

Complete C# Database Application with One Line of Code!

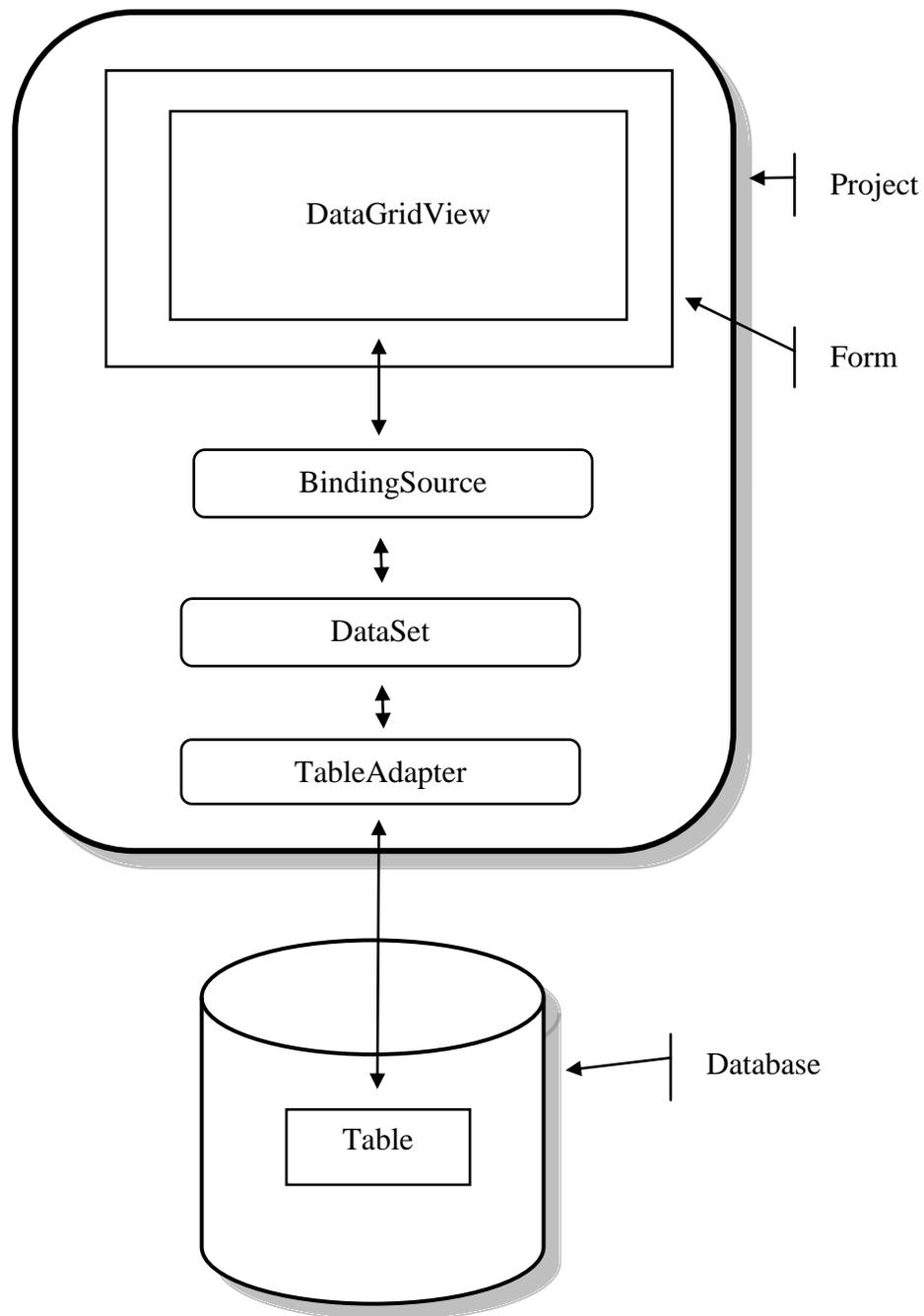
By [Chuck Connell](#)

I learned C# after working with IBM/Lotus Notes and Domino. In that product set, you can create a full database application without writing any programming code at all. The application includes an on-disk database, a GUI front-end that supports create/update/delete of records, and a security infrastructure. The whole development process is point-and-click.

I wanted to use Visual C# to duplicate the same general type of application and hoped to do so in a “visual” style with the same development simplicity. Examples and tutorials that I found within Microsoft.com and around the web were somewhat helpful, but they all lacked important details. They often showed part of a solution, but not all. Or they emphasized lots of manual coding. I never found a single example that contained what I was looking for – a full database application, developed from start to finish, using just the GUI tools of the Visual C# IDE. So I wrote my own, presented here.

The result requires one line of coding – not quite fully visual, but pretty close! The finished program is essentially a “Hello World” application for database operations. It works as-is but is meant to be used as a starting point for larger programs with expanded data fields and fancier front-ends.

Before the step-by-step instructions, let’s look at where we are headed. The diagram on the next page shows the structure of the basic C# database application we will create.



The diagram shows the following parts:

- A Visual C# **project** is an overall programming task and all its associate pieces.
- A **form** is a visible interface that users can see when the application runs.

- **DataGridView** is UI tool built into Visual C# that allows for the display and update of data records.
- **BindingSource** is a class that connects visible data to its underlying source.
- **DataSet** is a class that instantiates an internal data table, similar to an external database, but existing only in-memory at runtime.
- **TableAdapter** is a class that connects DataSets to on-disk databases.
- A **database** is a set of external data records that exist apart from the application. In this case, we use an SQL Compact database, although the application supports other storage methods also.
- A **table** is a set of related records within a database. A database can contain multiple, possibly unrelated, tables.

The example creates a database of music selections including song title, artist name, release date and comments. Of course, you can modify the topic and fields to suit your needs.

Create the application...

1. From the Start page, press New Project / Windows Form Application / Name = MyMusic.
2. Expand the default form (Form1) so it fills most of the design pane, by dragging the lower-right corner of the form. (See Figure #1 at end of article.)

Create the database...

1. Expose the Database Explorer window, with View / Other Windows / Database Explorer.
2. Right-click in the explorer pane, Add Connection.
3. Set Data Source = Microsoft SQL Server Compact, Data Source = My Computer.
4. Press Create. Set Filename = C:\Users\your-name\Documents\MyMusic, Collation = default, Encryption = default (unencrypted), OK.
5. Press Test Connection, then OK, to create the database on disk.
6. You should see MyMusic.sdf in the C# Database Explorer window. (And in your regular Windows Documents folder.)

Create a table within the database...

1. Expand the database using the blue triangle. You should see Tables and Replication.
2. Right click on Tables, Create Table.
3. Table Name = MyMusic.
4. Define four columns by clicking and typing in the column definition table. Leave all defaults except as noted below.
5. Column Name = Song Title, Allow Nulls = NO, Unique = YES, Primary = YES.
6. Column Name = Artist.
7. Column Name = Release Date, Data Type = DATETIME.
8. Column Name = Comment, Length = 1000.
9. Press OK to save the column definitions.

10. In the Database Explorer window, you should be able to expand MyMusic.sdf / Tables / MyMusic / Columns, and see the four columns you created.

Add some data records to the database, using the built-in manual tool for doing so...

1. In the Database Explorer window, right click on the MyMusic table, Show Data Table.
2. Type some data into the table, such as below. (See Figure #2.) Note that a record is not saved until you advance the cursor to the next line.
 - a. Title = Help!, Artist = The Beatles, Date = 8/6/1965
 - b. Title = Come As You Are, Artist = Nirvana, Date = 3/2/1992
 - c. Title = No Line On The Horizon, Artist = U2, Date = 2/27/2009
3. You can test the column attributes by trying to enter duplicate song titles, or an empty song title, or an invalid date. All should be disallowed.
4. Save your work, with File / Save All.

Verify that you have a permanent database and that it contains the records you specified...

1. Exit from C# completely, and then restart it.
2. Choose the same project and go back to the data table above.
3. You should see the sample data you entered.

Create a DataGridView that connects to your on-disk database...

1. Go to the form design pane, by choosing "Form1.cs [Design]" from the horizontal tabs near the center of the screen.
2. Make sure the designer toolbox is visible, with View / Other Windows / Toolbox.
3. Expand the Data category of tools.
4. Drag a DataGridView onto Form1.
5. You should see the DataGridView tasks box. If not, open it with the small right arrow on the DataGridView.
6. Choose Data Source = Add Project Data Source.
7. Set Data Source Type = Database.
8. Database Model = Dataset.
9. Data Connection = MyMusic.sdf.
10. Copy the file to your project and modify the connection = No. (The default is Yes, which means to create another copy of your database within the project folders. But this can be confusing during testing since there are two versions of the database file.)
11. Save connection as = MyMusicConnectionString.
12. Choose database objects = select all.
13. DataSet name = MyMusicDataSet.
14. Press Finish, to create the connection.
15. Close the DataGridView tasks box, using the small left arrow, leaving all the defaults.
16. You should see the MyMusic table that you defined earlier, within the DataGridView within Form1.
17. Expand the DataGridView, by dragging its lower-right corner, so you can see all four data columns. (See Figure #3.)

18. Save your work, with File / Save All.
19. Test the program, with Debug / Start Debugging.
20. You should see Form1 pop up, with the data rows that you entered earlier. You should be able to modify the data in the table, although your changes will not be saved. (See Figure #4.)

Add a button to save data changes entered at runtime....

1. Make sure the designer toolbox is visible, with View / Other Windows / Toolbox.
2. Expand the Common Controls category of tools.
3. Drag a Button onto Form1 below the DataGridView.
4. Show the button properties box if it is not visible, with View / Other Windows / Properties.
5. Set (Name) = saveButton.
6. Set Text = Save Changes.
7. Save the button changes, with File / Save All.
8. Expand the button size if necessary to show the full text, by dragging its lower-right corner.
9. Double click on the Save Changes button to show its programming code.
10. There should already be a routine named saveButton_Click. Add this single line of code into its body, which says to update the TableAdapter (and therefore the on-disk database) with the data from the in-memory DataSet.

```
this.myMusicTableAdapter.Update(this.myMusicDataSet.MyMusic);
```

Test the program within Visual C#....

1. File / Save All.
2. Debug / Start.
3. Make some changes to the database, including adding a new song.
4. Press the Save Changes button. Close the program window using the X in the upper-right corner.
5. Exit completely from C#, and then restart it.
6. Choose the same project, then Debug / Start.
7. You should see that the change you made to the database, verifying that they were permanent. (See Figure #5.)

Publish the program so it runs outside of the Visual C# IDE.... (These steps assume a standard program release for local installation. As you proceed, you will see options for web and file-share publication also.)

1. Project / Publish.
2. Location = c:\temp\MyMusic\.
3. How will users install = From a CD.
4. The application will not check for updates = Enabled.
5. Press Finish to publish the application.
6. Stop Visual C# completely.

7. Go to c:\temp\MyMusic\.
8. Run Setup.exe to install and run the program.
9. MyMusic will be added to the Windows Start menu and an uninstaller will be added to Control Panel / Programs and Features.

You have written a complete database application, with one line of manual coding!

Chuck Connell is a senior software architect, programmer and team leader. He wrote the book [Beautiful Software](#) and has taught software engineering at Boston University. See his full list of services and contact information at chc-3.com.

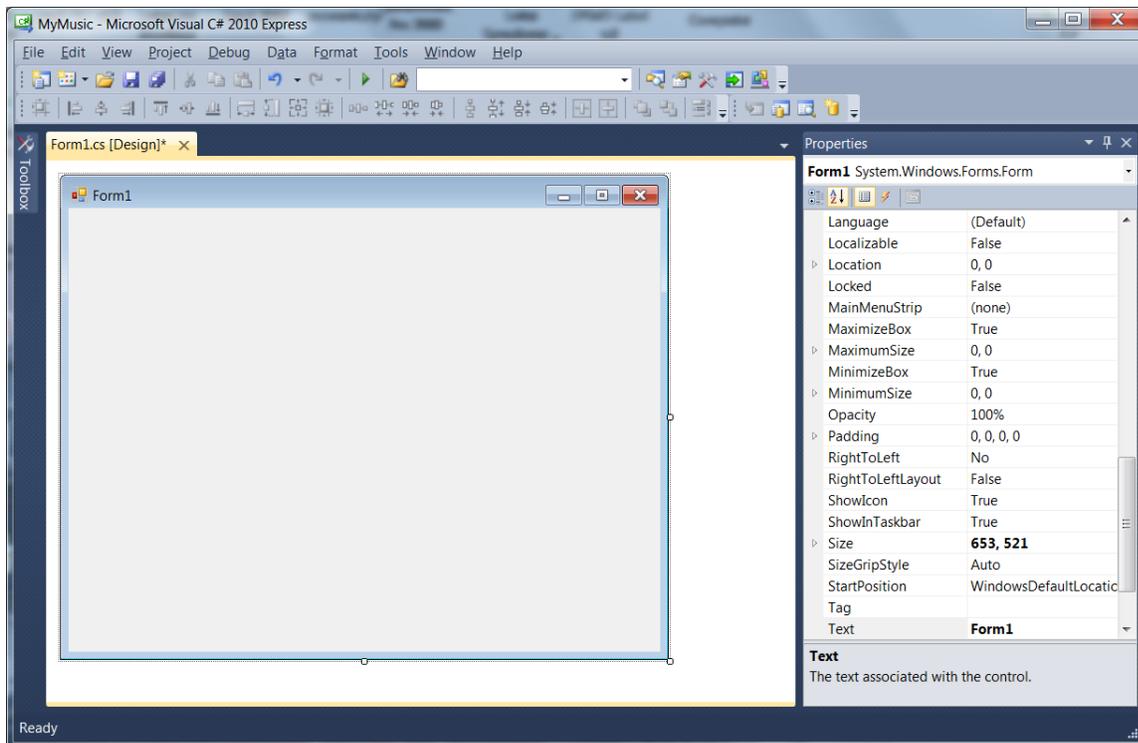


Figure #1

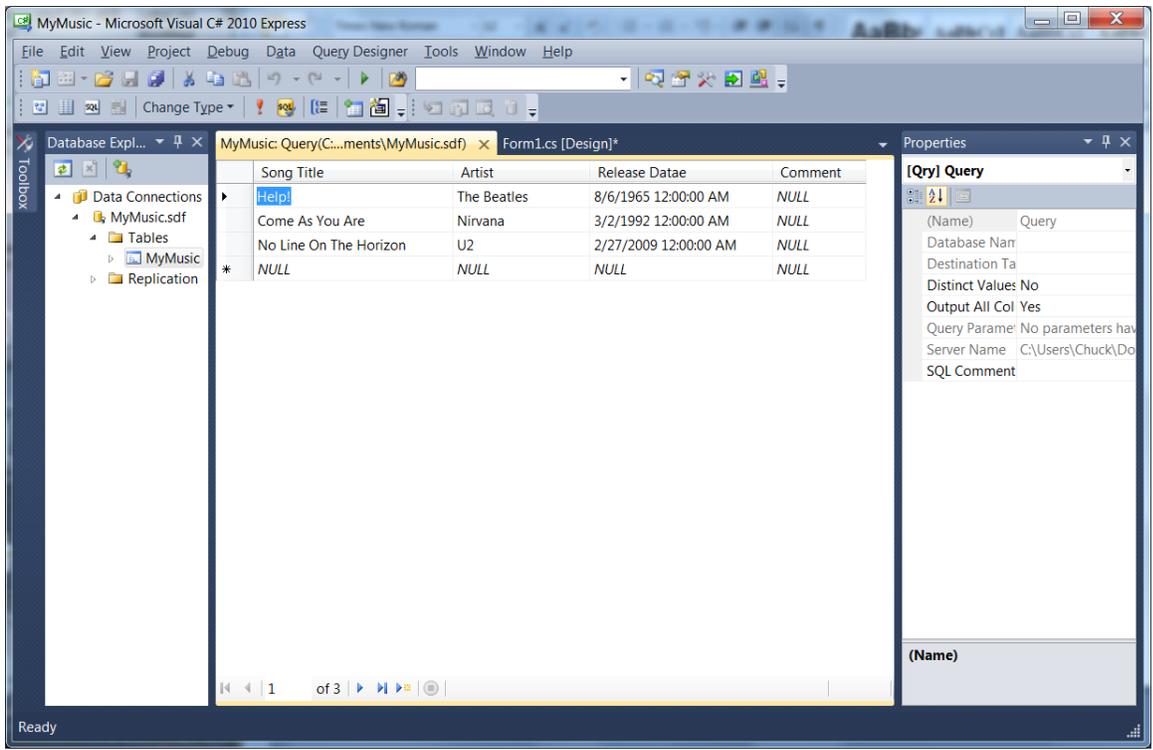


