

THE EXPERT'S VOICE® IN C#

SECOND EDITION

Beginning C# 5.0 Databases

*LEARN TO CREATE DATABASE OBJECTS
AND PROGRAM AGAINST THEM IN BOTH
T-SQL AND C#*

Vidya Vrat Agarwal

apress®

Beginning C# 5.0 Databases

Second Edition



Vidya Vrat Agarwal

Apress®

Beginning C# 5.0 Databases, Second Edition

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*To my sweet daughters, Arshika ("Sparkly") and Vamika ("Pearly"),
and my beautiful beloved and supportive wife, Rupali.*

You are all precious in my eyes and honoured and I love you.

— Vidya Vrat Agarwal

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About the Author



■ **Vidya Vrat Agarwal**, a Microsoft .NET purist and an MCT, MCPD, MCTS, MCSD.NET, MCAD.NET, and MCSD, works with Lionbridge Technologies (NASDAQ: LIOX), and his business card reads Technical Architect. He is also a lifetime member of the Computer Society of India (CSI). He started working on Microsoft .NET with its beta release. He has contributed as an author and technical reviewer to many books published by Apress.

He lives with his beloved wife, Rupali, and lovely daughters, Vamika (“Pearly”) and Arshika (“Sparkly”). He believes that nothing will turn into a reality without them. He is the follower of the concept “No pain, no gain.” He blogs at <http://Dotnetpassion.blogspot.com>. You can reach him at vidya_mct@yahoo.com.

About the Technical Reviewer



■ **Michael Mayberry** has been developing software with Microsoft technologies for more than 13 years. Over those years he has consistently adopted new solutions and tools to solve increasingly larger problems.

Michael currently serves as a software architect for a large nonprofit organization in the Dallas–Fort Worth area. He has become an expert in integration, providing solutions that allow new software to interact with existing systems. His experiences range from content management systems to data warehouses to CRM systems.

Michael has always valued team building and sharing his knowledge with others. Recently, he expanded his focus to include writing and reviewing. He has been a technical reviewer for many projects and has coauthored a book.

When he is not working, Michael enjoys spending time with his beautiful wife and four children.

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I would like to thank my wife, Rupali, for being so understanding, patient, and helpful. I also would like to thank my two little angels, my daughters Arshika (“Sparkly”) and Vamika (“Pearly”); you are great kids.

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Rupali, you are an amazing person who is an entrepreneur in the professional world and also managed the home and kids; all my successes are dedicated to you. I am so thankful to God for having the three of you in my life.

I also would like to thank my technical reviewer, Michael Mayberry, who comes with great experience in database programming and helped me refine this work for a better reader experience.

I also would like to thank Christine, Apress project manager, and Douglas, Apress editor, for helping me throughout this book with schedule and editing.

Introduction

Welcome to this book. You have in your hands a book of ready-made solutions to common problems encountered while writing SQL to run against an Oracle database. I've written this book for the person in a hurry who needs to solve a specific problem and then get on with the job. Each recipe addresses a specific problem and presents a solid, working solution to that problem. For those who are interested, each recipe also provides an extended discussion of the solution and sometimes alternative solutions.

Who This Book Is For

If you are an application developer who likes to interact with databases using C#, this book is for you, because it covers programming SQL Server 2012 using C# 5.0. This book does not require or even assume that you have sound knowledge of C# 2.0 or SQL Server 2000 and database concepts. I have covered all the fundamentals that other books assume a reader must have before moving on with the chapters.

This book is a must for any application developer who intends to interact with databases using C# 2012 as the development tool; if this is you, then this book is a must.

How This Book Is Structured

I've split the book into four parts, each covering one broad aspect of building database applications using C# 5.0 and SQL Server 2012 database.

Part 1 deals with understanding the fundamentals of databases.

Part 2 covers the concepts of working with databases and XML.

Part 3 discusses working with data using ADO.NET.

Part 4 is a compendium of special topics and ranges from advanced ADO.NET features to SQL CLR.

Conventions

Throughout the book, I've kept a consistent style for presenting SQL and results. Where a piece of code, a SQL reserved word, or a fragment of SQL appears in the text, it is presented in fixed-width Courier font, such as this (working) example:

```
select * from dual;
```

Where I discuss the syntax and options of SQL commands, I've used a conversational style so you can quickly reach an understanding of the command or technique. This means I haven't duplicated large syntax diagrams that better suit a reference manual.

Downloading the Code

The code for the examples shown in this book is available on the Apress web site, www.apress.com. A link can be found on the book's information page under the Source Code/Downloads tab. This tab is located underneath the Related Titles section of the page.

Contacting the Author

Should you have any questions or comments—or even spot a mistake you think I should know about—you can contact the author at vidya_mct@yahoo.com.

PART I

Understanding Tools and Fundamentals Databases

Getting and Understanding Your Tools

This book is designed to help you learn how to build database-oriented applications with the C# 2012 programming language and the SQL Server 2012 database server application. The development tools used in this book are Microsoft Visual Studio 2012 and Microsoft SQL Server 2012 (code name Denali) Express edition, both of which work with Microsoft .NET Framework 4.5.

■ **Note** For the purposes of this book, I'm using the free versions of Visual Studio and SQL Server that are available for download from <http://msdn.microsoft.com>. If you are using the more full-featured versions of these tools, you can still follow along with the examples in this book.

Visual Studio 2012 targets multiple .NET Framework versions by allowing you to build and maintain applications for earlier versions of the .NET Framework, namely, .NET 2.0, .NET 3.0, .NET 3.5, and .NET 4.0, in addition to its native and default support for .NET 4.5. The Visual Studio integrated development environment (IDE) helps developers be productive, and it offers various types of application templates and tools to perform most of the application development activities.

SQL Server is one of the most advanced relational database management systems (RDBMSs) available. SQL Server continues to provide and support the integration of the .NET common language runtime (CLR) into the SQL Server database engine, making it possible to implement database objects using managed code written in a .NET language such as Visual C# .NET or Visual Basic .NET. Besides this, just like previous releases, SQL Server comes with multiple services such as analysis services, data transformation services, reporting services, notification services, Service Broker, Database Mail, PowerShell support, and so on. SQL Server offers one common environment, SQL Server Management Studio (SSMS), for both database developers and database administrators (DBAs).

SQL Server 2012 Express edition is the relational database subset of SQL Server 2012 that provides virtually all the online transaction processing (OLTP) capabilities of SQL Server 2012 Express, that supports databases up to 10GB in size (and up to 32,767 databases per SQL Server 2012 Express instance), and that can handle hundreds of concurrent users.

Now that you know a little about these development tools, you'll learn how to obtain and install them, and you'll learn about the sample databases you'll need to work through the example in this book. This chapter will cover the following:

- Obtaining Visual Studio 2012
- Installing SQL Server 2012 Express

- Troubleshooting the SQL Server service
- Installing the AdventureWorks sample database

Obtaining Visual Studio 2012

This book requires Visual Studio 2012 to be installed on your computer. At the time of this writing, the available version of Visual Studio is Visual Studio 2012 Developer Preview. To find download information about Visual Studio 2012, go to <http://msdn.microsoft.com/vstudio>.

You can also directly download the installer ISO image files from the MSDN Subscriptions site at <http://msdn.microsoft.com>. Access the downloadable setup files by clicking the Visual Studio link in the Developer Center; then extract the downloaded file and run Setup.exe.

If you have a setup DVD or CDs of Visual Studio 2012, just put the DVD or CD1 into your computer's disk drive and complete the setup by following the instructions, making sure you have enough disk space on your C drive.

Visual Studio 2012 has various software components, so you need to decide whether you want to install them when installing Visual Studio. The examples in this book require only the C# language component, but you may want to install other languages such as VB .NET, VC++, and F#, and so on, for your future programming needs.

Installing SQL Server 2012 Express

To install SQL Server 2012 Express for the purposes of working through the examples in this book, follow these steps:

1. Go to www.microsoft.com/betaexperience/pd/SQLEXPCTAV2/enus/default.aspx. Decide which version you need based on your CPU architecture, 32-bit or 64-bit, and in the Select Product drop-down, select Express with Tools. Then click Download.
2. The Download Manager will begin. If the Download Manager is not already installed on your computer, then it will prompt you to install it. Click Install.
3. Based on whether you chose the 32-bit or 64-bit version, you will be prompted to save the file `SQLEXPRTW_x86_ENU.exe` or `SQLEXPRTW_x64_ENU.exe`, which is the SQL Server 2012 Express setup utility.
4. Save this file to a location on your host computer (such as on your desktop). When the download of the file is complete, click Close.
5. Run the file to begin the installation, and follow the steps to install it.
6. When the Completing the SQL Server Management Setup window appears, click the Finish button.
7. After a successful installation, you will see all the SQL Server components installed in your Start All Programs Microsoft SQL Server 2012 menu. It is important to make sure your SQL Server service is running, so to verify that, you need to invoke the Services list. Go to Start, Run, `Services.msc` or Control Panel Administrative Tools Services. A Services window will load; scroll down until you see SQL Server service listed, as shown in Figure 1-1.

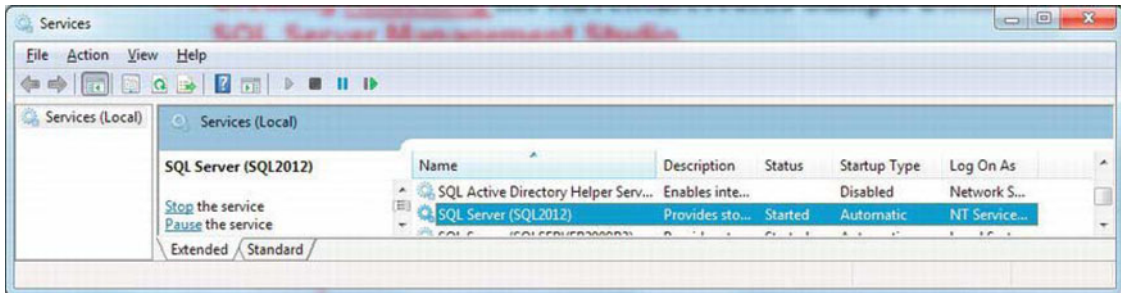


Figure 1-1. Services window showing SQL Server service running

8. Please note the name in the parentheses (your SQL instance name). This might be different from machine to machine; hence, it is important to know the SQL instance name before you connect with it to continue working with SQL Server. If you have multiple versions of SQL Server, then multiple SQL Server Services will be listed, and you will be required to know your SQL Server 2012 instance name that you want to use.
9. If the SQL Server service is not running, then you can manually start it by right-clicking and choosing Start. Your service should be then listed as Started under Status. You must have this service running before you perform any database-related operation.

Again, you need to remember the SQL Server instance name you used during this installation so you can smoothly connect to and build database applications.

Because SQL Server 2012 doesn't come with a sample database, you need to install and configure the sample databases separately. The next section talks about installing and configuring the AdventureWorks databases in SQL Server Management Studio.

Installing and Attaching the AdventureWorks Sample Database

For your database query purposes and in order to build a database application with C#, you need a database. For these purposes, this book will use AdventureWorks for the SQL Server 2012 release.

Installing the AdventureWorks Database

To install the database, follow these steps:

1. Go to <http://msftbdbprodsamples.codeplex.com/releases/view/4004>, and click the link AdventureWorksDB.msi.
2. Click I Agree for the license agreement; you will be prompted to run or save the AdventureWorksDB.msi file to your system.
3. Change the location to save the file; you can keep it anywhere on your computer system, but it is recommended you keep it with the other database files under your SQL Server instance, which will be located at C:\Program Files\Microsoft SQL Server\MSSQL11.<your SQL Server 2012 instance name>\MSSQL\DATA. You can verify the folder name of your SQL instance by

viewing the name in your machine; as shown in Figure 1-1, the name you see in parentheses on your system will be the folder name where you may want to save the database files.

4. If you are not able to find the folder location that maps to the SQL Server instance, you can choose to save the files at any location on your system.
5. After choosing the file location, the setup wizard will bring the AdventureWorks_Data.mdf and AdventureWorks_Log.ldf files to your specified location. Click Finish to close the wizard after the successful installation of the files.

Attaching the AdventureWorks Sample Database

Attach is the process used to associate the .mdf file to the database server so that you can start working with the database objects and data associated with tables.

You need to access SQL Server Management Studio to attach the AdventureWorks2008 database. To do so, follow these steps:

1. Make sure you know your SQL Server instance name through which your SQL Server is running; in my case, it's SQL2012, as you saw in Figure 1-1 earlier. You can check your instance name as described earlier.
2. Open SQL Server Management Studio from your installed SQL Server 2012 application, and in the Connect to Server dialog box, enter **localhost\<your server name>** as the server name (see Figure 1-2). In some cases, you may see *localhost* being replaced by just a dot (.) or real machine name. (You can view the machine name from your computer properties.)



Figure 1-2. Connect to Server dialog

3. As shown in Figure 1-2, set the following options:
 - a. Set “Server type” to Database Engine.
 - b. Set “Server name” to localhost\<your server name>. For me, as shown in Figure 1-1, the name is SQL2012, so the server name will be localhost\SQL2012. Also note that the server name is not case-sensitive; you can type in any case (lower or upper) you want.
 - c. Set Authentication to Windows Authentication. This is the default authentication type SQL Server gets installed with. This indicates that the machine’s logged-in user name will be carried over to connect to SQL Server.
 - d. Set “User name” to the user credentials by which you want to connect to SQL Server. Many SQL Server databases are installed with Windows Authentication, and hence you will see the same machine’s logged-in user name by default added here. In many cases, it might be Administrator or a unique name like you see in Figure 1-2, which is Redmond\v-vidyag.
4. Click the Connect button, and you will be taken to SQL Server Management Studio, which will look something like Figure 1-3.

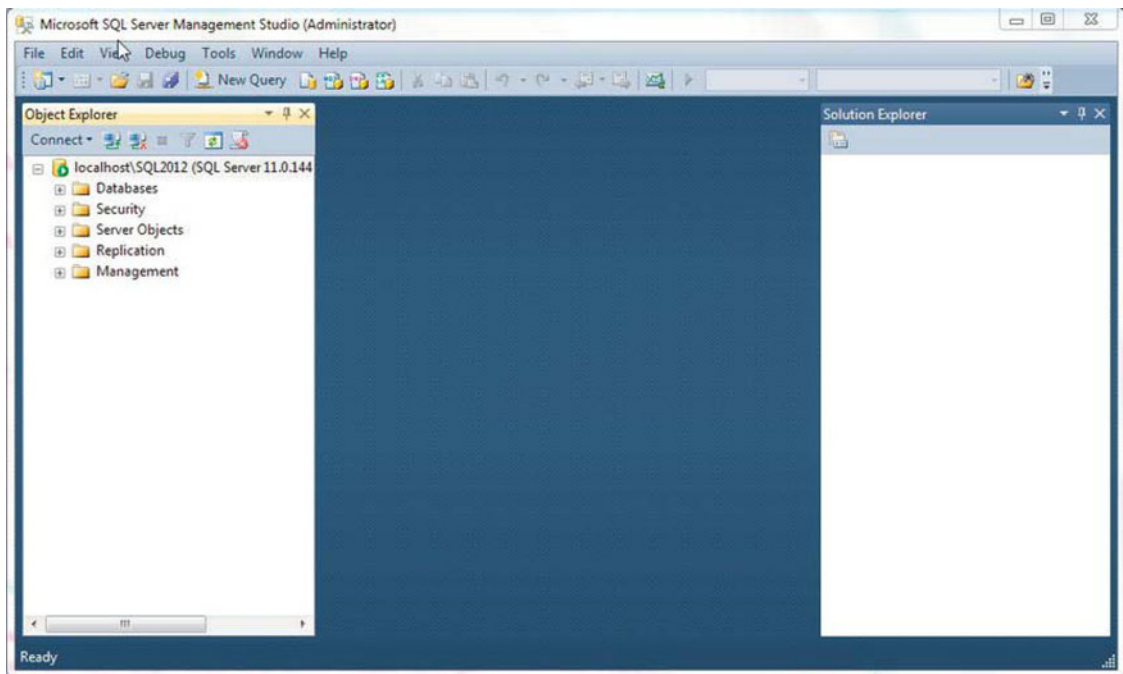


Figure 1-3. SQL Server Management Studio after successful connection to SQL Server database engine

5. If instead of having a window as shown in Figure 1-3 you get an error after clicking the Connect button in the Connect to Server dialog, it will look like Figure 1-4.

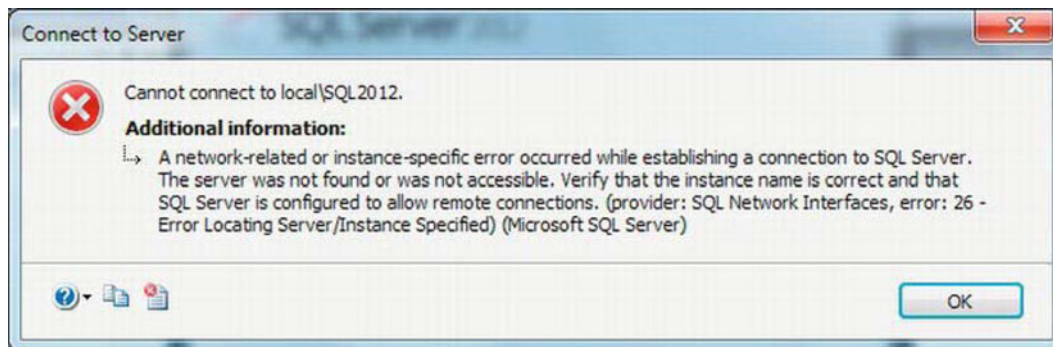


Figure 1-4. Error while connecting to server

You may receive this error for a few reasons:

- The SQL Server service instance name (in this example it is SQL2012) you provided is not running.
 - The machine name you used to specify the SQL instance is not correct. The error shown in Figure 1-3 says I used "local\SQ2012" as "machine name\instance name," which is incorrect unless that machine name is really local (in which case the SQL Server instance name is not correct).
1. To fix the error, specify the correct parameter, check that the SQL Server service is started, or pass the correct machine name.
 2. Once you have successfully loaded SSMS, the next step is to attach the sample database AdventureWorks2008R2, which you have already downloaded. To do so, right-click the Databases node and select Attach, as shown in Figure 1-5.