LINQ FOR DUMMIES®

by John Paul Mueller

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LINQ
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About the Author

John Paul Mueller is a freelance author and technical editor. He has writing in his blood, having produced 80 books and over 300 articles to date. The topics range from networking to artificial intelligence and from database management to heads-down programming. Some of his current books include a Windows power optimization book, books on both Windows Server 2008 GUI and Windows Server 2008 Server Core, and a programmer's guide that discusses the new Office Fluent User Interface (RibbonX). His technical editing skills have helped more than 56 authors refine the content of their manuscripts. John has provided technical editing services to both *Data Based Advisor* and *Coast Compute* magazines. He's also contributed articles to the following magazines: *CIO.com*, *DevSource*, *InformIT*, *Informant*, *DevX*, *SQL Server Professional*, *Visual C++ Developer*, *Hard Core Visual Basic*, *asp.netPRO*, *Software Test and Performance*, and *Visual Basic Developer*.

When John isn't working at the computer, you can find him in his workshop crafting wood projects or making candles. On any given afternoon, you can find him working at a lathe or putting the finishing touches on a bookcase. He also likes making glycerin soap, which comes in handy for gift baskets. You can reach John on the Internet at `JMueller@mwt.net`. John is also setting up a Web site and blog at `http://www.johnmuellerbooks.com/`; feel free to look and make suggestions on how he can improve it.

Dedication

This book is dedicated to my friend Osvaldo Téllez Almirall (Chicho). We've had many conversations about music and life in general and I've always felt that I came away a better person for them.

Author's Acknowledgments

Thanks to my wife, Rebecca, for working with me to get this book completed. I really don't know what I would have done without her help in researching and compiling some of the information that appears in this book. She also did a fine job of proofreading my rough draft.

Russ Mullen deserves thanks for his technical edit of this book. He added greatly to the accuracy and depth of the material that you see here. I appreciated the time he devoted to checking my code for accuracy. As I wrote this book, I also spent a good deal of time bouncing ideas off Russ, which is a valuable aid to any author.

Matt Wagner, my agent, deserves credit for helping me get the contract in the first place and taking care of all the details that most authors don't consider. I always appreciate his assistance. It's good to know that someone wants to help.

A number of people read all or part of this book to help me refine the approach, test the examples, and generally provide input that every reader wishes they could have. These unpaid volunteers helped in ways too numerous to mention here. I especially appreciate the efforts of Osvaldo Téllez Almirall, who provided me with some interesting bits of information. Bill Salkin gave me some good ideas. Andrew Matthews provided me with significant help and coding examples for the LINQ to RDF provider. In fact, a number of people made suggestions on how to improve my coding technique. I'd like to thank each person who wrote me with an idea by name, but there are simply too many.

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We're proud of this book; please send us your comments through our online registration form located at www.dummies.com/register/.

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Introduction

Language INtegrated Query (LINQ) sounds like some kind of formless question that depends on how someone speaks. Of course, your queries are integrated with your language! How can you make them otherwise?

LINQ is actually a new feature of .NET Framework that expands your grasp well beyond things Microsoft. In fact, after playing with LINQ for quite some time I thought I'd start to run out of new data sources to query, but it hasn't happened yet. You can use LINQ to query just about anything (and I only say "just about" because I'm sure there is something LINQ can't reach).

The thing that should excite you most about LINQ is that it helps you access technologies that you couldn't ordinarily access or couldn't do so with ease. For example, you can use LINQ to access MySQL easily, without considering a workaround. You can also access Resource Description Framework (RDF) files, something that would be tough without LINQ. You get all of these additional opportunities to access varied data sources and you'll write less code, not more, to do it. LINQ is truly one of the most interesting features that Microsoft has ever added to .NET Framework, and you'd miss out on a lot if you didn't explore the LINQ technology for your own programming needs.

About This Book

LINQ For Dummies is your gateway to a new world — one in which you can ask questions (programmatically) of literally anything. This book starts with the basics. You need to discover the LINQ basics before you can begin pulling information from Active Directory, but LINQ is so small compared to many technologies that the basics require only a few pages. Most of this book is about getting serious work accomplished.

After working with LINQ for a while, I discovered that there are inequities in the LINQ world. For one thing, it seems as if Microsoft is avoiding Visual Basic .NET because their Web site has a decided lack of Visual Basic .NET materials. It was hard to find Visual Basic .NET examples on third-party Web sites too. I hope that this situation will change, but for now you have Chapter 4, which tells you the Visual Basic .NET side of the story, and Chapter 16, which provides you with a host of Visual Basic .NET resources.

