Working with Data in ASP.NET 2.0 :: Creating New Stored Procedures for the Typed DataSet's TableAdapters

Introduction

The Data Access Layer (DAL) for these tutorials uses Typed DataSets. As discussed in the Creating a Data Access Layer tutorial, Typed DataSets consist of strongly-typed DataTables and TableAdapters. The DataTables represent the logical entities in the system while the TableAdapters interface with the underlying database to perform the data access work. This includes populating the DataTables with data, executing queries that return scalar data, and inserting, updating, and deleting records from the database.

The SQL commands executed by the TableAdapters can be either ad-hoc SQL statements, such as `SELECT` *`columnList`* `FROM` *`TableName`*, or stored procedures. The TableAdapters in our architecture use ad-hoc SQL statements. Many developers and database administrators, however, prefer stored procedures over ad-hoc SQL statements for security, maintainability, and updateability reasons. Others ardently prefer ad-hoc SQL statements for their flexibility. In my own work I favor stored procedures over ad-hoc SQL statements, but chose to use ad-hoc SQL statements to simplify the earlier tutorials.

When defining a TableAdapter or adding new methods, the TableAdapter's wizard makes it just as easy to create new stored procedures or use existing stored procedures as it does to use ad-hoc SQL statements. In this tutorial we'll examine how to have the TableAdapter's wizard auto-generate stored procedures. In the next tutorial we will look at how to configure the TableAdapter's methods to use existing or manually-created stored procedures.

> **Note:** See Rob Howard's blog entry Don't Use Stored Procedures Yet? and Frans Bouma's blog entry Stored Procedures are Bad, M'Kay? for a lively debate on the pros and cons of stored procedures and ad-hoc SQL.

Stored Procedure Basics

Functions are a construct common to all programming languages. A function is a collection of statements that are executed when the function is called. Functions can accept input parameters and may optionally return a value. *Stored procedures* are database constructs that share many similarities with functions in programming languages. A stored procedure is made up of a set of T-SQL statements that are executed when the stored procedure is called. A stored procedure may accept zero to many input parameters and can return scalar values, output parameters, or, most commonly, result sets from `SELECT` queries.

> **Note:** Stored procedures are oftentimes referred to as "sprocs" or "SPs".

Stored procedures are created using the `CREATE PROCEDURE` T-SQL statement. For example, the following T-SQL script creates a stored procedure named `GetProductsByCategoryID` that takes in a single parameter named `@CategoryID` and returns the `ProductID`, `ProductName`, `UnitPrice`, and `Discontinued` fields of those columns in the `Products` table that have a matching `CategoryID` value:

```
CREATE PROCEDURE GetProductsByCategoryID
(
    @CategoryID int
)
AS

SELECT ProductID, ProductName, UnitPrice, Discontinued
FROM Products
WHERE CategoryID = @CategoryID
```

Once this stored procedure has been created, it can be called using the following syntax:

```
EXEC GetProductsByCategory categoryID
```

Note: In the next tutorial we will examine creating stored procedures through the Visual Studio IDE. For this tutorial, however, we are going to let the TableAdapter wizard automatically generate the stored procedures for us.

In addition to simply returning data, stored procedures are often used to perform multiple database commands within the scope of a single transaction. A stored procedure named `DeleteCategory`, for example, might take in a `@CategoryID` parameter and perform two `DELETE` statements: first, one to delete the related products and a second one deleting the specified category. Multiple statements within a stored procedure are *not* automatically wrapped within a transaction. Additional T-SQL commands need to be issued to ensure the stored procedure's multiple commands are treated as an atomic operation. We'll see how to wrap a stored procedure's commands within the scope of a transaction in the subsequent tutorial.

When using stored procedures within an architecture, the Data Access Layer's methods invoke a particular stored procedure rather than issuing an ad-hoc SQL statement. This centralizes the location of the SQL statements executed (on the database) rather than having it defined within the application's architecture. This centralization arguably makes it easier to find, analyze, and tune the queries and provides a much clearer picture as to where and how the database is being used.

For more information on stored procedure fundamentals, consult the resources in the Further Reading section at the end of this tutorial.

Step 1: Creating the Advanced Data Access Layer Scenarios Web Pages

Before we start our discussion on creating a DAL using stored procedures, let's first take a moment to create the ASP.NET pages in our website project that we will need for this and the next several tutorials. Start by adding a new folder named `AdvancedDAL`. Next, add the following ASP.NET pages to that folder, making sure to associate each page with the `Site.master` master page:

- `Default.aspx`
- `NewSprocs.aspx`
- `ExistingSprocs.aspx`
- `JOINs.aspx`
- `AddingColumns.aspx`
- `ComputedColumns.aspx`
- `EncryptingConfigSections.aspx`
- `ManagedFunctionsAndSprocs.aspx`

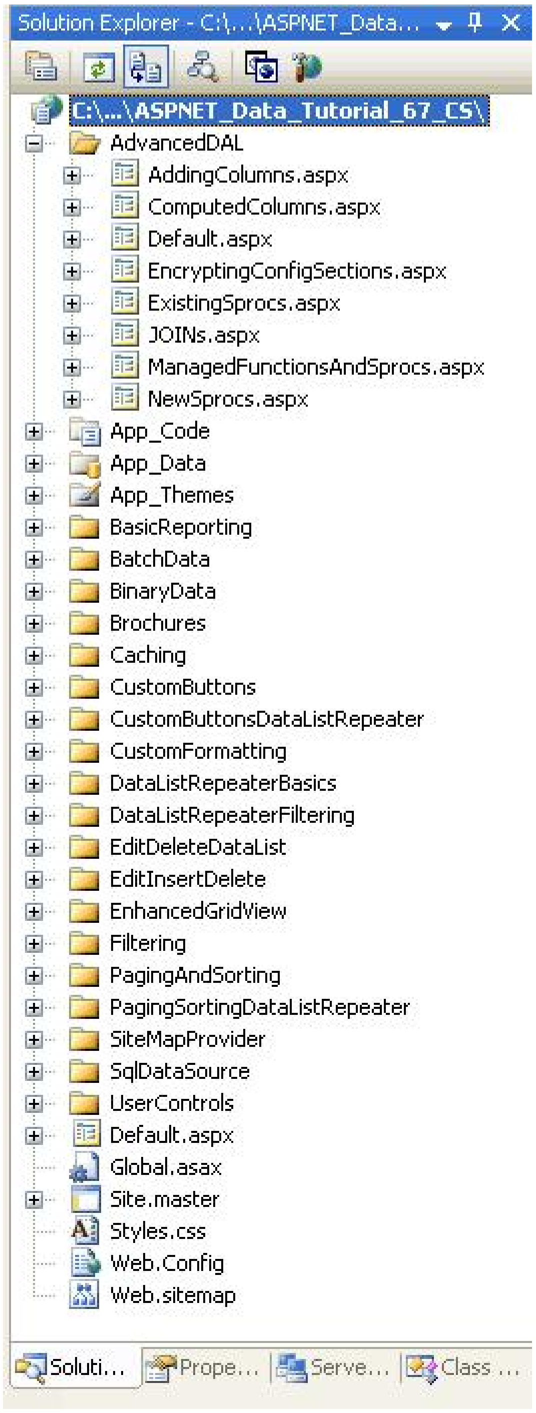


Figure 1: Add the ASP.NET Pages for the Advanced Data Access Layer Scenarios Tutorials

Like in the other folders, `Default.aspx` in the `AdvancedDAL` folder will list the tutorials in its section. Recall that the `SectionLevelTutorialListing.ascx` User Control provides this functionality. Therefore, add this User Control to `Default.aspx` by dragging it from the Solution Explorer onto the page's Design view.

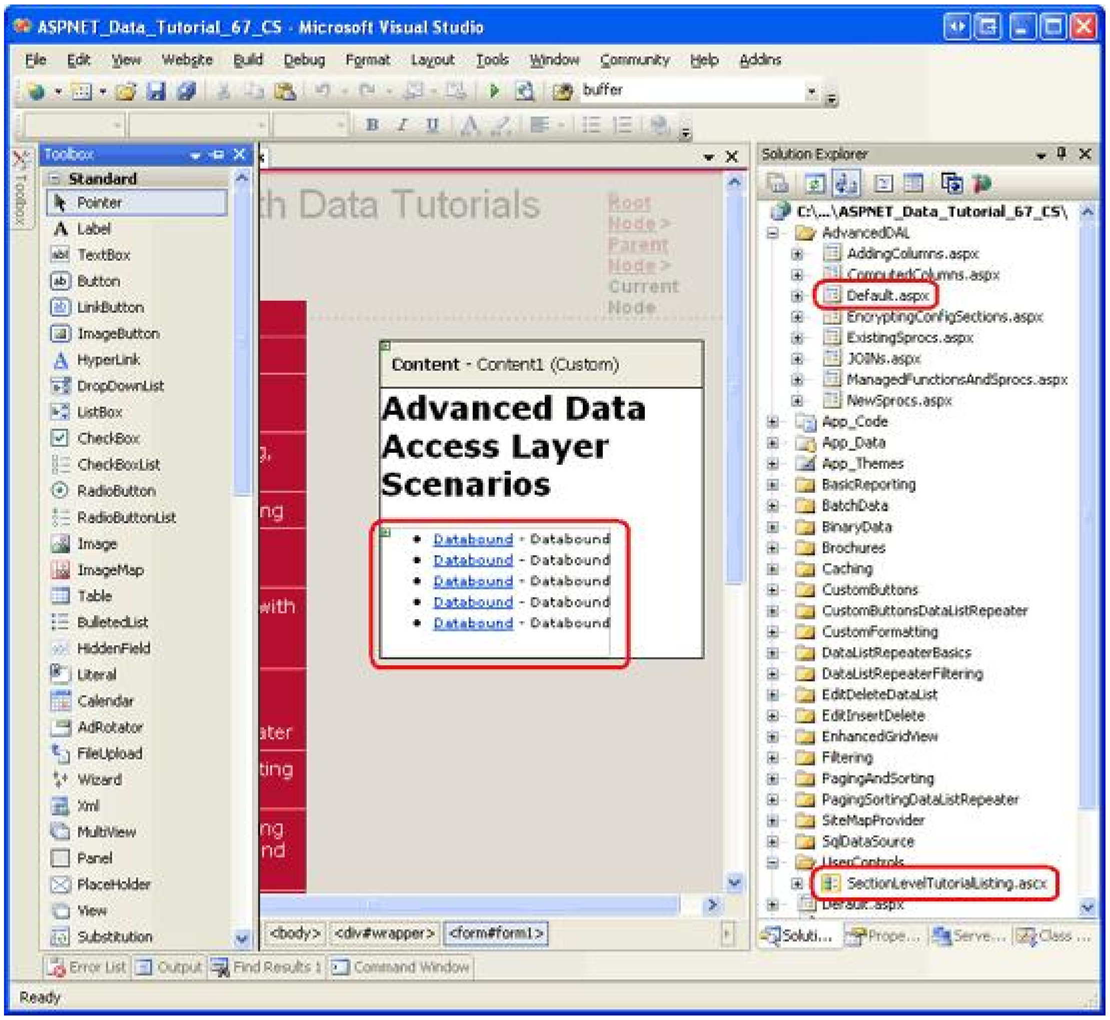

ASPNET_Data_Tutorial_67_CS - Microsoft Visual Studio
Toolbox
Solution Explorer
Advanced Data Access Layer Scenarios
Default.aspx
SectionLevelTutorialListing.ascx

Figure 2: Add the `SectionLevelTutorialListing.ascx` User Control to `Default.aspx`

Lastly, add these pages as entries to the `Web.sitemap` file. Specifically, add the following markup after the "Working with Batched Data" `<siteMapNode>`:

```
<siteMapNode url="~/AdvancedDAL/Default.aspx"
    title="Advanced DAL Scenarios"
    description="Explore a number of advanced Data Access Layer scenarios.">

    <siteMapNode url="~/AdvancedDAL/NewSprocs.aspx"
        title="Creating New Stored Procedures for TableAdapters"
        description="Learn how to have the TableAdapter wizard automatically
            create and use stored procedures." />
    <siteMapNode url="~/AdvancedDAL/ExistingSprocs.aspx"
        title="Using Existing Stored Procedures for TableAdapters"
        description="See how to plug existing stored procedures into a
            TableAdapter." />
    <siteMapNode url="~/AdvancedDAL/JOINs.aspx"
        title="Returning Data Using JOINs"
        description="Learn how to augment your DataTables to work with data
            returned from multiple tables via a JOIN query." />
    <siteMapNode url="~/AdvancedDAL/AddingColumns.aspx"
        title="Adding DataColumns to a DataTable"
```

```
            description="Master adding new columns to an existing DataTable." />
        <siteMapNode url="~/AdvancedDAL/ComputedColumns.aspx"
            title="Working with Computed Columns"
            description="Explore how to work with computed columns when using
                Typed DataSets." />
        <siteMapNode url="~/AdvancedDAL/EncryptingConfigSections.aspx"
            title="Protected Connection Strings in Web.config"
            description="Protect your connection string information in
                Web.config using encryption." />
        <siteMapNode url="~/AdvancedDAL/ManagedFunctionsAndSprocs.aspx"
            title="Creating Managed SQL Functions and Stored Procedures"
            description="See how to create SQL functions and stored procedures
                using managed code." />
    </siteMapNode>
```

After updating `Web.sitemap`, take a moment to view the tutorials website through a browser. The menu on the left now includes items for the advanced DAL scenarios tutorials.

