

Microsoft

# Microsoft<sup>®</sup> SQL Server<sup>®</sup> 2012

Patrick LeBlanc



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# Step by Step



# Microsoft SQL Server 2012 Step by Step

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## About the Author

**Patrick LeBlanc** is a Data Platform Technical Solution Professional at Microsoft, working directly with customers on the business value of SQL Server. He founded a website devoted to teaching SQL Server technologies and is a coauthor of several books on SharePoint and business intelligence.

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# Microsoft<sup>®</sup> SQL Server<sup>®</sup> 2012 Step by Step

Patrick LeBlanc

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*I would like to dedicate this book to my wife. When I am frustrated and just want to quit, she finds a way to motivate me and drive me to get back on track. During the writing of this book, she never complained once about the long nights of typing. Instead she encouraged and supported me the whole time. Thank you sweetheart for all that you do for our family. I could not have done this without you.*

—PATRICK LEBLANC

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# Introduction

SQL Server is Microsoft's core database platform. Microsoft SQL Server has matured from supporting small departmental tasks to hosting some of the largest databases deployed in the world today. More recent releases of SQL Server boast capabilities and features that surpass those of most of its competitors.

SQL Server 2012 continues the trend by adding hundreds of new capabilities and features to an already robust toolkit. These features include more advanced and scalable high-availability and disaster recovery solutions, streamlined development and deployment processes, advanced and resilient auditing capabilities, and several new Transact-SQL (T-SQL) enhancements, to mention a few.

This book provides a comprehensive tour of the vast majority of the tools and features available within the Microsoft SQL Server Database Engine. Each chapter provides an overview and explanation of the feature, followed by steps that demonstrate how to implement, deploy, or use that feature in your environment. As you progress through each section and chapter, you will build on the knowledge you gained in previous chapters.

## Who should read this book

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This book teaches the fundamentals of the SQL Server 2012 Database Engine platform. It is intended for information technology (IT) professionals who are new to SQL Server, those who are new to SQL Server 2012, or those who are moving from another relational database engine to SQL Server. IT professionals who are experienced with SQL Server may find useful information here; however, most of the content is introductory and focused on teaching the fundamental concepts.

This book assumes that you have at least a minimal understanding of relational databases. Beyond that, a basic knowledge of Microsoft technologies such as Windows will assist in some areas.

## Who should not read this book

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This book is not for experienced SQL Server database administrators (DBAs)—it is aimed at teaching the fundamentals of SQL Server.

## Organization of this book

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This book is divided into nine parts, each of which focuses on a different aspect or technology of SQL Server 2012.

- Part I, “Getting started with Microsoft SQL Server 2012,” provides an overview of SQL Server 2012, and then details how to install SQL Server and use the administrative and development tools.
- Part II, “Designing databases,” focuses on creating databases and tables, with a small emphasis on indexing.
- Part III, “Advanced database design topics,” focuses on advanced techniques such as compression and partitioning. In addition, you will be introduced to the topic of database snapshots.
- Part IV, “Using Transact-SQL (T-SQL),” delves into the details of using T-SQL to manipulate data in your SQL Server databases and tables.
- Part V, “Creating other database objects,” continues the introduction of T-SQL, but this time the focus is on creating other database objects that you can use for data retrieval.
- Part VI, “SQL Server replication,” provides an overview of each replication type available in SQL Server 2012.
- Part VII, “Database maintenance,” includes several chapters that explain how to build a comprehensive maintenance solution that ensures the availability and performance of your SQL Server environment.
- Part VIII, “Database management,” covers several aspects of the technology that assist you as the DBA in proactively monitoring and managing a single or multiserver SQL Server topology.
- Finally, Part IX, “High-availability solutions,” focuses on the features of SQL Server that ensure that your servers are available should a catastrophic event occur.

## Conventions and features in this book

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This book presents information using conventions designed to make the information readable and easy to follow.

- Each exercise consists of a series of tasks, presented as numbered steps (1, 2, and so on) listing each action you must take to complete the exercise.
- Boxed elements with labels such as “Note” provide additional information or alternative methods for completing a step successfully.
- Text that you type (apart from code blocks) appears in bold.
- A plus sign (+) between two key names means that you must press those keys at the same time. For example, “Press Alt+Tab” means that you hold down the Alt key while you press the Tab key.
- A vertical bar between two or more menu items (for example, File | Close) means that you should select the first menu or menu item, then the next, and so on.

## System requirements

---

You will need the following hardware and software to complete the practice exercises in this book:

- Windows 7 SP1 32-bit or higher, or Windows Server 2008 Standard SP2 32-bit or higher
- Microsoft SQL Server 2012 Evaluation edition, SQL Server 2012 Developer edition, or SQL Server 2012 Enterprise edition



**Note** You can use other editions of SQL Server 2012, but you will be limited by the feature set supported by the SQL Server edition that you have installed.

- 2.0 GHz Pentium III+ (or faster) processor
- 1 GB of available, physical RAM
- 2 GB of available disk space
- Video (800 × 600 or higher resolution) monitor with at least 256 colors

- CD-ROM or DVD-ROM drive
- Microsoft mouse or compatible pointing device

You will also need to have administrator access to your computer to configure SQL Server 2012.

## Code samples

---

Most of the chapters in this book include exercises that let you interactively try out new material learned in the main text. All sample projects, in both their pre-exercise and postexercise formats, can be downloaded from the following page:

*<http://www.microsoftpressstore.com/title/9780735663862>*

Follow the instructions to download the <yoursamplefile.zip> file.



**Note** In addition to the code samples, your system should have Microsoft Visual Studio 2010 and SQL Server 2008 installed. The following instructions use SQL Server Management Studio 2008 to set up the sample database used with the practice examples. Install the latest service packs for each product, if they are available.

## Installing the code samples

Follow these steps to install the code samples on your computer so that you can use them with the exercises in this book.

1. Unzip the 9780735663862\_files.zip file that you downloaded from the book's website (name a specific directory along with directions to create it, if necessary).
2. If prompted, review the displayed end user license agreement. If you accept the terms, select the accept option, and then click Next.



**Note** If the license agreement doesn't appear, you can access it from the same webpage from which you downloaded the 9780735663862\_files.zip file.



## Using the code samples

The folder created by the Setup.exe program contains three subfolders.

- **Sample Database** This folder contains the SQL script used to build the sample database.
- **Exercises** The main example projects referenced in each chapter appear in this folder. Many of these projects are incomplete and will not run without following the steps indicated in the associated chapter. Separate folders indicate each chapter's sample code, and there are distinct folders for the C# and Visual Basic versions of each example.
- **Completed Exercises** This folder contains all content from the Exercises folder, but with chapter-specific instructions applied.

To complete an exercise, access the appropriate chapter-and-language folder in the Exercises folder, and open the project file. If your system is configured to display file extensions, Visual Basic project files use a .vbproj extension; C# project files use .csproj as the file extension.

## Acknowledgments

---

I would like to first start by thanking God for giving me the knowledge and dedication to complete this book. Next, I would like to thank my wife Karlyn and two children, PJ and Kalyn, for supporting me in this project. There were many long nights and many days when I just did not want to write, and they would provide the motivation that I needed to get it done. Thanks to each of them for lighting a fire in me to complete this book. I would like to especially thank my wife for her continued and ongoing commitment to me and my career. She exemplifies what a good mother, wife, and role model should be, and I just want to say thanks for everything.

To my technical editor, William Assaf, I say thanks for all the great comments and corrections. Without you, none of this would have been possible. During the long nights spent writing, I made so many mistakes, and unfortunately you had to read and find them. Thanks for that. I would also like to thank you for stepping in and writing Chapter 24, "Extended Events," and Chapter 30, "Dynamic management objects," probably two of the best chapters in the book.

I would also like to thank the two people who helped me write Chapter 31, “AlwaysOn,” and Chapter 32, “Log shipping,” Chad Churchwell and Mindy Curnutt. I wrangled them at the PASS Summit in 2012, and a month later I had complete chapters from both. Thanks for all your help on this project.

Finally, I would like to thank the editing team who worked on my book. They were the most patient group of editors that I have worked with: Jeff Riley, Melanie Yarbrough, and Nicole LeClerc. Thanks, everyone, for working so hard on this book.

## Errata & book support

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We’ve made every effort to ensure the accuracy of this book and its companion content. Any errors that have been reported since this book was published are listed on our Microsoft Press site:

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# Using SQL Server 2012 administration and development tools

**After completing this chapter, you will be able to**

- Use SQL Server 2012 Books Online.
- Create solutions and projects with SQL Server Management Studio.
- Use Object Explorer.
- Use SQL Server Data Tools.
- Use SQL Server Configuration Manager.

## Using SQL Server Books Online

---

Over the years, Microsoft SQL Server Books Online (BOL) has been criticized for its lack of content and its inability to effectively explain how to use various SQL Server tools and options. However, as the versions of SQL Server have progressed, so has the documentation. Unfortunately, the perception of BOL remains marred by the many years of criticism and, in some cases, its limited content. While BOL does not and probably will never provide a walk-through for every possible task, it does offer a good foundation and starting point for anyone interested in gaining general knowledge about all of the capabilities of SQL Server.

In previous versions of SQL Server BOL, content was installed locally by default. In Microsoft SQL Server 2012, this has changed slightly. When you open BOL for the first time, the Online Help Consent dialog box opens, as shown in Figure 3-1.



**FIGURE 3-1** The SQL Server 2012 Online Help Consent dialog box displays the first time you open SQL Server Books Online.

You have the option of storing the help content locally or viewing it online. If you decide to view it online, you can always change the setting later. In the next exercise, you'll install BOL locally.

### Install Books Online locally

1. Click the Yes button in the Online Help Consent dialog box Microsoft Help Viewer 1.1 displays.
2. Click the Help Library Manager icon.
3. In the Help Library Manager dialog box, click Install Content from Online. A fetch process begins that provides you with a list of available content.
4. From the list, click the Add button next to Books Online, located under the SQL Server 2012 category.
5. Click the Update button. The install process begins.
6. When the update is complete, click the Finish button.
7. Click Exit.
8. Close Microsoft Help Viewer.
9. Now open SQL Server Books Online by clicking Start | All Programs | Microsoft SQL Server 2012 | Documentation & Community | SQL Server Documentation.
10. In the left navigation section, you should see several SQL Server choices.

Take some time to explore the contents of BOL. If you are just getting started with SQL Server, or even if you are seasoned SQL Server veteran, you are bound to find all sorts of information that will provide insight into the full feature set available within SQL Server 2012.

# Using SQL Server Management Studio

---

Your ability to efficiently manage and maintain your SQL Server environment has been greatly improved with the introduction of Microsoft SQL Server Management Studio (SSMS) in SQL Server 2005. Administrators can configure other SQL Server components, such as replication, availability groups, Microsoft SQL Server Agent, change data capture (CDC), and many other features that will be discussed later in this book. In addition, you can create databases and database objects, such as tables, views, and stored procedures. Finally, after building a database, you can also manage the data inside the database using SSMS.

## Get started with SQL Server Management Studio

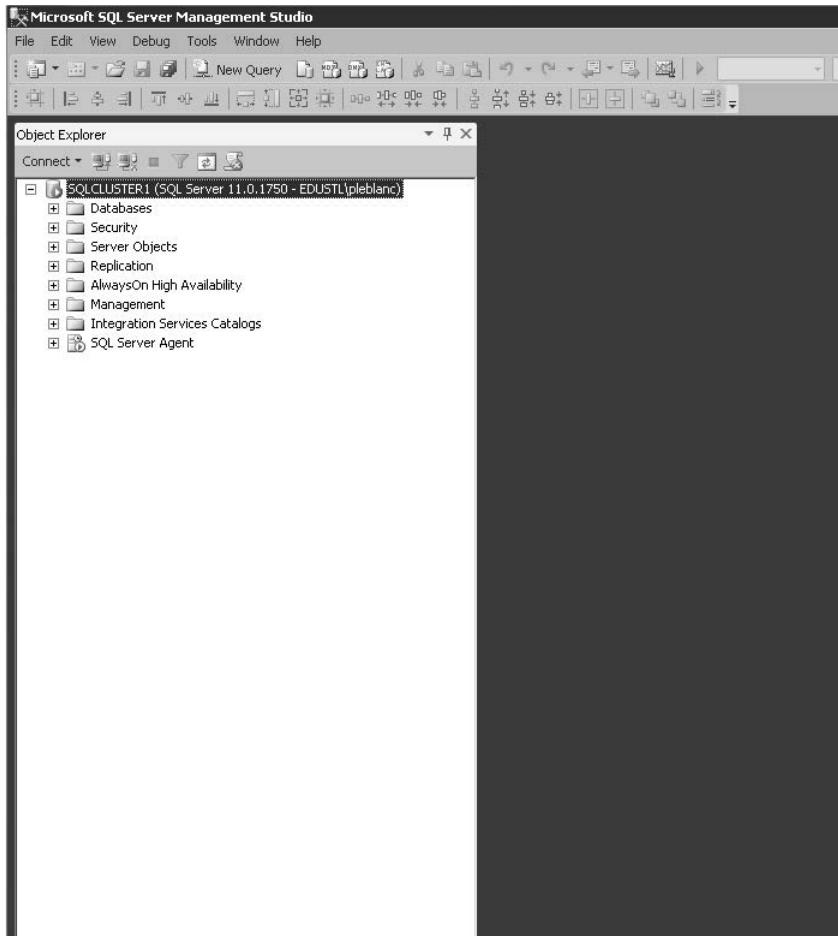
1. To open SSMS, click Start | All Programs | Microsoft SQL Server 2012 | SQL Server Management Studio.
2. When SSMS opens, the Connect to Server dialog box appears. Accept the defaults for every option except the Server Name drop-down list. Type your server name and click the Connect button.

Before you start using SSMS, let's take a quick tour of the environment. First, you may notice that the SSMS environment is very similar to that of most Microsoft products. At the very top is the main menu, which has several options available. Directly below the main menu is the Standard toolbar, which is loaded by default. If you right-click anywhere on either toolbar, a context menu appears. From this menu, you can select other choices that will add new items to the existing toolbars or add new toolbars to the menu. Below all the menus and to the left of the window is Object Explorer.

Object Explorer is a multifunctional window available in SSMS. As previously mentioned, it provides an intuitive interface for navigating and accessing server features and databases. Moreover, you can use Object Explorer to connect to multiple instances of SQL Server, Integration Services, Analysis Services, and Reporting Services instances. Once connected, you have the ability to create databases and database objects, configure other features and components, run performance reports, and perform a number of other functions. When you are connected to an instance of SQL Server, simply right-click to access additional functionality that further demonstrates the true power and flexibility of SSMS. For example, if you right-click the Databases folder, you can create, attach, or restore a database. You may have also noticed that Object Explorer has its own menu. This menu allows you to connect to or disconnect from an instance of SQL Server, refresh the items displayed in the window, and perform many other functions. You'll get started with Object Explorer in the next exercise.

## Use Object Explorer

1. Open SSMS if you have not already done so. When prompted by the Connect to Server dialog box, ensure that Database Engine is selected from the Server Type drop-down list, type your server name in the Server Name drop-down list, and ensure that Windows Authentication is selected in the Authentication drop-down list.
2. If Object Explorer does not open, select Object Explorer from the View menu or press F8. Object Explorer will appear to the left of the SSMS window.



3. Near the top of Object Explorer, you should see the word *Connect* with a drop-down arrow located directly to the left. Click the drop-down arrow and use the menu that opens to connect to other SQL Server components. Since you have installed only a Database Engine, that is the only component that can be connected.

4. You can explore various server objects by expanding any of the folders displayed in Object Explorer. For example, expand the Management folder. You can now view and configure features such as Data Collection, Database Mail, and Extended Events.
5. Right-click the server name, which is the topmost item in the Object Explorer tree. From the context menu, select Reports | Standard Reports | Server Dashboards. This report provides you with a high-level overview of the server.
6. To view more detailed information, instead of selecting Server Dashboards from the report list, select Activity-All Active Sessions. This report reveals all active open sessions on that server.
7. In the toolbar located above Object Explorer, click the button labeled New Query. A new query window opens in which you can write queries to create objects, configure components, and query database objects.



**Note** The preceding steps provide a quick overview of some of the SSMS functionality. Throughout this book, you'll learn more details and additional steps to help you take full advantage of the capabilities of SSMS.

While out of the box SSMS is configured to provide a full set of functionality to administrators and developers, it also provides you with the ability to make it your own. If you don't like Object Explorer on the left, you can move it, or if you don't like the font of the query editor, you can change it to one of your choice. You have several options available for configuration.

### Personalize SQL Server Management Studio

1. Open SSMS if it is not already open.
2. Select Tools | Options.
3. In the Options dialog box, select Fonts and Colors.
4. Select Courier New from the Font drop-down list.
5. Select 16 from the Size drop-down list.
6. Click OK.
7. Open a query window and type **SELECT @@SERVERNAME**. Click the red exclamation point icon in the menu bar to execute the query.
8. Open Object Explorer if it is not already open.

9. Click the drop-down arrow located to the right of the words *Object Explorer*. Select Float from the menu.
10. Click and drag Object Explorer onto the left docking option that appears. This docks Object Explorer back in its original position. Explore a little and move it to other docking locations. Find the one that best fits your preference.

## Using SQL Server Management Studio to create solutions and projects

---

While most of this chapter's content has been specific to administrators, SSMS does provide functionality for developers as well. In other words, you can create project-based solutions that help you organize your development and configuration scripts. Using SSMS, you can create a solution, which is a container of projects. Within SSMS, you can create two types of projects:

- SQL Server Scripts
- Analysis Services Scripts

In the next exercise, you will create a SQL Server Scripts project.

### Create solutions and projects

1. Open SSMS if it is not already open.
2. From the menu select File | New | Project.
3. The New Project dialog box opens.
4. There are two Installed Templates to select from. Ensure that you select the SQL Server Management Studio Projects template. This choice provides two project types. Select SQL Server Scripts.
5. At the bottom of the screen, in the Name text box, type **SBS2012Chp3**.
6. Accept the defaults for the Location and Solution drop-down lists.
7. Type **SBS2012** in the Solution Name text box.
8. Click OK.  
To the right, you will notice a new docked window labeled Solution Explorer.
9. Right-click the Connections folder.



10. Select New Connection.
11. Type your server name in the Server Name drop-down list.
12. Click OK.
13. Right-click the Queries folder.
14. Select New Query.
15. Right-click the newly created query and select Rename.
16. Change the name of the query to **Select Server Name**. Ensure that you don't remove .sql.
17. In the query editor, type **SELECT @@SERVERNAME**.
18. Select File | Save All.

## Using SQL Server Data Tools

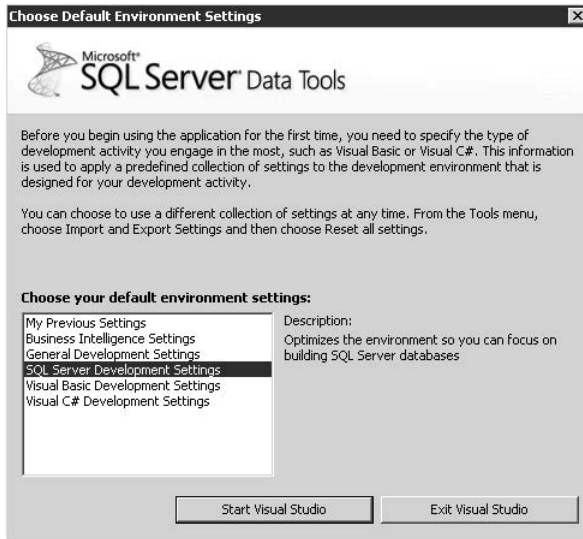
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SQL Server 2012 introduces a new development environment for SQL Server database developers called SQL Server Data Tools (SSDT). Although the primary purpose of this tool is development, it can be used for database deployment and database-level configurations. Using SSDT, you can create databases and database objects such as tables, views, stored procedures, and triggers. You can also edit data within the tables. In addition, you can execute queries and perform database schema compares.