The second inequity that *LINQ For Dummies* addresses is the needs of the Visual Studio 2005 developer. It appears that everyone assumes you have Visual Studio 2008. Although most of this book was written with Visual Studio

2008 in mind, there isn't any reason you can't write LINQ applications using Visual Studio 2005, and Chapter 5 provides the information you need. The remaining examples in the book will even work with Visual Studio 2005 with a little tweaking.

You'll also find a host of example types in *LINQ For Dummies.* For example, did you know that you can access the content of Office 2007 documents using LINQ? Chapter 10 tells you about all of the interesting things you can do with Office 2007 once you have LINQ at your disposal. The astonishing thing is that you can perform these tasks with little code. Using LINQ, it's possible to both read and write Office 2007 documents without resorting to odd programming strategies.

LINQ can also make your life as a developer considerably easier. Chapter 14 provides an array of interesting techniques you can use to obtain information about your applications that you might not have even thought available. Only in *LINQ For Dummies* can you find all of these mind-boggling techniques in one place.

Conventions Used in This Book

I always try to show you the fastest way to accomplish any task. In many cases, this means using a menu command such as File➪New➪Project. When working with LINQ, I'll tell you which dialog box tab to access first, and then which feature to use on that tab.

This book also uses special type to emphasize some information. For example, entries that you need to type appear in **bold**. All code, Web site URLs, and on-screen messages appear in `monofont type`. When I define a new word, you'll see that word in *italics*.

Because you use multiple applications when you're working with LINQ, I always point out when to move from one application to the next. When a chapter begins, I introduce the main application for that chapter. All the commands in that chapter are for the main application until I specifically tell you to move to another application. I also tell you when it's time to move back to the main application.

What You Should Read

Anyone who doesn't have any LINQ experience should read all of Part I. It's possible to skip Chapter 1 if you don't want to know about the array of LINQ providers already on the market or the other interesting things you can do with LINQ, but most people have a number of special needs and Chapter 1 is where you discover how to fulfill them.

Someone who's been exposed to LINQ but hasn't worked with it can probably skip Part I and begin with Part II. Make sure you read the chapters in turn. No, the chapters don't provide interlocked information, forcing you to grind through one chapter at a time, but the LINQ to DataSet provider does build on the LINQ to Objects provider, so you need to know both to create a LINQ to Objects application.

If you're familiar with the basic LINQ to providers (you have written programs using them) and just want to see the other things that LINQ can do, you'll want to start with Part III. In some cases, you may have questions about a particular technique and you can refer to Parts I and II when you need to answer such questions. Part III doesn't provide quite as much hand holding, so you do need to know how LINQ works to use it.

What You Don't Have to Read

Most of the chapters contain some advanced material that will interest only some readers. When you see one of these specialized topics (such as the requirements for using COM+ in Vista and Windows Server 2008 in Chapter 13), feel free to skip it. Most of this advanced material appears in sidebars and some of it applies only when you use a specific operating system. The sidebar title will always indicate the special nature of the advanced material.

You can also skip any material marked with a Technical Stuff icon. This material is helpful, but you don't have to know it to work with LINQ. I include this material because I find it helpful in my programming efforts and hope that you will, too.

Foolish Assumptions

You might find it difficult to believe that I've assumed anything about you — after all, I haven't even met you yet! Although most assumptions are indeed foolish, I made these assumptions to provide a starting point for the book.

I'm assuming that you've worked with Windows long enough to know how the keyboard and mouse work. You should also know how to use menus and other basic Windows features. It's also essential to know how to use the Visual Studio IDE and that you know at least one .NET language. This book doesn't provide any instruction on how to write applications outside the instructions needed to write LINQ applications. If you don't know what a `foreach` loop is, you definitely require a different book.

Some portions of the book work with Web pages and others use XML; you need to know at least a little about these technologies to use those sections.

You don't have to be an expert in any of these areas, but more knowledge is better. You must also have a very good knowledge of the programming language you use to work with LINQ.

This is a book for someone who has development experience. I'm assuming that you have a very good knowledge of either Visual Basic .NET or C#. You must also know how to work with any extension technology you want to access. For example, if you want to write a LINQ query to access COM+, you need to know something about COM+ before you can read about it in this book. The same holds true for Active Directory, RDF, MySQL, Office 2007, or any of the other extension technologies described in the book.

How This Book Is Organized

This book contains several parts. Each part demonstrates a particular LINQ concept. In each chapter, I discuss a particular topic and include example programs that you can use to discover more about LINQ on your own. You can find the source code for this book on the Dummies.com Web site at `http://www.dummies.com/go/linqfd`.

Part I: An Overview of LINQ

Part I looks at LINQ as a technology and introduces you to essential concepts such as the operators used to create a LINQ query. In addition, this part reviews the .NET Framework technologies that make LINQ queries possible. This is also the part of the book that helps you use LINQ with both Visual Basic .NET and Visual Studio 2005. One of the central themes of this part of *LINQ For Dummies* is helping you discover all the tasks that LINQ can perform.

Part II: Using Standard LINQ to Technologies

.NET Framework comes with four providers. A *provider* is a link between your application and the data source it requires. Each of the four LINQ providers that come with .NET Framework appear in a separate chapter in Part II. Using just these four providers, you can query any object, any data set, any kind of XML, and SQL Server. These four providers cover a lot of ground. Just knowing them will give you access to a considerable range of data, much of which isn't even hosted on Windows.

Part III: Extending LINQ to New Horizons

The four basic LINQ providers can perform quite a few tasks, but they have limits. Sometimes it isn't a matter of being able to access the data, but merely one of accessing the data without a lot of extra programming. Part III shows how you can combine third-party providers with LINQ to create some remarkable applications. Because the applications in this part of the book are unique, you'll want to skip around a bit and read about the technologies that interest you the most first.

Part IV: The Part of Tens

The final part of the book provides you with some helpful tips and resources you can use to make your LINQ development experience even better. Chapter 14 shows how you can use LINQ to create a better development environment for yourself. Chapter 15 helps you discover ways to use LINQ to make the application environment better for users and support staff, while reducing your workload. Chapter 16 provides ten truly useful resources that will help reduce your development time. If you have the idea by now that LINQ is all about making things easier, you have understood the intent of this book.

The accompanying Web site

This book contains a lot of code, and you might not want to type it. In fact, it's probably better if you don't attempt to type this code manually. Fortunately, you can find the source code for this book on the Dummies.com Web site at `http://www.dummies.com/go/linqfd`. The source code is organized by chapter, and I'll always tell you about the example files in the text. The best way to work with a chapter is to download all the source code for it at one time.

Icons Used in This Book

As you read this book, you'll see icons in the margins that indicate material of interest (or not, as the case may be).This section briefly describes each icon in this book.

Tips are nice because they help you save time or perform some task without a lot of extra work. The tips in this book are timesaving techniques or pointers to resources that you should try to get the maximum benefit from LINQ.

I don't want to sound like an angry parent or some kind of maniac, but you should avoid doing anything marked with a Warning icon. Otherwise, you could find that your program melts down and takes your data with it.

Whenever you see this icon, think *advanced* tip or technique. You might find these tidbits of useful information just too boring for words, or they could contain the solution you need to get a program running. Skip these bits of information whenever you like.

If you don't get anything else out of a particular chapter or section, remember the material marked by this icon. This text usually contains an essential process or bit of information that you must know to write LINQ programs successfully.

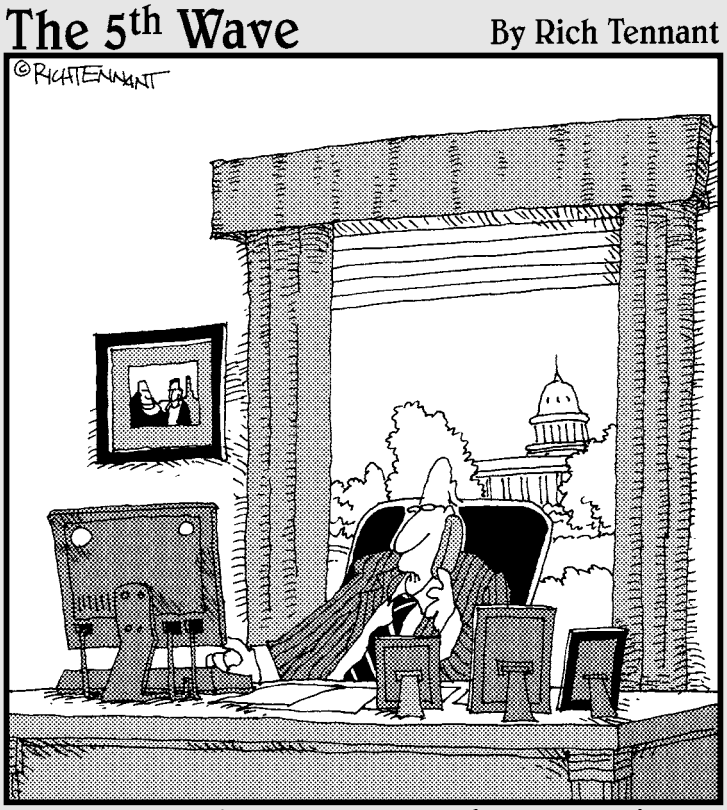
Where to Go from Here

It's time to start your LINQ adventure! I recommend that anyone who has only a passing knowledge of LINQ go right to Chapter 1. This chapter contains essential, get-started information that you need for writing your first LINQ program.