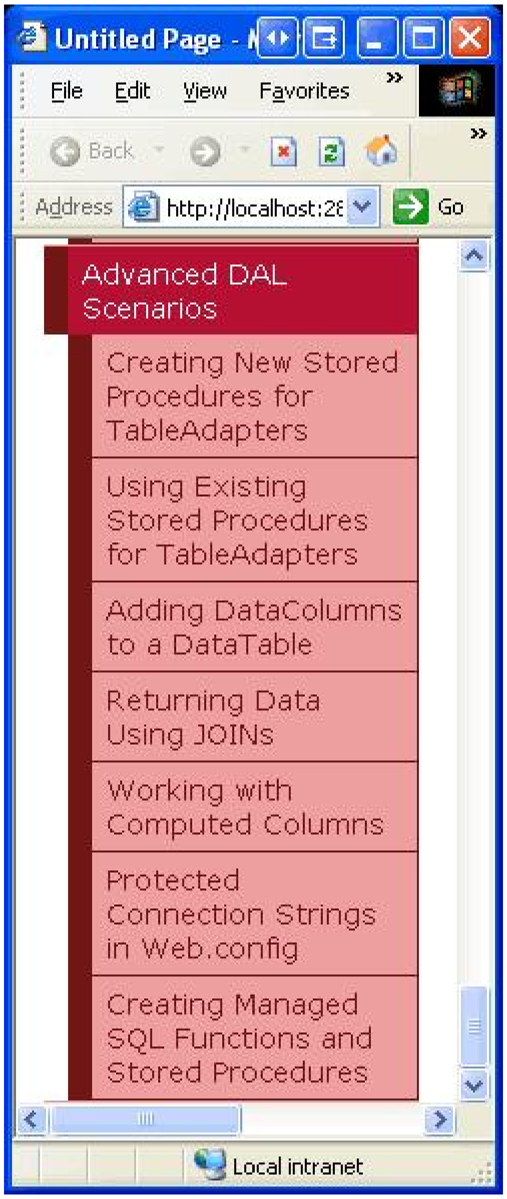
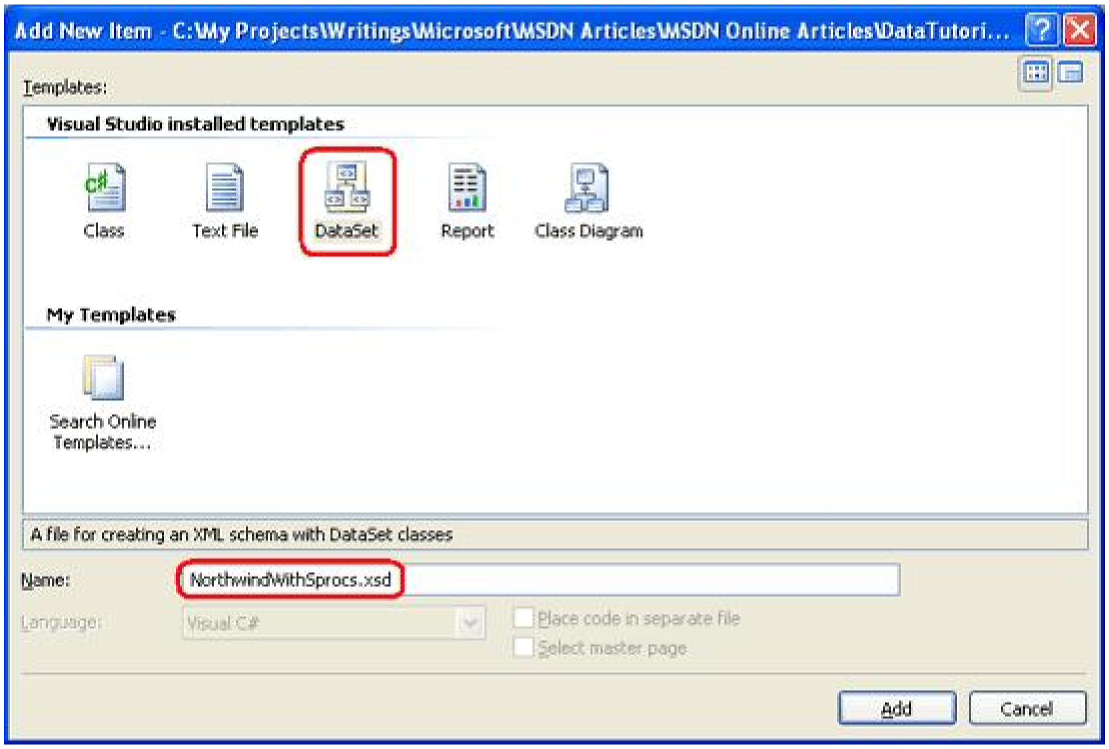

Untitled Page
File Edit View Favorites
Back
Address http://localhost:28
Go
Advanced DAL Scenarios
Creating New Stored Procedures for TableAdapters
Using Existing Stored Procedures for TableAdapters
Adding DataColumns to a DataTable
Returning Data Using JOINs
Working with Computed Columns
Protected Connection Strings in Web.config
Creating Managed SQL Functions and Stored Procedures
Local intranet

Figure 3: The Site Map Now Includes Entries for the Advanced DAL Scenarios Tutorials

Step 2: Configuring a TableAdapter to Create New Stored Procedures

To demonstrate creating a Data Access Layer that uses stored procedures instead of ad-hoc SQL statements, let's create a new Typed DataSet in the `~/App_Code/DAL` folder named `NorthwindWithSprocs.xsd`. Since we have stepped through this process in detail in previous tutorials, we will proceed quickly through the steps here. If you get stuck or need further step-by-step instructions in creating and configuring a Typed DataSet, refer back to the Creating a Data Access Layer tutorial.

Add a new DataSet to the project by right-clicking on the `DAL` folder, choosing Add New Item, and selecting the DataSet template as shown in Figure 4.


Add New Item - C:\My Projects\Writings\Microsoft\MSDN Articles\MSDN Online Articles\DataTutori...
Templates:
Visual Studio installed templates
Class
Text File
DataSet
Report
Class Diagram
My Templates
Search Online Templates...
Add
Cancel

A file for creating an XML schema with DataSet classes

Name: NorthwindWithSprocs.xsd

Language: Visual C#

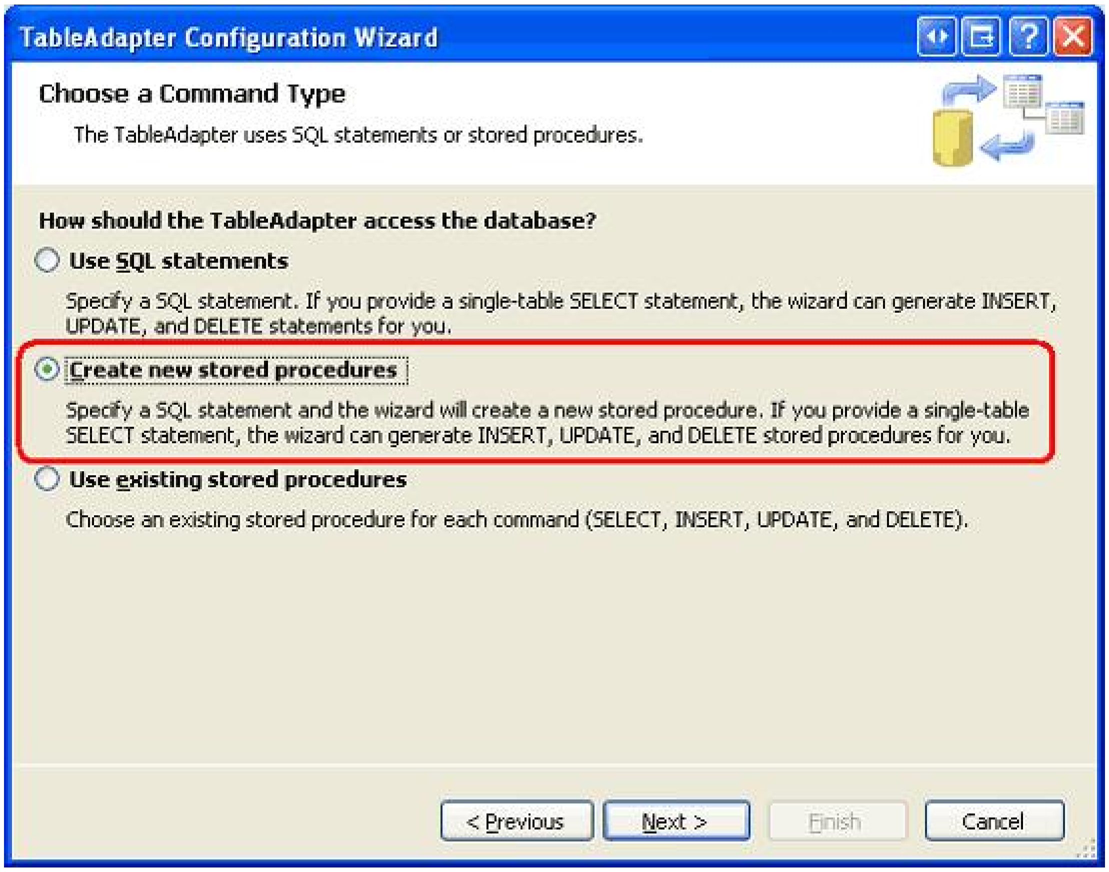
Place code in separate file

Select master page

Figure 4: Add a New Typed DataSet to the Project Named `NorthwindWithSprocs.xsd`

This will create the new Typed DataSet, open its Designer, create a new TableAdapter, and launch the TableAdapter Configuration Wizard. The TableAdapter Configuration Wizard's first step asks us to select the database to work with. The connection string to the Northwind database should be listed in the drop-down list. Select this and click Next.

From this next screen we can choose how the TableAdapter should access the database. In previous tutorials, we selected the first option, "Use SQL statements." For this tutorial, select the second option, "Create new stored procedures," and click Next.


TableAdapter Configuration Wizard

Choose a Command Type

The TableAdapter uses SQL statements or stored procedures.

How should the TableAdapter access the database?

( ) Use SQL statements

Specify a SQL statement. If you provide a single-table SELECT statement, the wizard can generate INSERT, UPDATE, and DELETE statements for you.

[✓ Create new stored procedures]

Specify a SQL statement and the wizard will create a new stored procedure. If you provide a single-table SELECT statement, the wizard can generate INSERT, UPDATE, and DELETE stored procedures for you.

( ) Use existing stored procedures

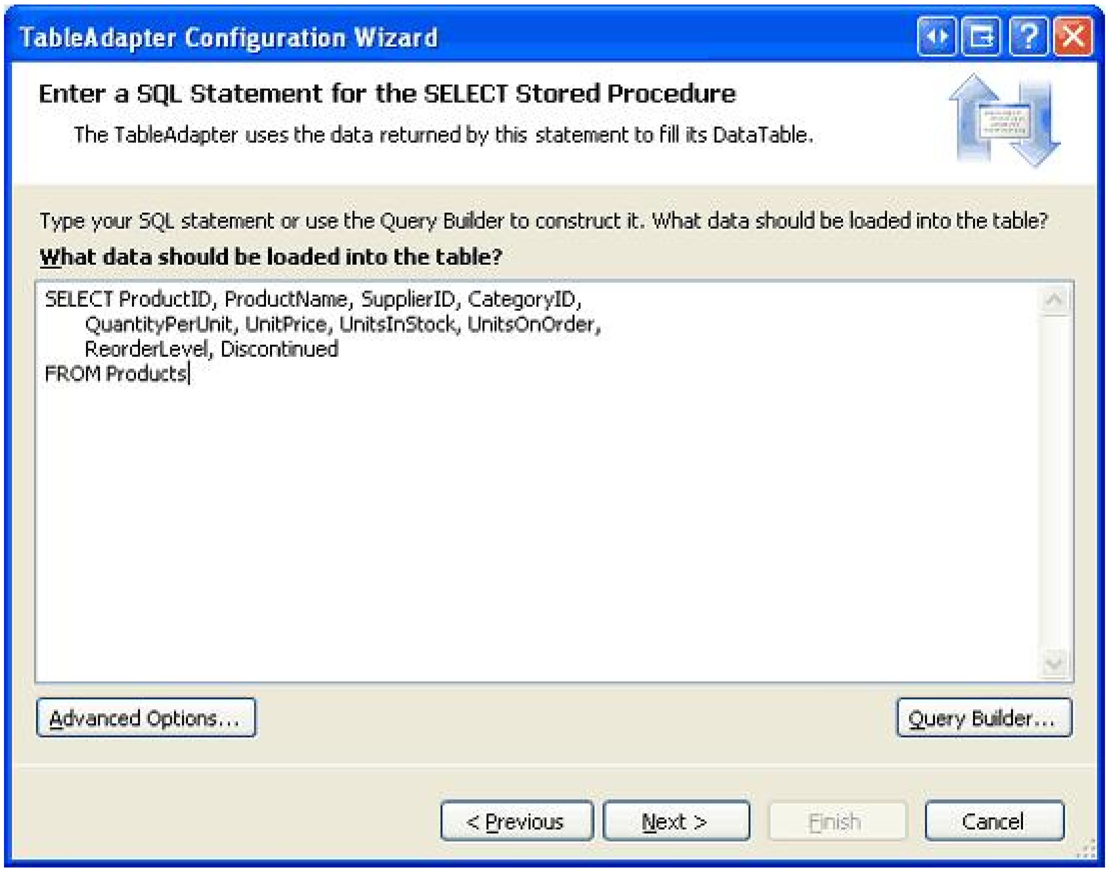
Choose an existing stored procedure for each command (SELECT, INSERT, UPDATE, and DELETE).

Figure 5: Instruct the TableAdpater to Create New Stored Procedures

Just like with using ad-hoc SQL statements, in the following step we are asked to provide the `SELECT` statement for the TableAdapter's main query. But instead of using the `SELECT` statement entered here to perform an ad-hoc query directly, the TableAdapter's wizard will create a stored procedure that contains this `SELECT` query.

Use the following `SELECT` query for this TableAdapter:

```
SELECT ProductID, ProductName, SupplierID, CategoryID,
       QuantityPerUnit, UnitPrice, UnitsInStock, UnitsOnOrder,
       ReorderLevel, Discontinued
FROM Products
```


TableAdapter Configuration Wizard
Enter a SQL Statement for the SELECT Stored Procedure
The TableAdapter uses the data returned by this statement to fill its DataTable.
Type your SQL statement or use the Query Builder to construct it. What data should be loaded into the table?
What data should be loaded into the table?
Advanced Options...
Query Builder...
< Previous
Next >
Finish
Cancel

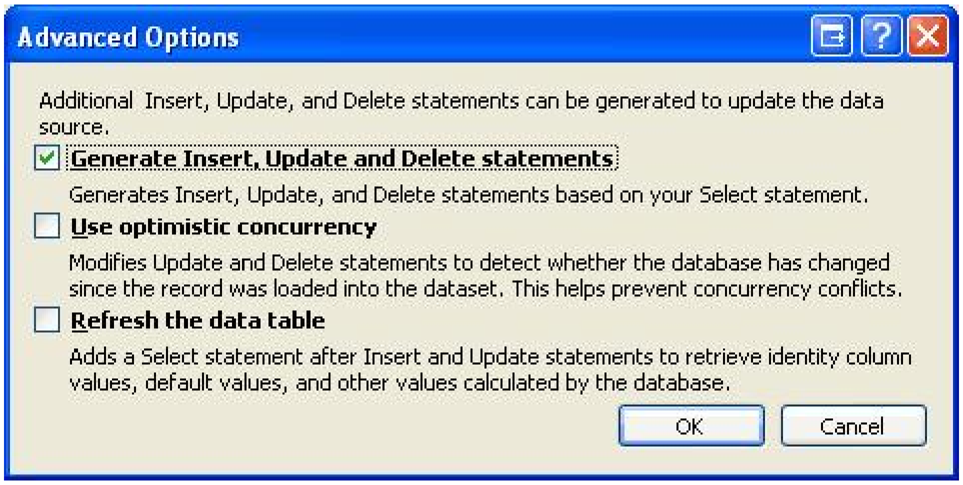
```
SELECT ProductID, ProductName, SupplierID, CategoryID,
      QuantityPerUnit, UnitPrice, UnitsInStock, UnitsOnOrder,
      ReorderLevel, Discontinued
FROM Products
```

Figure 6: Enter the `SELECT` Query

Note: The query above differs slightly from the main query of the `ProductsTableAdapter` in the `Northwind` Typed DataSet. Recall that the `ProductsTableAdapter` in the `Northwind` Typed DataSet includes two correlated subqueries to bring back the category name and company name for each product's category and supplier. In the upcoming Updating the TableAdapter to Use JOINs tutorial we will look at adding this related data to this TableAdapter.

Take a moment to click the "Advanced Options" button. From here we can specify whether the wizard should also generate insert, update, and delete statements for the TableAdapter, whether to use optimistic concurrency, and whether the data table should be refreshed after inserts and updates. The "Generate Insert, Update and Delete statements" option is checked by default. Leave it checked. For this tutorial, leave the "Use optimistic concurrency" options unchecked.