Figure #2

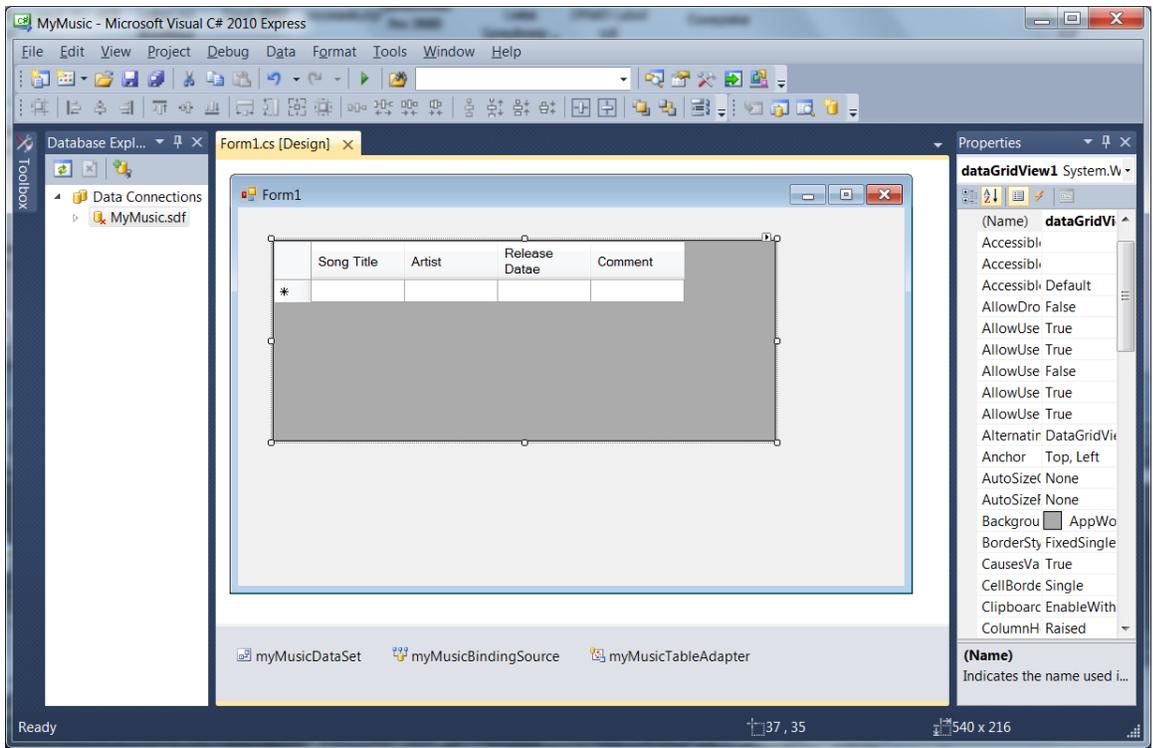


Figure #3

