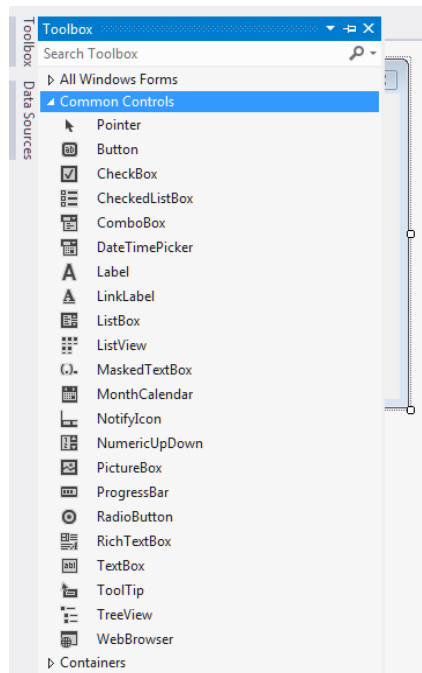
Step1: From the **View** menu, select **Designer**.

This opens Form1, in design view, if it is not already open.

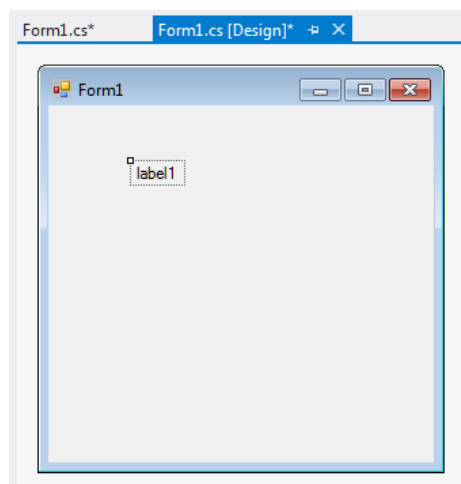
You will toggle between Code and Designer a lot. The keyboard shortcuts are **F7** and **shift- F7** respectively.

Step2: From the **View** menu, select **Toolbox**.

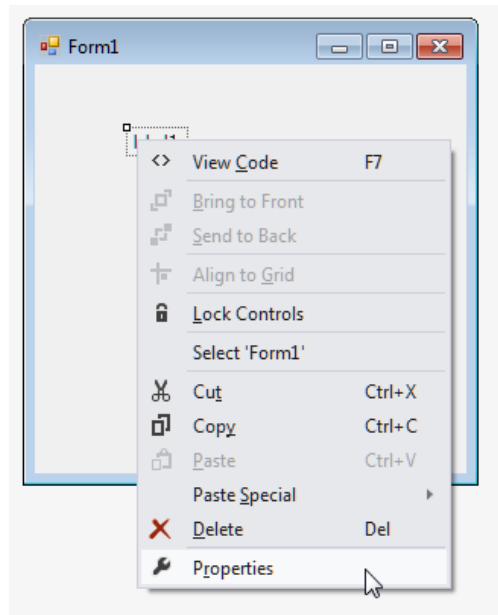
Step3: In the Toolbox, expand **Common Controls**.



Step4: In the Toolbox, select **Label**, and drag it onto the Form1.



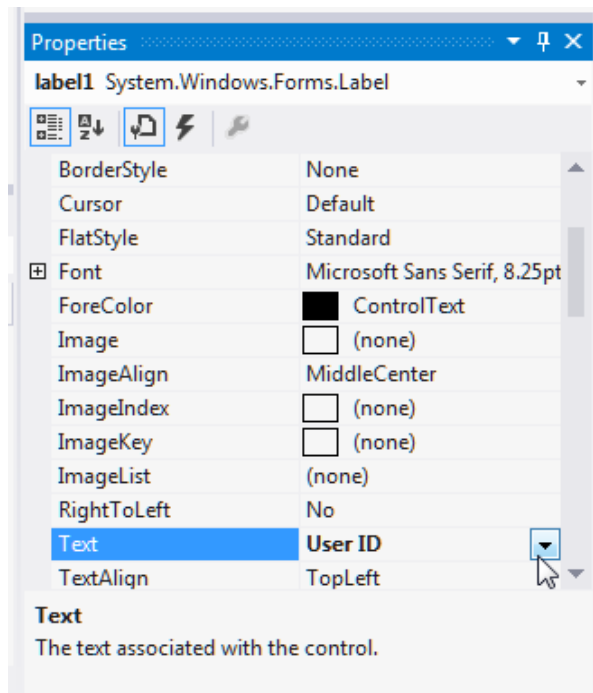
Step5: On Form1, right-click **label1**.



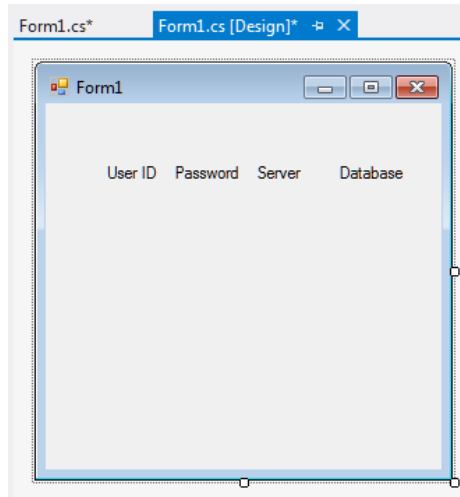
Step6: From the menu, select **Properties**, if the Properties Window is not already visible.

The Properties Window appears.

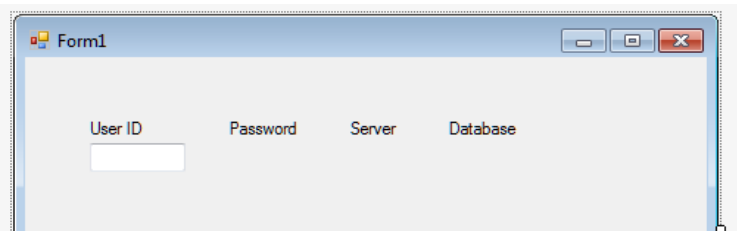
Step7: In the Properties Window, change the Text property from **label1** to **User ID**.



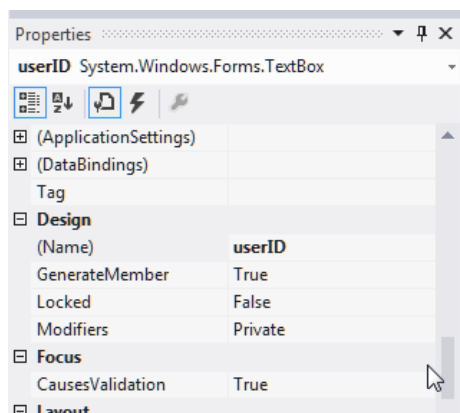
Step8: Repeat steps 4 through 7 three times, placing three more labels on Form 1 and changing their text properties to **Password**, **Server** and **Database**.



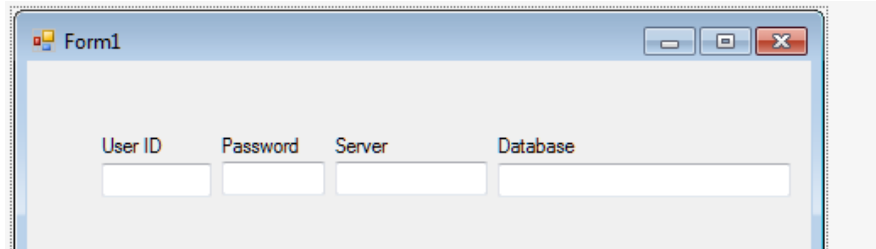
Step9: You may want to now expand the form by dragging the left margin to allow for reasonably sized fields to be accommodated. In the Toolbox, select **TextBox**, and drag it onto the Form1, under the User ID label.



Step10: In the Properties Window, change the Name property to userID.

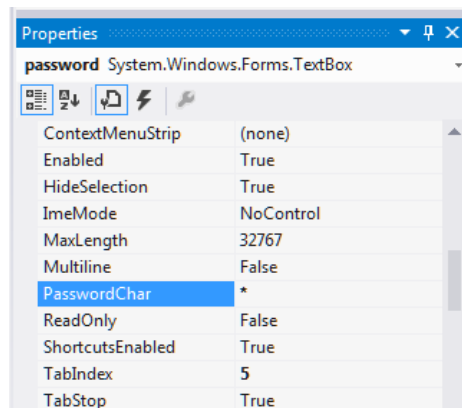


Step11: Repeat steps 9 and 10 three times, positioning three more text boxes under the existing labels, and setting the Name property to **password**, **server** and **database**.



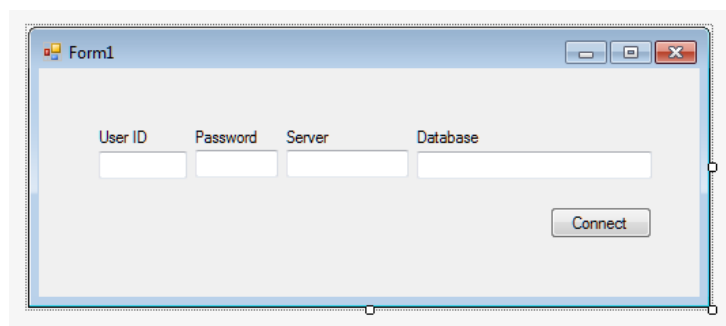
Step12: Select the text box under the Password label. In the Properties Window, scroll to the PasswordChar property and set it to an asterisk (*).

This masks the password during entry.



Step13: From the Toolbox, select **Button** and drag it onto Form1.

In the Properties Window, change the Text property of the button from **button1** to **Connect**, and change the **Name** property to **connect**.



Step14: Save.

Show Navigation

4.5 Writing the Connection Code

Now we write the code that takes the information provided to the user interface and connects to the database.

To connect to the database, you must create a connection object.

To write code that connects to the database:

These steps enable your application to connect to the database based on data that the user enters into the Form1 control. See [Compiling and Running the Application](#).

From the **View** menu, select **Code**.

Step1: Add the code indicated to instantiate a database connection string.

Visual C#: Add the class variable `conn` to the `Form1` class right after the `public Form1()` block with this code.

```
private RdbConnection conn = new RdbConnection();
```

```

using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Text;
using System.Windows.Forms;
using Oracle.DataAccess.RdbClient;

namespace PERS_Connect_CS
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }
        private RdbConnection conn = new RdbConnection();
    }
}

```

Visual Basic: Add the `conn` class variable in the `Form1` class declaration, using this code.

```

Public Class Form1
    Dim conn As New RdbConnection

```

```

Imports Oracle.DataAccess.RdbClient

Public Class Form1
    Dim conn As New RdbConnection
End Class

```

Step2: Save your changes.

Step3: Change to Designer view by clicking on the **View** menu and selecting **Designer**.

Step4: Double-click the **Connect** button on Form1 to open the code window to the `connect_Click()` method.

Insert the code indicated into the `connect_Click()` method.

Visual C#:

```

conn.ConnectionString = "User Id=" + userID.Text +
    ";pwd=" + password.Text +
    ";server=" + server.Text +

```

```
";database=" + database.Text +  
";type=Thin;";  
  
conn.Open();
```

Visual Basic:

```
conn.ConnectionString = "User Id=" + userID.Text & _  
";pwd=" + password.Text & _  
";server=" + server.Text & _  
";database=" + database.Text & _  
";type=Thin;";  
  
conn.Open();
```

Visual Basic `Imports` statements, at or near the top of a code file.

Before a connection can be opened, it must be built from user input for the `User Id`, `pwd`, `server`, and `database`.

The `Open()` method makes the actual connection.

Note that in this example we are making a connection to a JDBC Thin Server as designated by the `";type=Thin;"` portion of the connection string we are building. If you wish to make a connection to a SQL/Services service, omit this part of the connection string.

Step5: Set the `Enabled` attribute of the button to `false` by inserting the indicated code at the end of the `connect_Click()` method.

This disables the `Connect` button, which is a good practice once a connection is successfully made.

Visual C#:

```
connect.Enabled = false;
```

```

using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;
using Oracle.DataAccess.RdbClient;

namespace PERS_CONNECT_CS
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }
        private RdbConnection conn = new RdbConnection();

        private void connect_Click(object sender, EventArgs e)
        {
            conn.ConnectionString = "User Id=" + userID.Text +
";pwd=" + password.Text +
";server=" + server.Text +
";database=" + database.Text +
";type=Thin;";

            conn.Open();
            connect.Enabled = false;
        }
    }
}

```

Visual Basic:

```
connect.Enabled = false
```

```

Dim conn As New RdbConnection

Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
    conn.ConnectionString = "User Id=" + userID.Text & _
";pwd=" + password.Text & _
";database=" + database.Text & _
";type=Thin;"

    conn.Open()
    connect.Enabled = False
End Sub
End Class

```

You have now finished writing an application that can connect to the Oracle Rdb database.

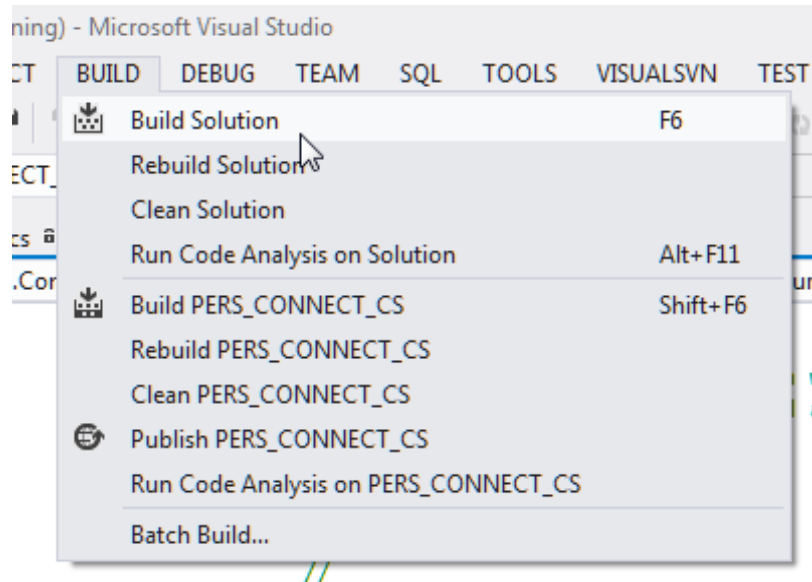
The following sections show how to use it.

4.6 Compiling and Running the Application

This section shows how to compile and run the application you created in the previous sections.

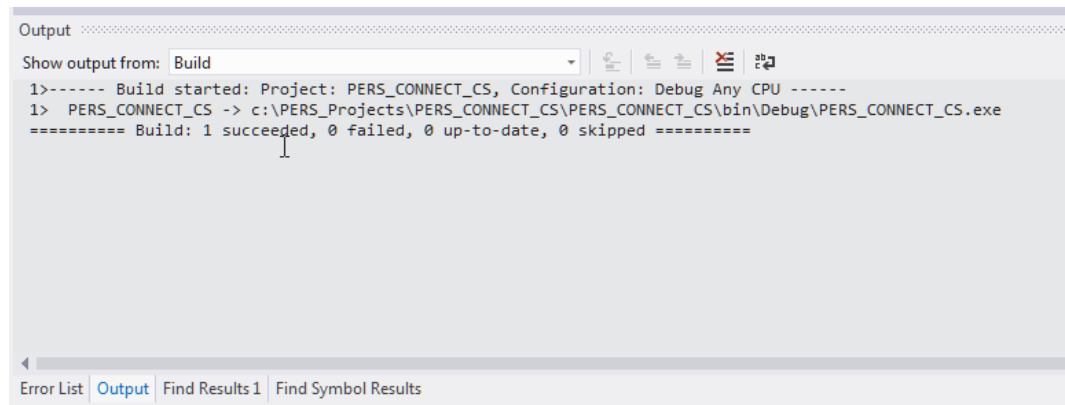
To compile and run the application:

Step1: From the **Build** menu, select **Build Solution**.



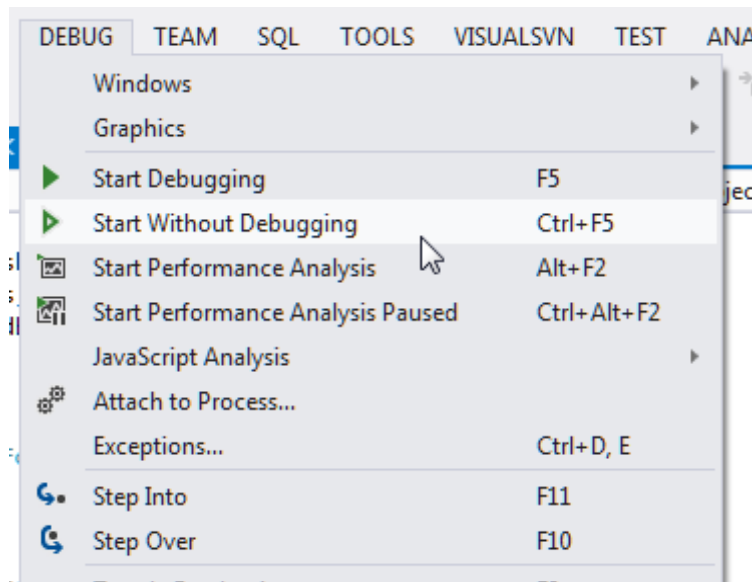
Step2: Ensure that there are no errors reported in the output window, available from the **View** menu.

The following graphics shows a typical output result.



Step3: If there are any errors indicated, from the **View** menu, select **Error List** and fix the errors.

Step4: From the **Debug** menu, select **Start Without Debugging** to run the application.



Step5: In the Form1 application, enter the User ID, Password , Server, and Database. If you used the connection string exactly as shown in **Step 4** above, you will be making a connection to a JDBC Thin Server. Please ensure that the data you enter in the **Server** field does contain a valid JDBC server specified in the form "host:port", for example "my_server_node:1701"

If you omit the ";type=Thin;" part of the connection string, then you are requesting for a SQL/Services service connection, in which case ensure the data entered in the **Server** field is in the form of "host:service" for example, "my_sqs_server:GENERIC".

Step6:

Click **Connect**.

Once the connection is opened, the Connect button is disabled. You have succeeded in implementing a connection to an Oracle Rdb Database.

4.7 Error Handling

Applications must be able to handle run-time errors gracefully. For example, if you try to log in using an incorrect password, the application you developed

so far cannot establish a connection to the database, and exits with the following unhandled exception

```
%RDB-E-AUTH_FAIL: authentication failed for user
```

You must reselect Start Without Debugging to try this with a different password.

Error handling manages occurrences of conditions that change the normal flow of program execution. Oracle Rdb Data Provider for .NET contains a single classes for error handling and support:

- The `RdbException` class represents an exception that is thrown when the Oracle Rdb Data Provider for .NET encounters an error. Each `RdbException` object contains a description and an error number that describes the error or warning.

4.7.1 Using Try-Catch-Finally Block Structure

.NET languages use Try-Catch-Finally block structure for error handling. With this structure, the Try code is the main code, the goal that the application wants to accomplish. The Catch code catches errors of various types, as shown in the next two section. The Finally block comes last and always executes.

The Finally block frequently contains the `Dispose` method, which closes and disposes of the connection. Having the `Dispose` method in the Finally block ensures that the database connection is always closed after the Try-Catch-Finally block completes. Closing database connections after the application no longer requires database access is important for many reasons, especially data security.

Attempting to close a closed database connection does not cause an error. The attempt is irrelevant. Nonetheless, placing `Dispose()` in the Finally code block guarantees that the connection is closed.

The next section shows how to use Try-Catch-Finally block structure with general errors, and the section after that, with Oracle Rdb errors.

4.7.2 Handling General Errors

This section shows how to handle general errors using a Try-Catch-Finally block.

To handle general errors:

Step1: Change the code of the `connect_Click()` method in `Form1` by adding an implementation of the Try-Catch-Finally syntax.

New code is in bold font.