When having the stored procedures automatically created by the TableAdapter wizard, it appears that the "Refresh the data table" option is ignored. Regardless of whether this checkbox is checked, the resulting insert and update stored procedures retrieve the just-inserted or just-updated record, as we will see in Step 3.



Additional Insert, Update, and Delete statements can be generated to update the data source.

[✓] Generate Insert, Update and Delete statements

Generates Insert, Update, and Delete statements based on your Select statement.

[ ] Use optimistic concurrency

Modifies Update and Delete statements to detect whether the database has changed since the record was loaded into the dataset. This helps prevent concurrency conflicts.

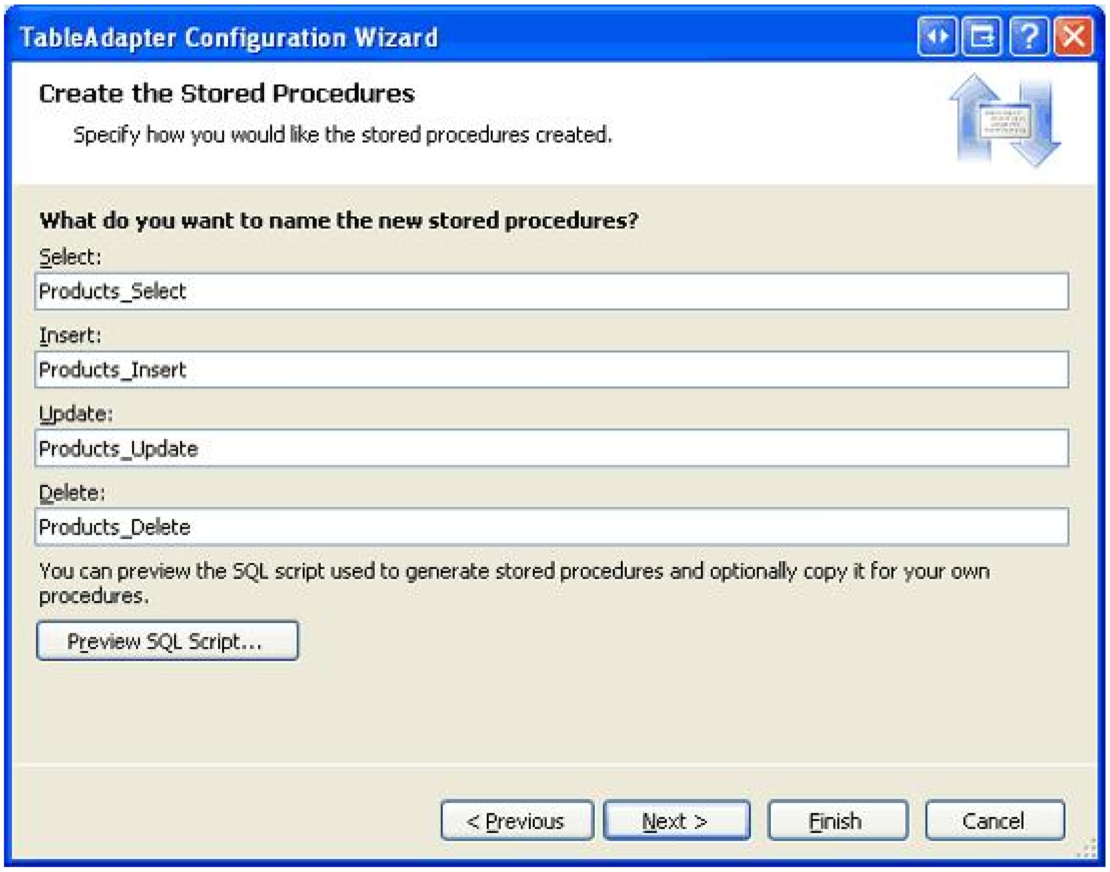
[ ] Refresh the data table

Adds a Select statement after Insert and Update statements to retrieve identity column values, default values, and other values calculated by the database.

Figure 7: Leave the "Generate Insert, Update and Delete statements" Option Checked

Note: If the "Use optimistic concurrency" option is checked, the wizard will add additional conditions to the `WHERE` clause that prevent data from being updated if there were changes in other fields. Refer back to the Implementing Optimistic Concurrency tutorial for more information on using the TableAdapter's built-in optimistic concurrency control feature.

After entering the `SELECT` query and confirming that the "Generate Insert, Update and Delete statements" option is checked, click Next. This next screen, shown in Figure 8, prompts for the names of the stored procedures the wizard will create for selecting, inserting, updating, and deleting data. Change these stored procedures' names to `Products_Select`, `Products_Insert`, `Products_Update`, and `Products_Delete`.


TableAdapter Configuration Wizard

Create the Stored Procedures

Specify how you would like the stored procedures created.

What do you want to name the new stored procedures?

Select: Products_Select

Insert: Products_Insert

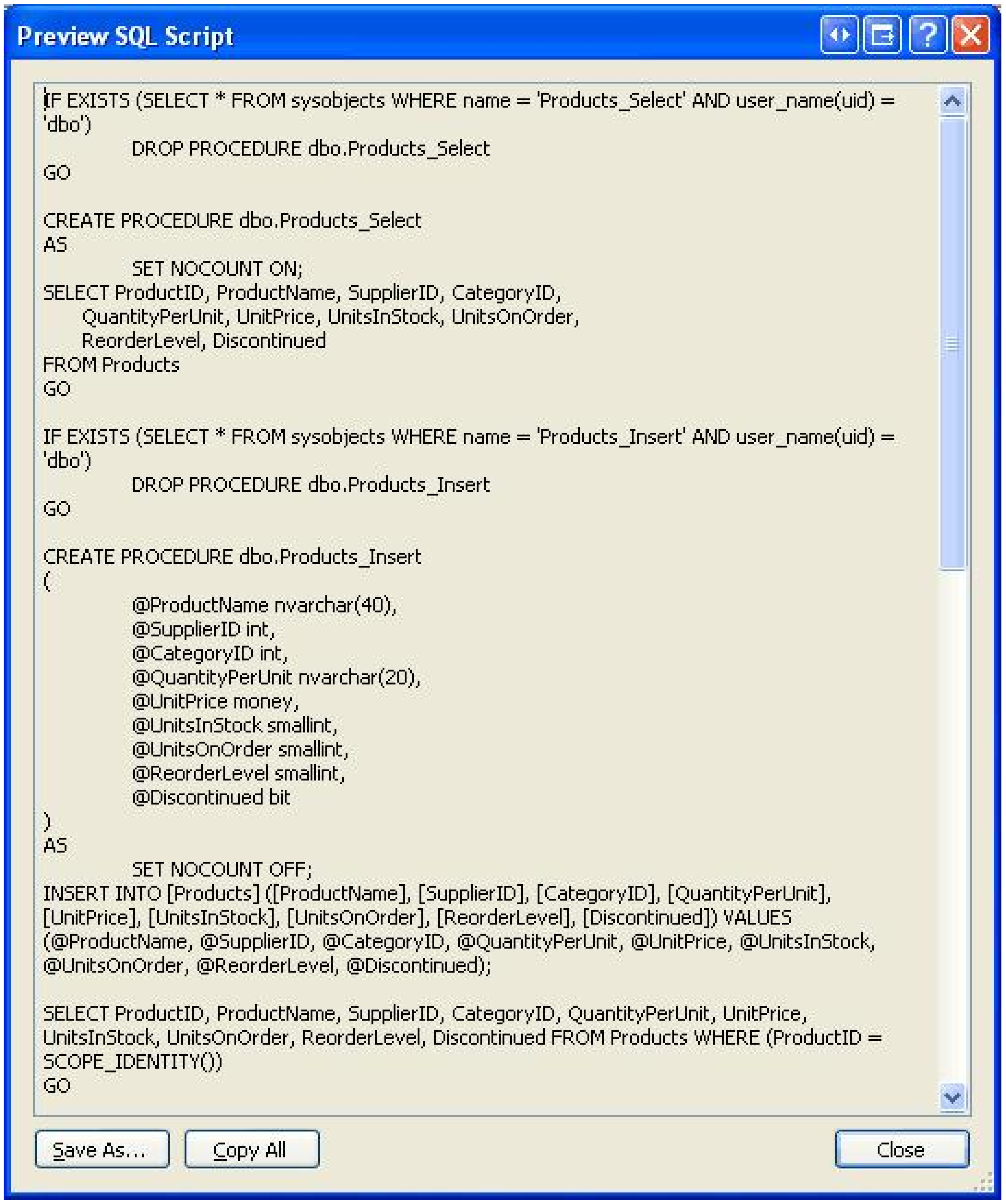
Update: Products_Update

Delete: Products_Delete

You can preview the SQL script used to generate stored procedures and optionally copy it for your own procedures.

Figure 8: Rename the Stored Procedures

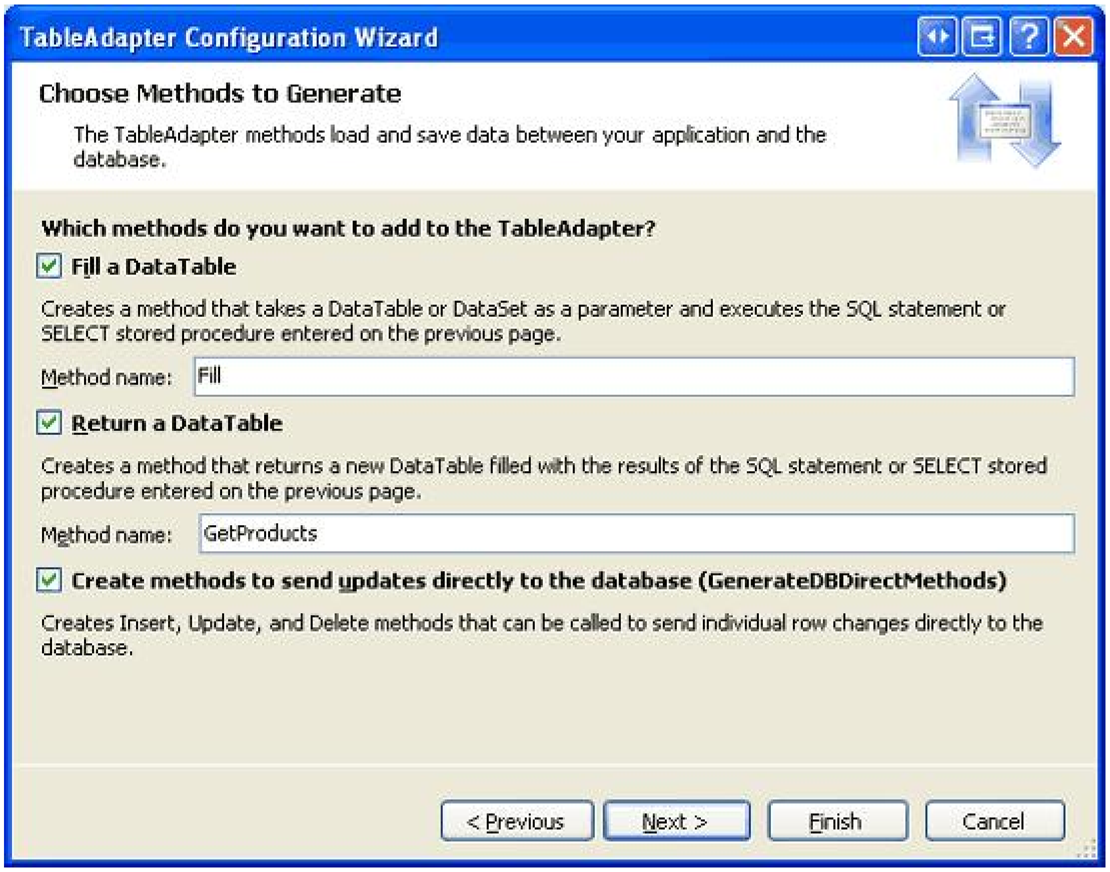
To see the T-SQL the TableAdapter wizard will use to create the four stored procedures, click the "Preview SQL Script" button. From the Preview SQL Script dialog box you may save the script to a file or copy it to the clipboard.



```
IF EXISTS (SELECT * FROM sysobjects WHERE name = 'Products_Select' AND user_name(uid) =
'dbo')
            DROP PROCEDURE dbo.Products_Select
GO

CREATE PROCEDURE dbo.Products_Select
AS
            SET NOCOUNT ON;
SELECT ProductID, ProductName, SupplierID, CategoryID,
      QuantityPerUnit, UnitPrice, UnitsInStock, UnitsOnOrder,
      ReorderLevel, Discontinued
FROM Products
GO

IF EXISTS (SELECT * FROM sysobjects WHERE name = 'Products_Insert' AND user_name(uid) =
'dbo')
            DROP PROCEDURE dbo.Products_Insert
GO

CREATE PROCEDURE dbo.Products_Insert
(
            @ProductName nvarchar(40),
            @SupplierID int,
            @CategoryID int,
            @QuantityPerUnit nvarchar(20),
            @UnitPrice money,
            @UnitsInStock smallint,
            @UnitsOnOrder smallint,
            @ReorderLevel smallint,
            @Discontinued bit
)
AS
            SET NOCOUNT OFF;
INSERT INTO [Products] ([ProductName], [SupplierID], [CategoryID], [QuantityPerUnit],
[UnitPrice], [UnitsInStock], [UnitsOnOrder], [ReorderLevel], [Discontinued]) VALUES
(@ProductName, @SupplierID, @CategoryID, @QuantityPerUnit, @UnitPrice, @UnitsInStock,
@UnitsOnOrder, @ReorderLevel, @Discontinued);

SELECT ProductID, ProductName, SupplierID, CategoryID, QuantityPerUnit, UnitPrice,
UnitsInStock, UnitsOnOrder, ReorderLevel, Discontinued FROM Products WHERE (ProductID =
SCOPE_IDENTITY())
GO
```

Figure 9: Preview the SQL Script Used to Generate the Stored Procedures

After naming the stored procedures, click Next to name the TableAdapter's corresponding methods. Just like when using ad-hoc SQL statements, we can create methods that fill an existing DataTable or return a new one. We can also specify whether the TableAdapter should include the DB-Direct pattern for inserting, updating, and deleting records. Leave all three checkboxes checked, but rename the Return a DataTable method to `GetProducts` (as shown in Figure 10).


TableAdapter Configuration Wizard

Choose Methods to Generate

The TableAdapter methods load and save data between your application and the database.

Which methods do you want to add to the TableAdapter?

☑ Fill a DataTable

Creates a method that takes a DataTable or DataSet as a parameter and executes the SQL statement or SELECT stored procedure entered on the previous page.

Method name: Fill

☑ Return a DataTable

Creates a method that returns a new DataTable filled with the results of the SQL statement or SELECT stored procedure entered on the previous page.

Method name: GetProducts

☑ Create methods to send updates directly to the database (GenerateDBDirectMethods)

Creates Insert, Update, and Delete methods that can be called to send individual row changes directly to the database.

Figure 10: Name the Methods `Fill` and `GetProducts`

Click Next to see a summary of the steps the wizard will perform. Complete the wizard by clicking the Finish button. Once the wizard completes, you will be returned to the DataSet's Designer, which should now include the `ProductsDataTable`.

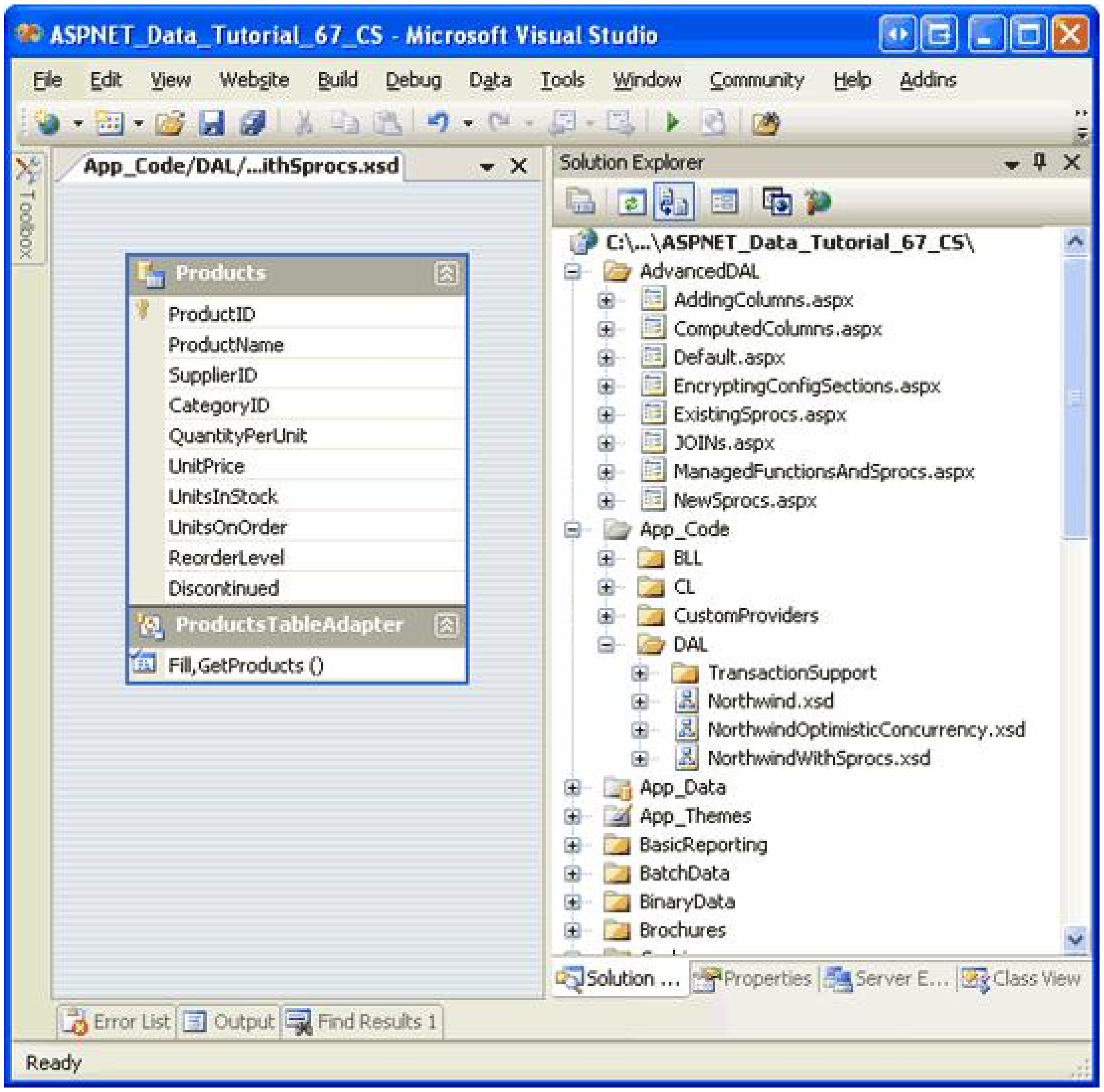


Figure 11: The DataSet's Designer Shows the Newly Added `ProductsDataTable`

Step 3: Examining the Newly Created Stored Procedures

The TableAdapter wizard used in Step 2 automatically created the stored procedures for selecting, inserting, updating, and deleting data. These stored procedures can be viewed or modified through Visual Studio by going to the Server Explorer and drilling down into the database's Stored Procedures folder. As Figure 12 shows, the Northwind database contains four new stored procedures: `Products_Delete`, `Products_Insert`, `Products_Select`, and `Products_Update`.

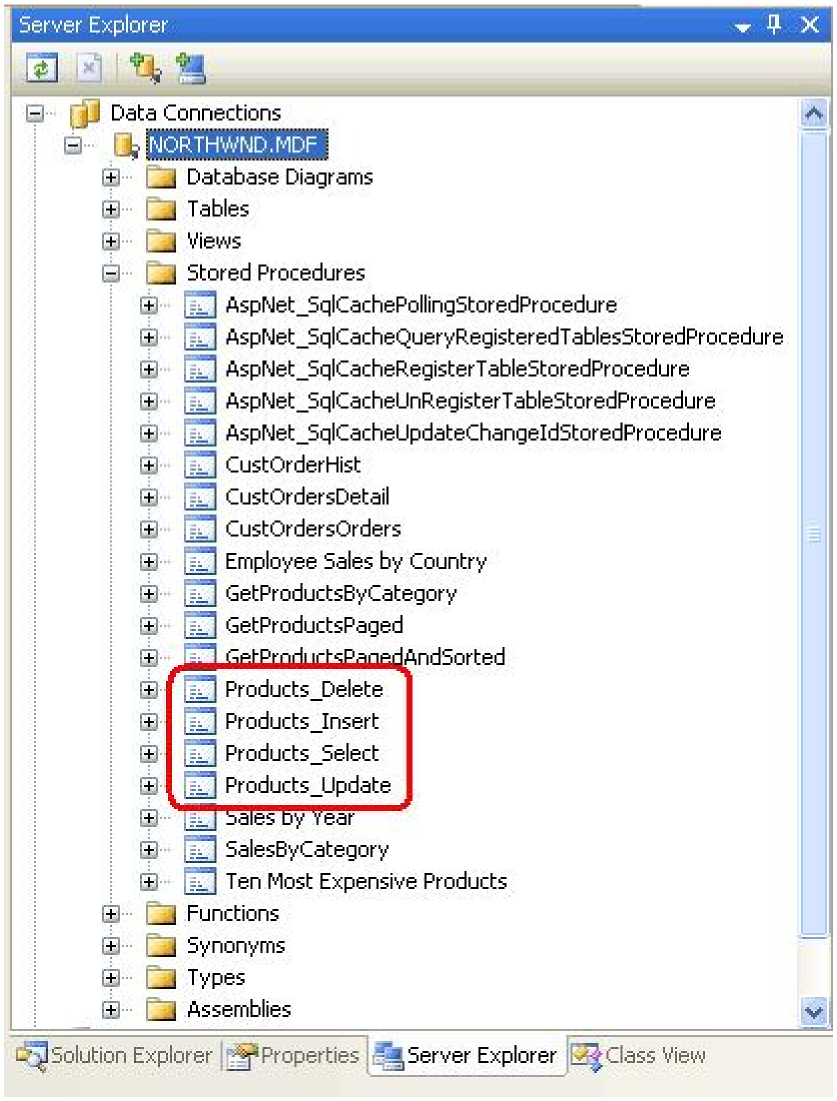
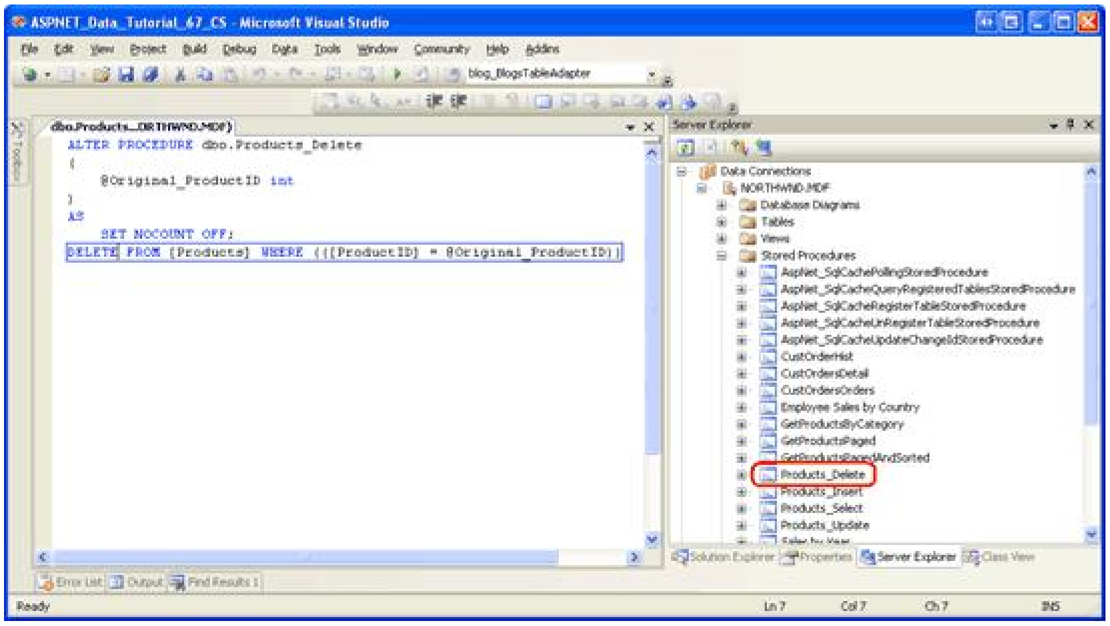


Figure 12: The Four Stored Procedures Created in Step 2 Can Be Found in the Database's Stored Procedures Folder

Note: If you do not see the Server Explorer, go to the View menu and choose the Server Explorer option. If you do not see the product-related stored procedures added from Step 2, try right-clicking on the Stored Procedures folder and choosing Refresh.

To view or modify a stored procedure, double-click its name in the Server Explorer or, alternatively, right-click on the stored procedure and choose Open. Figure 13 shows the `Products_Delete` stored procedure, when opened.



```
ALTER PROCEDURE dbo.Products_Delete
(
    @Original_ProductID int
)
AS
    SET NOCOUNT OFF;
DELETE FROM [Products] WHERE (([ProductID] = @Original_ProductID))
```

ASPNET_Data_Tutorial_67_CS - Microsoft Visual Studio
File Edit View Project Build Debug Data Tools Window Community Help Addins
blog_BlogsTableAdapter
dbo.Products...ORTHWND.MDF)
Server Explorer
Data Connections
NORTHWND.MDF
Database Diagrams
Tables
Views
Stored Procedures
AspNet_SqlCachePollingStoredProcedure
AspNet_SqlCacheQueryRegisteredTablesStoredProcedure
AspNet_SqlCacheRegisterTableStoredProcedure
AspNet_SqlCacheUnRegisterTableStoredProcedure
AspNet_SqlCacheUpdateChangeIdStoredProcedure
CustOrderHist
CustOrdersDetail
CustOrdersOrders
Employee Sales by Country
GetProductsByCategory
GetProductsPaged
GetProductsPagedAndSorted
Products_Delete
Products_Insert
Products_Select
Products_Update
Sales by Year
Solution Explorer
Properties
Server Explorer
Class View
Error List
Output
Find Results 1
Ready
Ln 7
Col 7
Ch 7
INS

Figure 13: Stored Procedures Can Be Opened and Modified From Within Visual Studio

The contents of both the `Products_Delete` and `Products_Select` stored procedures are quite straightforward. The `Products_Insert` and `Products_Update` stored procedures, on the other hand, warrant a closer inspection as they both perform a `SELECT` statement after their `INSERT` and `UPDATE` statements. For example, the following SQL makes up the `Products_Insert` stored procedure:

```
ALTER PROCEDURE dbo.Products_Insert
(
    @ProductName nvarchar(40),
    @SupplierID int,
    @CategoryID int,
    @QuantityPerUnit nvarchar(20),
    @UnitPrice money,
    @UnitsInStock smallint,
    @UnitsOnOrder smallint,
    @ReorderLevel smallint,
    @Discontinued bit
)
AS
    SET NOCOUNT OFF;
INSERT INTO [Products] ([ProductName], [SupplierID], [CategoryID], [QuantityPerUnit],
    [UnitPrice], [UnitsInStock], [UnitsOnOrder], [ReorderLevel], [Discontinued])
VALUES (@ProductName, @SupplierID, @CategoryID, @QuantityPerUnit, @UnitPrice,
    @UnitsInStock, @UnitsOnOrder, @ReorderLevel, @Discontinued);

SELECT ProductID, ProductName, SupplierID, CategoryID, QuantityPerUnit, UnitPrice,
    UnitsInStock, UnitsOnOrder, ReorderLevel, Discontinued
FROM Products
WHERE (ProductID = SCOPE_IDENTITY())
```

The stored procedure accepts as input parameters the `Products` columns that were returned by the `SELECT` query specified in the TableAdapter's wizard and these values are used in an `INSERT` statement. Following the `INSERT` statement, a `SELECT` query is used to return the `Products` column values (including the `ProductID`) of the newly added record. This refresh capability is useful when adding a new record using the Batch Update pattern as it automatically updates the newly added `ProductRow` instances' `ProductID` properties with the auto-incremented values assigned by the database.

The following code illustrates this feature. It contains a `ProductsTableAdapter` and `ProductsDataTable` created for the `NorthwindWithSprocs` Typed DataSet. A new product is added to the database by creating a `ProductsRow` instance, supplying its values, and calling the TableAdapter's `Update` method, passing in the `ProductsDataTable`. Internally, the TableAdapter's `Update` method enumerates the `ProductsRow` instances in the passed-in DataTable (in this example there is only one - the one we just added), and performs the appropriate insert, update, or delete command. In this case, the `Products_Insert` stored procedure is executed, which adds a new record to the `Products` table and returns the details of the newly-added record. The `ProductsRow` instance's `ProductID` value is then updated. After the `Update` method has completed, we can access the newly-added record's `ProductID` value through the `ProductsRow`'s `ProductID` property.

```
' Create the ProductsTableAdapter and ProductsDataTable
Dim productsAPI As New NorthwindWithSprocsTableAdapters.ProductsTableAdapter
Dim products As New NorthwindWithSprocs.ProductsDataTable

' Create a new ProductsRow instance and set its properties
Dim product As NorthwindWithSprocs.ProductsRow = products.NewProductsRow()
product.ProductName = "New Product"
product.CategoryID = 1  ' Beverages
product.Discontinued = False

' Add the ProductsRow instance to the DataTable
products.AddProductsRow(product)

' Update the DataTable using the Batch Update pattern
productsAPI.Update(products)

' At this point, we can determine the value of the newly-added record's ProductID
Dim newlyAddedProductIDValue as Integer = product.ProductID
```

The `Products_Update` stored procedure similarly includes a `SELECT` statement after its `UPDATE` statement.

```
ALTER PROCEDURE dbo.Products_Update
(
    @ProductName nvarchar(40),
    @SupplierID int,
    @CategoryID int,
    @QuantityPerUnit nvarchar(20),
    @UnitPrice money,
    @UnitsInStock smallint,
    @UnitsOnOrder smallint,
    @ReorderLevel smallint,
    @Discontinued bit,
    @Original_ProductID int,
    @ProductID int
)
AS
    SET NOCOUNT OFF;
UPDATE [Products]
SET [ProductName] = @ProductName, [SupplierID] = @SupplierID,
    [CategoryID] = @CategoryID, [QuantityPerUnit] = @QuantityPerUnit,
    [UnitPrice] = @UnitPrice, [UnitsInStock] = @UnitsInStock,
    [UnitsOnOrder] = @UnitsOnOrder, [ReorderLevel] = @ReorderLevel,
    [Discontinued] = @Discontinued
WHERE (([ProductID] = @Original_ProductID));

SELECT ProductID, ProductName, SupplierID, CategoryID, QuantityPerUnit,
    UnitPrice, UnitsInStock, UnitsOnOrder, ReorderLevel, Discontinued
FROM Products
WHERE (ProductID = @ProductID)
```

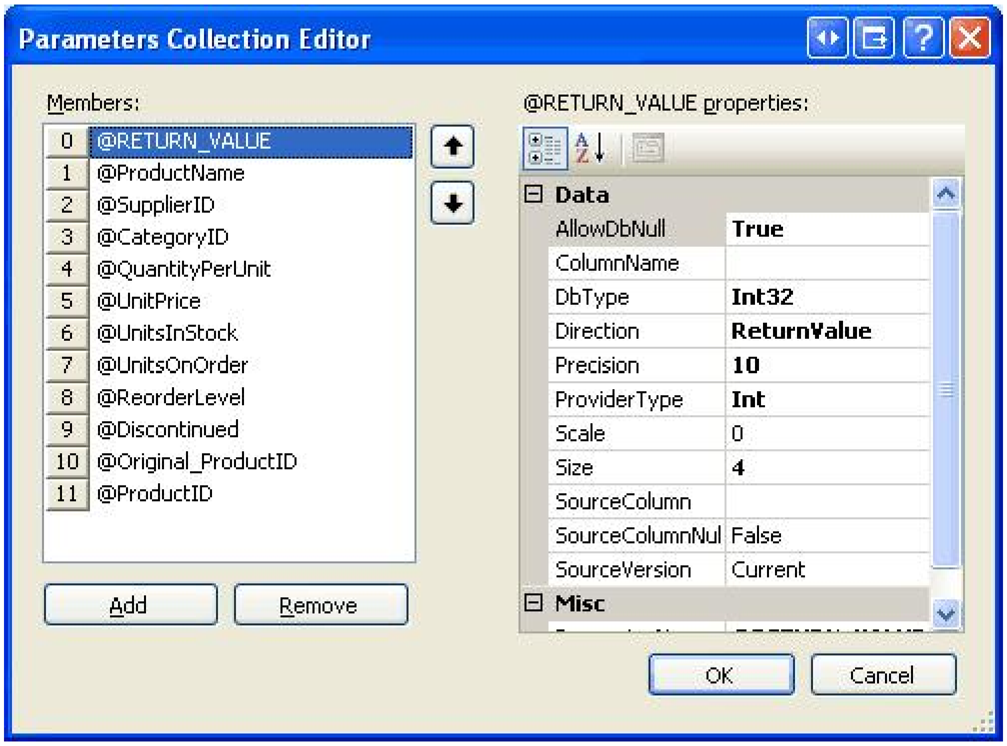
Note that this stored procedure includes two input parameters for `ProductID`: `@Original_ProductID` and `@ProductID`. This functionality allows for scenarios where the primary key might be changed. For example, in an employee database, each employee record might use the employee's social security number as their primary key. In order to change an existing employee's social security number, both the new social security number and the original one must be supplied. For the `Products` table, such functionality is not needed because the `ProductID` column is an `IDENTITY` column and should never be changed. In fact, the `UPDATE` statement in the `Products_Update` stored procedure doesn't include the `ProductID` column in its column list. So, while `@Original_ProductID` is used in the `UPDATE` statement's `WHERE` clause, it is superfluous for the `Products` table and could be replaced by the `@ProductID` parameter. When modifying a stored procedure's parameters it is important that the TableAdapter method(s) that use that stored procedure are also updated.

Step 4: Modifying a Stored Procedure's Parameters and Updating the TableAdapter

Since the `@Original_ProductID` parameter is superfluous, let's remove it from the `Products_Update` stored procedure altogether. Open the `Products_Update` stored procedure, delete the `@Original_ProductID` parameter, and, in the `WHERE` clause of the `UPDATE` statement, change the parameter name used from `@Original_ProductID` to `@ProductID`. After making these changes, the T-SQL within the stored procedure should look like the following:

```
    ALTER PROCEDURE dbo.Products_Update
    (
        @ProductName nvarchar(40),
        @SupplierID int,
        @CategoryID int,
        @QuantityPerUnit nvarchar(20),
        @UnitPrice money,
        @UnitsInStock smallint,
        @UnitsOnOrder smallint,
        @ReorderLevel smallint,
        @Discontinued bit,
        @ProductID int
    )
    AS
        SET NOCOUNT OFF;
    UPDATE [Products] SET [ProductName] = @ProductName, [SupplierID] = @SupplierID,
        [CategoryID] = @CategoryID, [QuantityPerUnit] = @QuantityPerUnit,
        [UnitPrice] = @UnitPrice, [UnitsInStock] = @UnitsInStock,
        [UnitsOnOrder] = @UnitsOnOrder, [ReorderLevel] = @ReorderLevel,
        [Discontinued] = @Discontinued
    WHERE (([ProductID] = @ProductID));

    SELECT ProductID, ProductName, SupplierID, CategoryID, QuantityPerUnit,
        UnitPrice, UnitsInStock, UnitsOnOrder, ReorderLevel, Discontinued
    FROM Products
    WHERE (ProductID = @ProductID)
```

To save these changes to the database, click the Save icon in the toolbar or hit Ctrl+S. At this point, the `Products_Update` stored procedure does not expect an `@Original_ProductID` input parameter, but the TableAdapter is configured to pass such a parameter. You can see the parameters the TableAdapter will send to the `Products_Update` stored procedure by selecting the TableAdapter in the DataSet Designer, going to the Properties window, and clicking the ellipses in the `UpdateCommand`'s `Parameters` collection. This brings up the Parameters Collection Editor dialog box shown in Figure 14.



Members:

0	@RETURN_VALUE
1	@ProductName
2	@SupplierID
3	@CategoryID
4	@QuantityPerUnit
5	@UnitPrice
6	@UnitsInStock
7	@UnitsOnOrder
8	@ReorderLevel
9	@Discontinued
10	@Original_ProductID
11	@ProductID

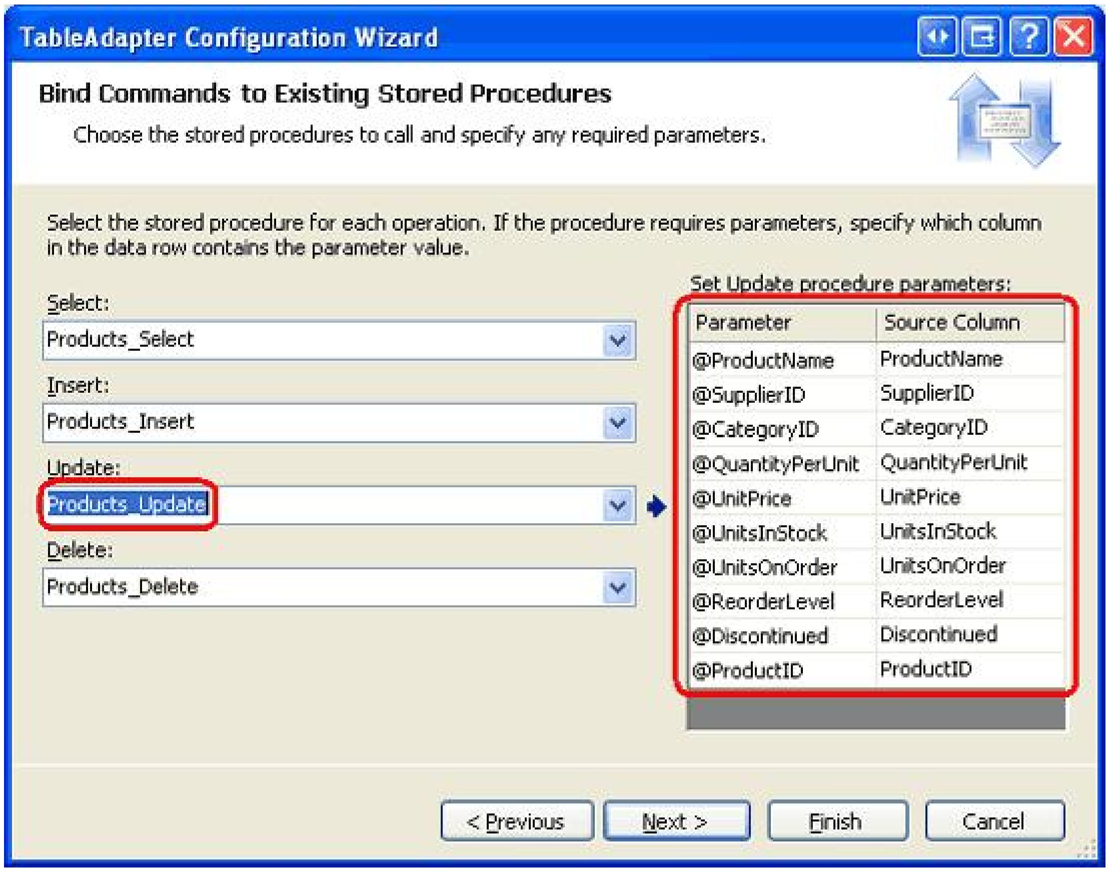
@RETURN_VALUE properties:

Data	
AllowDbNull	True
ColumnName	
DbType	Int32
Direction	ReturnValue
Precision	10
ProviderType	Int
Scale	0
Size	4
SourceColumn	
SourceColumnNul	False
SourceVersion	Current
Misc	

Figure 14: The Parameters Collection Editor Lists the Parameters Used Passed to the `Products_Update` Stored Procedure

You can remove this parameter from here by simply selecting the `@Original_ProductID` parameter from the list of members and clicking the Remove button.

Alternatively, you can refresh the parameters used for all of the methods by right-clicking on the TableAdapter in the Designer and choosing Configure. This will bring up the TableAdapter Configuration wizard, listing the stored procedures used for selecting, inserting, updating, and deleting, along with the parameters the stored procedures expect to receive. If you click on the Update drop-down list you can see the `Products_Update` stored procedures expected input parameters, which now no longer includes `@Original_ProductID` (see Figure 15). Simply click Finish to automatically update the parameter collection used by the TableAdapter.


TableAdapter Configuration Wizard

Bind Commands to Existing Stored Procedures

Choose the stored procedures to call and specify any required parameters.

Select the stored procedure for each operation. If the procedure requires parameters, specify which column in the data row contains the parameter value.

Select: Products_Select

Insert: Products_Insert

Update: Products_Update

Delete: Products_Delete

Set Update procedure parameters:

Parameter	Source Column
@ProductName	ProductName
@SupplierID	SupplierID
@CategoryID	CategoryID
@QuantityPerUnit	QuantityPerUnit
@UnitPrice	UnitPrice
@UnitsInStock	UnitsInStock
@UnitsOnOrder	UnitsOnOrder
@ReorderLevel	ReorderLevel
@Discontinued	Discontinued
@ProductID	ProductID

Figure 15: You Can Alternatively Use the TableAdapter's Configuration Wizard to Refresh Its Methods' Parameter Collections

Step 5: Adding Additional TableAdapter Methods

As Step 2 illustrated, when creating a new TableAdapter it is easy to have the corresponding stored procedures automatically generated. The same is true when adding additional methods to a TableAdapter. To illustrate this, let's add a `GetProductByProductID(productID)` method to the `ProductsTableAdapter` created in Step 2. This method will take as input a `ProductID` value and return details about the specified product.

Start by right-clicking on the TableAdapter and choosing Add Query from the context menu.

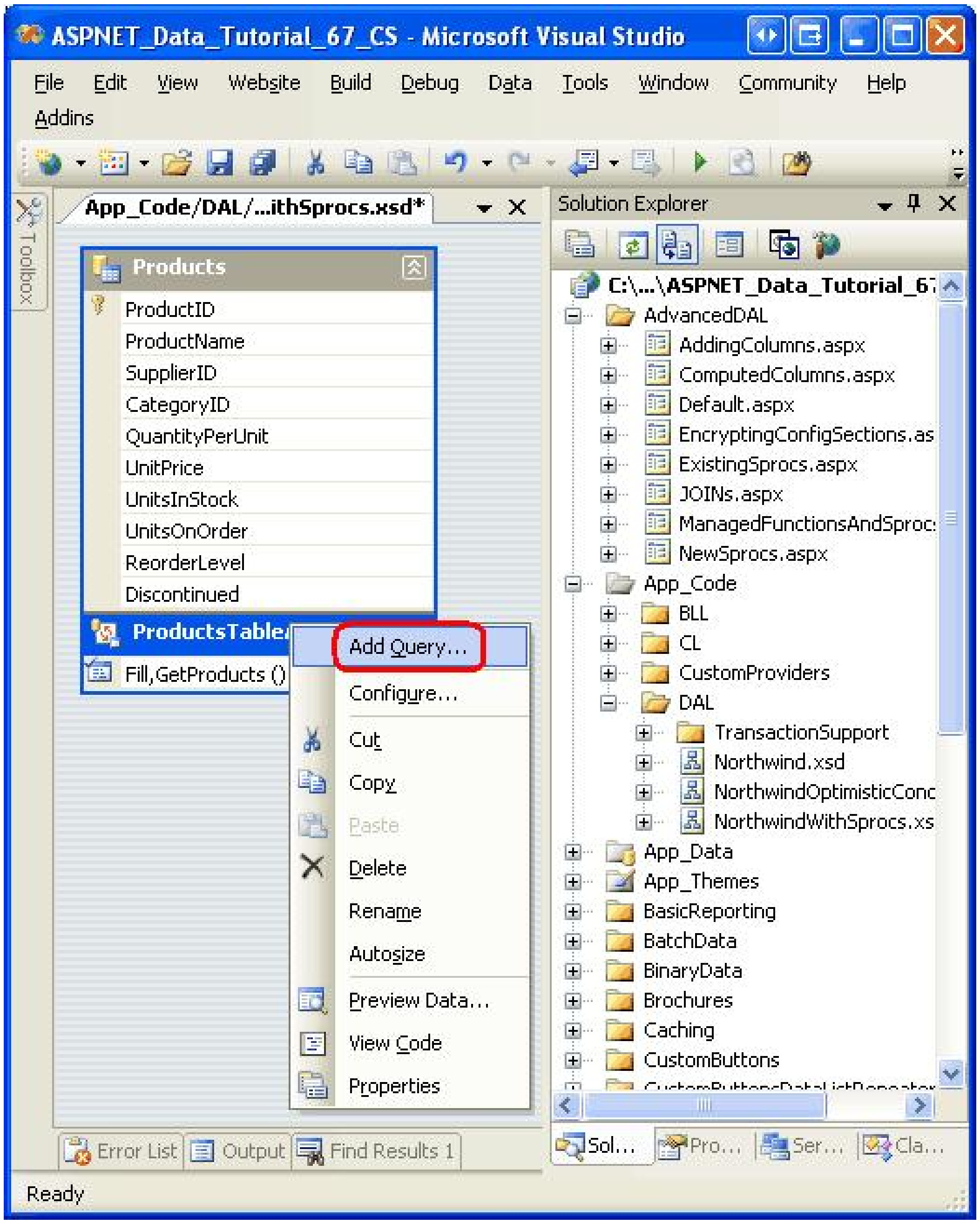
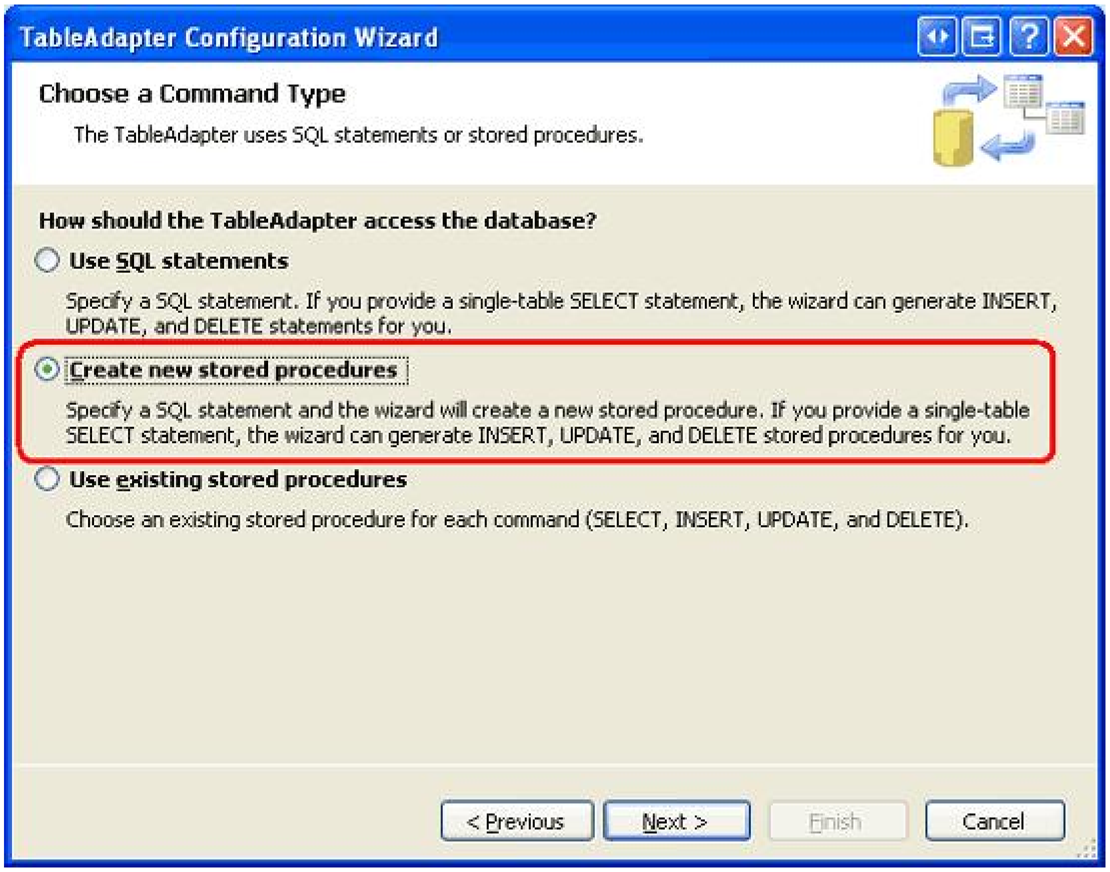


Figure 16: Add a New Query to the TableAdapter

This will start the TableAdapter Query Configuration wizard, which first prompts for how the TableAdapter should access the database. To have a new stored procedure created, choose the “Create a new stored procedure” option and click Next.



Choose a Command Type

The TableAdapter uses SQL statements or stored procedures.

How should the TableAdapter access the database?

Use SQL statements

Specify a SQL statement. If you provide a single-table SELECT statement, the wizard can generate INSERT, UPDATE, and DELETE statements for you.

[✓ Create new stored procedures]

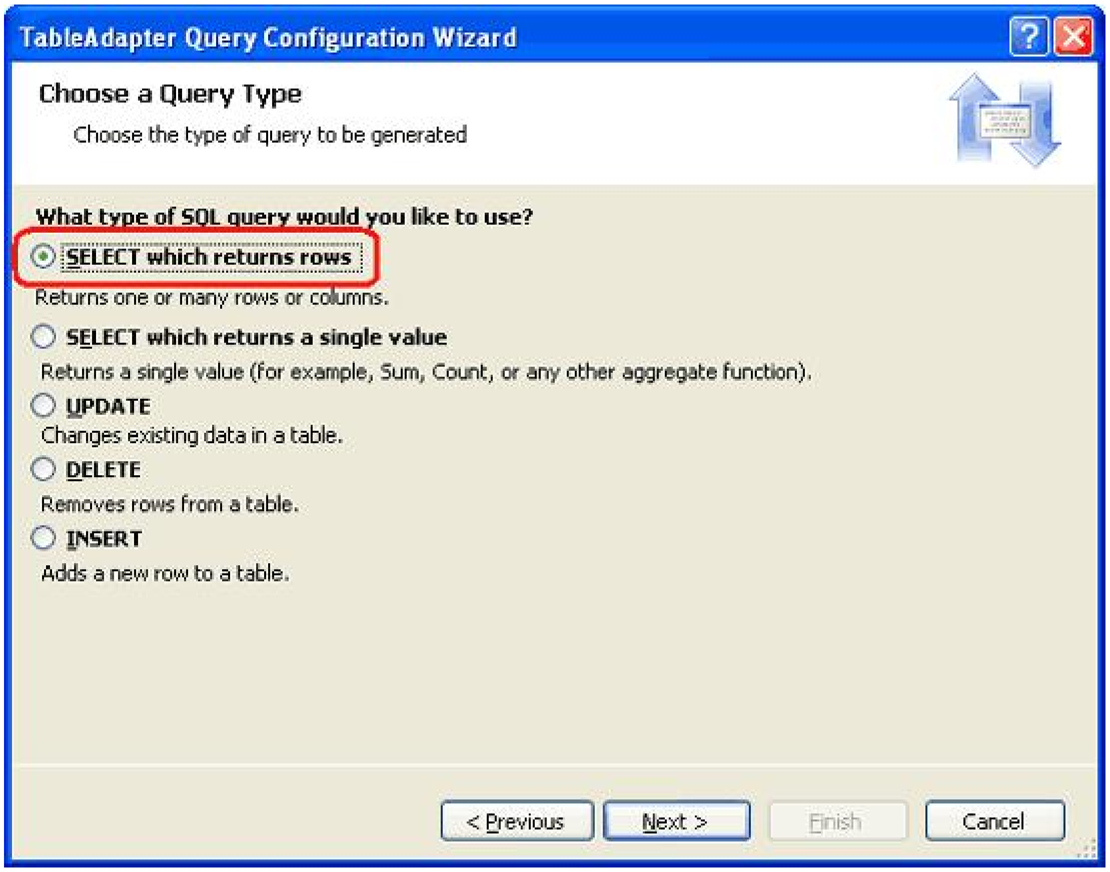
Specify a SQL statement and the wizard will create a new stored procedure. If you provide a single-table SELECT statement, the wizard can generate INSERT, UPDATE, and DELETE stored procedures for you.

Use existing stored procedures

Choose an existing stored procedure for each command (SELECT, INSERT, UPDATE, and DELETE).

Figure 17: Choose the "Create a new stored procedure" Option

The next screen asks us to identify the type of query to execute, whether it will return a set of rows or a single scalar value, or perform an `UPDATE`, `INSERT`, or `DELETE` statement. Since the `GetProductByProductID (productID)` method will return a row, leave the "SELECT which returns row" option selected and hit Next.


TableAdapter Query Configuration Wizard

Choose a Query Type

Choose the type of query to be generated

What type of SQL query would you like to use?

[✓ SELECT which returns rows]

Returns one or many rows or columns.

SELECT which returns a single value

Returns a single value (for example, Sum, Count, or any other aggregate function).

UPDATE

Changes existing data in a table.

DELETE

Removes rows from a table.

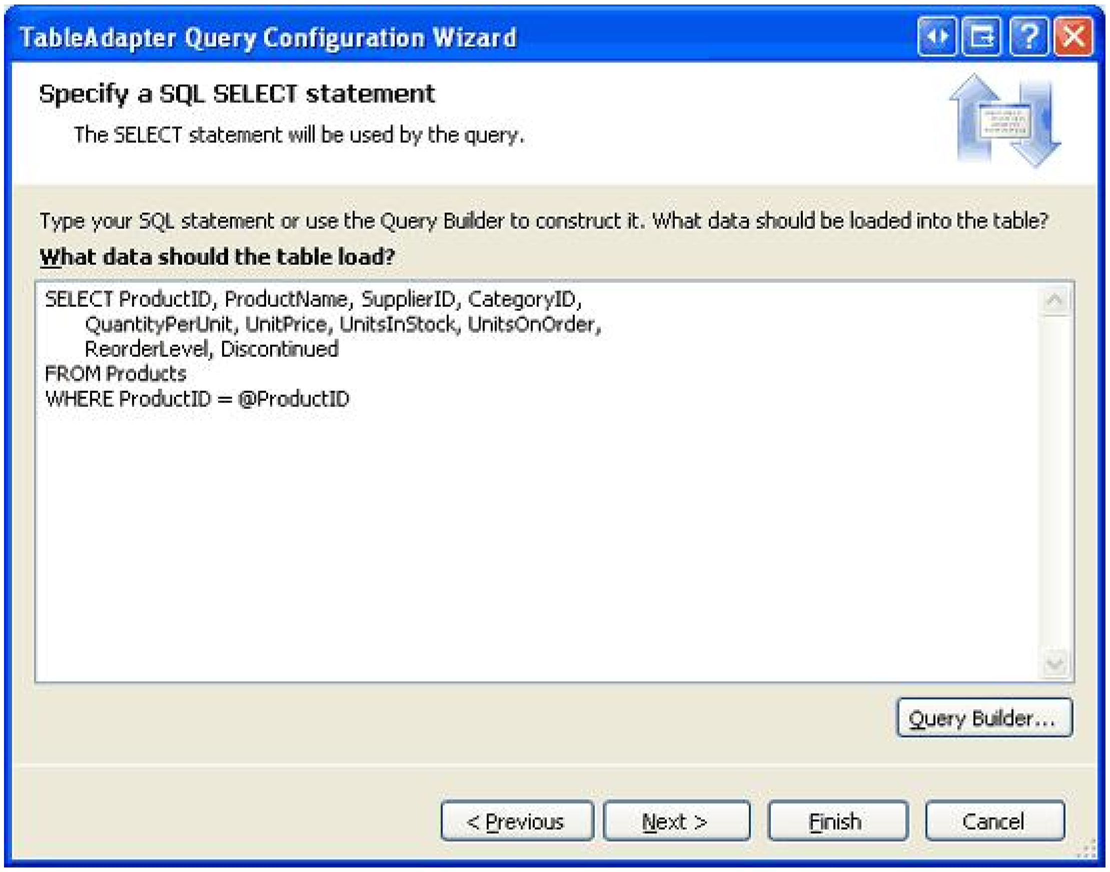
INSERT

Adds a new row to a table.

Figure 18: Choose the "SELECT which returns row" Option

The next screen displays the TableAdapter's main query, which just lists the name of the stored procedure (`dbo.Products_Select`). Replace the stored procedure name with the following `SELECT` statement, which returns all of the product fields for a specified product:

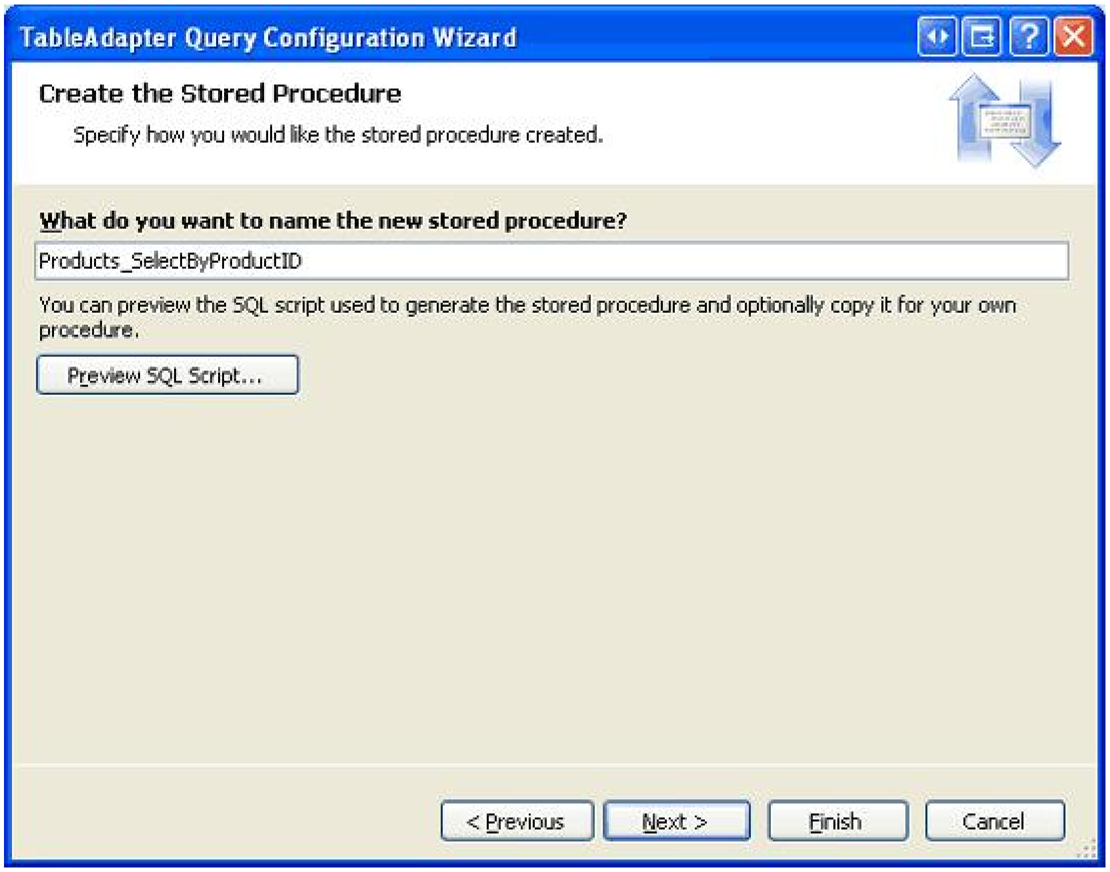
```
SELECT ProductID, ProductName, SupplierID, CategoryID,
       QuantityPerUnit, UnitPrice, UnitsInStock, UnitsOnOrder,
       ReorderLevel, Discontinued
FROM Products
WHERE ProductID = @ProductID
```


TableAdapter Query Configuration Wizard
Specify a SQL SELECT statement
The SELECT statement will be used by the query.
Type your SQL statement or use the Query Builder to construct it. What data should be loaded into the table?
What data should the table load?
Query Builder...
< Previous
Next >
Finish
Cancel

```
SELECT ProductID, ProductName, SupplierID, CategoryID,
      QuantityPerUnit, UnitPrice, UnitsInStock, UnitsOnOrder,
      ReorderLevel, Discontinued
FROM Products
WHERE ProductID = @ProductID
```

Figure 19: Replace the Stored Procedure Name with a `SELECT` Query

The subsequent screen asks you to name the stored procedure that will be created. Enter the name `Products_SelectByProductID` and click Next.



