# Tutorial 2: Introduction to Database Programming with ADO.NET

## Overview

- A Database is an organized collection of information that is divided into tables.
- Each table is further divided into rows and columns; these columns store the actual information.
- You access a database using Structured Query Language (SQL), which is a standard language supported by most database software including SQL Server, Access, and Oracle.
- In this tutorial, you'll see a C# program that connects to a Access database, retrieves and displays the contents stored in the columns of a row from a table, and then disconnects from the database.

## Obtaining the Required Access Database

- Before you can develop C# programs, you'll need to copy the Access Database.
- This tutorial uses a database named `Northwind`.
- This database contains the information for the fictitious `Northwind` Company, which sells food products to customers.
- `Northwind` is one of the example databases which come together with Visual Studio 2005 and Microsoft Office Professional 2003.
- Customer information in the `Northwind` database is stored in a table named Customers; you'll see the use of this table in the example program later in this chapter.
- You can locate the `Northwind` database in the following location:

```
C:\Program Files\Microsoft Visual Studio 8\SDK\v2.0\QuickStart
\aspnet\samples\data\App_Data\Northwind.mdb
```

or

```
C:\Program Files\Microsoft Office\OFFICE11\SAMPLES\Northwind.mdb
```

- Copy and paste the Northwind database to your website `App_Data` folder.

## Developing Your First ADO.NET Program

- In this section you'll plunge into ADO.NET programming and see a C# program that performs the following tasks:
    1. Connects to the Northwind database
    2. Retrieves a row from the Customers table
    3. Displays the columns from the row
    4. Closes the database connection

## Connecting to an Access Database

- In this section you'll see examples of connecting an Access database.
- To interact with either of these databases in your program, you use classes from the `System.Data.OleDb` namespace.
- This namespace contains classes for use with databases that support object linking and embedding for databases (OLE DB).
- You connect to an Access database using an `OleDbConnection` object-rather than a `SqlConnection` object-with a connection string of the following format:

  ```
  provider=Microsoft.Jet.OLEDB.4.0;data source=databaseFile
  ```

  where `databaseFile` is the directory and filename of your Access database. Notice that you specify the provider in the connection string, which is set to `Microsoft.Jet.OLEDB.4.0`.

- The following example creates a string named `connectionString` with the appropriate format to connect to the Access `Northwind` database stored in the `Northwind.mdb` file:

```
string connectionString = "provider=Microsoft.Jet.OLEDB.4.0;"
      + "data source="
      + Page.Server.MapPath("App_Data\\northwind.mdb");
```

- Notice the use of two backslash characters in the data source part of the connection string. The first backslash is used to specify that the second backslash is to be treated literally; therefore `\\` is treated as `\` in the connection string. You'll need to locate the Northwind.mdb file on your hard disk and set your connection string appropriately.
- The following example creates an `OleDbConnection` object, passing connectionString (set in the previous line of code) to the constructor:

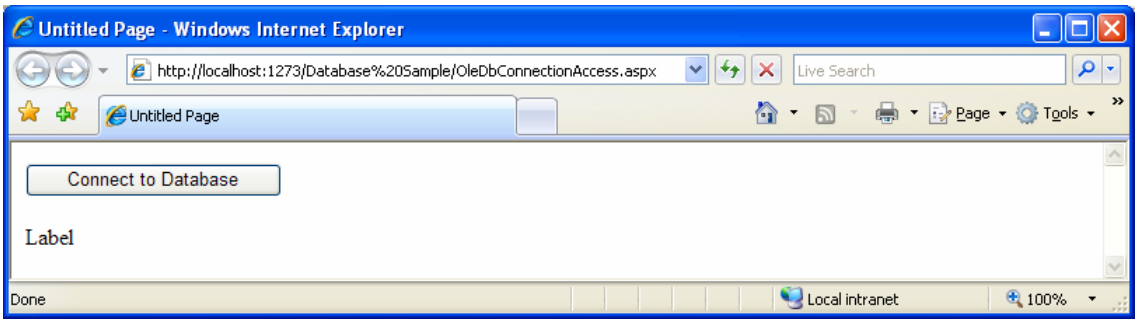
  ```
  System.OleDb.OleDbConnection myOleDbConnection =
        new System.OleDb.OleDbConnection(connectionString);
  ```