Visual C#:

```
private void connect_Click(object sender, EventArgs e)
{
    conn.ConnectionString = "User Id=" + userID.Text +
        ";pwd=" + password.Text +
        ";server=" + server.Text +
        ";database=" + database.Text +
        ";type=Thin;";conn.Open();

    try
    {
        conn.Open();
        connect.Enabled = false;
    }
    catch (Exception ex)
    {
        MessageBox.Show(ex.Message.ToString());
    }
    finally
    {
        conn.Dispose();
    }
}
```

Alternatively, you can use C# syntax that disposes of a connection when it goes out of scope, with the `using` keyword, as follows:

```
using (RdbConnection conn = new RdbConnection())
{
    conn.Open();
    // application code
    ...
}
```

Visual Basic:

```
Try
    conn.Open()
    connect.Enabled = false

Catch ex As Exception
```

```
MessageBox.Show(ex.Message.ToString())  
  
Finally  
    conn.Dispose()  
End Try
```

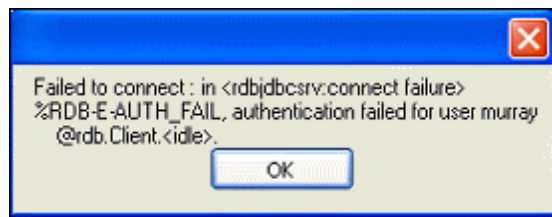
Step2: From the Build menu, select Rebuild Solution.

Ensure that there are no errors.

Step3: From the Debug menu, select Start Without Debugging.

Step4: Run the application again, as described in section [Compiling and Running the Application](#), and attempt to connect using an incorrect password.

This time, the application catches the error and displays it in a pop-up window, %RDB-E-AUTH_FAIL: authentication failed for user.



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Chapter 5 Retrieving and Updating with ORDP.NET

This chapter contains:

- [Using the Command Object](#)
- [Retrieving Data: a Simple Query](#)
- [Retrieving Data: Bind Variables](#)
- [Retrieving Data: Multiple Values](#)
- [Using the DataSet Class with Oracle Rdb Data Provider for .NET](#)
- [Enabling Updates to the Database](#)

5.1 Using the Command Object

To view, edit, insert or delete data in a database, you must encapsulate a request in an `RdbCommand` object specifying a SQL command, stored procedure, or table name. The `RdbCommand` object creates the request, sends it to the database, and returns the result.

To use the command object:

Step1: Make two copies of `Form1.xx`, from application `PERS_Connect_xx` in [Building a Simple .NET Application Using ORDP.NET](#). To make copies, see the instructions in [Copying a Form](#).

Name the copies `Form2.cs` or `Form2.vb` and `Form3.cs` or `Form3.vb`. The first copy is for the first part of the chapter, and the second copy for the second part of the chapter

Step2: Open `Form2.cs` or `Form2.vb`.

Note that the actual form in the designer still says `Form1`, as you renamed code files but not the actual form controls within the project.

Step3: Create a string that represents the SQL query and add to the body of the `try` statement.

The new code is in bold typeface.

Visual C#:

```

try
{
    conn.Open();
    connect.Enabled = false;

    // SQL Statement
    string sql = "select department_name from departments"
        + " where department_code = 'ENG'";
}

```

Visual Basic:

```

Try
    conn.Open()
    connect.Enabled = False

    Dim sql As String = "select department_name from departments" & _
        "where department_code = 'ENG'"

```

Step4: Use the new `sql` variable to create the `RdbCommand` object, and set the `CommandType` property to run a text command.

Visual C#:

```

try
{
    conn.Open();
    connect.Enabled = false;

    // SQL Statement
    string sql = "select department_name from departments"
        + " where department_code = 'ENG'";

    RdbCommand cmd = new RdbCommand(sql, conn);
    cmd.CommandType = CommandType.Text;
}

```

Visual Basic:

```

Try
    conn.Open()
    connect.Enabled = False

    Dim sql As String = "select department_name from departments" & _
        "where department_code = 'ENG'"

    Dim cmd As New RdbCommand(sql, conn)
    cmd.CommandType = CommandType.Text

```

Step5: Save your work.

5.2 Retrieving Data: a Simple Query

This section demonstrates retrieving data from the database.

The `ExecuteReader()` method of an `RdbCommand` object returns an `RdbDataReader` object, which can be accessed to display the result on the form. The application uses a **Listbox** to display the results.

To retrieve data:

Step1: Create an `RdbDataReader` object, by adding the code indicated to the bottom of the Try block of the `connect_Click()` method.

This enables you to read the result of the query.

The new code is in bold typeface

Visual C#:

```
try
{
    conn.Open();
    connect.Enabled = false;

    // SQL Statement
    string sql = "select department_name from departments"
        + " where department_code = 'ENG'";

    RdbCommand cmd = new RdbCommand(sql, conn);
    cmd.CommandType = CommandType.Text;

    RdbDataReader dr = cmd.ExecuteReader();
    dr.Read();
}
}
```

Visual Basic:

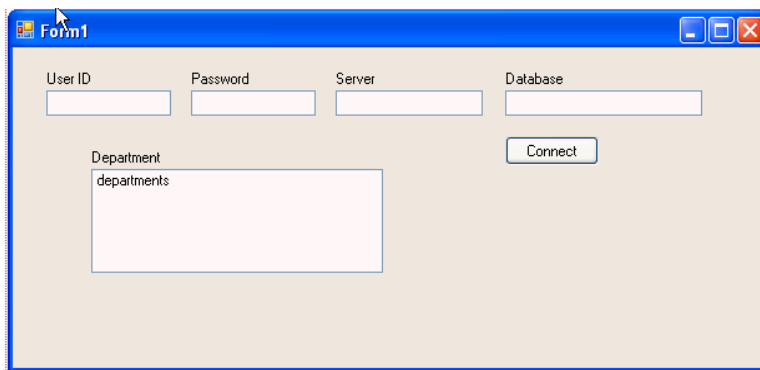
```
Try
    conn.Open()
    connect.Enabled = False

    Dim sql As String = "select department_name from departments" & _
        "where department_code = 'ENG' "

    Dim cmd As New RdbCommand(sql, conn)
    cmd.CommandType = CommandType.Text

    Dim dr As RdbDataReader = cmd.ExecuteReader()
    dr.Read()
```

- Step2:** Open Form1 in **Design view**. From the **View** menu, select **Designer**.
- Step3:** From the **View** menu, select **Toolbox**.
- Step4:** From the **Toolbox**, select a **Label** and drag it onto Form1.
- Step5:** From the **View** menu, select **Properties Window**.
- Step6:** In the **Properties** window, change the **Text** of the label to Department.
- Step7:** From the Toolbox, under Window forms, select a **ListBox** and drag it onto Form1.
- Step8:** In the **Properties** window, under Design, change the **Name** to departments.



- Step9:** Add accessor type methods for retrieving data from the query result.

Double-click the **connect** button to edit the `connect_click()` method, and add the code indicated to the bottom of the `try` block.

Visual C#:

```
departments.Items.Add(dr.GetString(0));
```

Visual Basic:

```
departments.Items.Add(dr.GetString(0))
```

Typed accessors, such as `GetString`, return native .NET data types and native Oracle Rdb data types. Zero-based ordinals passed to the accessors specify which column in the result set to return.

The `try` block should look like this now:

Visual C#:

```
try
{
    conn.Open();
    connect.Enabled = false;

    // SQL Statement
    string sql = "select department_name from departments"
        + " where department_code = 'ENG'";

    RdbCommand cmd = new RdbCommand(sql, conn);
    cmd.CommandType = CommandType.Text;

    RdbDataReader dr = cmd.ExecuteReader();
    dr.Read();

    departments.Items.Add(dr.GetString(0));
}
}
```

Visual Basic:

```
Try
    conn.Open()
    connect.Enabled = False

    Dim sql As String = "select department_name from departments" & _
        "where department_code = 'ENG' "

    Dim cmd As New RdbCommand(sql, conn)
    cmd.CommandType = CommandType.Text

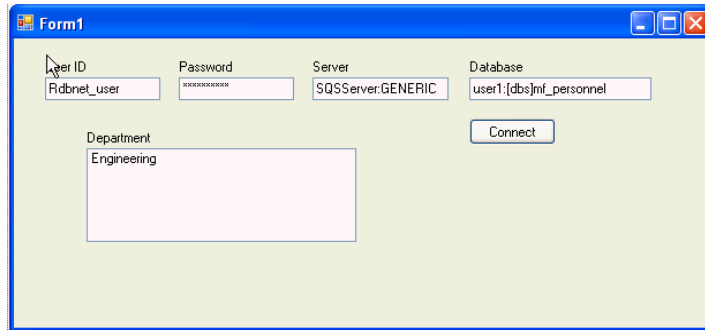
    Dim dr As RdbDataReader = cmd.ExecuteReader()
    dr.Read()

    departments.Items.Add(dr.GetString(0))
}
```

Step10: Build and save the application.

Step11: Run the application. Enter the login server and database information.

After you connect, the `departments` list box shows `Engineering`, the correct name for department with code `'ENG'` in the `Departments` table, as requested by the `SELECT` statement.



5.3 Retrieving Data: Bind Variables

Bind variables are placeholders inside a SQL statement.

The following code shows a typical `SELECT` statement that does not use bind variables, with the value `10` specified in the `WHERE` clause of the statement.

```
SELECT department_name FROM departments WHERE department_code = 'ENG'
```

The following code replaces the numerical value with a bind variable `:department_id`. A bind variable identifier always begins with a single colon (`:`).

```
SELECT department_name FROM departments WHERE department_code = :department_id
```

Note that bind variables can also be used with `UPDATE`, `INSERT`, and `DELETE` statements, and also with stored procedures. The following code illustrates how to use bind variables in an `UPDATE` statement:

```
UPDATE departments SET department_name = :department_name  
WHERE department_code = : department_id
```

You can use the `RdbParameter` class to represent each bind variable in your .NET code. The `RdbParameterCollection` class contains the `RdbParameter` objects associated with the `RdbCommand` object for each statement. The `RdbCommand` class passes your SQL statement to the database and returns the results to your application.

To retrieve data using bind variables:

- Step1:** Move the **ListBox** named **Departments** to the right.
- Step2:** From the **View** menu, select **Toolbox**.
- Step3:** From the Toolbox, select a **TextBox** and drag it onto Form1, under the label that says **Department**.
- Step4:** From the **View** menu, select **Properties** Window.
- Step5:** In the Properties window, change **Name** to **departmentID**.

Step6: Change the **SELECT** statement to use the bind variable by adding the code indicated to the Try block of the `connect_Click()` method.

Changed or new code is in bold typeface.

Visual C#:

```
string sql = "select department_name from departments "+
    "where department_code = :department_id";
RdbCommand cmd = new RdbCommand(sql, conn);
cmd.CommandType = CommandType.Text;
RdbParameter p_department_id = new RdbParameter("department_id", DbType.String);

p_department_id.Value = departmentID.Text;
cmd.Parameters.Add(p_department_id);

RdbDataReader dr = cmd.ExecuteReader();
dr.Read();

departments.Items.Add(dr.GetString(0));
```

Visual Basic:

```
Dim sql As String = "select department_name from departments " & _
    "where department_code = :department_id"
Dim cmd As RdbCommand = New RdbCommand(sql, conn)
cmd.CommandType = CommandType.Text
Dim p_department_id as RdbParameter = new RdbParameter("department_id",
    DbType.String)

p_department_id.Value = departmentID.Text
cmd.Parameters.Add(p_department_id)

Dim dr As RdbDataReader = cmd.ExecuteReader()
dr.Read()

departments.Items.Add(dr.GetString(0))
```

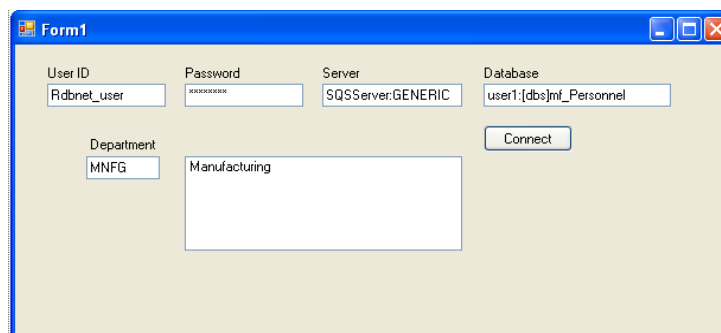
For this code, the parameter object sets the `DbType` property, but there is no need to set the `Direction` property because it uses the default value, `Input`. There is no need to set the `Size` property because the object is an input parameter, and the data provider can determine the size from the value.

Step7: **Save** and **run** the application.

Step8: Enter the login information, and a typical department code, such as "MNFG", from the MF_PERSONNEL database.

Step9: Click **Connect**.

The application returns the name of the department that corresponds to the department ID.



5.4 Retrieving Data: Multiple Values

You frequently need to retrieve more than just one value from the database. A `DataReader` object can retrieve values for multiple columns and multiple rows. Consider the multiple column, multiple row query in the following example:

```
SELECT department_code, department_name, manager_id FROM departments
WHERE department_code < 'ENG'
```

Processing multiple rows from the `DataReader` object requires a looping construct. Also, a control that can display multiple rows is useful. Because the `RdbDataReader` object is a forward-only, read-only cursor, it cannot be bound to an updatable or backward scrollable control such as Windows Forms `DataGrid` control. An `RdbDataReader` object is, however, compatible with a `ListBox` control.

To retrieve multiple values:

Step1: In the `try` block of the `connect_Click()` method, change the SQL query to return a multiple row result set and add a while loop to enclose the read method that displays the department names.

Visual C#:

```
try
{
    ...
    string sql = "select department_name from departments " +
        "where department_code < :department_id";
    ...
    while (dr.Read())
    {
        departments.Items.Add(dr.GetString(0));
    }
}
```

Visual Basic:

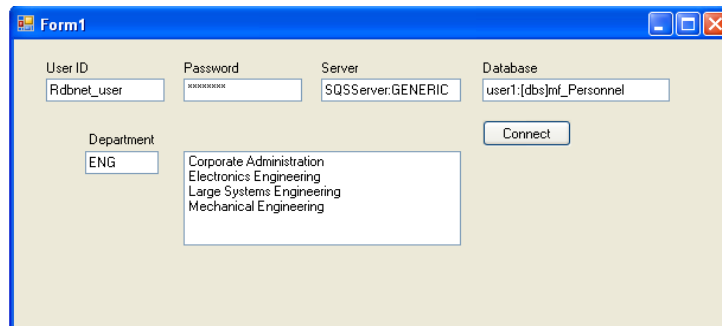
```
Try
...
Dim sql As String = "select department_name from departments " & _
    "where department_code < :department_id"
...
While (dr.Read())
    departments.Items.Add(dr.GetString(0))
End While
```

Step2: **Save** and **run** the application.

Step3: Enter the login information and enter "**ENG**" for the department.

Step4: Click **Connect**.

The application returns the name of the departments that correspond to the query.

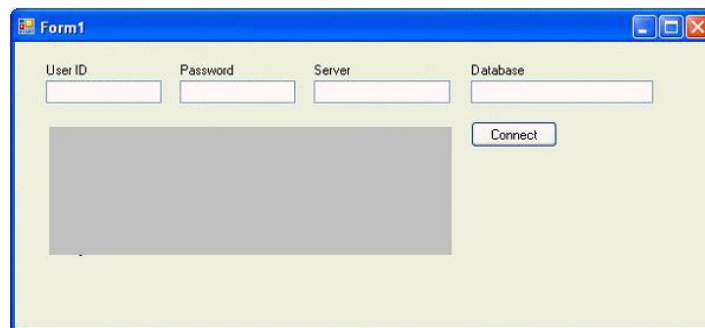


5.5 Using the DataSet Class with Oracle Rdb Data Provider for .NET

The `DataSet` class provides a memory-resident copy of database data. It consists of one or more tables that store relational or XML data. Unlike an `RdbDataReader` object, a `DataSet` is updatable and backward scrollable.

To use the DataSet class:

- Step1:** If you have not done so before, make another copy of the Form1 that you completed in Chapter 3, and name it `Form3.vb` or `.cs`, as described in [Copying a Form](#)
- Step2:** If `Form1.xx` does not appear in the Solution Explorer, from the Project menu, select **Show All Files**.
- Step3:** From the View menu, select **Designer view**.
- Step4:** From the View menu, select **Toolbox**.
- Step5:** From the Toolbox, select a **DataGridView** and drag it onto Form1.
- Step6:** From the View menu, select **Properties Window**.
- Step7:** In the Properties window, change the Name of the data grid view to `departments`.



- Step8:** From the View menu, select **Code**.
- Step9:** Immediately after the `conn` declaration in the code, add variable declarations to the class variables, as indicated.

Visual C#:

```
public partial class Form1 : Form
{
    public Form1()
    {
        InitializeComponent();
    }
    private RdbConnection conn = new RdbConnection();
    private RdbCommand cmd;
```

```

private RdbDataAdapter da;
private RdbCommandBuilder cb;
private DataSet ds;
...

```

Visual Basic:

```

Public Class Form1
    Dim conn As New RdbConnection
    Private cmd As RdbCommand
    Private da As RdbDataAdapter
    Private cb As RdbCommandBuilder
    Private ds As DataSet

```

Step10: Within the `connect_Click()` method `try` block, add code to:

- Query the database
- Fill the `DataSet` with the result of the command query
- Bind the `DataSet` to the data grid (departments)

Visual C#:

```

conn.Open();
connect.Enabled = false;

string sql = "select * from departments where "+
    "department_id < 'ENG'";
cmd = new RdbCommand(sql, conn);
cmd.CommandType = CommandType.Text;

da = new RdbDataAdapter(cmd);
cb = new RdbCommandBuilder(da);
ds = new DataSet();

da.Fill(ds);

departments.DataSource = ds.Tables[0];

```

Visual Basic:

```

conn.Open()
connect.Enabled = False

Dim sql As String = "select * from departments where " + _
    "department_id < 'ENG'"
cmd = New RdbCommand(sql, conn)
cmd.CommandType = CommandType.Text

da = New RdbDataAdapter(cmd)
cb = New RdbCommandBuilder(da)
ds = New DataSet()

da.Fill(ds)

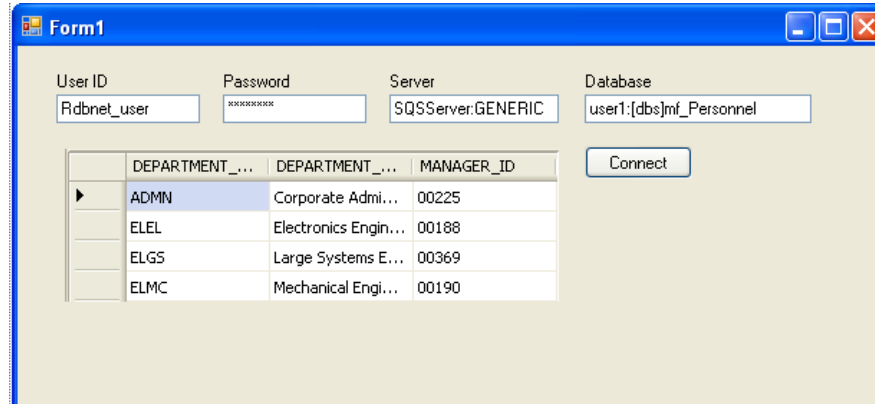
```

```
departments.DataSource = ds.Tables(0)
```

Step11: Build and **save** the application.

Step12: Run the application, entering the **login** and **data source**.

After you successfully connect to the database, the data grid is populated with the results of the query.



5.6 Enabling Updates to the Database

At this point, the `DataSet` contains a client copy of the database data. In this section, you will add a button that enables client data changes to be saved back to the database. The following section will show you how to test updating, inserting, and deleting the data.

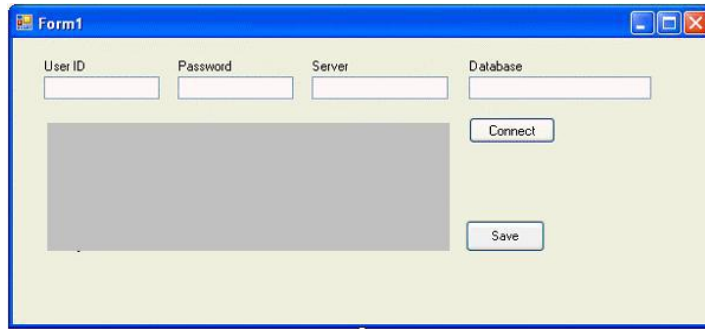
To enable saving data from the `DataSet` to the database:

Step1: From the Toolbox, drag and drop a **Button** onto **Form1**.

Step2: In the Properties window, change the Name of the button to `save`.

Change the Text property to `Save`.

Step3: At the top of the Properties Window, click Events (the lightning bolt). In the list of events, select the click event. In the second column, enter the event name, `save_Click`.



Step4: From the View menu, select **Code**.

Step5: Add code that updates the data, to the body of the `save_Click()` method, as indicated.

Visual C#:

```
da.Update(ds.Tables[0]);
```

Visual Basic:

```
da.Update(ds.Tables(0))
```

You may see some errors show up in the Error List. These will disappear after you add the code in the next step.

Step6: Within the `Form()` method or `Form1_Load` method, add the code indicated.

Visual C#:

```
public Form1()  
{  
    InitializeComponent();  
    save.Enabled = false;  
}
```

Visual Basic:

```
Private Sub Form1_Load(ByVal sender As System.Object, & _  
    ByVal e As System.EventArgs) Handles MyBase.Load  
    save.Enabled = false
```

Step7: Within the `connect_Click()` method `try` block, add code to enable the Save button as indicated:

Visual C#:

```
conn.Open();
...
departments.DataSource = ds.Tables[0];

save.Enabled = true;
```

Visual Basic:

```
conn.Open()
...
departments.DataSource = ds.Tables(0)

save.Enabled = True
```

Step8: Remove the `conn.Dispose()` call from the `finally` block in the `connect_Click()` method.

Note: In the previous code used in this example, this method was necessary to dispose or close the connection. However, with these changes to the code, it is necessary to keep the connection open after the query result returns, so that data changes made by the end user are propagated to the database. A general override call, `components.Dispose()`, is already part of the definition of Form1.

Step9: **Build** and **save** the application.

Step10: **Run** the application, entering the login and data source.

After you successfully connect to the database, the data grid is populated with the results of the query.

DEPARTMENT_...	DEPARTMENT_...	MANAGER_ID
ADMN	Corporate Admi...	00225
ELEL	Electronics Engin...	00188
ELGS	Large Systems E...	00369
ELMC	Mechanical Engi...	00190

Show Navigation

Chapter 6 ORDP.NET and Visual Studio Wizards

In this section you will use the Visual Studio integrated development environment (IDE), along with the standard Visual Studio wizards to automatically generate the code to access data from your Rdb database

This chapter contains:

- [Create a New application](#)
- [Add connection to RDB database in MS server explorer](#)
- [Create a datasource for the employees table](#)
- [Design the windows application](#)

6.1 Create a New application

Create a new windows forms application using the **File →New →project** menu. Call it **empapp**.

See [Creating a New Project](#) for the steps to create a new project.

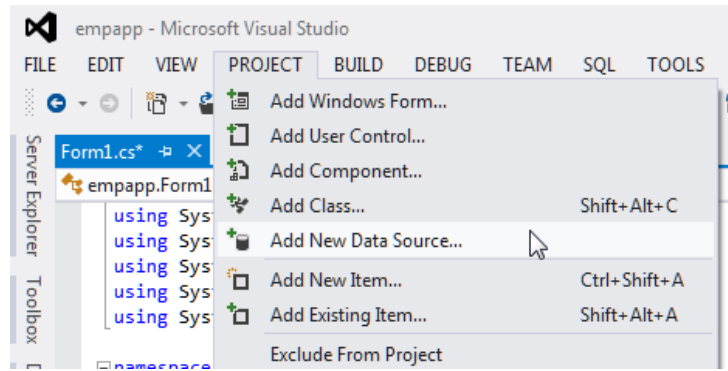
6.2 Add connection to Rdb database in Server Explorer

See [Connecting to the Oracle Rdb Database](#) for steps to connect to your database.

6.3 Create a datasource for the employees table

To create a new Data Source:

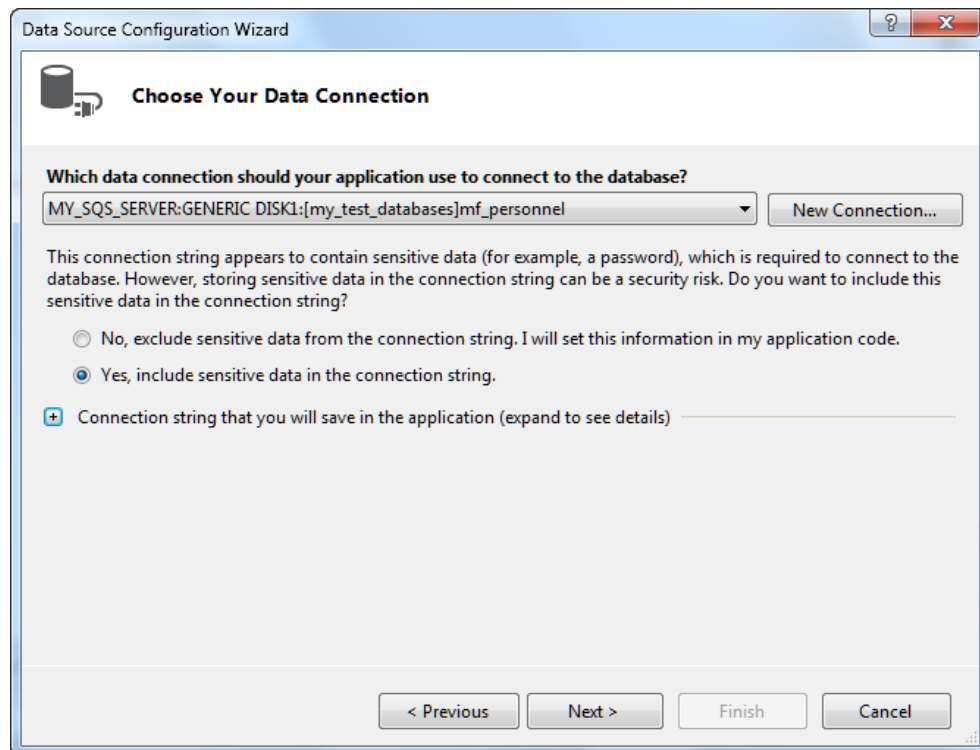
Step1: Using the top-level menu **Project → Add New** Data Source.



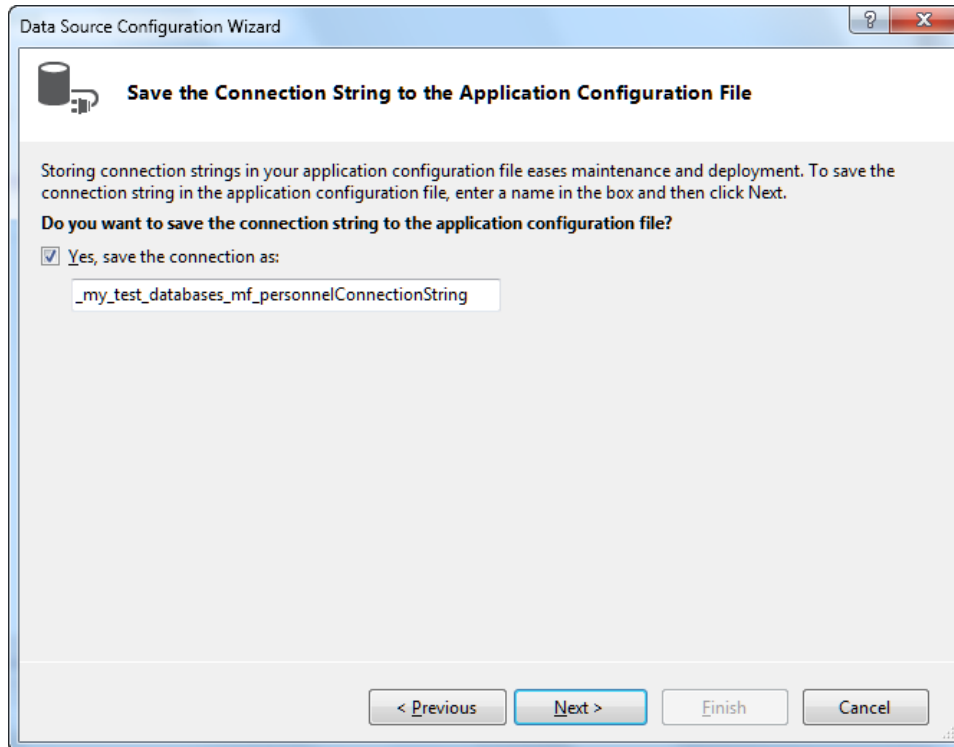
Step2: In the wizard, keep the default selection for "Database". Click **Next**

Step3: In **Choose a Database Model** keep the default selection for "Dataset". Click **Next**

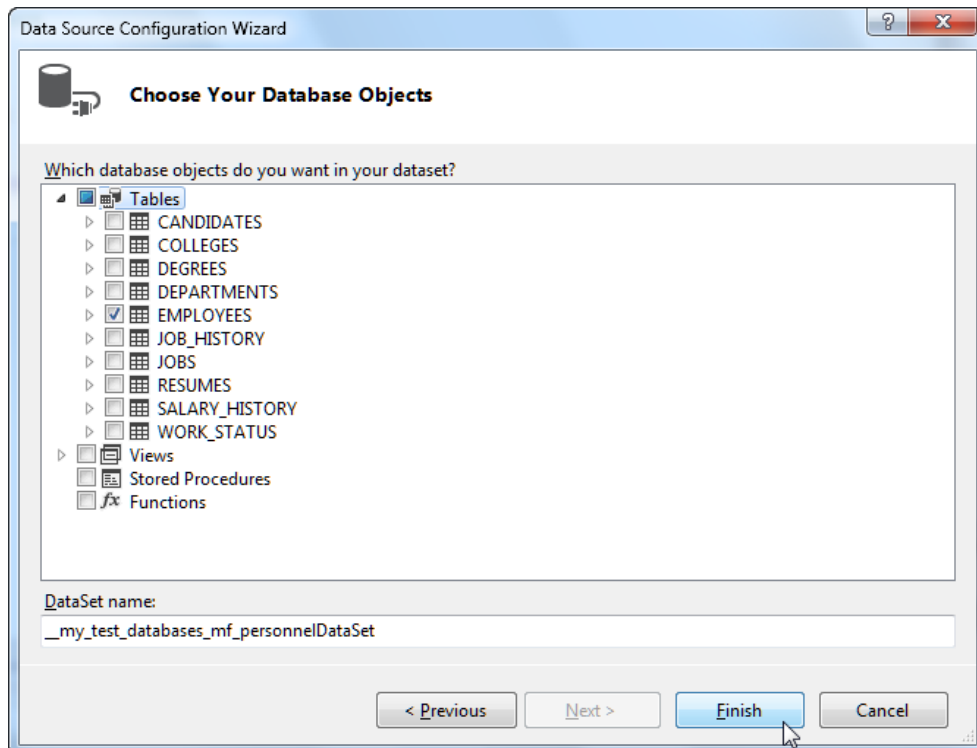
Step4: From the list of connection, select the connection to the sample that was created that was created earlier, select the option to include the sensitive data in connection string. Click **Next**



Step5: Check to save the connection string to the Application Configuration File Click **Next**



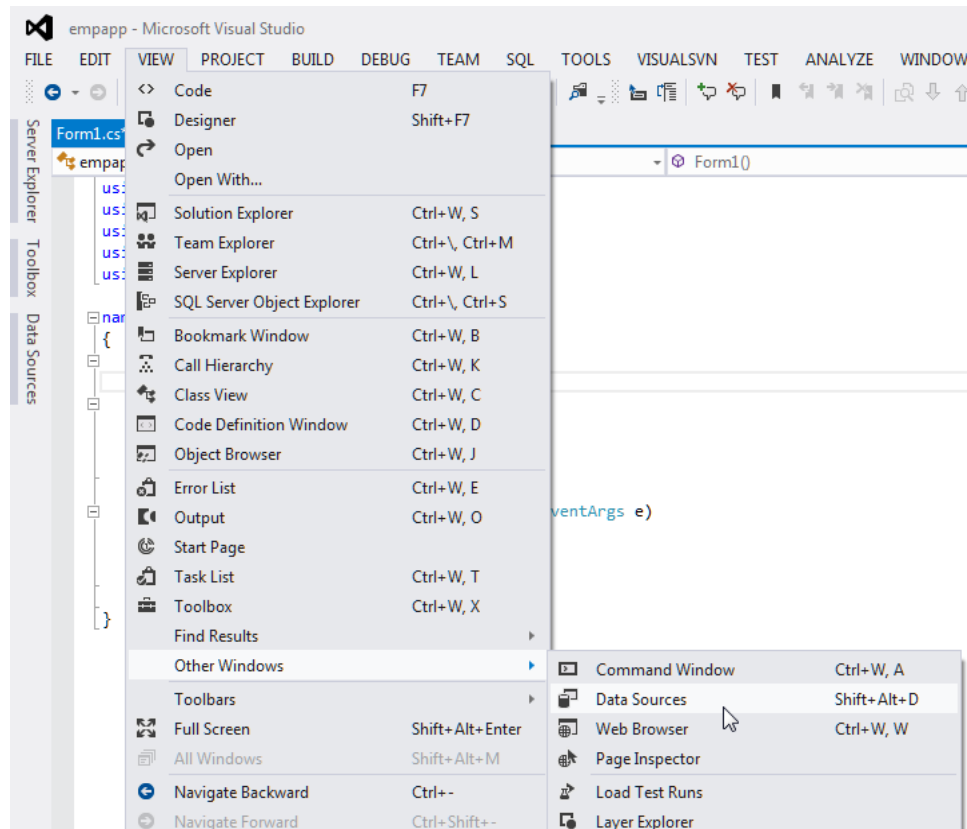
Step6: A tree of available table will be displayed, select the employees table from the list of tables by checking the box next to it. Click **finish**

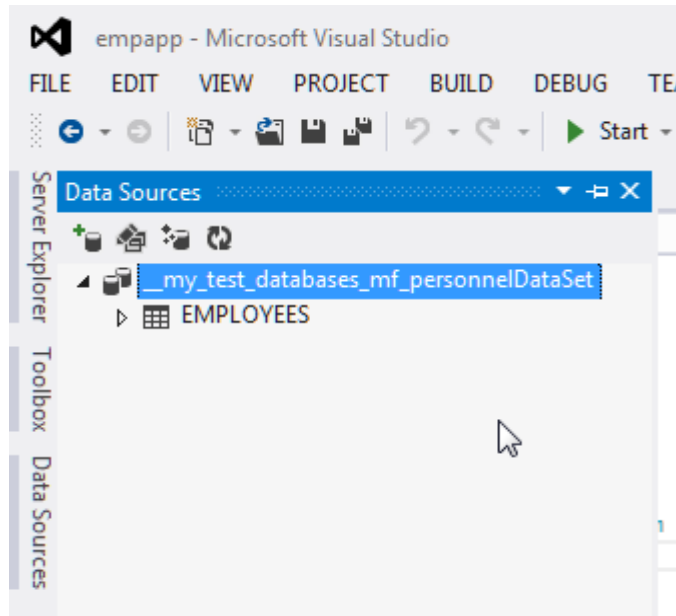


Step7: A data source for employees will be added in the "Data Sources" tab panel.

You can make the data source window visible using the top level menu

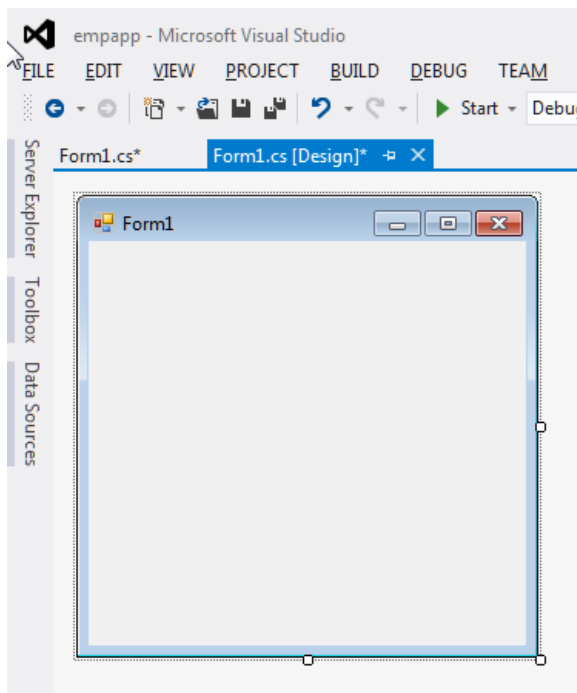
View → Other Windows → Data sources



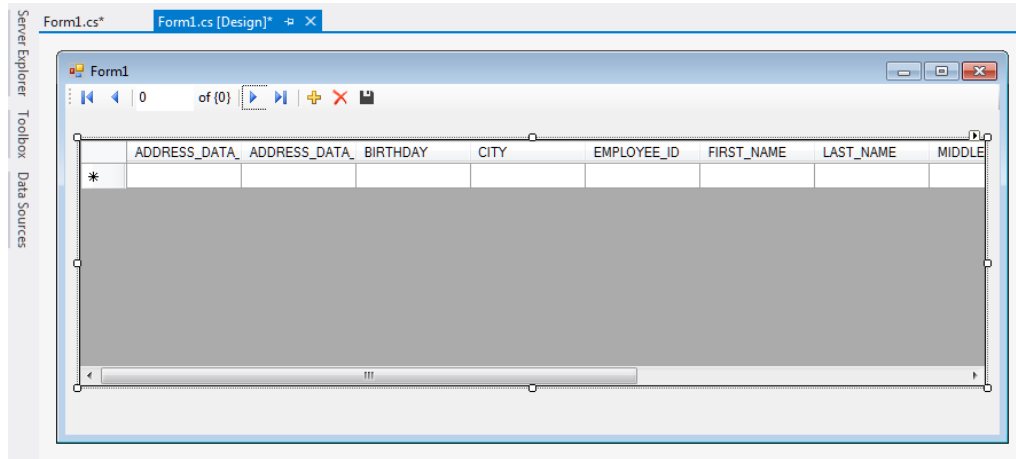


6.4 Design the windows application

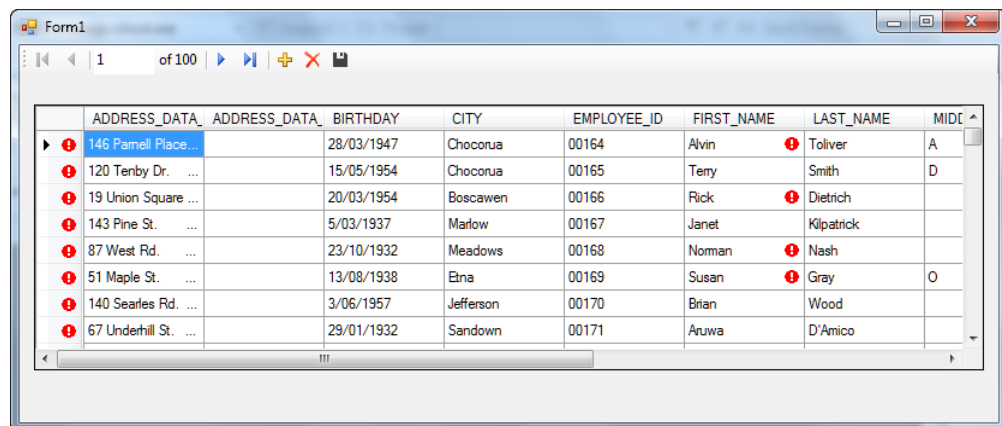
Step1: Ensure that **Form1.cs** is open in **design** mode.