Create the Stored Procedure

Specify how you would like the stored procedure created.

What do you want to name the new stored procedure?

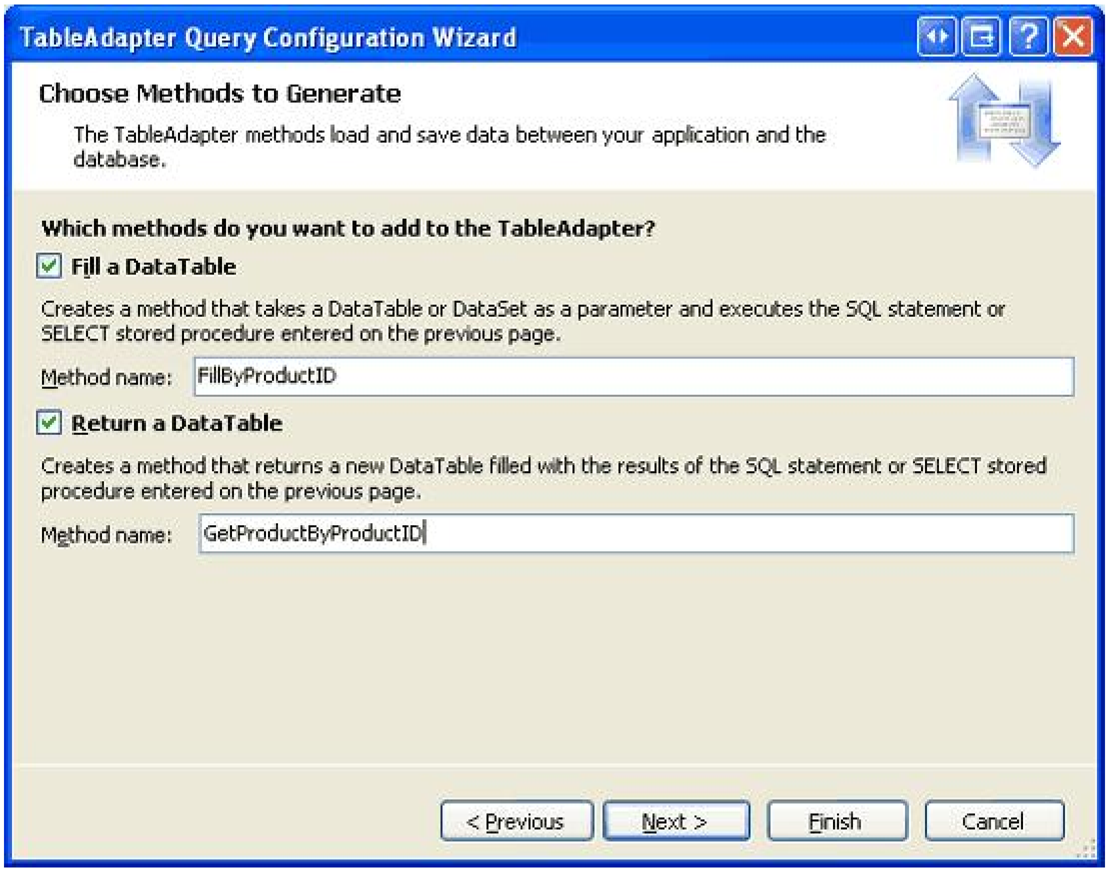
Products_SelectByProductID

You can preview the SQL script used to generate the stored procedure and optionally copy it for your own procedure.

Preview SQL Script...

Figure 20: Name the New Stored Procedure `Products_SelectByProductID`

The final step of the wizard allows us to change the method names generated as well as indicate whether to use the Fill a DataTable pattern, Return a DataTable pattern, or both. For this method, leave both options checked, but rename the methods to `FillByProductID` and `GetProductByProductID`. Click Next to view a summary of the steps the wizard will perform and then click Finish to complete the wizard.



Choose Methods to Generate

The TableAdapter methods load and save data between your application and the database.

Which methods do you want to add to the TableAdapter?

[✓] Fill a DataTable

Creates a method that takes a DataTable or DataSet as a parameter and executes the SQL statement or SELECT stored procedure entered on the previous page.

Method name: FillByProductID

[✓] Return a DataTable

Creates a method that returns a new DataTable filled with the results of the SQL statement or SELECT stored procedure entered on the previous page.

Method name: GetProductByProductID

Figure 21: Rename the TableAdapter's Methods to `FillByProductID` and `GetProductByProductID`

After completing the wizard, the TableAdapter has a new method available, `GetProductByProductID(productID)` that, when invoked, will execute the `Products_SelectByProductID` stored procedure that was just created. Take a moment to view this new stored procedure from the Server Explorer by drilling into the Stored Procedures folder and opening `Products_SelectByProductID` (if you do not see it, right-click on the Stored Procedures folder and choose Refresh).

Note that the `SelectByProductID` stored procedure takes `@ProductID` as an input parameter and executes the `SELECT` statement that we entered in the wizard.

```
ALTER PROCEDURE dbo.Products_SelectByProductID
(
    @ProductID int
)
AS
    SET NOCOUNT ON;

SELECT ProductID, ProductName, SupplierID, CategoryID,
       QuantityPerUnit, UnitPrice, UnitsInStock, UnitsOnOrder,
       ReorderLevel, Discontinued
FROM Products
WHERE ProductID = @ProductID
```

Step 6: Creating a Business Logic Layer Class

Throughout the tutorial series we have strived to maintain a layered architecture in which the Presentation Layer made all of its calls to the Business Logic Layer (BLL). In order to adhere to this design decision, we first need to create a BLL class for the new Typed DataSet before we can access product data from the Presentation Layer.

Create a new class file named `ProductsBLLWithSprocs.vb` in the `~/App_Code/BLL` folder and add to it the following code:

```
Imports NorthwindWithSprocsTableAdapters

<System.ComponentModel.DataObject()> _
Public Class ProductsBLLWithSprocs
    Private _productsAdapter As ProductsTableAdapter = Nothing
    Protected ReadOnly Property Adapter() As ProductsTableAdapter
        Get
            If _productsAdapter Is Nothing Then
                _productsAdapter = New ProductsTableAdapter()
            End If

            Return _productsAdapter
        End Get
    End Property


    <System.ComponentModel.DataObjectMethodAttribute _
        (System.ComponentModel.DataObjectMethodType.Select, True)> _
    Public Function GetProducts() As NorthwindWithSprocs.ProductsDataTable
        Return Adapter.GetProducts()
    End Function


    <System.ComponentModel.DataObjectMethodAttribute _
        (System.ComponentModel.DataObjectMethodType.Select, False)> _
    Public Function GetProductByProductID(ByVal productID As Integer) _
        As NorthwindWithSprocs.ProductsDataTable
        Return Adapter.GetProductByProductID(productID)
    End Function


    <System.ComponentModel.DataObjectMethodAttribute _
        (System.ComponentModel.DataObjectMethodType.Insert, True)> _
    Public Function AddProduct _
        (ByVal productName As String, ByVal supplierID As Nullable(Of Integer), _
         ByVal categoryID As Nullable(Of Integer), ByVal quantityPerUnit As String, _
         ByVal unitPrice As Nullable(Of Decimal), _
         ByVal unitsInStock As Nullable(Of Short), _
         ByVal unitsOnOrder As Nullable(Of Short), _
         ByVal reorderLevel As Nullable(Of Short), _
         ByVal discontinued As Boolean) _
         As Boolean

        ' Create a new ProductRow instance
        Dim products As New NorthwindWithSprocs.ProductsDataTable()
        Dim product As NorthwindWithSprocs.ProductsRow = products.NewProductsRow()

        product.ProductName = productName
        If Not supplierID.HasValue Then
```

```
            product.SetSupplierIDNull()
        Else
            product.SupplierID = supplierID.Value
        End If
        If Not categoryID.HasValue Then
            product.SetCategoryIDNull()
        Else
            product.CategoryID = categoryID.Value
        End If
        If quantityPerUnit Is Nothing Then
            product.SetQuantityPerUnitNull()
        Else
            product.QuantityPerUnit = quantityPerUnit
        End If
        If Not unitPrice.HasValue Then
            product.SetUnitPriceNull()
        Else
            product.UnitPrice = unitPrice.Value
        End If
        If Not unitsInStock.HasValue Then
            product.SetUnitsInStockNull()
        Else
            product.UnitsInStock = unitsInStock.Value
        End If
        If Not unitsOnOrder.HasValue Then
            product.SetUnitsOnOrderNull()
        Else
            product.UnitsOnOrder = unitsOnOrder.Value
        End If
        If Not reorderLevel.HasValue Then
            product.SetReorderLevelNull()
        Else
            product.ReorderLevel = reorderLevel.Value
        End If
        product.Discontinued = discontinued

        ' Add the new product
        products.AddProductsRow(product)
        Dim rowsAffected As Integer = Adapter.Update(products)

        ' Return true if precisely one row was inserted, otherwise false
        Return rowsAffected = 1
    End Function


    <System.ComponentModel.DataObjectMethodAttribute _
        (System.ComponentModel.DataObjectMethodType.Update, True)> _
    Public Function UpdateProduct
        (ByVal productName As String, ByVal supplierID As Nullable(Of Integer), _
         ByVal categoryID As Nullable(Of Integer), ByVal quantityPerUnit As String, _
         ByVal unitPrice As Nullable(Of Decimal), _
         ByVal unitsInStock As Nullable(Of Short), _
         ByVal unitsOnOrder As Nullable(Of Short), _
         ByVal reorderLevel As Nullable(Of Short), _
         ByVal discontinued As Boolean, ByVal productID As Integer) _
         As Boolean
        Dim products As NorthwindWithSprocs.ProductsDataTable = _
            Adapter.GetProductByProductID(productID)

        If products.Count = 0 Then
            ' no matching record found, return false
            Return False
        End If

        Dim product As NorthwindWithSprocs.ProductsRow = products(0)

        product.ProductName = productName
        If Not supplierID.HasValue Then
            product.SetSupplierIDNull()
        Else
            product.SupplierID = supplierID.Value
        End If
        If Not categoryID.HasValue Then
            product.SetCategoryIDNull()
        Else
            product.CategoryID = categoryID.Value
        End If
        If quantityPerUnit Is Nothing Then
            product.SetQuantityPerUnitNull()
        Else
            product.QuantityPerUnit = quantityPerUnit
        End If
        If Not unitPrice.HasValue Then
            product.SetUnitPriceNull()
        Else
            product.UnitPrice = unitPrice.Value
        End If
        If Not unitsInStock.HasValue Then
            product.SetUnitsInStockNull()
        Else
            product.UnitsInStock = unitsInStock.Value
        End If
        If Not unitsOnOrder.HasValue Then
            product.SetUnitsOnOrderNull()
        Else
            product.UnitsOnOrder = unitsOnOrder.Value
        End If
        If Not reorderLevel.HasValue Then
            product.SetReorderLevelNull()
        Else
            product.ReorderLevel = reorderLevel.Value
        End If
        product.Discontinued = discontinued

        ' Update the product record
        Dim rowsAffected As Integer = Adapter.Update(product)

        ' Return true if precisely one row was updated, otherwise false
        Return rowsAffected = 1
    End Function


    <System.ComponentModel.DataObjectMethodAttribute _
```

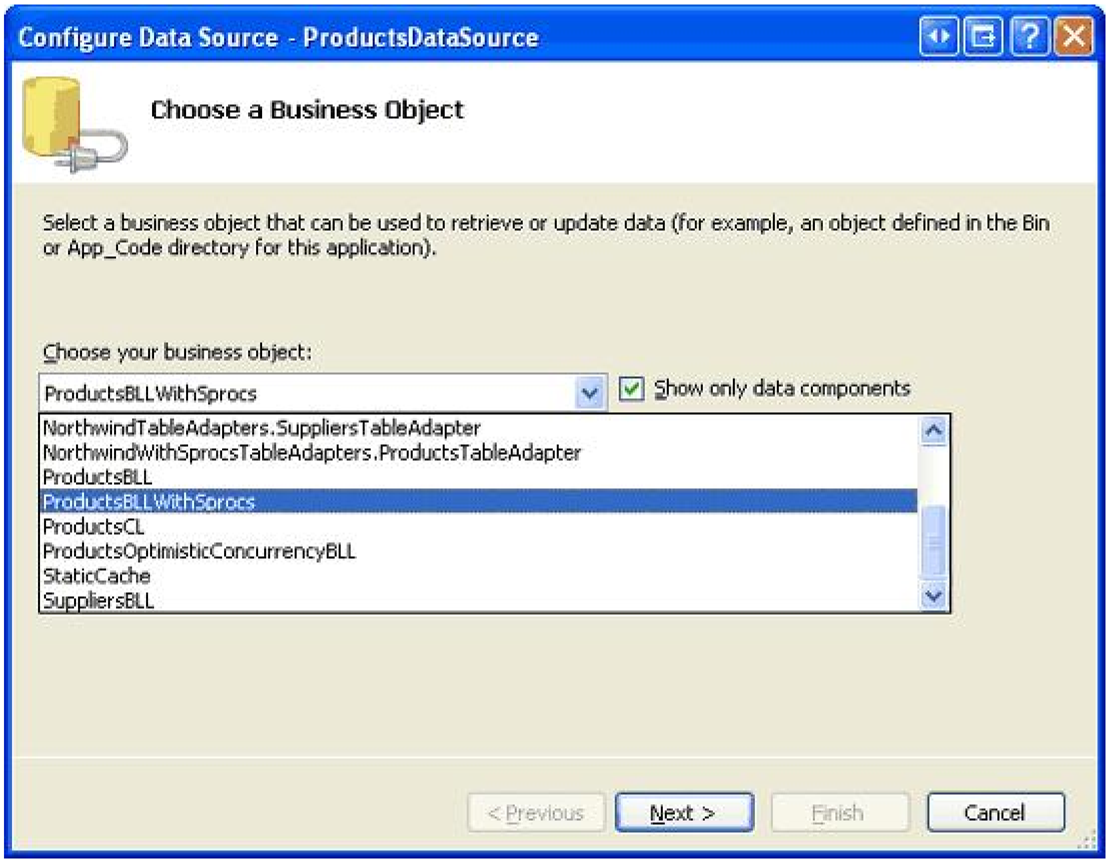
```
            (System.ComponentModel.DataObjectMethodType.Delete, True)> _
        Public Function DeleteProduct(ByVal productID As Integer) As Boolean
            Dim rowsAffected As Integer = Adapter.Delete(productID)

            ' Return true if precisely one row was deleted, otherwise false
            Return rowsAffected = 1
        End Function
    End Class
```

This class mimics the `ProductsBLL` class semantics from earlier tutorials, but uses the `ProductsTableAdapter` and `ProductsDataTable` objects from the `NorthwindWithSprocs` DataSet. For example, rather than having a `Imports  NorthwindTableAdapters` statement at the start of the class file as `ProductsBLL` does, the `ProductsBLLWithSprocs` class uses `Imports  NorthwindWithSprocsTableAdapters`. Likewise, the `ProductsDataTable` and `ProductsRow` objects used in this class are prefixed with the `NorthwindWithSprocs` namespace. The `ProductsBLLWithSprocs` class provides two data access methods, `GetProducts` and `GetProductByProductID`, and methods to add, update, and delete a single product instance.