If you already have some LINQ experience, move right to Chapter 6. It is important to know about the four LINQ providers that come with .NET Framework. Otherwise, you might find that it's hard to understand how the third-party LINQ providers described in Part III work. If you desperately need LINQ on your next project, read through Chapter 6 first before you move on to Part III because every LINQ provider available today builds on the LINQ to Objects provider.

Part I

An Overview of LINQ



"Yes, I know how to query information from the program, but what if I just want to leak it instead?"

In this part . . .

Someone once said that the beginning is a good place to start; well, this is the beginning. Chapter 1 introduces you to LINQ — it clears up any questions you might have about what LINQ is and what it can do. Most importantly, it introduces you to a considerably larger view of LINQ than you might have at the outset. Chapter 2 takes what you discover in Chapter 1 and shows you how to apply it in the form of practical LINQ queries.

Chapter 3 is special — it tells you about the unique features in .NET Framework that make LINQ a workable solution. You'll probably find yourself referring to this chapter as you read the rest of the book.

Chapters 4 and 5 provide exclusive information for Visual Basic.NET and Visual Studio 2005 developers. It seems as if these two groups get left out of most books, but you'll find them here.

Chapter 1

Getting to Know LINQ

In This Chapter

- Defining LINQ uses, benefits, and design goals
- Considering the real world uses of LINQ
- Defining declarative programming languages
- Understanding the LINQ namespaces

The Language INtegrated Query (LINQ) feature of Visual Studio 2008 provides you with a new way to interact with data of all types. In fact, this new feature provides you with tools that make it easier to create queries using less code. The resulting queries are often easier to understand than other techniques for deriving information from both standard (think databases) nonstandard (think memory data structures) data sources. In addition, you gain a measure of flexibility that most developers associate with using a database, not lists provided internally as part of applications.

The easiest way to think of LINQ at the outset is as a means of looking for something — a specialized kind of search. Because most people are inundated with information today, providing a fast means of locating specific data is important. LINQ provides the means to perform a search without writing a lot of code. Everything is built in to the development environment so all you need to consider is what to find, not how to find it. Unlike other kinds of searches, however, LINQ provides the means to look inside data structures that you normally can't search, such as objects. It can also standardize the methods you use to perform searches within Web services. In short, LINQ

- Provides access to a huge range of data
- Lets you simplify searches to locate just what you need
- Reduces the code required to perform a search
- Enables you to focus on the search instead of writing search routines
- Interacts with all kinds of data sources using a standardized approach

This chapter serves as an introduction to LINQ. You discover how LINQ will make your coding experience better, reduce real world complexity, and make searches more accurate. As part of discovering LINQ, you also need to know about declarative languages, and this chapter provides the information you need. Finally, since LINQ is part of the .NET Framework, you need to know which namespaces support it, so this chapter provides an introduction to these new namespaces.

Considering LINQ

LINQ is possibly the most exciting new feature Microsoft has added to Visual Studio 2008. Sure, the other features that Microsoft added are important, but they don't have the overwhelming reach of LINQ to change the way developers write applications. Anyone can use LINQ to create a better application — one that works more efficiently and uses less code. In addition, you no longer have to write custom search routines that differ from developer to developer. By using LINQ to perform searches of all types, you can standardize another part of your code base and incrementally improve overall developer productivity. The following sections describe LINQ in greater detail.

Understanding the task that LINQ performs

LINQ is all about searching efficiently and consistently. Your application searches efficiently by performing the task using less code and obtaining the results faster. Consistency comes from using the same code pattern to perform a search no matter what source of data you want to work with. From a pattern perspective, a search of an array looks the same as a search of a Web service or SQL Server database. Using LINQ, it no longer matters whether the data resides in SQL Server or MySQL, or even both. LINQ does divide queries into four common types (using different providers) that augment the basic patterns described in Chapter 2:

- LINQ to Object
- LINQ to DataSet
- LINQ to SQL
- LINQ to XML

It's possible to have other kinds of "LINQ to" scenarios by adding other libraries. For example, you can find a LINQ to Active Directory library at `http://www.codeplex.com/LINQtoAD`. The goal, however, is to perform