Step2: Drag and Drop the **Employees** data source from the data sources window onto the form. You will have to drag the left side of the form to make it wider so it may accommodate the fields from employees.



Step3: Build and Run the windows application



Show Navigation

Chapter 7 ORDP.NET and drag and drop

In this section you will use the Visual Studio integrated development environment (IDE), along with drag and drop to automatically generate the code to access data from your Rdb database.

This chapter contains:

- [Create a New application](#)
- [Add connection to RDB database in MS server explorer](#)
- [Add a new Typed DataSet](#)
- [Designing the windows application](#)
- [Running the windows application](#)

7.1 Create a New application

Create a new windows application using the **File →New →project** menu. Call it **empapp2**.

See [Creating a New Project](#) for the steps to create a new project.

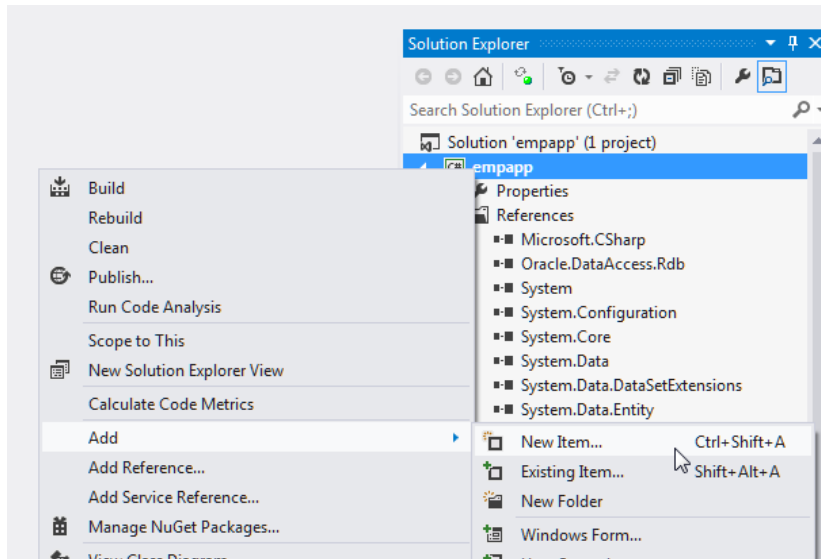
7.2 Add connection to Rdb database in Server Explorer

See [Connecting to the Oracle Rdb Database](#) for steps to connect to your database if you do not already have a connection.

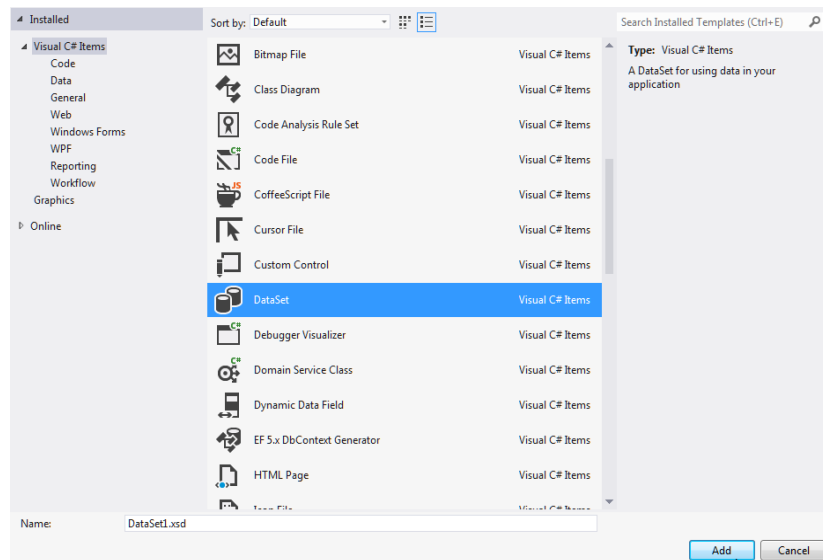
7.3 Add a new Typed DataSet

To add a new Typed DataSet to your project:

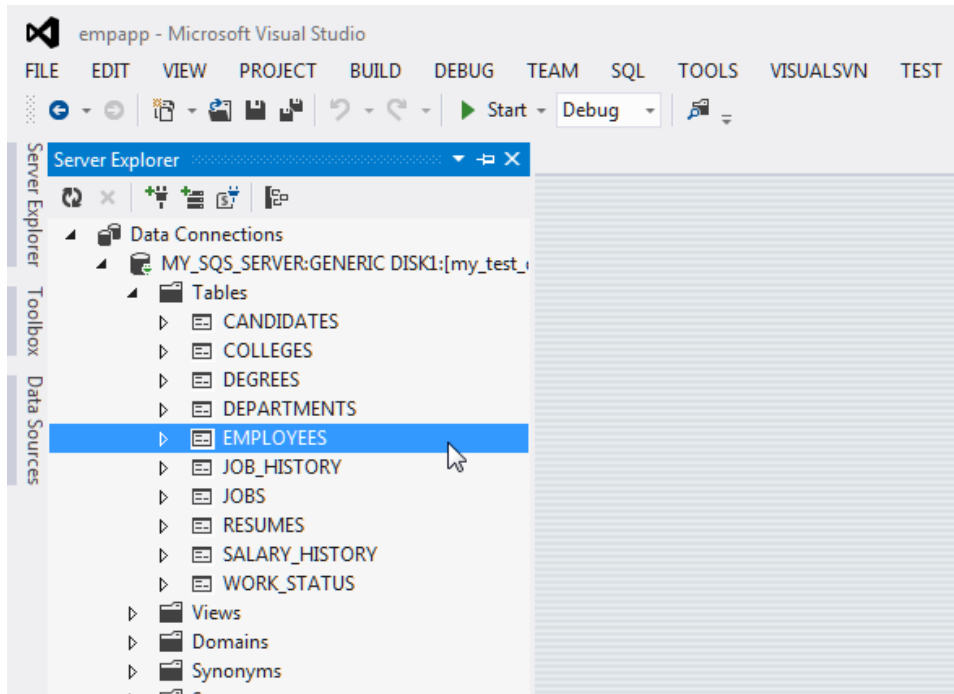
Step1: Using the Microsoft Solution Explorer, right click on the **empapp2**, and select **Add → New Item**



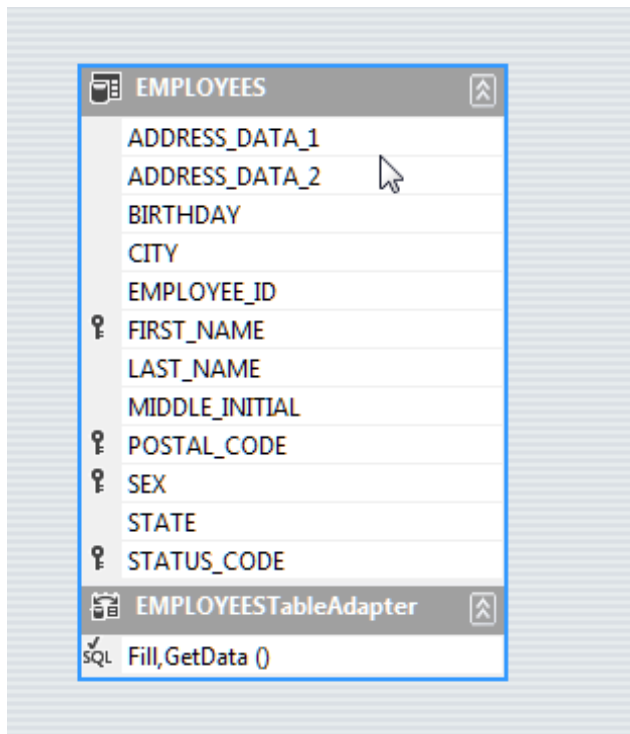
Step2: Select **DataSet**. Click **Add**. The Microsoft Dataset Designer will be opened.



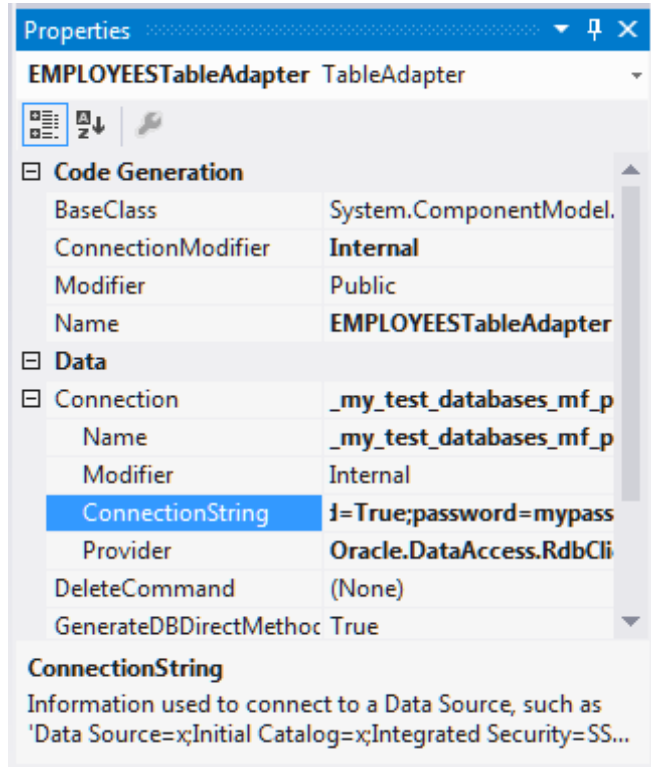
From the Microsoft Server Explorer, drag and drop "Employees" table onto the open designer.



This will create a datasource and an associated **EMPLOYEESTableAdapter** that can you use in your application to access the employees table.



Step3: Ensure the password is added to the connection string. Select **EMPLOYEESTableAdapter**, and right click to view its properties. Click in the **ConnectionString** field and append your password in the below format
Password=yourpassword

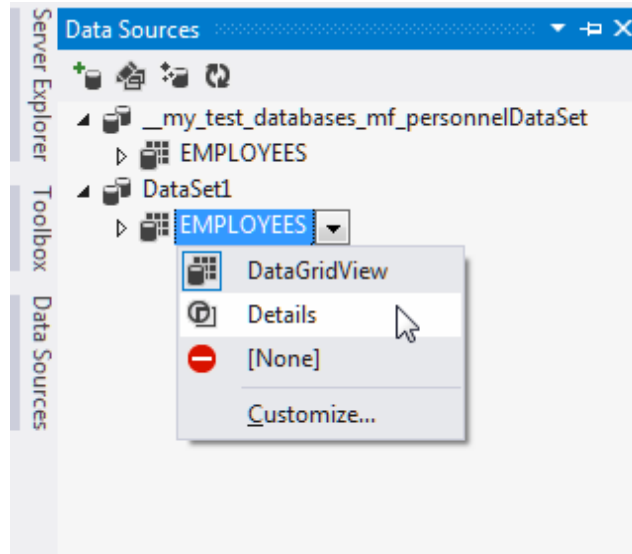


7.4 Designing the windows application

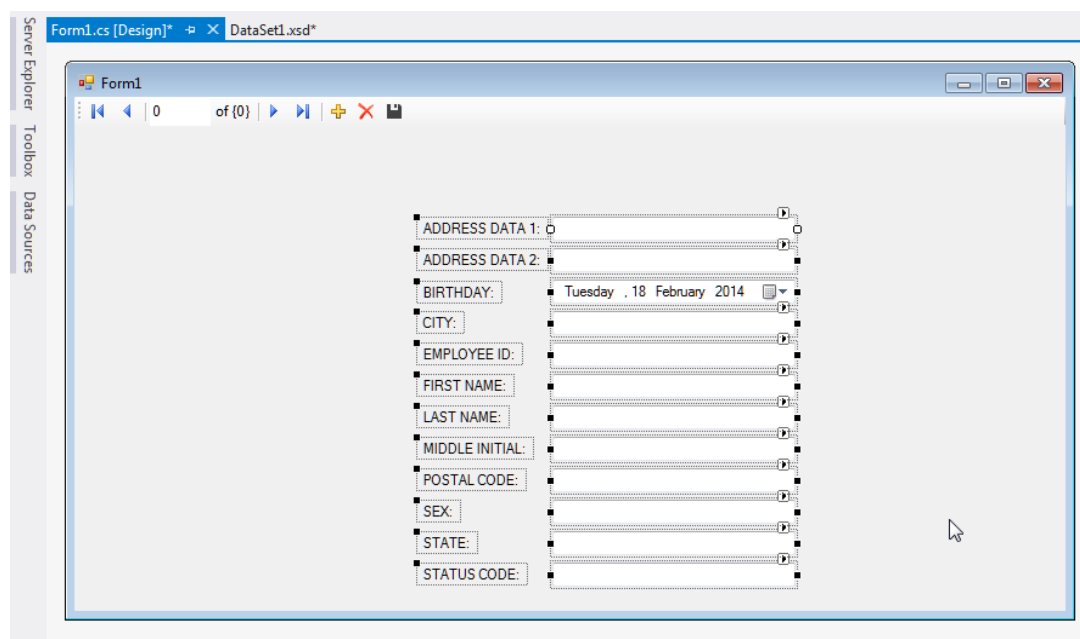
To design the application:

Step1: Ensure the Form1.cs is open in design mode.

Step2: Using the Microsoft data sources window, use the smart menu on the Employees data source, and select **Details**



Step3: Drag and drop the Employees data source from the data source window onto the form.



A prototype form to access the employees data will be created for you.

7.5 Running the windows application

Run the application using the top-level menu. You can insert, delete rows and change the existing data.

Form1

0 of 0

ADDRESS DATA 1: 146 Pamell Place

ADDRESS DATA 2:

BIRTHDAY: Friday , 28 March 1947

CITY: Chocorua

EMPLOYEE ID: 00164

FIRST NAME: Alvin

LAST NAME: Toliver

MIDDLE INITIAL: A

POSTAL CODE: 03817

SEX: M

STATE: NH

STATUS CODE: 1

Show Navigation

Chapter 8 Configuration wizard and generating queries

Wizards make it easy to perform many operations within Visual studio. The Table Adapter Query Configuration Wizard simplifies the creation of queries you may execute on your Rdb database.

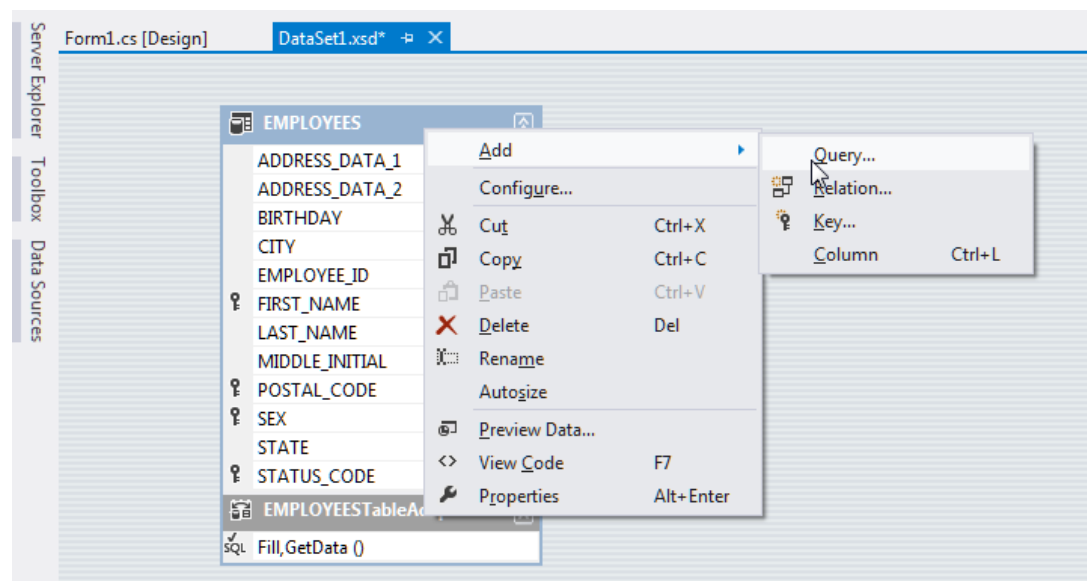
This chapter contains:

- [Using the Query Configuration Wizard](#)
- [Using the Query Builder](#)
- [Methods Generation](#)

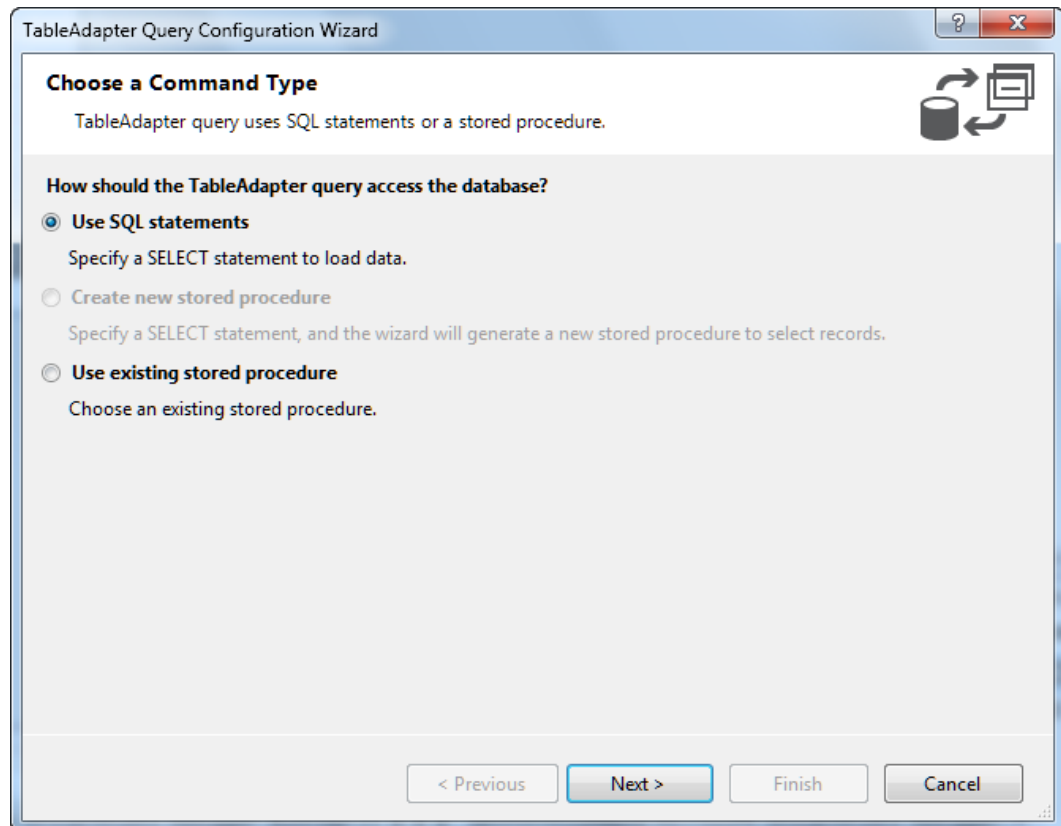
8.1 Using the Query Configuration Wizard

To use the Query Configuration Wizard:

Step1: In the DataSet XSD window right click dataset and click **add→Query**

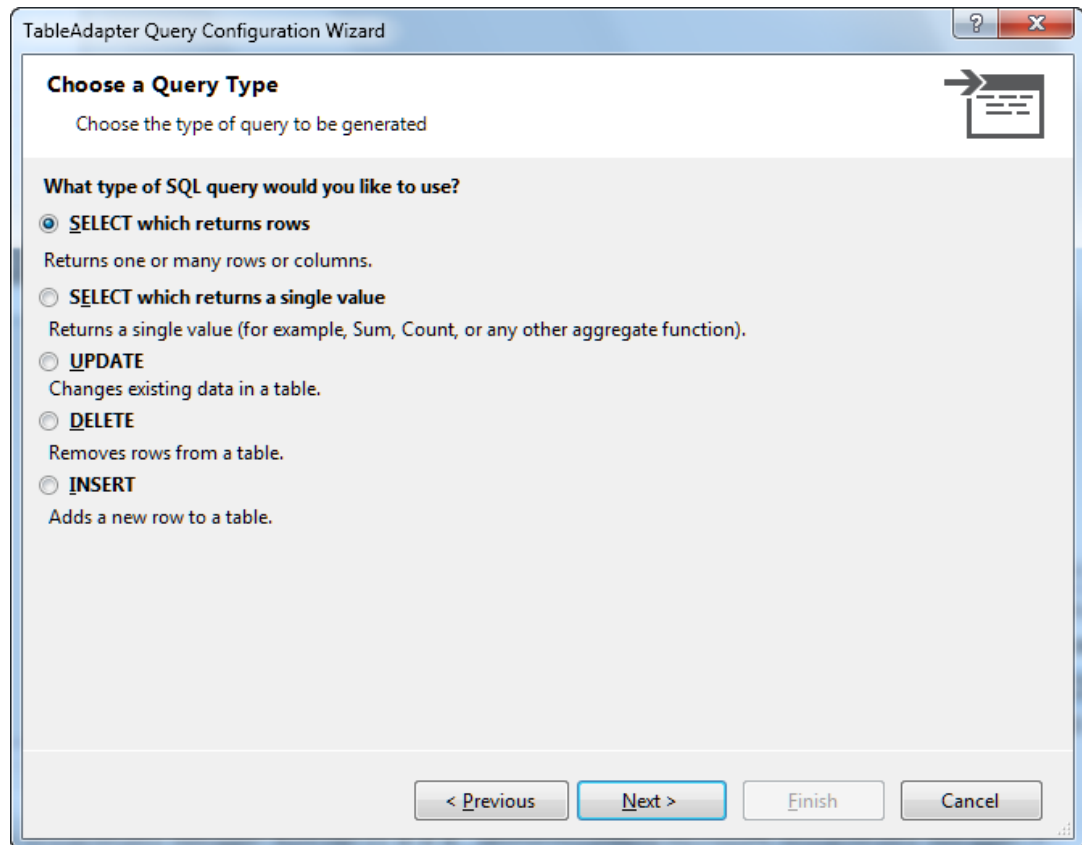


The Table Adapter Query Configuration Wizard will be shown.