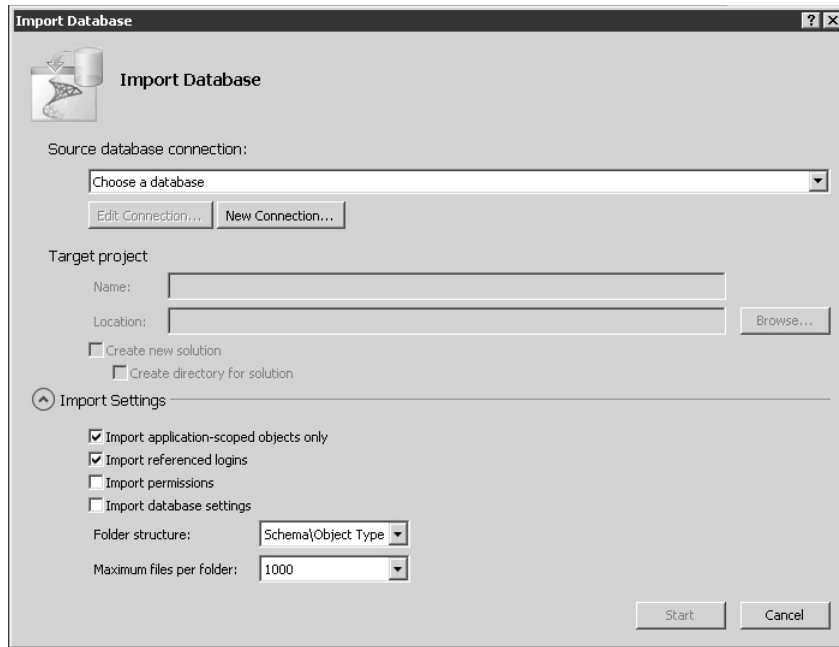
SSDT replaces Business Intelligence Development Studio (BIDS). As a result, not only can you create and deploy databases, but you can also create Analysis Services, Integration Services, and Reporting Services projects. In addition, these projects can be checked into source control solutions such as Team Foundation Server.

### Use SQL Server Data Tools

1. Click Start | Microsoft SQL Server 2012 | SQL Server Data Tools.
2. If this is your first time opening SSDT, you will be prompted with the following screen. The options available will vary depending on the software installed on your machine.



3. Select SQL Server Development Settings from the Choose Your Default Environment Settings list box.
4. Click Start Visual Studio.
5. Choose File | New | Project.
6. In the Recent Templates pane located in the left of the New Project dialog box, select SQL Server.
7. Select SQL Server Database Project from the project list.
8. In the Name text box, type **AdventureWorks**.
9. Accept the default for the Location drop-down list.
10. In the Solution Name text box, type **SBSChp3**.
11. Click OK.
12. In Solution Explorer, right-click the AdventureWorks project. Select Import | Database. The Import Database dialog box appears.