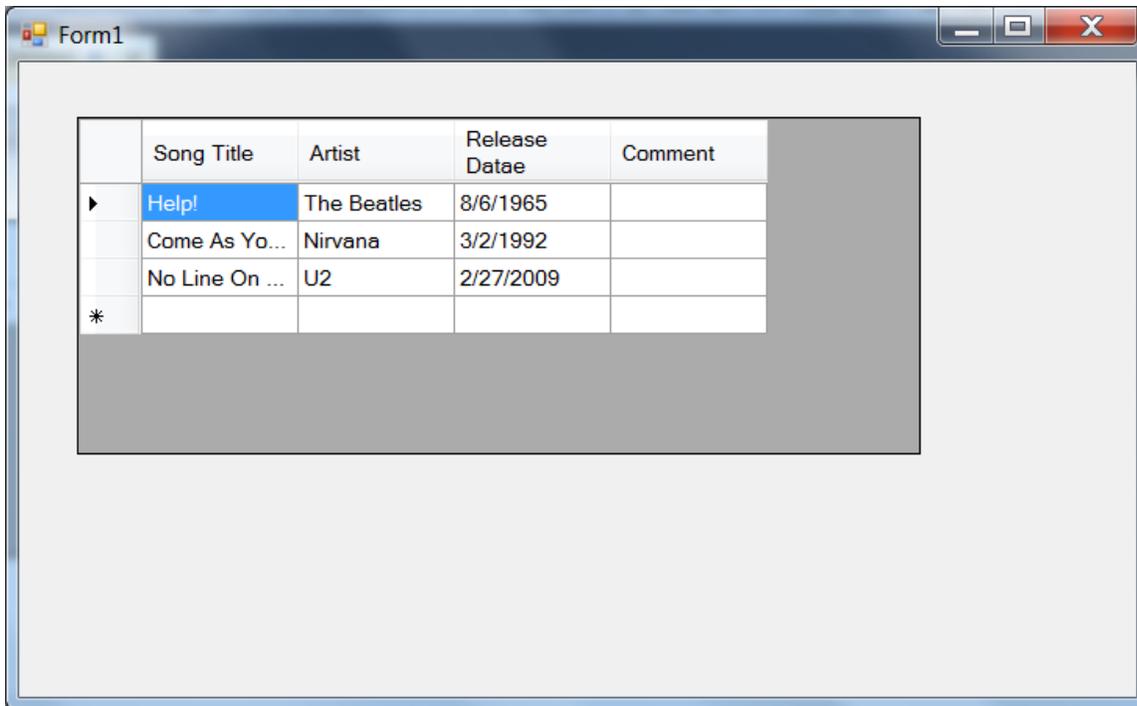


Figure #4

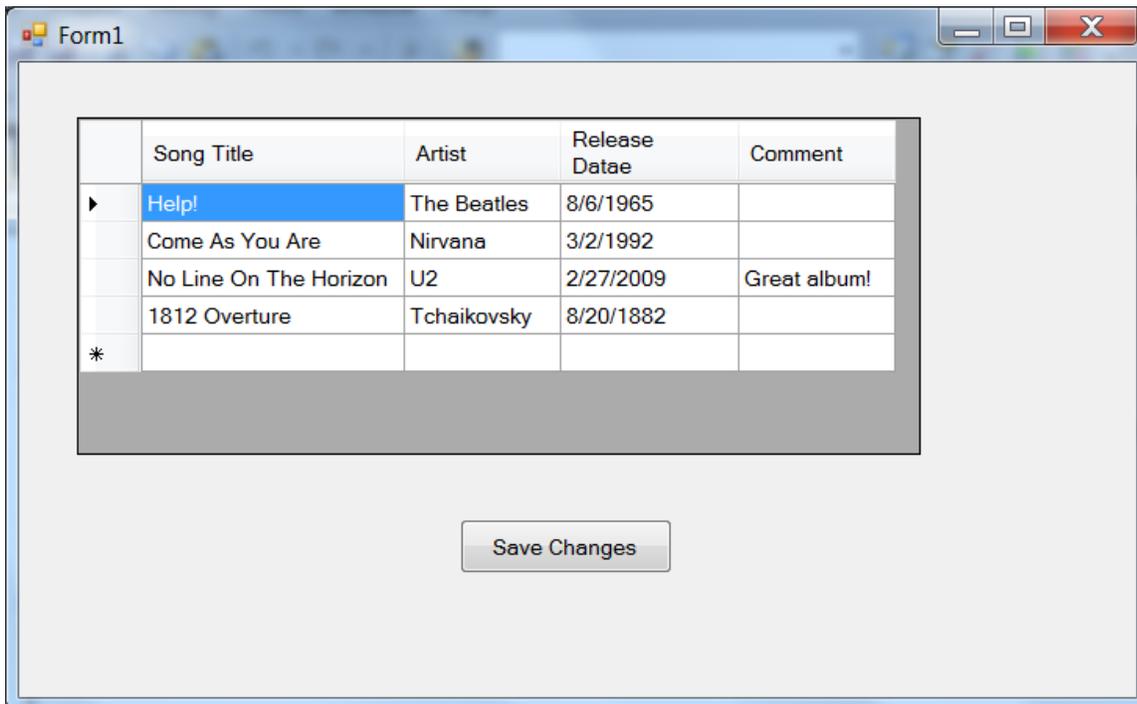


Figure #5