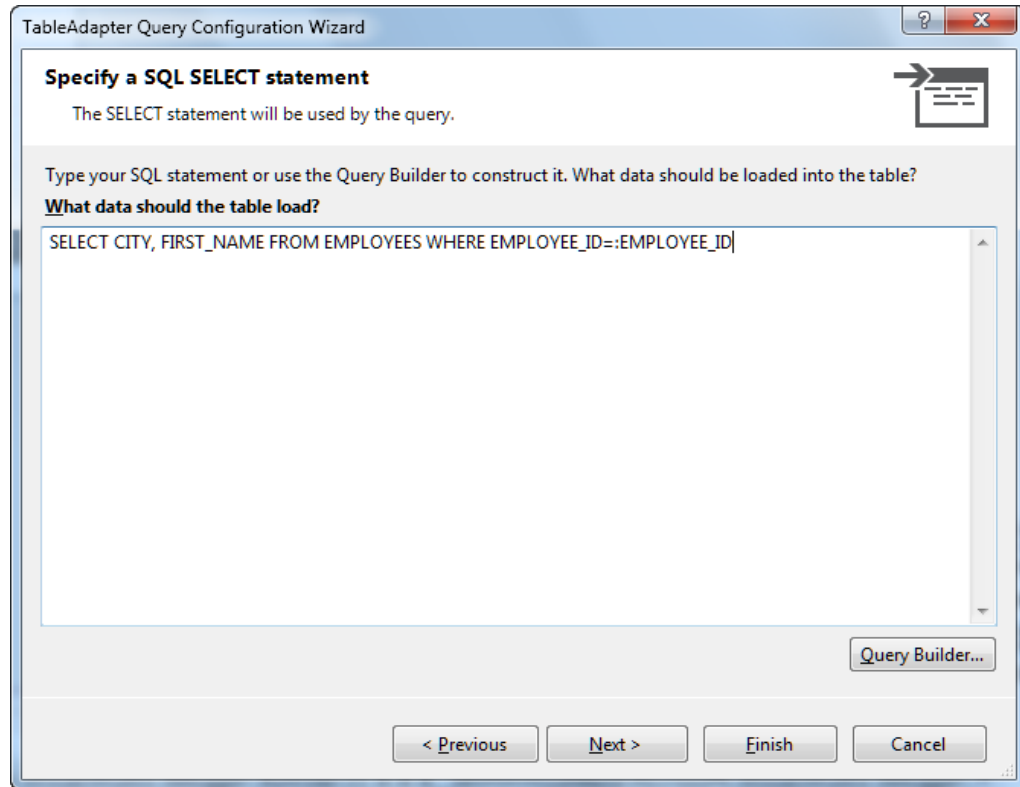
Step2: Select **Use SQL Statement**

Clicking **Next** will bring up the query Type window. This window allows you to choose from several types of standard SQL statements.



Step3: Select the query type **SELECT which returns rows.**

Step4: Click **Next** to bring up the query specification window. This is where you may enter a SQL query statement.. Use the ":" character pre-pended to parameter names to specify parameters you wish to use.



For example to return details of an employee giving the **employee_id**:

```
SELECT CITY, FIRST_NAME FROM EMPLOYEES WHERE EMPLOYEE_ID=:EMPLOYEE_ID
```

Step5: Click **Finish**. We have just added a select functionality to the typed dataset using **TableAdapter** without writing a single line of code.

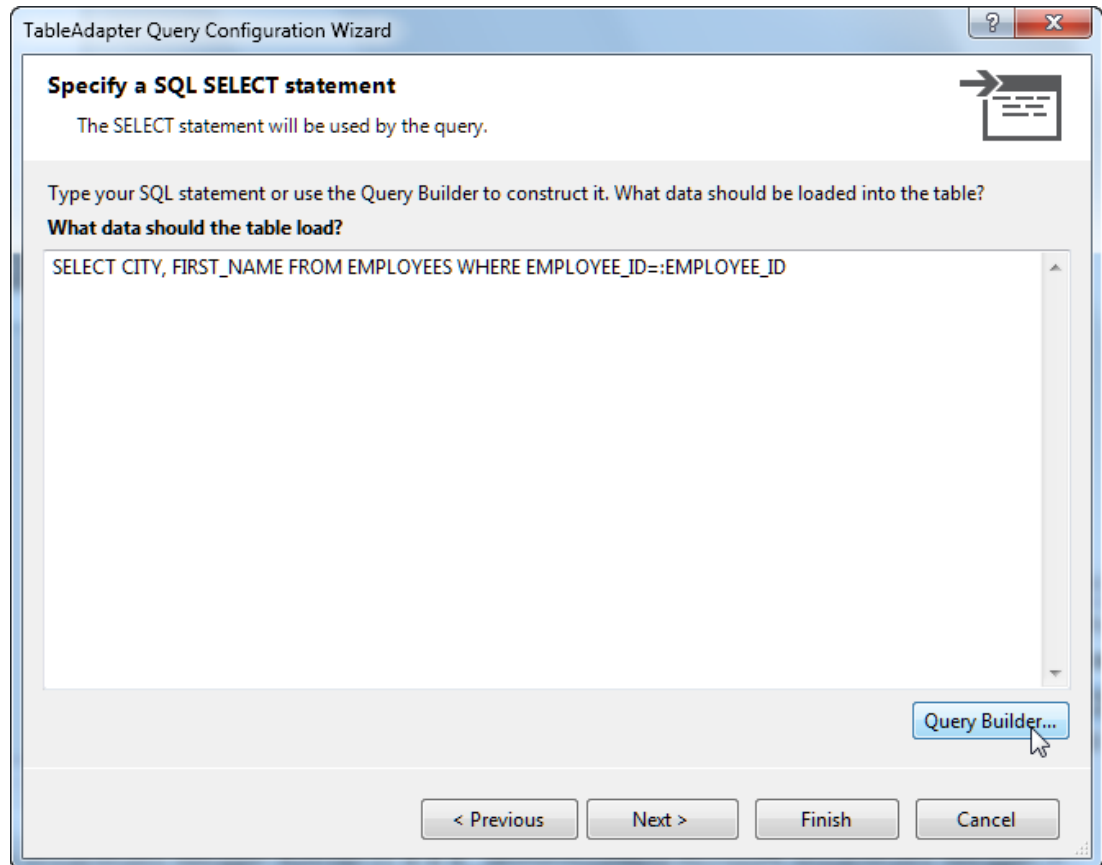
Repeat the above steps to produce other statements such as **UPDATE** and **DELETE** .

8.2 Using the Query Builder

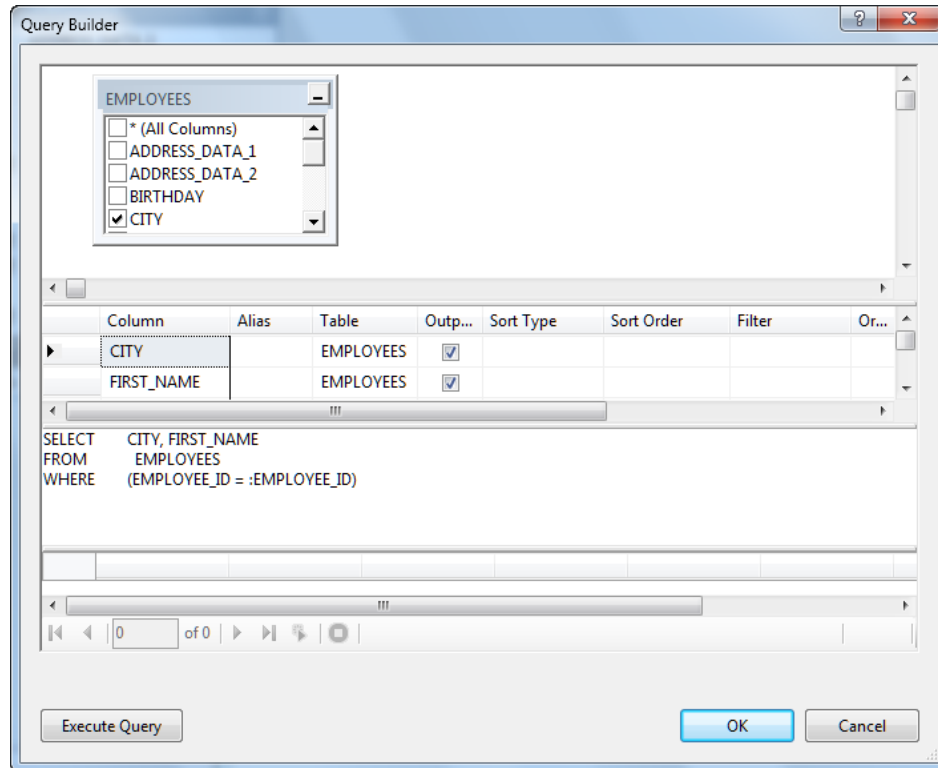
Instead of entering the SQL text directly Visual Studio provides the **Query Builder** option within the configuration Wizard that allows quick and easy creation of syntactically correct SQL queries on your datasets.

Using Query Builder to generate queries:

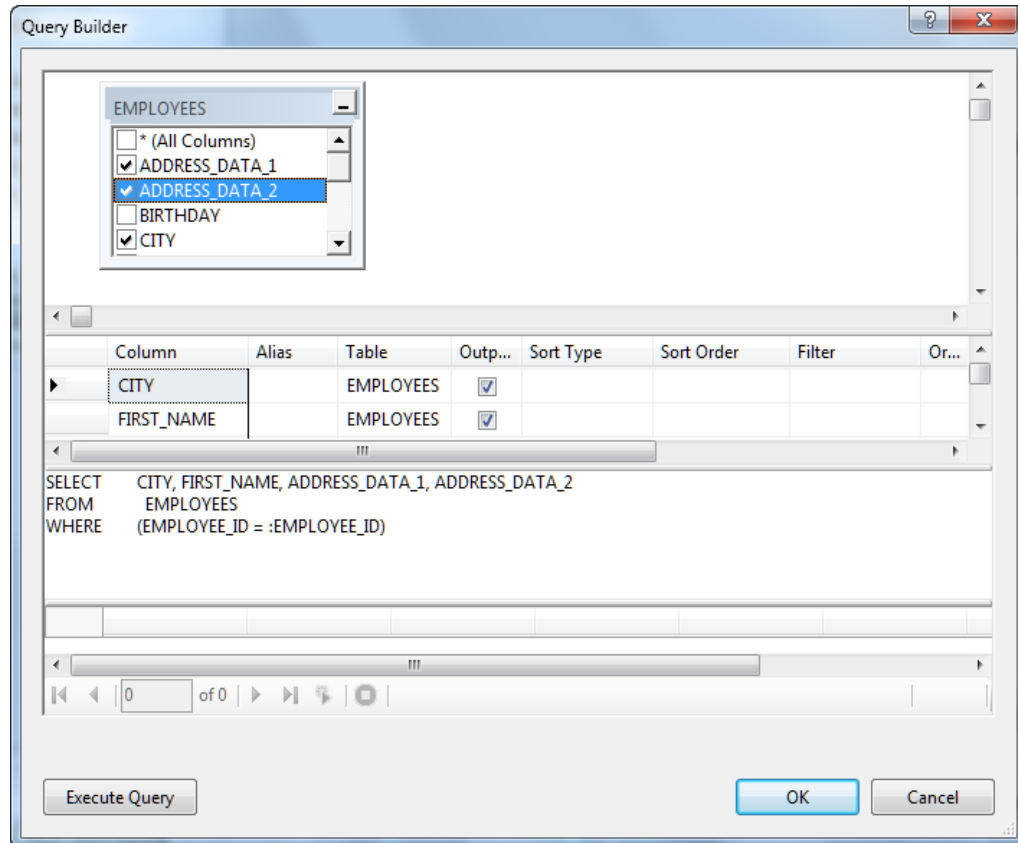
Step1: Starting with Query Configuration Wizard used in the previous walk-through, Click **Query Builder** to bring up the builder window .



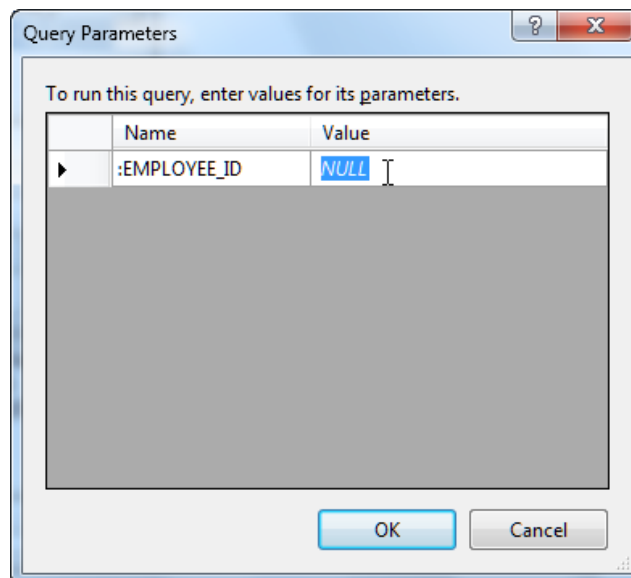
Step2: This will bring up a window allowing you to choose columns for your query, in this case it will be preloaded with the query we typed in before.



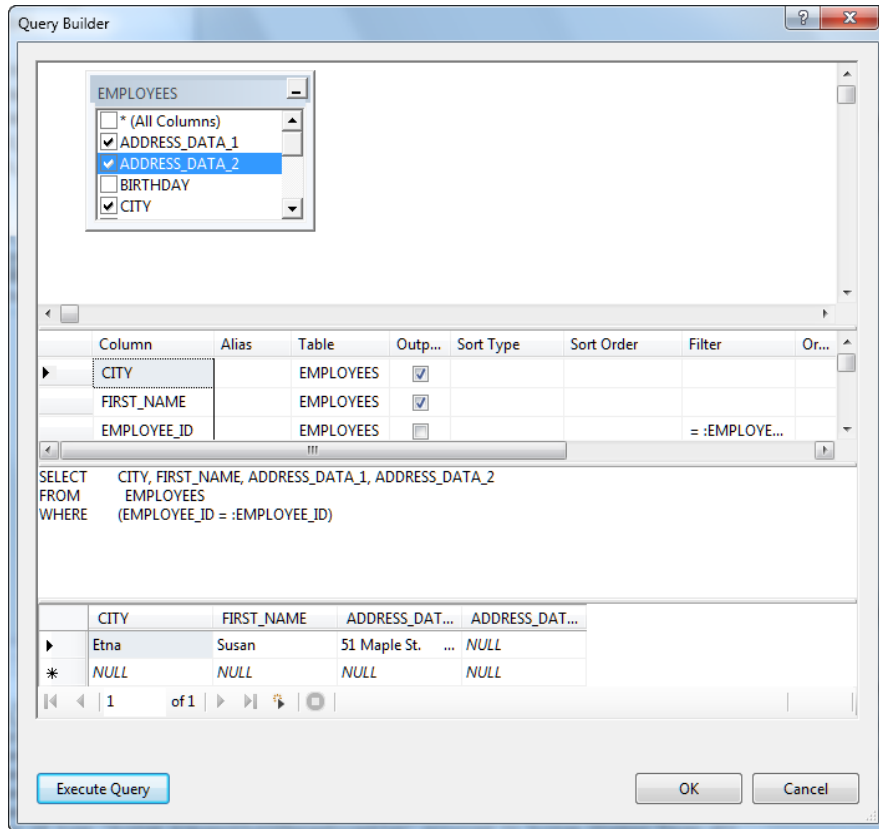
Step3: Within the **EMPLOYEES** table check the columns name and Parameters to the query (Filter) as shown below.



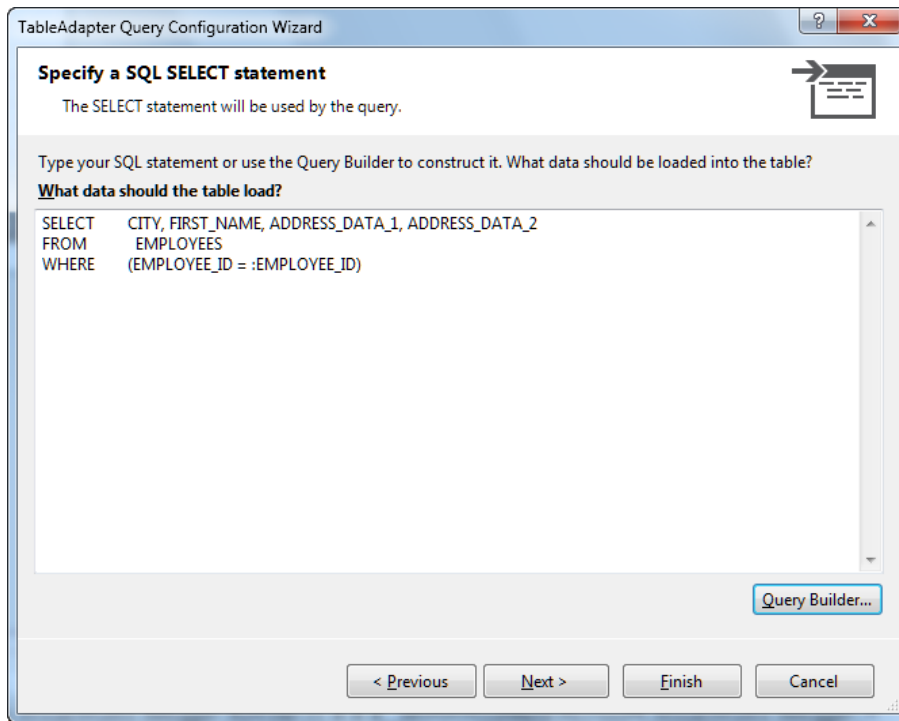
Step4: Click **Execute Query** to execute the generated query. You will be prompted for the employee_id. Enter a valid id and press **OK**.