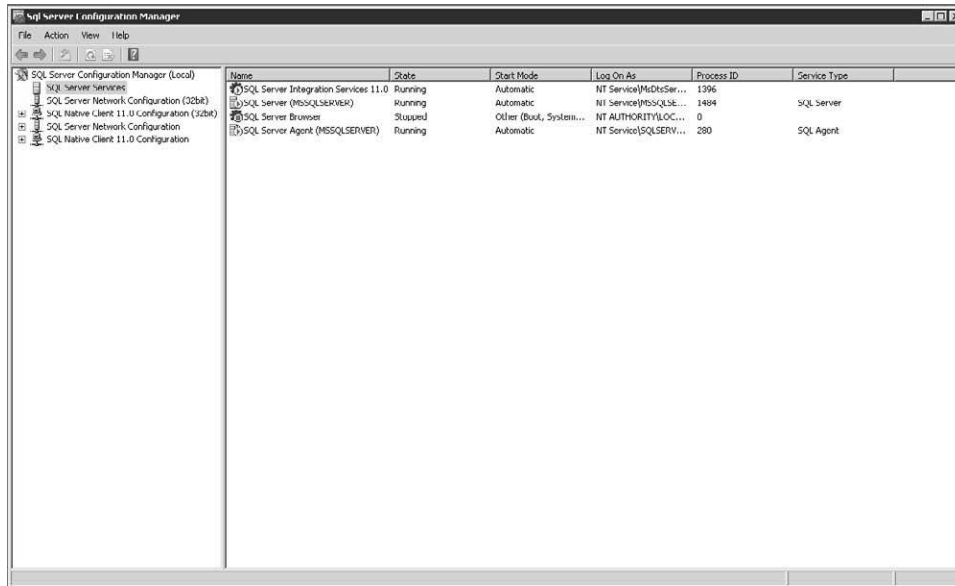
13. Click the New Connection button.
14. Type your server name in the Server Name drop-down list.
15. Select AdventureWorks2008R2 from the Select or Enter Database Name drop-down list.
16. Change the selection in the Folder Structure drop-down list to Object Type.
17. Click OK.
18. Accept all the defaults for the remaining items and click the Start button. The database import process begins.
19. Once all the objects have been imported, click the Finish button.
20. In Solution Explorer, expand the Tables folder.
21. Double-click the Address.sql item.
22. In the table designer view, locate AddressLine1 under the Name column. For that column, change the Data Type from nvarchar(60) to nvarchar(65).
23. Right-click the AdventureWorks project in Solution Explorer and select Publish from the context menu. Now the changes are deployed to the database on the server.



**Note** The changes made in the design view are replicated to the script view. If the changes are made in the script view, they are replicated to the design view.

# Using SQL Server Configuration Manager

SQL Server Configuration Manager, shown in Figure 3-2, allows you to manage the SQL Server services that have been installed on your server.



**FIGURE 3-2** SQL Server Configuration Manager.

Using SQL Server Configuration Manager, you can perform the following actions:

- Start, stop, and pause a service
- Change service accounts
- Configure network protocols
- Configure advanced properties such as AlwaysOn and FileStream

Because these services are centralized, administrators are able to configure and manage services from one location.

Changing accounts and account passwords are actions often required or requested. For example, during installation you may have accepted the defaults for the service account that runs SQL Server, and now you need to change them. As a best practice, you should always use SQL Server Configuration Manager to make the changes because it not only changes the account, but also sets necessary changes to registry permissions so that the account has the proper permissions.

## Use SQL Server Configuration Manager

1. Open SQL Server Configuration Manager by clicking Start | All Programs | Microsoft SQL Server 2012 | Configuration Tools | SQL Server Configuration Manager.
2. In the left pane, right-click the SQL Server (MSSQLSERVER).
3. Click Properties in the context menu.
4. In the Properties dialog box, you will notice several tabs. Click each to view the available options.
5. With the Log On tab activated, click the Stop button.
6. Click the Start button.
7. Click OK.
8. Expand the SQL Server Network Configuration item.
9. Select Protocols from MSSQLSERVER.
10. If you want to enable the Named Pipes protocol, right-click and select Enable from the context menu.

## Summary

---

In this chapter, you learned about several administrative and development tools included in Microsoft SQL Server 2012. Individually, each includes further tools that provide administrators and developers with the ability to create and manage SQL Server instances and objects at different levels. Together, they offer a comprehensive set of tools providing a one-stop shop for the functionality needed to maintain one to many instances of SQL Server.

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# About the Author



**PATRICK LEBLANC** is a Microsoft SQL Server and Business Intelligence Technical Solution Professional. He has written several blogs and articles on his blog at <http://patrickleblanc.com>, [www.sqlservercentral.com](http://www.sqlservercentral.com), and [www.bidn.com](http://www.bidn.com). Along with his 10 plus years of experience, he holds a Master of Science degree from Louisiana State University. He is the author and co-author of four SQL Server books. His past work experience includes senior consultant at Pragmatic Works and database architect at several companies. Prior to joining Microsoft, he was awarded the Microsoft MVP award for his contributions to the community.