Step 7: Working with the `NorthwindWithSprocs` DataSet from the Presentation Layer

At this point we have created a DAL that uses stored procedures to access and modify the underlying database data. We have also built a rudimentary BLL with methods to retrieve all products or a particular product along with methods for adding, updating, and deleting products. To round off this tutorial, let's create an ASP.NET page that uses the BLL's `ProductsBLLWithSprocs` class for displaying, updating, and deleting records.

Open the `NewSprocs.aspx` page in the `AdvancedDAL` folder and drag a GridView from the Toolbox onto the Designer, naming it `Products`. From the GridView's smart tag choose to bind it to a new ObjectDataSource named `ProductsDataSource`. Configure the ObjectDataSource to use the `ProductsBLLWithSprocs` class, as shown in Figure 22.


Configure Data Source - ProductsDataSource

Choose a Business Object

Select a business object that can be used to retrieve or update data (for example, an object defined in the Bin or App_Code directory for this application).

Choose your business object:

ProductsBLLWithSprocs

[✓] Show only data components

NorthwindTableAdapters.SuppliersTableAdapter
NorthwindWithSprocsTableAdapters.ProductsTableAdapter
ProductsBLL
ProductsBLLWithSprocs
ProductsCL
ProductsOptimisticConcurrencyBLL
StaticCache
SuppliersBLL

Figure 22: Configure the ObjectDataSource to Use the `ProductsBLLWithSprocs` Class

The drop-down list in the SELECT tab has two options, `GetProducts` and `GetProductByProductID`. Since we want to display all products in the GridView, choose the `GetProducts` method. The drop-down lists in the UPDATE, INSERT, and DELETE tabs each only have one method. Ensure that each of these drop-down lists has its appropriate method selected and then click Finish.

After the ObjectDataSource wizard has completed, Visual Studio will add BoundFields and a CheckBoxField to the GridView for the product data fields. Turn on the GridView's built-in editing and deleting features by checking the "Enable Editing" and "Enable Deleting" options present in the smart tag.

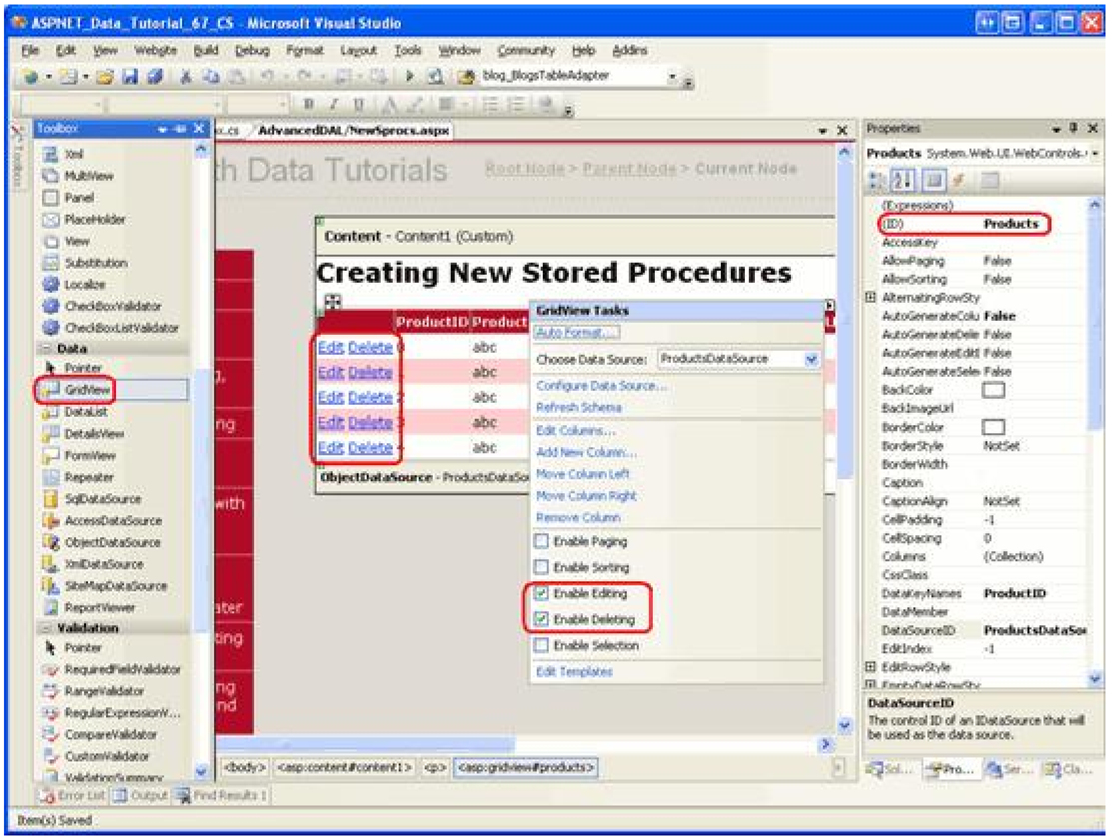

ASPNET_Data_Tutorial_67_CS - Microsoft Visual Studio
Toolbox
GridView
Creating New Stored Procedures
GridView Tasks
Choose Data Source: ProductsDataSource
Enable Editing
Enable Deleting
Properties
(ID) Products
DataKeyNames ProductID
DataSourceID ProductsDataSource

Figure 23: The Page Contains a GridView with Editing and Deleting Support Enabled

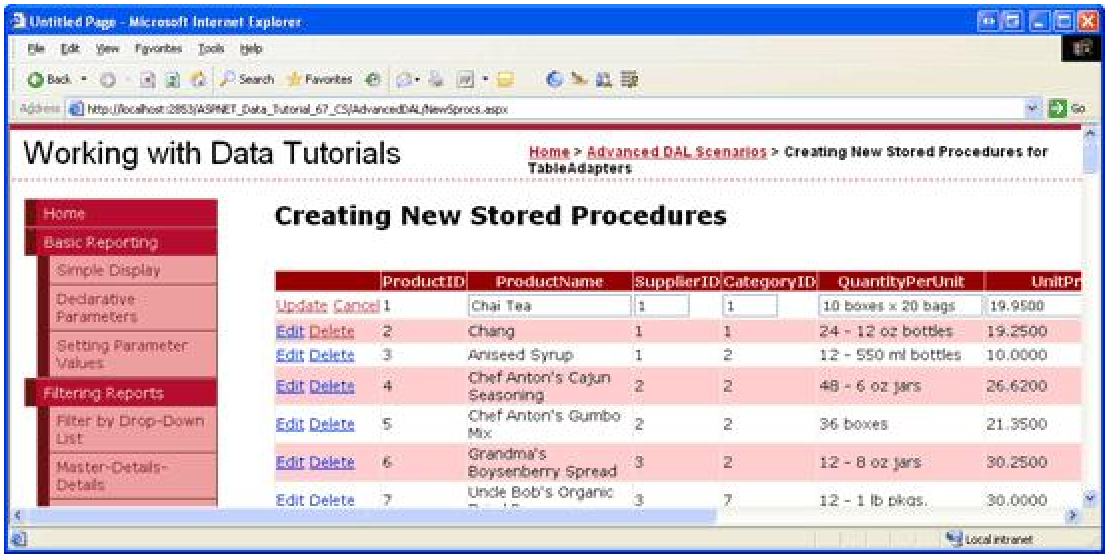
As we've discussed in previous tutorials, at the completion of the ObjectDataSource's wizard, Visual Studio sets the `OldValuesParameterFormatString` property to "original_{0}". This needs to be reverted to its default value of "{0}" in order for the data modification features to work properly given the parameters expected by the methods in our BLL. Therefore, be sure to set the `OldValuesParameterFormatString` property to "{0}" or remove the property altogether from the declarative syntax.

After completing the Configure Data Source wizard, turning on editing and deleting support in the GridView, and returning the ObjectDataSource's `OldValuesParameterFormatString` property to its default value, your page's declarative markup should look similar to the following:

```
<asp:GridView ID="Products" runat="server" AutoGenerateColumns="False"
    DataKeyNames="ProductID" DataSourceID="ProductsDataSource">
    <Columns>
        <asp:CommandField ShowDeleteButton="True" ShowEditButton="True" />
        <asp:BoundField DataField="ProductID" HeaderText="ProductID"
            InsertVisible="False" ReadOnly="True"
            SortExpression="ProductID" />
        <asp:BoundField DataField="ProductName" HeaderText="ProductName"
            SortExpression="ProductName" />
        <asp:BoundField DataField="SupplierID" HeaderText="SupplierID"
            SortExpression="SupplierID" />
        <asp:BoundField DataField="CategoryID" HeaderText="CategoryID"
            SortExpression="CategoryID" />
        <asp:BoundField DataField="QuantityPerUnit" HeaderText="QuantityPerUnit"
            SortExpression="QuantityPerUnit" />
        <asp:BoundField DataField="UnitPrice" HeaderText="UnitPrice"
            SortExpression="UnitPrice" />
        <asp:BoundField DataField="UnitsInStock" HeaderText="UnitsInStock"
            SortExpression="UnitsInStock" />
        <asp:BoundField DataField="UnitsOnOrder" HeaderText="UnitsOnOrder"
            SortExpression="UnitsOnOrder" />
        <asp:BoundField DataField="ReorderLevel" HeaderText="ReorderLevel"
            SortExpression="ReorderLevel" />
        <asp:CheckBoxField DataField="Discontinued" HeaderText="Discontinued"
            SortExpression="Discontinued" />
    </Columns>
</asp:GridView>

<asp:ObjectDataSource ID="ProductsDataSource" runat="server"
    DeleteMethod="DeleteProduct" InsertMethod="AddProduct"
    SelectMethod="GetProducts" TypeName="ProductsBLLWithSprocs"
    UpdateMethod="UpdateProduct">
    <DeleteParameters>
        <asp:Parameter Name="productID" Type="Int32" />
    </DeleteParameters>
    <UpdateParameters>
        <asp:Parameter Name="productName" Type="String" />
        <asp:Parameter Name="supplierID" Type="Int32" />
        <asp:Parameter Name="categoryID" Type="Int32" />
        <asp:Parameter Name="quantityPerUnit" Type="String" />
        <asp:Parameter Name="unitPrice" Type="Decimal" />
        <asp:Parameter Name="unitsInStock" Type="Int16" />
        <asp:Parameter Name="unitsOnOrder" Type="Int16" />
        <asp:Parameter Name="reorderLevel" Type="Int16" />
        <asp:Parameter Name="discontinued" Type="Boolean" />
        <asp:Parameter Name="productID" Type="Int32" />
    </UpdateParameters>
    <InsertParameters>
        <asp:Parameter Name="productName" Type="String" />
        <asp:Parameter Name="supplierID" Type="Int32" />
        <asp:Parameter Name="categoryID" Type="Int32" />
        <asp:Parameter Name="quantityPerUnit" Type="String" />
        <asp:Parameter Name="unitPrice" Type="Decimal" />
        <asp:Parameter Name="unitsInStock" Type="Int16" />
        <asp:Parameter Name="unitsOnOrder" Type="Int16" />
        <asp:Parameter Name="reorderLevel" Type="Int16" />
        <asp:Parameter Name="discontinued" Type="Boolean" />
    </InsertParameters>
</asp:ObjectDataSource>
```

At this point we could tidy up the GridView by customizing the editing interface to include validation, having the `CategoryID` and `SupplierID` columns render as DropDownLists, and so on. We could also add a client-side confirmation to the Delete button, and I encourage you to take the time to implement these enhancements. Since these topics have been covered in previous tutorials, however, we will not cover them again here.

Regardless of whether you enhance the GridView or not, test out the page's core features in a browser. As Figure 24 shows, the page lists the products in a GridView that provides per-row editing and deleting capabilities.


Untitled Page - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://localhost:2853/ASPNET_Data_Tutorial_67_CS/AdvancedDAL/NewSprocs.aspx
Go
Working with Data Tutorials
Home > Advanced DAL Scenarios > Creating New Stored Procedures for TableAdapters
Home
Basic Reporting
Simple Display
Declarative Parameters
Setting Parameter Values
Filtering Reports
Filter by Drop-Down List
Master-Details-Details
Local intranet

Creating New Stored Procedures

	ProductID	ProductName	SupplierID	CategoryID	QuantityPerUnit	UnitPr
Update Cancel	1	Chai Tea	1	1	10 boxes x 20 bags	19.9500
Edit Delete	2	Chang	1	1	24 - 12 oz bottles	19.2500
Edit Delete	3	Aniseed Syrup	1	2	12 - 550 ml bottles	10.0000
Edit Delete	4	Chef Anton's Cajun Seasoning	2	2	48 - 6 oz jars	26.6200
Edit Delete	5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.3500
Edit Delete	6	Grandma's Boysenberry Spread	3	2	12 - 8 oz jars	30.2500
Edit Delete	7	Uncle Bob's Organic	3	7	12 - 1 lb pkgs.	30.0000

Figure 24: The Products Can Be Viewed, Edited, and Deleted from the GridView

Summary

The TableAdapters in a Typed DataSet can access data from the database using ad-hoc SQL statements or through stored procedures. When working with stored procedures, either existing stored procedures can be used or the TableAdapter wizard can be instructed to create new stored procedures based on a `SELECT` query. In this tutorial we explored how to have the stored procedures automatically created for us.

While having the stored procedures auto-generated helps save time, there are certain cases where the stored procedure created by the wizard doesn't align with what we would have created on our own. One example is the `Products_Update` stored procedure, which expected both `@Original_ProductID` and `@ProductID` input parameters even though the `@Original_ProductID` parameter was superfluous.

In many scenarios, the stored procedures may already have been created, or we may want to build them manually so as to have a finer degree of control over the stored procedure's commands. In either case, we would want to instruct the TableAdapter to use existing stored procedures for its methods. We shall see how to accomplish this in the next tutorial.

Happy Programming!

Further Reading

For more information on the topics discussed in this tutorial, refer to the following resources:

- Creating and Maintaining Stored Procedures
- Retrieving Scalar Data from a Stored Procedure
- SQL Server Stored Procedure Basics
- Stored Procedures: An Overview
- Writing a Stored Procedure

About the Author

Scott Mitchell, author of seven ASP/ASP.NET books and founder of 4GuysFromRolla.com, has been working with Microsoft Web technologies since 1998. Scott works as an independent consultant, trainer, and writer. His latest book is *Sams Teach Yourself ASP.NET 2.0 in 24 Hours*. He can be reached at mitchell@4GuysFromRolla.com. or via his blog, which can be found at http://ScottOnWriting.NET.

Special Thanks To…

This tutorial series was reviewed by many helpful reviewers. Lead reviewer for this tutorial was Hilton Geisenow. Interested in reviewing my upcoming MSDN articles? If so, drop me a line at mitchell@4GuysFromRolla.com.