Step5: The results of the operation will be displayed in the results window.



Step6: Click "OK" to accept the query .



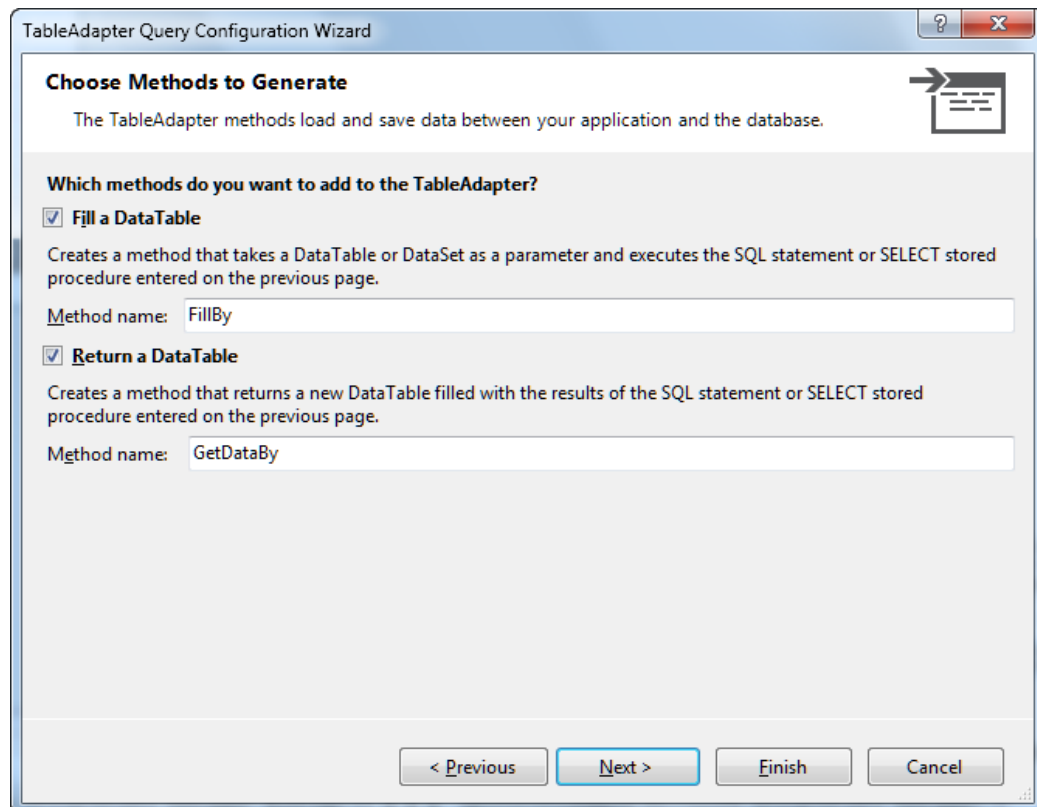
Step7: Click "**Finish**". Your query is now ready to use. The Query Configuration Wizard will now display the Methods Generation window.

8.3 Methods Generation

Once you have generated a query, this query may be used within the TableAdapter . The next step is to choose what methods should be available within your TableAdapter.

How to choose methods:

Step1: Press NEXT in the Query Configuration Wizard to bring up the choose Methods To Generate panel.

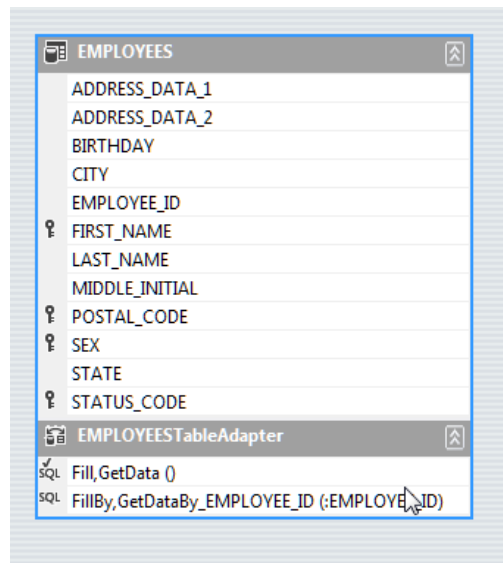


Step2: Select the **Fill A DataTable** and **Return a DataTable** .

Step3: Change the **Return a DataTable** method name to **GetDataBy_EMPID**

Step4: Press **FINISH**.

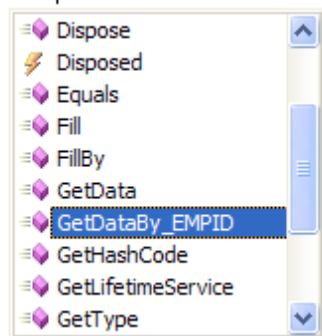
The final dataset in the designer show look like the following:



Step5: To execute the above functionality in your code, instantiate the table adapter as follows:

```
DataSet1TableAdapters.EMPLOYEEESTableAdapter adapt = new
DataSet1TableAdapters.EMPLOYEEESTableAdapter ();
```

This new select function can now also be seen in the TableAdapter intellisense.



Step6: The methods provide by the TableAdapter may be used within your code

```
// Get Employee details by employee_id
dataGridView1.DataSource=adapt.GetDataBy_EMPID(00164);
```

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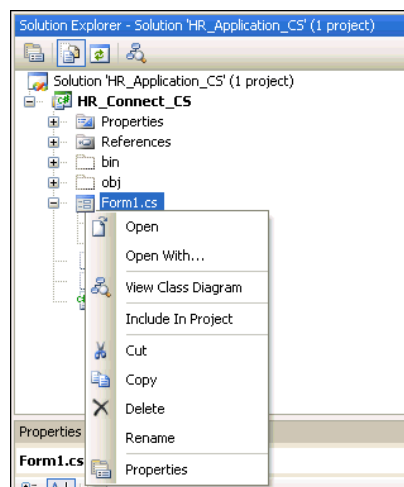
Chapter 9 Copying a Form

Because you will be using this application to learn about various aspects of application development with Oracle Rdb, you should make copies of your form for reuse.

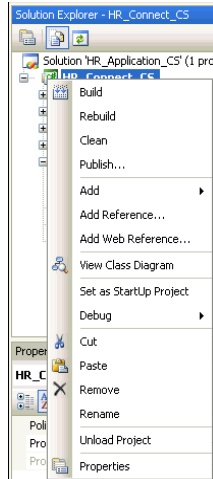
To create a copy of an existing form:

Step1: In the Solution Explorer, right-click on `Form1.xx` or any other file you need to copy. Select **Copy**.

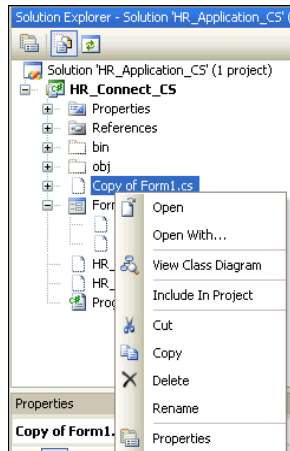
If `Form1.xx` does not appear in the Solution Explorer, from the Project menu, select **Show All Files**.



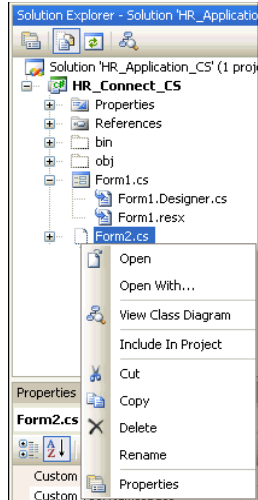
Step2: Right-click **HR_Connect_CS** or other project. Select **Paste**.



Step3: Right-click **Copy of Form1 .cs**. Select **Rename**. Change the name of the form to **Form2 .cs**.



Step4: Right-click on **Form1 .cs**, and select **Include In Project**.



Step5: Right-click on `Form1.cs`, and select **Exclude From Project**.

You can include and exclude forms from the project just by reversing these steps.

Note:

This process generally works smoothly. If you encounter a problem, try running **Rebuild Solution** from the **Build** menu.

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Chapter 10 Oracle Rdb Entity Framework Provider

The Entity Framework is a new part of ADO.NET that allows you to build your applications against conceptual data models. It provides a greater level of abstraction and supports code that is independent of any particular relational database.

It provides an Entity Data Model (EDM) for defining data at the database and conceptual level and mapping between the two. It includes a nice set of tools that can be used to generate the EDM and corresponding objects that represent the database. This eliminates much of the required boilerplate data access code, and makes it a snap to create data-centric applications.

The chapter also provides some simple examples on how to carry out Model-First and Database-First application development using the Oracle Rdb Entity Framework Provider.

Model-first is the ability to start with a conceptual model and create the database from it. Database-first is the ability to start with the database and build your EDM from the database objects.

The examples in this chapter are based on Visual Studio 2012. If you are using another version of Visual Studio, the user interface may have changed. Please refer to your Visual studio documentation to see how the same objectives may be achieved.

This chapter contains:

- [Creating new Windows Form Application](#)
- [Reference the Oracle Rdb EntityFramework Provider](#)
- [Adding an Entity Data Model](#)
- [Create a new Entity](#)
- [Creating Complex Types](#)
- [Generating Database Schema from Model](#)

10.1 Creating new Windows Form Application

The first step is to create a new Windows Forms application:

Step1: In Visual Studio IDE, select **File→New→Project** from the main menu.

Choose the Windows Forms Application installed template. Click **OK**. The solution is created.

Step2: Right-click on `Form1.cs` and select **Exclude From Project**.

10.2 Reference the Oracle Rdb EntityFramework Provider

Before you can use EntityFramework 6 with Oracle Rdb you should install the latest version of the Oracle Rdb Entity Framework provider using the Microsoft NuGet package installer.

Microsoft NuGet is the software development package manager for Microsoft .NET. The NuGet client tools produce and consume these packages, including non-Microsoft software, such as ORDP.NET.

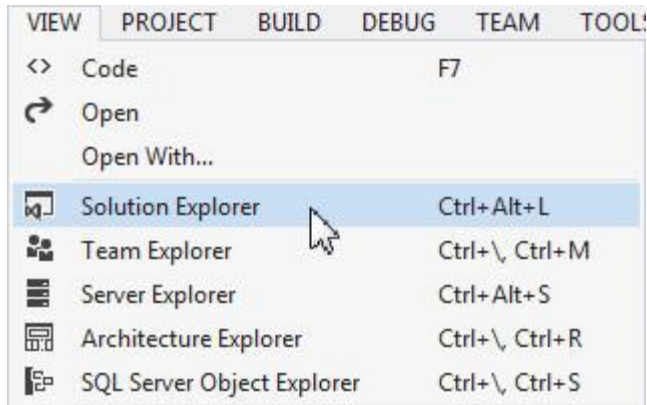
The [NuGet Gallery](#) is the central repository for hosting and consuming packages.

Starting with release 7.3.4.0.0 ORDT, you can use the Oracle Rdb Entity NuGet package to configure your Microsoft Projects to use ORDT in conjunction with Entity Framework release 6 (EF6) .

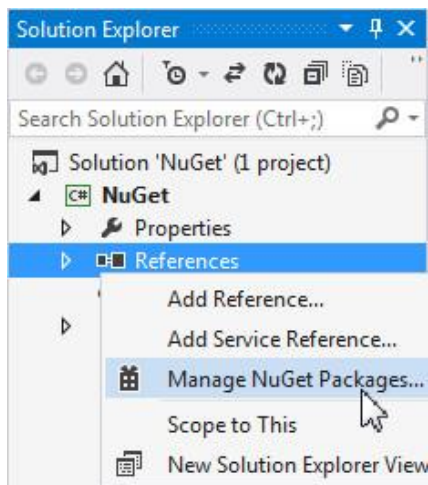
Note: Currently the Oracle Rdb Entity NuGet package only configures your projects for use with EF6, you still must manually download and install ORDT. This may change in future releases of ORDT.

The following steps show how to use NuGet to help configure your project to use ORDT with EF6.

Step1: In Visual Studio IDE, select **View > Solution Explorer** from the main menu.

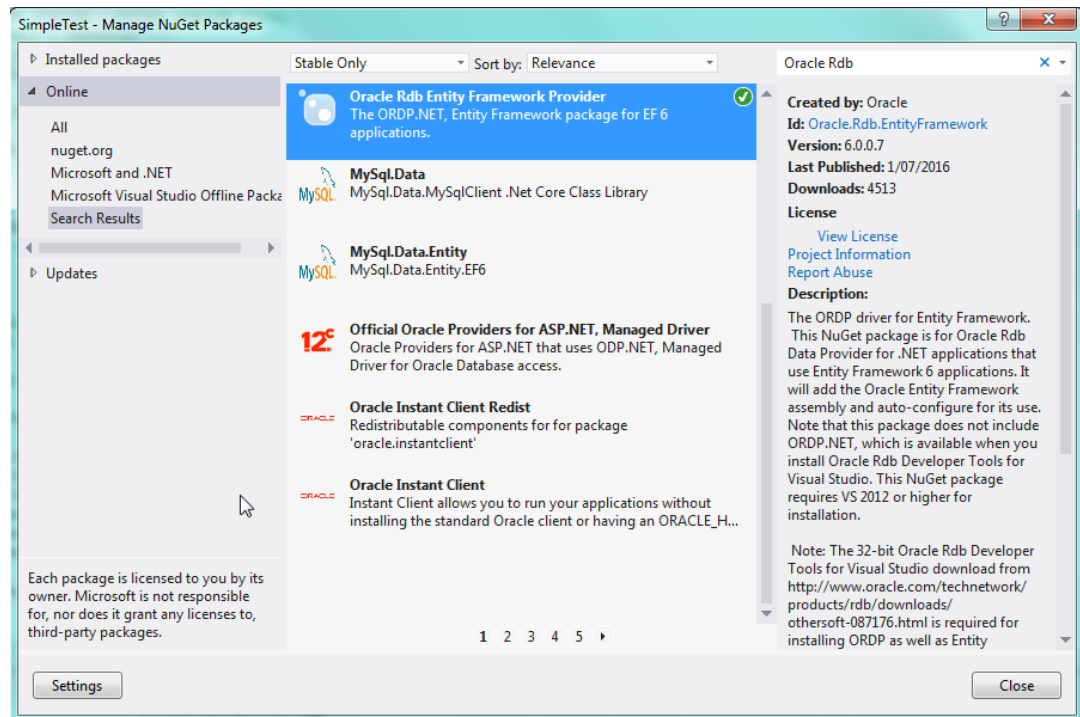


Step2: Right-click **References** in the Solution Explorer and choose **Manage NuGet Packages**.



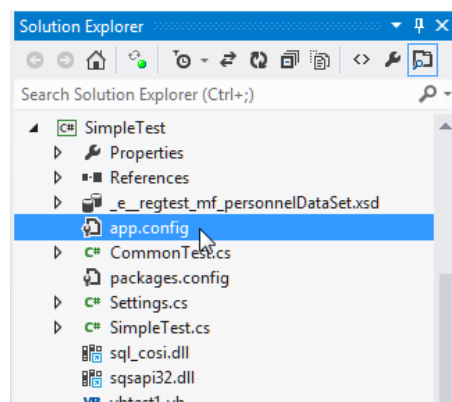
Step3: In the **Manage NuGet Packages** window, ensure that you have selected **nuget.org** in the left panel, under the **Online** tab. On the upper right side of the window, there is a search bar. Search for **Oracle Rdb**.

Select **Oracle Rdb Entity Framework Provider** (with the Id **Oracle.Rdb.EntityFramework**) in the search results and click **Install**.



The package installation will not download any software, but it will setup your environment so that you may use the NuGet package to configure your projects. Once the package has been installed, a green tick mark will be placed against the product name.

Step4: To confirm that ORDP.NET and Entity Framework have been automatically configured, from the Solution Explorer window, open **App.config**.



You will see that ORDP.NET and Entity Framework configuration information has been added to the project.

```

app.config*  NuGet.config  NuGet Gallery  Package.nuspec  Variables.wxi  Ident.cs
</applicationSettings>
<startup>
  <supportedRuntime version="v4.0" sku=".NETFramework,Version=v4.5" />
</startup>
<entityFramework>
  <providers>
    <provider invariantName="System.Data.SqlClient" type="System.Data.Entity.SqlServer.SqlProviderSe
    <provider invariantName="Oracle.DataAccess.RdbClient" type="Oracle.DataAccess.RdbClient.RdbProvi
  </providers>
  <defaultConnectionFactory type="Oracle.DataAccess.RdbClient.Entity.RdbConnectionFactory, Oracle.Da
</entityFramework>
<connectionStrings>

```

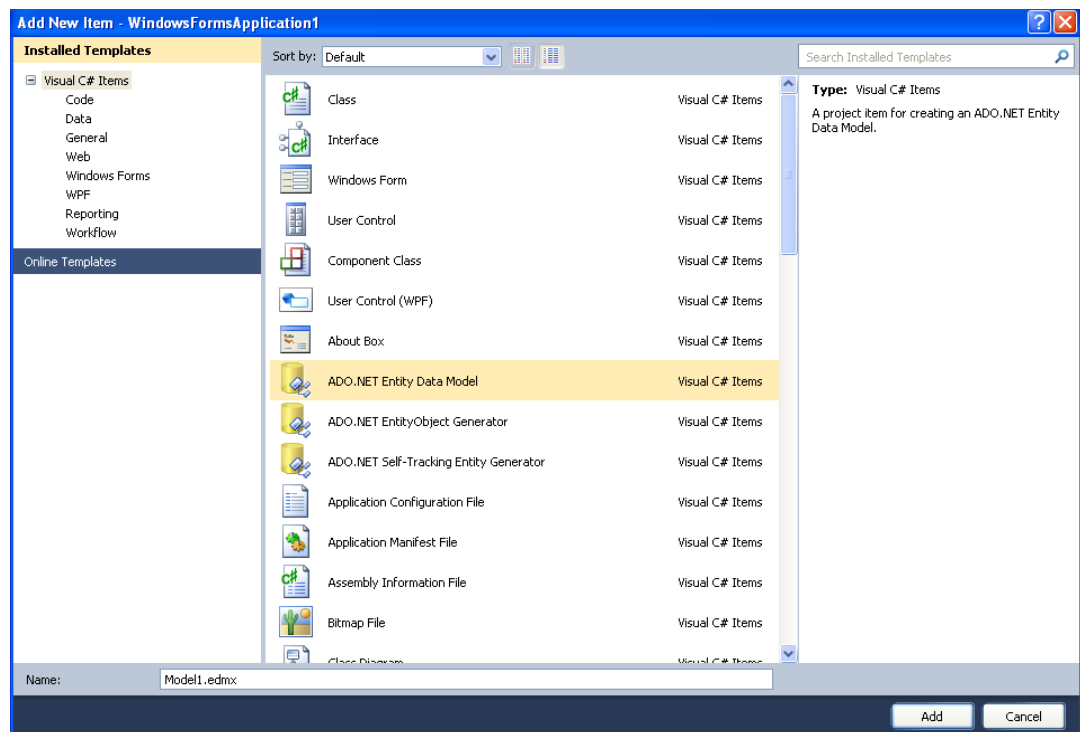
You can now proceed to generate an Entity Data Model from an existing database schema.

10.3 Adding an Entity Data Model

How to add an Entity Data Model:

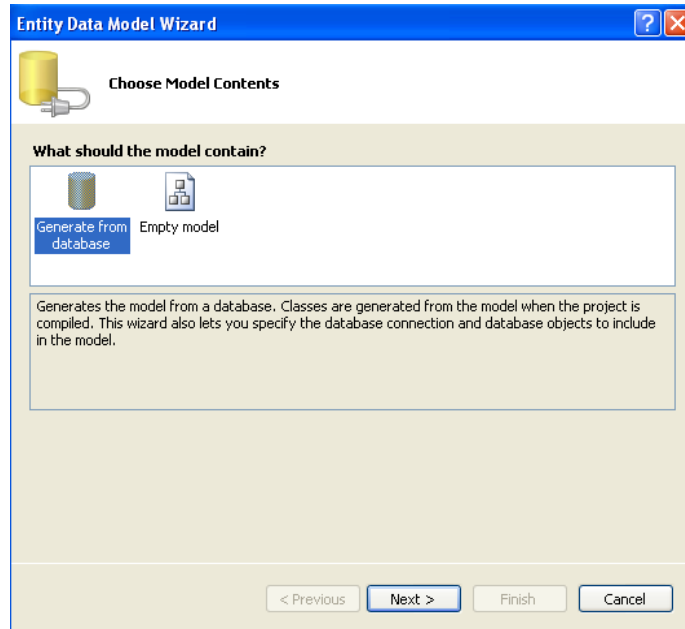
Step1: In the Solution Explorer, right-click your application and select **Add → New Item**. This opens **Visual Studio installed templates** screen.

Step2: From **Visual Studio installed templates**, select **ADO.NET Entity Data Model**. Click **Add**.

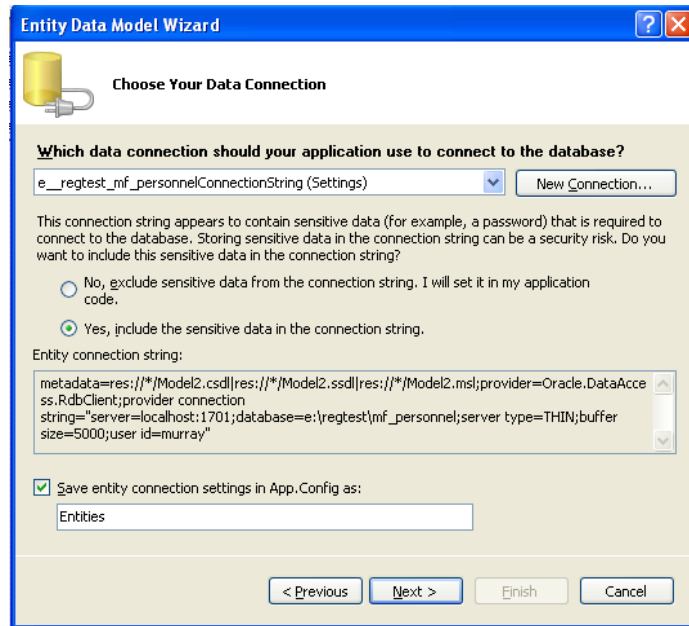


You will now see the **Entity Data Model Wizard**. This wizard is used to generate the Entity Data Model from the database specified in the database connection string (in next step).

Step3: Select the icon **Generate from database**. Click **Next**.



Step4: You can now select the connection if you have made connection to the test database earlier or create a new connection:



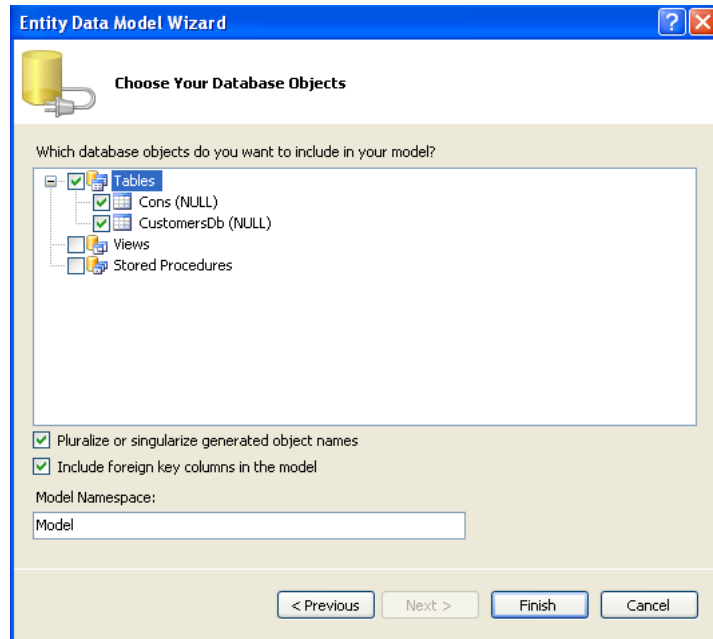
If you have not already done so, you can create the new connection at this time by clicking **New Connection**. See [Connecting to the Oracle Rdb Database](#) for details on each fields shown in **New Connection** Form.

Step5: Click **Next**

The Entity Data Model Wizard connects to the database. You are then presented with a tree structure of the database.

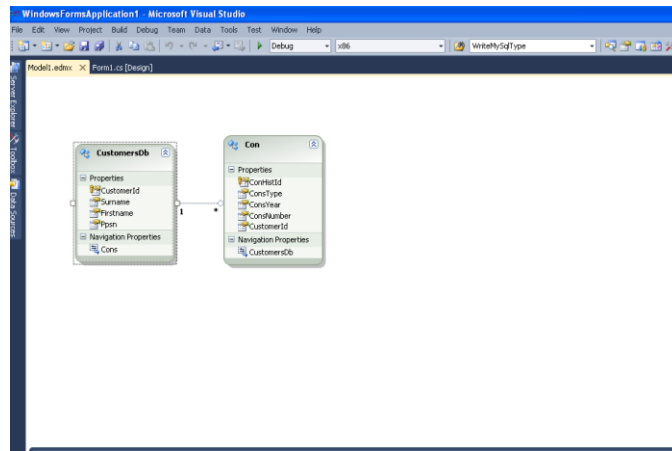
Here you can select the object you would like to include in your model. Here also we have chosen to select all tables, just as a part of example. But, you have an option to select any specific table.

Step6: Check the box against **Tables** node.



Step7: Click **Finish** to create the model and exit the wizard.

Visual Studio will generate the model then display it.



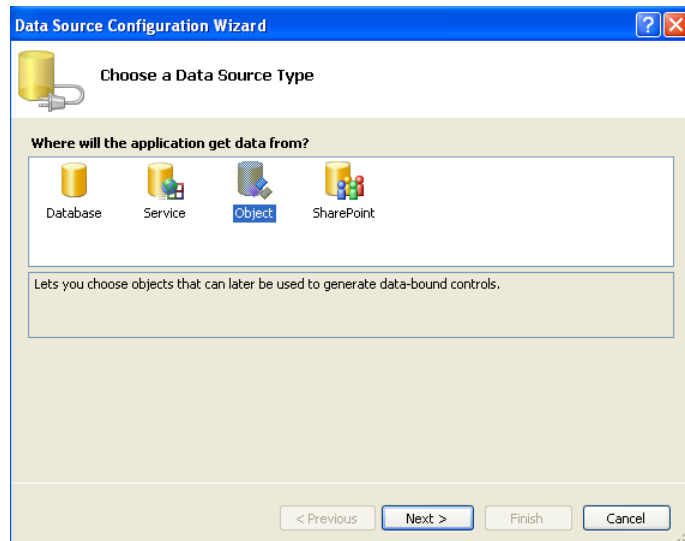
10.4 Adding a new Data Source

You will now add a new Data Source to your project and see how it can be used to read and write to the database.

To add a new Data source:

Step1: From the Visual Studio Main Menu, select **Project**→ **Add New Data Source**.

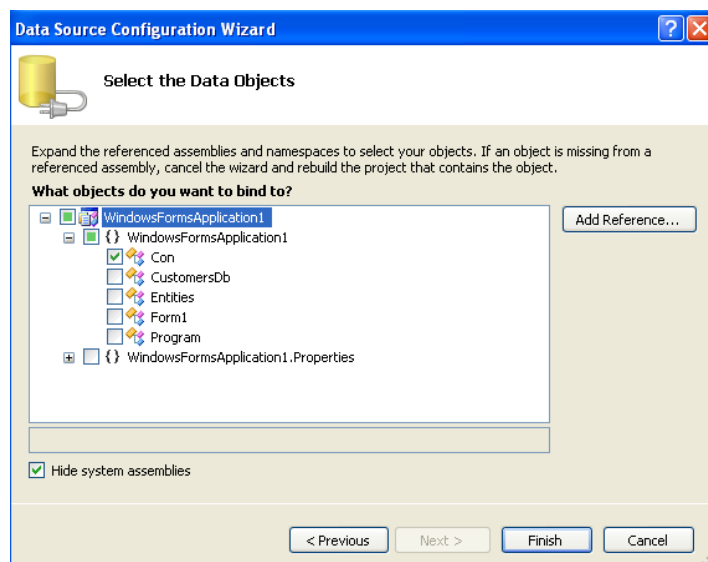
You will be presented with the Data Source Configuration Wizard.



Step2: Select the **Object** icon. Click **Next**.

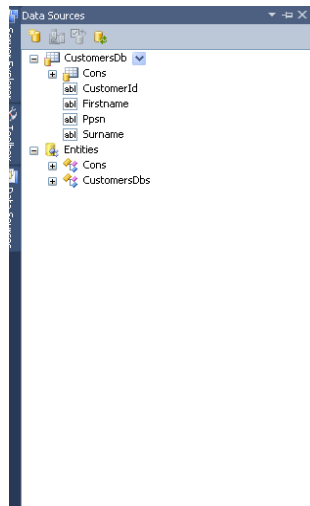
Step3: You will now select the Object you wish to bind to. Expand the tree.

In this tutorial we have chosen **Con** table as a example. Once the **Con** table has been selected click **Finish**.



The **Con** object will be displayed in the Data Sources panel. If the Data Sources panel is not displayed, select **Data→Show Data** Sources from the Visual Studio Main Menu.

The docked panel will then be displayed.



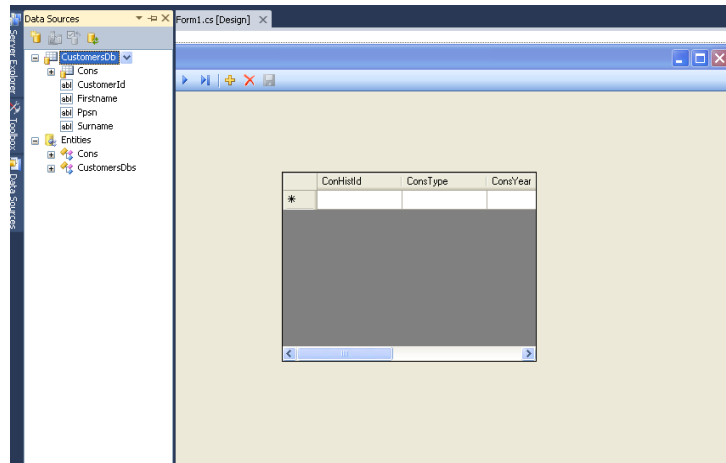
10.4.1 Using the Data Source in a Windows Form

To use the Data Source:

Step1: In the Data Sources panel, select the **Data Source** you just created and **drag and drop** it onto the Form Designer.

By default the Data Source object will be added as a **Data Grid View control**.

Note: the Data Grid View control is bound to the **consBindingSource** and the Navigator control is bound to **consBindingNavigator**.



Step2: **Save** and **rebuild** the solution before continuing.

10.4.2 Adding Code to Populate the Data Grid View

You are now ready to add code to ensure that the Data Grid View control will be populated with data from the **Con** database table.

How to add code to Populate the view:

Step1: Double-click the form to access its code.

Step2: Add code to instantiate the Entity Data Model's EntityContainer object and retrieve data from the database to populate the control.

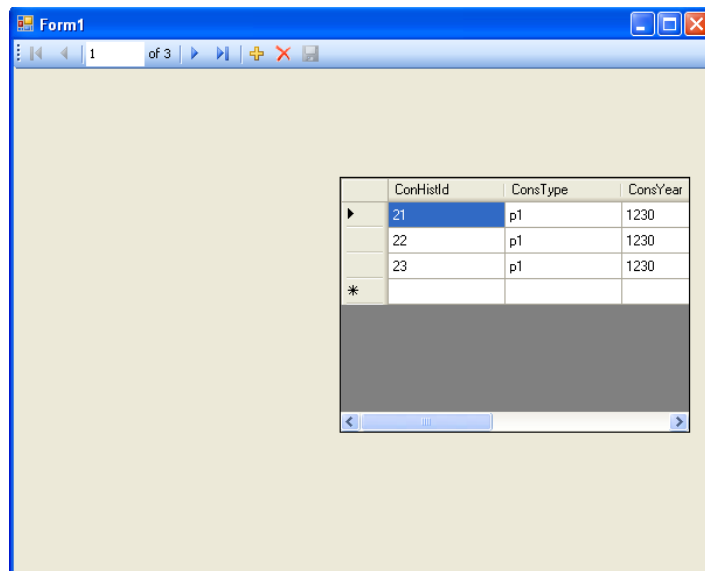

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Windows.Forms;

namespace WindowsFormsApplication1
{
    public partial class Form1 : Form
    {
        Entities we;
        public Form1()
        {
            InitializeComponent();
        }

        private void Form1_Load(object sender, EventArgs e)
        {
            we = new Entities();
            consBindingSource.DataSource = we.Cons;
        }
    }
}
```

Step3: Save and rebuild the solution.

Step4: Run the solution. Ensure the grid is populated and you can navigate through the data.



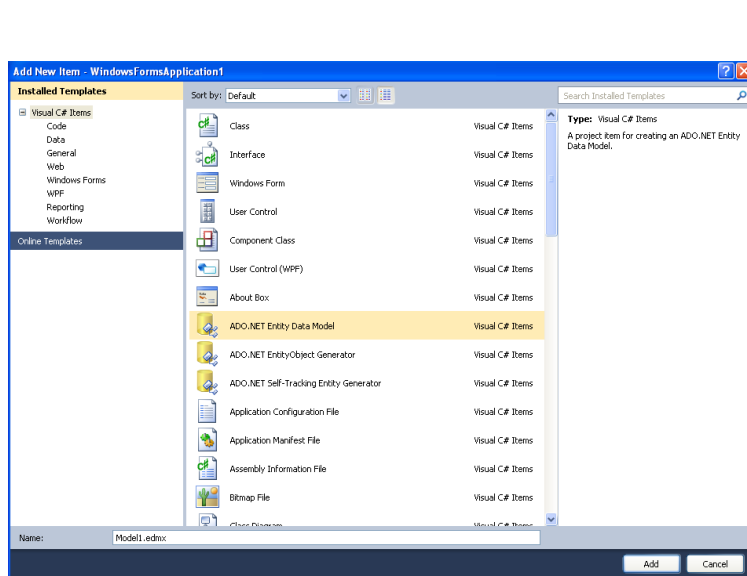
10.5 Create a new Entity

A new Entity Data model can be created from scratch by using the **Entity Data Model Designer**.

How to create an Entity Data Model:

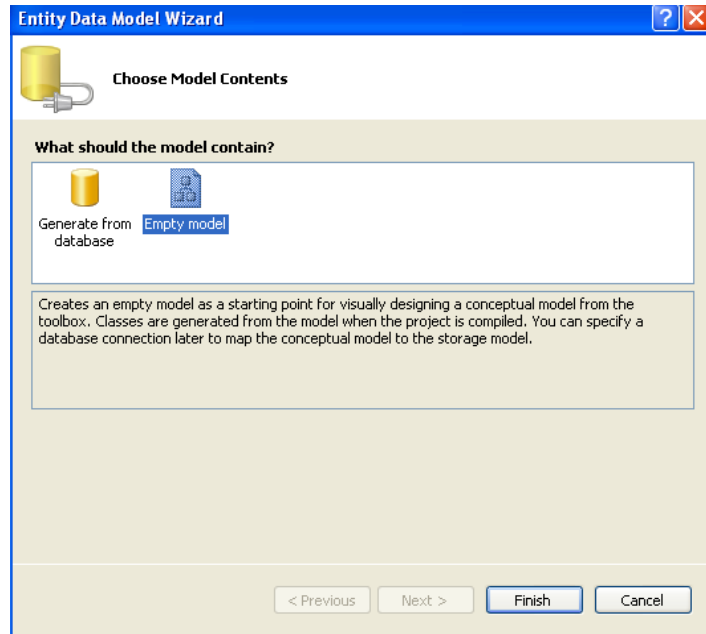
Step1: In the Solution Explorer, right-click your application and select **Add → New Item**.

Step2: From Visual Studio installed templates, select **ADO.NET Entity Data Model**. Click **Add**.



You will now see the **Entity Data Model Wizard**. This wizard is used to generate the Entity Data Model from the database specified in the database connection string

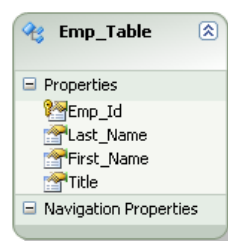
Step3: Select the icon **Entity model**. Click **Finish**.



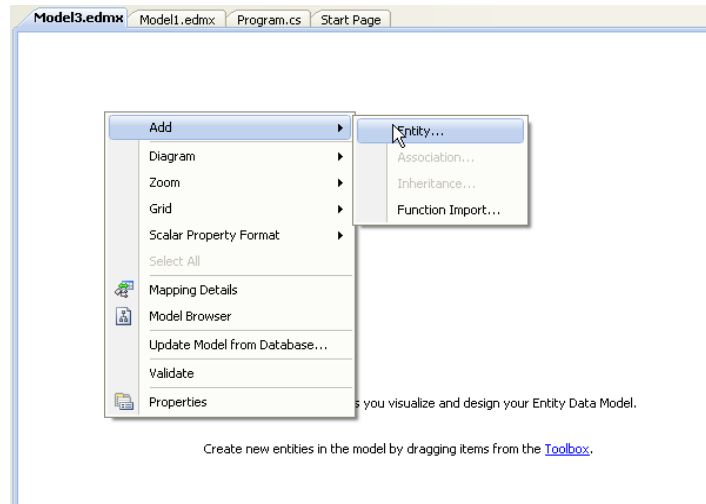
An empty Entity Data Model Designer Form should now be displayed.



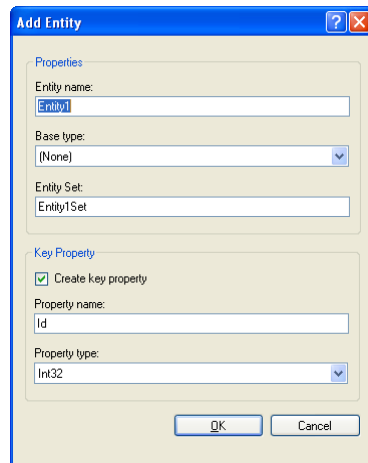
We will now show how to design a following sample entity:



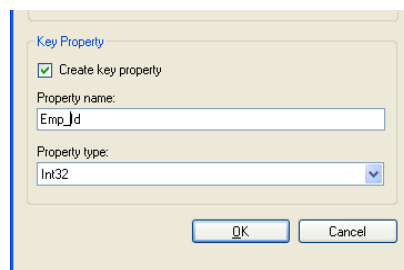
Step4: Add a new Entity by right-clicking in the Model Designer and selecting **Add→ Entity**.



The Add Entity form will be displayed.

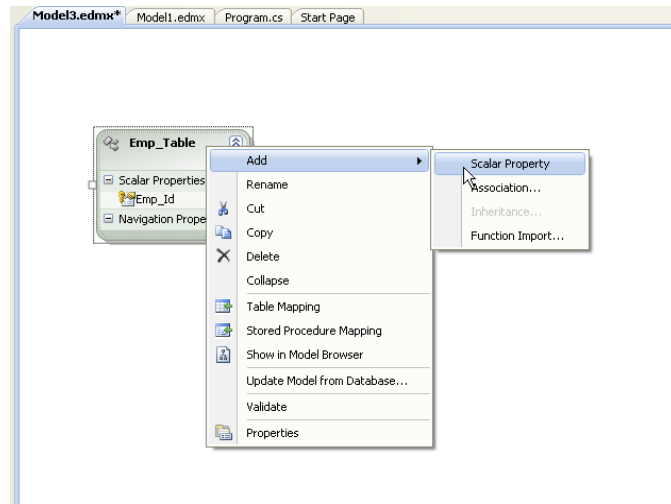


Step5: Change the **Entity name** to `Emp_Table` and the Key **Property name** to `Emp_id`. The Entity Set will be automatically changed to `Emp_TableSet`

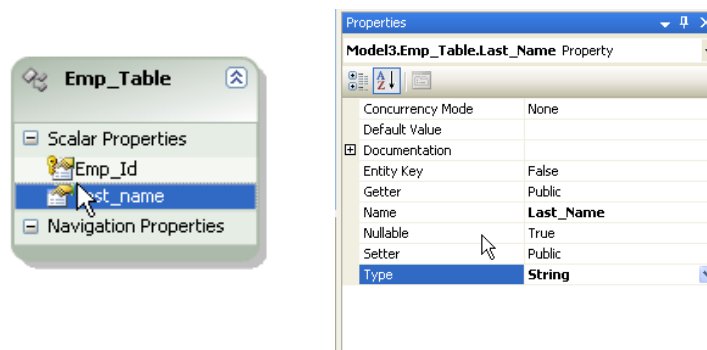


Step6: press **OK**.

Step7: Right-click the new entity and use **Add → Scalar Property** to add three more String properties Last_name, First_name and Title



Remember to change the **Properties → Type** for each of the new properties to **String** by selecting the respective scalar properties.



10.6 Creating Complex Types

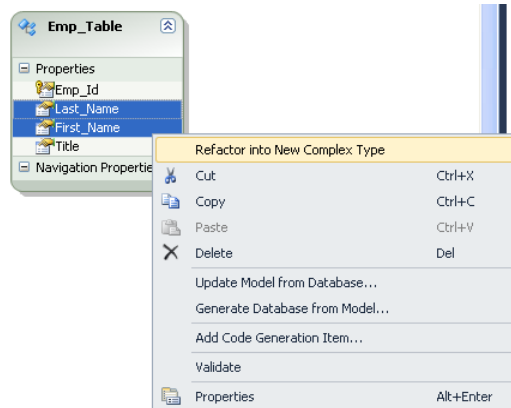
Complex types are non-scalar properties of entity types which enable scalar properties to be organized within entities. This makes easier to work with objects, allowing the grouping of related properties in Entities.

As an example, let us create the Complex type `Employee_Name` instead of the `Last_Name` and `First_Name` properties.

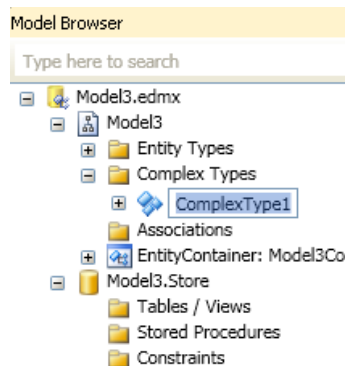
To create a Complex type:

Step1: Hold the **CRTL** key and **Select** the properties in the data model that you want to group together

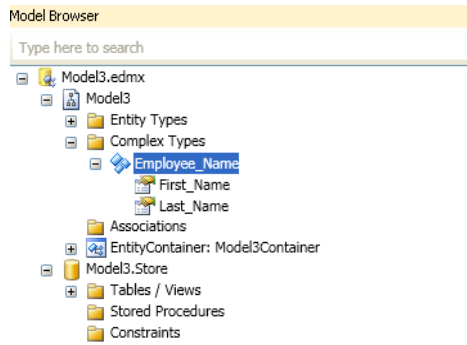
Step2: Right click in the **context menu**, select **Refactor into New Complex Type**



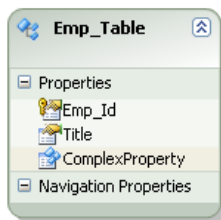
The model browser will display a new Complex Type.



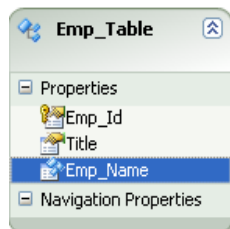
Step3: Now let's give a more meaningful name. If you expand the **Complex Type1**, you will see the properties that we previously selected. Change the name from `ComplexType1` to `Employee_Name`.



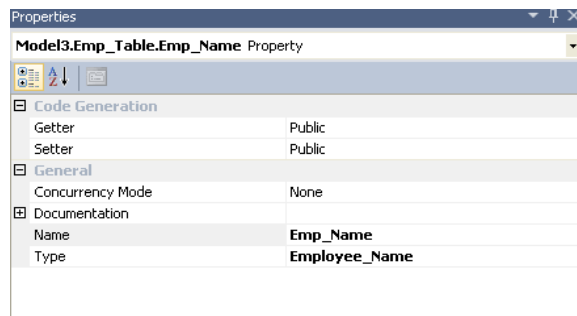
If you look at your data model you will see that **ComplexProperty** has been added to the list.



Step4: Change the name from `ComplexProperty` to `Emp_Name`.



If you look at the properties, you will see that the type of **Emp_Name** is the complex type name that is **Employee_Name** which we just created.



10.6.1 Using the Complex Type created

The Complex type you created may be used as follows:

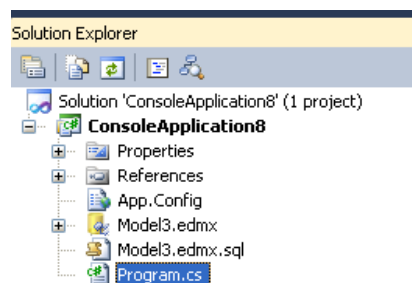
Step1: In Visual Studio, select **File→New→Project** from the main menu.

Choose the Console Application installed template. Click **OK**. The solution is created.

Step2: Design a new Entity with Complex Types. See [Create a new Entity](#) , [Creating Complex Types](#)

Step3: Generate the Database schema from the data model you have designed. See [Generating Database Schema from Model](#)

The Console Application's solution explorer looks as follows:



Step4: Open `Program.cs` file by double clicking on it.

Step5: Write the code to use the complex type just created.


```

Model3.edmx* Program.cs* X
ConsoleApplication8.Program Main(string[] args)
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;

namespace ConsoleApplication8
{
    class Program
    {
        static void Main(string[] args)
        {
            using (var context = new Model3Container())
            {
                Emp_Table tab = new Emp_Table();
                tab.Emp_Name.Last_Name = "John";
                tab.Emp_Name.First_Name = "king";
                tab.Title = "
            context.AddTo
            context.SaveChanges
        }
    }
}

```

Step6: The Complete code looks as follows.

```

Model3.edmx Program.cs X
ConsoleApplication8.Program Main(string[] args)
using System.Text;

namespace ConsoleApplication8
{
    class Program
    {
        static void Main(string[] args)
        {
            using (var context = new Model3Container())
            {
                Emp_Table tab = new Emp_Table();
                tab.Emp_Name.Last_Name = "John";
                tab.Emp_Name.First_Name = "king";
                tab.Title = "Engineer";
                context.AddToEmp_Table(tab);
                context.SaveChanges();

                var newCourse = from c in context.Emp_Table where c.Emp_Name.Last_Name == "John" select c;

                foreach (Emp_Table db in newCourse)
                {
                    Console.WriteLine("Employee ID =(0)", db.Emp_Id);
                    Console.WriteLine("Employee First Name=(0)", db.Emp_Name.First_Name);
                    Console.WriteLine("Employee Designation =(0)", db.Title);
                }
            }
        }
    }
}

```

Step7: Save and **rebuild** the solution. See [Compiling and Running the Application](#)

Step8: Run the solution and we get following output on Console.

```
ex C:\WINDOWS\system32\cmd.exe
Employee ID =321
Employee First Name=king
Employee Designation =Engineer
Press any key to continue . . .
```

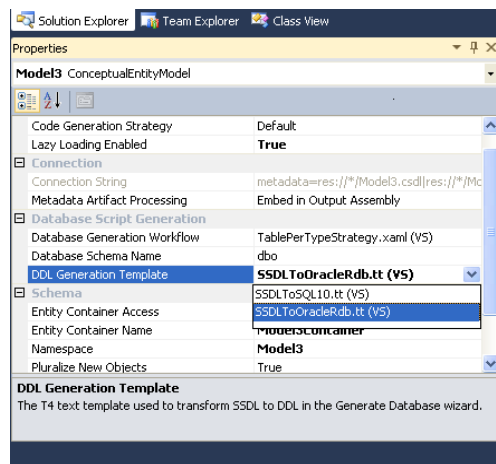
10.7 Generating Database Schema from Model

Beginning with Visual Studio 2010 and Entity Framework V3.5, you can generate a database schema from an existing Entity Data Model.

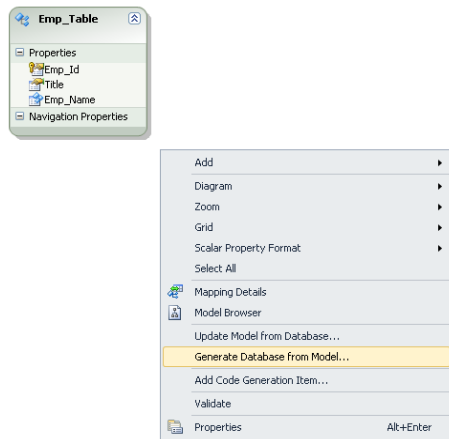
This section will take you through the steps required to generate a fresh database schema definition from a model.

How to generate a schema from an Entity Data Model:

Step1: From the **Properties** window of your selected data model choose **SSDLToOracleRdb.tt** in the **DDLGeneration Template** property as shown below:

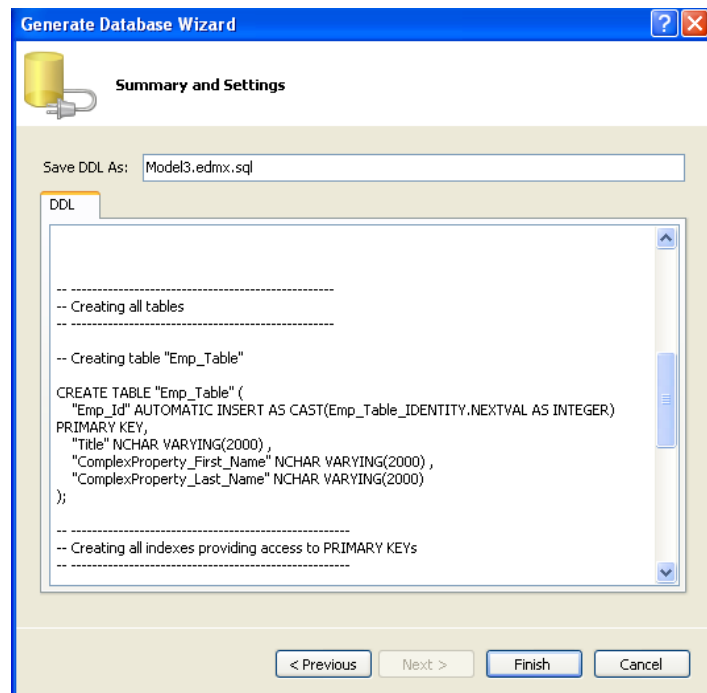


Step2: Right click on entity designer and select **Generate Database from model**



Step3: Add a Connection to the database when prompted.

Step4: Click **Next**. A new SQL script will be generated .



You can now copy the SQL script create and execute on your Rdb database using Interactive SQL.

Show Navigation

10.8 Using Fluent API

Fluent API provides a mechanism to change the default behavior of the database SQL generated by Entity Framework when your POCO objects are transformed into Oracle Rdb table definitions.

The following example shows how to use fluent API with ORDT.

Note: This example assumes you are already familiar with using Entity Framework **DbContext** to create code first data objects.

To begin with we will create our new model :

Visual C#:

```
public class ComicsEntities : DbContext
{
    #region Properties

    public DbSet<Series> Series { get; set; }
    public DbSet<Issue> Issues { get; set; }

    #endregion

    #region Methods

    protected override void OnModelCreating(
        System.Data.Entity.ModelConfiguration.ModelBuilder modelBuilder)
    {
        base.OnModelCreating(modelBuilder);

        // the fluent code will be added here
    }

    #endregion
}

public partial class Issue
{
    #region Properties

    public int IssueID { get; set; }
    public string Title { get; set; }
    public DateTime Time { get; set; }
    public int SeriesID { get; set; }

    public virtual Series Series { get; set; }

    #endregion
}

public class Series
{
    #region Properties
```

```

public int SeriesID { get; set; }
public string Name { get; set; }
public DateTime StartDate { get; set; }

public string Publisher { get; set; }

public virtual ICollection<Issue> Issues { get; set; }

#endregion
}

```

Once the model has been created we can use fluent API to configure the model further. Generally this is done by overriding the standard **OnModelCreating** method of **DbContext**:

Visual C#:

```

protected override void OnModelCreating(ModelBuilder modelBuilder)
{
    base.OnModelCreating(modelBuilder);

    modelBuilder.Entity<Series>().
        Property(s => s.Name).
        IsRequired().
        HasMaxLength(50);

    modelBuilder.Entity<Series>().
        Property(s => s.SeriesID).
        HasDatabaseGenerationOption(DatabaseGenerationOption.None);

    modelBuilder.Entity<Series>().
        HasMany(s => s.Issues).
        WithRequired(i => i.Series).
        HasForeignKey(i => i.SeriesID);

    modelBuilder.Entity<Series>().
        Ignore(s => s.PublisherID);

    modelBuilder.Entity<Issue>().
        Property(i => i.Title).
        IsRequired().
        HasMaxLength(50).
        HasColumnName("Name");
}

```

In the code above, we can use **Fluent API** to start to configure our Comics model.

We have set the maximum size of the **Series Name** column to 50 characters.

By default the ID fields are database-generated, that is, the field will be declared as an Identity column in the table. In the above example this behaviour has been suppressed for the **SeriesID** column.

As we want a one to many relationship between **Series** and its **Issues** we have declared the **Series** entity to have the **HasMany** property.

As we are not interested in storing the **Publisher** information in the database, we have suppressed column generation using **Ignore**. We have also chosen to change the column name that will be used in the database for the **Issue title**.

Now we can tie these components together in a small program that will generate the appropriate database objects for us, based on our model and the fluent API modifications:

Visual C#:

```
class Program
{
    static void Main(string[] args)
    {
        using (ComicsEntities context = new ComicsEntities())
        {
            var series = new Series
            {
                SeriesID = 1,
                Publisher = "NoWhereComics",
                Name = "FabAndFamous",
                StartDate = DateTime.Now
            };
            var issue = new Issue
            {
                Time = DateTime.Now,
                Title = "Entity Framework Funnies",
                Series = series
            };
            context.Series.Add(series);
            context.SaveChanges();
        }
    }
}
```

Running this example will generate a new database by the name **ComicsEntities** with the configurations provided in the **OnModelCreating** method. By default, the name of the database will be taken from the context name. To change the generated database name you need to change the constructor **DbContext** and pass in a string parameter specifying the required name:

Visual C#:

```
public ComicsEntities() : base("MyComicDatabase")
```

```
{  
}
```

Note: Please see the section [Creating and Dropping Oracle Rdb Databases](#) if you intend to create or drop databases.

10.8.1 Database Creation and Removal

Fluent API provides methods to control the creation and deletion of database instances. In the prior example the database will be created for you automatically, however you may wish to override this by specifying a **Database_INITIALIZER**.

The database initializer is called when the given DbContext type is used to access a database for the first time. The default strategy for Code First contexts is an instance of **System.Data.Entity.CreateDatabaseIfNotExists<TContext>**, thus in the prior example a database would be created if it did not already exist.

The following example shows how to change the database initializer:

Visual C#:

```
public class ComicsEntities : DbContext  
{  
    Public ComicsEntities(String url)  
    {  
        Database.setInitializer<ComicsEnties>(new ComicsInitializer());  
    }  
    #region Properties  
  
    public DbSet<Series> Series { get; set; }  
    public DbSet<Issue> Issues { get; set; }  
  
    #endregion  
  
    #region Methods  
    .  
    .  
    .  
    }  
public class ComicsInitializer : DropCreateDatabaseAlways<ComicsEntities>  
{  
    .  
    .  
    .  
}
```

In this example the database will be recreated each time the application is run.

Please see the Microsoft Entity Framework documentation for more information on database contexts and initialization.

Note: See the following section [Creating and Dropping Oracle Rdb Databases](#) if you intend to create or drop databases.

10.8.2 Creating and Dropping Oracle Rdb Databases

Currently, the creation and deletion of databases is only supported when using Thin connectivity within ORDP, that is, only connections using JDBC servers will accept these database operations.

By default JDBC servers do not allow CREATE and DROP database operations. The following requirements must be satisfied before these database operations may be carried out:

- The application is using Thin Connectivity.
- The JDBC server is running Oracle JDBC for Rdb Release 7.3.4.0.0 or later.
- The JDBC server is configured to allow your username access to server root and the CREATE or DROP database operations.
- The username provided has adequate OpenVMS privileges and quotas to carry out the operation.
- The username provided has appropriate Oracle Rdb privilege and authorization to carry out the operation.

Please see your **Oracle JDBC for Rdb User Guide** for more information on support of CREATE and DROP database.

Show Navigation

Chapter 11 Unsupported features

- Foreign Key support
- Open Table definition
- Alter Procedure
- Data View Designer
- Import/export table data as XML.

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Glossary

assembly

Assembly is Microsoft's term for the module that is created when a DLL or .EXE is compiled by a .NET compiler.

Binary Large Object (BLOB)

A large object datatype whose content consists of binary data. Additionally, this data is considered raw as its structure is not recognized by the database.

Character Large Object (CLOB)

The LOB datatype whose value is composed of character data corresponding to the database character set.

data provider

As the term is used with Rdb Data Provider for .NET, a data provider is the connected component in the ADO.NET model and transfers data between a data source and the DataSet.

dirty writes

Dirty writes means writing uncommitted or dirty data.

DDL

DDL refers to data definition language, which includes statements defining or changing data structure.

DOM

Document Object Model (DOM) is an application program interface (API) for HTML and XML documents. It defines the logical structure of documents and the way that a document is accessed and manipulated.

flush

Flush or flushing refers to recording changes (that is, sending modified data) to the database.

instantiate

A term used in object-based languages such as C# to refer to the creation of an object of a specific class.

Large Object (LOB)

The class of SQL datatype that is further divided into internal LOBs and external LOBs. Internal LOBs include BLOBs, CLOBs, and NCLOBs while external LOBs include BFILEs.

Microsoft .NET Framework Class Library

The Microsoft .NET Framework Class Library provides the classes for the .NET framework model.

namespace

- .NET:

A namespace is naming device for grouping related types. More than one namespace can be contained in an assembly.

- XML Documents:

A namespace describes a set of related element names or attributes within an XML document.

National Character Large Object (NCLOB)

The LOB datatype whose value is composed of character data corresponding to the database national character set.

octet

An 8-bit unit, usually referred to as BYTE

RdbDataReader

An `RdbDataReader` is a read-only, forward-only result set.

primary key

The column or set of columns included in the definition of a table's PRIMARY KEY constraint.

reference semantics

Reference semantics indicates that assignment is to a reference (an address such as a pointer) rather than to a value. See **value semantics**.

result set

The output of a SQL query, consisting of one or more rows of data.

savepoint

A point in the workspace to which operations can be rolled back.

stored procedure

A stored procedure is a block of SQL code that Rdb stores in the database and can be executed from an application.

Unicode

Unicode is a universal encoded character set that enables information from any language to be stored using a single character set.

URL

URL (Universal Resource Locator).

value semantics

Value semantics indicates that assignment copies the value, not the reference or address (such as a pointer). See **reference semantics**.

Show Navigation