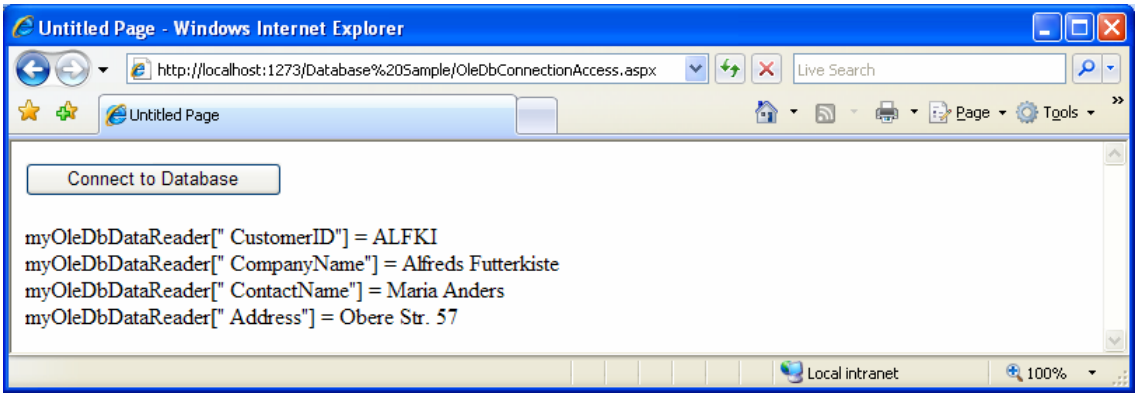
- Program segment below illustrates how to connect to the Northwind Access database using an OleDbConnection object and retrieve a row from the Customers table. Notice that you use an OleDbCommand and OleDbDataReader object to run a SQL statement and read the returned results from an Access database.

```
using System;
using System.Data;
using System.Configuration;
using System.Collections;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Web.UI.HtmlControls;

public partial class OleDbConnectionAccess : System.Web.UI.Page
{
      protected void Page_Load(object sender, EventArgs e)
      {

      }

      protected void Button1_Click(object sender, EventArgs e)
      {
            // formulate a string containing the details of the
            // database connection
            string connectionString = "provider=Microsoft.Jet.OLEDB.4.0;"
                  + "data source="
                  + Page.Server.MapPath("App_Data\\northwind.mdb");

            // create an OleDbConnection object to connect to the
            // database, passing the connection string to the constructor
            System.Data.OleDb.OleDbConnection myOleDbConnection = new
            System.Data.OleDb.OleDbConnection(connectionString);

            // create an OleDbCommand object
            System.Data.OleDb.OleDbCommand myOleDbCommand =
                  myOleDbConnection.CreateCommand();

            // set the CommandText property of the OleDbCommand object to
            // a SQL SELECT statement that retrieves a row from the
            // Customers table
            myOleDbCommand.CommandText = "SELECT CustomerID, CompanyName,
                  ContactName, Address FROM Customers WHERE CustomerID =
                  'ALFKI'";

            // open the database connection using the
            // Open() method of the OleDbConnection object
            myOleDbConnection.Open();

            // create an OleDbDataReader object and call the
            // ExecuteReader() method of the OleDbCommand object to run the
            // SELECT statement
            System.Data.OleDb.OleDbDataReader myOleDbDataReader =
                  myOleDbCommand.ExecuteReader();

            // read the row from the OleDbDataReader object using
            // the Read() method
            myOleDbDataReader.Read();

            // display the column values
            this.Label1.Text = "myOleDbDataReader[\" CustomerID\"] = "
                  + myOleDbDataReader["CustomerID"]
                  + "<br>"
```

```
                    + "myOleDbDataReader[\" CompanyName\"] = "
                    + myOleDbDataReader["CompanyName"]
                    + "<br>"
                    + "myOleDbDataReader[\" ContactName\"] = "
                    + myOleDbDataReader["ContactName"]
                    + "<br>"
                    + "myOleDbDataReader[\" Address\"] = "
                    + myOleDbDataReader["Address"];

            // close the OleDbDataReader object using the Close() method
            myOleDbDataReader.Close();

            // close the OleDbConnection object using the Close() method
            myOleDbConnection.Close();
        }
}
```

- The output from this program is as follows:



- Once you've created your Connection object and set its `ConnectionString` property to the appropriate details for your database connection, you can open the connection to the database.
- You do this by calling the `Open()` method of your Connection object. The following example calls the `Open()` method of `myOleDbConnection`:

  ```
  myOleDbConnection.Open();
  ```

- Once you've finished with your database connection, you call the Close() method of your Connection object. For example:

  ```
  myOleDbConnection.Close();
  ```

- Program segment below illustrates a connection to the `Northwind` database using a `OleDbConnection` object and display some of the properties of that object.

```
using System;
using System.Data;
using System.Configuration;
using System.Collections;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Web.UI.HtmlControls;

public partial class MyOleDbConnection : System.Web.UI.Page
{
      protected void Page_Load(object sender, EventArgs e)
      {

      }

      protected void Button1_Click(object sender, EventArgs e)
      {
            // formulate a string containing the details of the
            // database connection
            string connectionString = "provider=Microsoft.Jet.OLEDB.4.0;"
                  + "data source="
                  + Page.Server.MapPath("App_Data\\northwind.mdb");

            // create a OleDbConnection object to connect to the
            // database, passing the connection string to the constructor
            System.Data.OleDb.OleDbConnection myOleDbConnection =
                  new System.Data.OleDb.OleDbConnection(connectionString);

            // open the database connection using the
            // Open() method of the OleDbConnection object
            myOleDbConnection.Open();

            // display the properties of the OleDbConnection object
            this.Label1.Text = "myOleDbConnection.ConnectionString = "
                  + myOleDbConnection.ConnectionString
                  + "<br>"
                  + "myOleDbConnection.ConnectionTimeout = "
                  + myOleDbConnection.ConnectionTimeout
                  + "<br>"
```

```
                    + "myOleDbConnection.Database = "
                    + myOleDbConnection.Database
                    + "<br>"
                    + "myOleDbConnection.DataSource = "
                    + myOleDbConnection.DataSource
                    + "<br>"
                    + "myOleDbConnection.Provider = "
                    + myOleDbConnection.Provider
                    + "<br>"
                    + "myOleDbConnection.ServerVersion = "
                    + myOleDbConnection.ServerVersion
                    + "<br>"
                    + "myOleDbConnection.State = "
                    + myOleDbConnection.State;

            // close the database connection using the Close() method
            // of the OleDbConnection object
            myOleDbConnection.Close();
        }
}
```

- The output from this program is as follows: