

LINQ FOR **DUMMIES®**

by John Paul Mueller



WILEY

Wiley Publishing, Inc.

LINQ
FOR
DUMMIES®

LINQ FOR **DUMMIES®**

by John Paul Mueller



WILEY

Wiley Publishing, Inc.

LINQ For Dummies®

Published by
Wiley Publishing, Inc.
111 River Street
Hoboken, NJ 07030-5774
www.wiley.com

Copyright © 2008 by Wiley Publishing, Inc., Indianapolis, Indiana

Published by Wiley Publishing, Inc., Indianapolis, Indiana

Published simultaneously in Canada

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 646-8600. Requests to the Publisher for permission should be addressed to the Legal Department, Wiley Publishing, Inc., 10475 Crosspoint Blvd., Indianapolis, IN 46256, (317) 572-3447, fax (317) 572-4355, or online at <http://www.wiley.com/go/permissions>.

Trademarks: Wiley, the Wiley Publishing logo, For Dummies, the Dummies Man logo, A Reference for the Rest of Us!, The Dummies Way, Dummies Daily, The Fun and Easy Way, Dummies.com, and related trade dress are trademarks or registered trademarks of John Wiley & Sons, Inc. and/or its affiliates in the United States and other countries, and may not be used without written permission. All other trademarks are the property of their respective owners. Wiley Publishing, Inc., is not associated with any product or vendor mentioned in this book.

LIMIT OF LIABILITY/DISCLAIMER OF WARRANTY: THE PUBLISHER AND THE AUTHOR MAKE NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE ACCURACY OR COMPLETENESS OF THE CONTENTS OF THIS WORK AND SPECIFICALLY DISCLAIM ALL WARRANTIES, INCLUDING WITHOUT LIMITATION WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. NO WARRANTY MAY BE CREATED OR EXTENDED BY SALES OR PROMOTIONAL MATERIALS. THE ADVICE AND STRATEGIES CONTAINED HEREIN MAY NOT BE SUITABLE FOR EVERY SITUATION. THIS WORK IS SOLD WITH THE UNDERSTANDING THAT THE PUBLISHER IS NOT ENGAGED IN RENDERING LEGAL, ACCOUNTING, OR OTHER PROFESSIONAL SERVICES. IF PROFESSIONAL ASSISTANCE IS REQUIRED, THE SERVICES OF A COMPETENT PROFESSIONAL PERSON SHOULD BE SOUGHT. NEITHER THE PUBLISHER NOR THE AUTHOR SHALL BE LIABLE FOR DAMAGES ARISING HEREFROM. THE FACT THAT AN ORGANIZATION OR WEBSITE IS REFERRED TO IN THIS WORK AS A CITATION AND/OR A POTENTIAL SOURCE OF FURTHER INFORMATION DOES NOT MEAN THAT THE AUTHOR OR THE PUBLISHER ENDORSES THE INFORMATION THE ORGANIZATION OR WEBSITE MAY PROVIDE OR RECOMMENDATIONS IT MAY MAKE. FURTHER, READERS SHOULD BE AWARE THAT INTERNET WEBSITES LISTED IN THIS WORK MAY HAVE CHANGED OR DISAPPEARED BETWEEN WHEN THIS WORK WAS WRITTEN AND WHEN IT IS READ.

For general information on our other products and services, please contact our Customer Care Department within the U.S. at 800-762-2974, outside the U.S. at 317-572-3993, or fax 317-572-4002.

For technical support, please visit www.wiley.com/techsupport.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Library of Congress Control Number: 2008931623

ISBN: 978-0-470-27794-2

Manufactured in the United States of America

10 9 8 7 6 5 4 3 2 1



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.

Finally, I would like to thank Katie Feltman, Susan Pink, and the rest of the editorial and production staff for their assistance in bringing this book to print. It's always nice to work with such a great group of professionals.

Publisher's Acknowledgments

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

Some of the people who helped bring this book to market include the following:

Acquisitions, Editorial, and Media Development

Project Editor: Susan Pink

Acquisitions Editor: Katie Feltman

Copy Editor: Susan Pink

Technical Editor: Russ Mullen

Editorial Manager: Jodi Jensen

Assistant Project Manager: Jenny Swisher

Assistant Producer: Shawn Patrick

Editorial Assistant: Amanda Foxworth

Sr. Editorial Assistant: Cherie Case

Cartoons: Rich Tennant (www.the5thwave.com)

Composition Services

Project Coordinator: Katherine Key

Layout and Graphics: Stacie Brooks,
Reuben W. Davis, Melissa K. Jester,
Christin Swinford

Proofreaders: Linda Seifert, Amanda Steiner

Indexer: Sharon Shock

Publishing and Editorial for Technology Dummies

Richard Swadley, Vice President and Executive Group Publisher

Andy Cummings, Vice President and Publisher

Mary Bednarek, Executive Acquisitions Director

Mary C. Corder, Editorial Director

Publishing for Consumer Dummies

Diane Graves Steele, Vice President and Publisher

Joyce Pepple, Acquisitions Director

Composition Services

Gerry Fahey, Vice President of Production Services

Debbie Stailey, Director of Composition Services

Contents at a Glance



<i>Introduction</i>	<i>1</i>
<i>Part I: An Overview of LINQ</i>	<i>7</i>
Chapter 1: Getting to Know LINQ	9
Chapter 2: Creating Simple LINQ Queries.....	23
Chapter 3: Considering the .NET Language Extensions.....	47
Chapter 4: Working with LINQ in Visual Basic .NET.....	69
Chapter 5: Working with LINQ in Visual Studio 2005.....	91
<i>Part II: Using Standard LINQ to Technologies</i>	<i>105</i>
Chapter 6: LINQ to Object.....	107
Chapter 7: LINQ to DataSet.....	133
Chapter 8: LINQ to SQL Server.....	157
Chapter 9: LINQ to XML	181
<i>Part III: Extending LINQ to New Horizons.....</i>	<i>211</i>
Chapter 10: Using LINQ with Office 2007	213
Chapter 11: Advanced LINQ to SQL Server	233
Chapter 12: LINQ to Active Directory	253
Chapter 13: Other LINQ to Strategies.....	271
<i>Part IV: The Part of Tens</i>	<i>299</i>
Chapter 14: Ten Ways to Improve LINQ Development	301
Chapter 15: Ten Ways to Reduce Application Support Costs.....	321
Chapter 16: Ten LINQ Resources.....	335
<i>Index</i>	<i>347</i>

Table of Contents

***Introduction* 1**

About This Book	1
Conventions Used in This Book	2
What You Should Read	2
What You Don't Have to Read	3
Foolish Assumptions	3
How This Book Is Organized	4
Part I: An Overview of LINQ	4
Part II: Using Standard LINQ to Technologies	4
Part III: Extending LINQ to New Horizons	5
Part IV: The Part of Tens	5
The accompanying Web site	5
Icons Used in This Book	5
Where to Go from Here	6

***Part 1: An Overview of LINQ* 7**

Chapter 1: Getting to Know LINQ. 9

Considering LINQ	10
Understanding the task that LINQ performs	10
Contemplating why you need LINQ	11
Defining the LINQ design goals	14
Understanding the LINQ requirements	16
Using LINQ in the Real World	17
Understanding Declarative Programming	18
An Overview of the LINQ Namespaces	19
System.Linq namespace	19
System.Linq.Expressions namespace	19
System.Data.Linq namespace	20
System.Data.Linq.Mapping namespace	21
System.Data.SqlClient namespace	21
System.Data.SqlClient.Implementation namespace	22
System.Xml.Linq namespace	22

Chapter 2: Creating Simple LINQ Queries 23

Defining the LINQ Keywords	24
Working with from	24
Working with where	25

Working with orderby	26
Working with join.....	27
Working with let.....	28
Creating a Simple from Query.....	29
Understanding the simple query application code	29
Using the debugger to see the simple query in action.....	31
Filtering a Query	34
Grouping Queries	35
Creating Queries from Multiple Sources	36
Understanding the multiple-source application code.....	37
Working with the alternative multiple-source example.....	38
Using calculated values in multiple-source queries	39
Working with the Standard Query Operators	41
Mapping Keywords to Methods.....	43
Chapter 3: Considering the .NET Language Extensions	47
An Overview of the Language Extensions	48
Working with Lambda Expressions.....	51
Understanding the Role of the IEnumerable and IEnumerable<T> Interfaces	54
Understanding Object Initializers.....	57
Understanding Collection Initializers	58
Working with Extension Methods	61
Working with Partial Methods	62
An Overview of Expression Trees	64
Working with Query Expressions	67
Chapter 4: Working with LINQ in Visual Basic .NET	69
Understanding the Visual Basic Differences	70
Creating the Simple Visual Basic Example	72
Working with From	72
Working with Where.....	75
Working with Order By	78
Working with Join	79
Working with Let.....	81
Using the Additional Visual Basic Keywords	82
Working with Aggregate.....	83
Working with Distinct.....	84
Working with Skip	85
Working with Take	87
Working with Lambda Functions in Visual Basic	88
Chapter 5: Working with LINQ in Visual Studio 2005	91
Obtaining LINQ Support for Visual Studio 2005	92
Installing LINQ Support.....	92

Creating the Simple Visual Studio 2005 Project.....	93
Defining the project	94
Working with from	95
Working with join.....	98
Working with where	100
Working with orderby	102
Working with let.....	103

Part 11: Using Standard LINQ to Technologies..... 105

Chapter 6: LINQ to Object107

Considering the Use of Objects with LINQ	108
Creating the Simple Object Query Example.....	109
Understanding the Role of Deferred Operators.....	112
Creating the Deferred Operator Examples	113
Working with Concat	113
Working with AsEnumerable, AsQueryable, Cast, and Of Type	114
Working with OfType and Where	115
Working with DefaultIfEmpty, Empty, Range, and Repeat.....	116
Working with GroupBy and ToLookup	118
Working with GroupJoin and Join	120
Working with Skip, SkipWhile, Take, and TakeWhile	120
Working with Select and SelectMany	121
Working with Distinct, Except, Intersect, and Union	123
Working with OrderBy, OrderByDescending, Reverse, ThenBy, and ThenByDescending	124
Understanding the Role of Nondeferred Operators.....	125
Creating the Nondeferred Operator Examples	126
Working with Aggregate, Average, Count, LongCount, Max, Min, and Sum	127
Working with ToArray, ToDictionary, ToList, and ToLookup	128
Working with ElementAt, ElementAtOrDefault, First, First OrDefault, Last, LastOrDefault, Single, and SingleOrDefault	128
Working with SequenceEqual.....	129
Working with All, Any, and Contains.....	130

Chapter 7: LINQ to DataSet133

Considering the Use of DataSets with LINQ	134
Creating the Simple DataSet Example.....	136
Defining the test tables	136
Outputting the results.....	139
Exploring the connection.....	139
Understanding the LINQ to DataSet Operators	141

Creating the Filtered Output Example	142
Creating a simple display	143
Modifying the filtered output	144
Using the CopyToDataTable operator	146
Working with typed DataSets	148
Working with Multiple DataSet Tables	152

Chapter 8: LINQ to SQL Server157

Considering the Use of SQL Server with LINQ	158
Obtaining and Installing the Northwind Database	160
Downloading the database	161
Installing the database	162
Testing the Visual Studio connection	164
Generating the Northwind entity classes and XML mapping files	165
Creating the Simple SQL Server Query Example	168
Overcoming the Visual Studio 2008 connectivity issues	168
Defining the project	170
Adding the code	171
Viewing the debugger output	173
Using Object Relational Designer	175
Understanding the LINQ to SQL Server Operators	178

Chapter 9: LINQ to XML181

Considering the Use of XML with LINQ	182
Working with the LINQ to XML API	184
Understanding the LINQ to XML Operators.....	186
Working with XDeclaration, XElement, and XDocument.....	186
Working with XNamespace.....	188
Working with XProcessingInstruction	190
Working with XAttribute.....	191
Working with XComment and XText	192
Working with XCDATA	194
Working with XDocumentType	195
Working with XNodeDocumentOrderComparer.....	197
Working with XNodeEqualityComparer.....	199
Working with Remove	201
Working with XName.....	202
Creating the Simple XML File Example	204
Creating the project.....	204
Building an XML document	205
Saving an XML document	207
Loading an XML document.....	208

Part III: Extending LINQ to New Horizons..... 211**Chapter 10: Using LINQ with Office 2007213**

Understanding the Office Document Structure	214
Understanding LINQ Interaction with Office.....	216
Obtaining the Required Library.....	218
Creating the Office 2007 Document Example.....	219
Creating the project.....	220
Understanding the custom properties.....	221
Reading document properties.....	225
Writing document properties.....	228

Chapter 11: Advanced LINQ to SQL Server233

Considering SQL Server Issues	234
Understanding concurrency problems.....	234
Overcoming performance issues	238
Creating the Database Modification Example.....	240
Performing an insert.....	241
Performing an update.....	243
Performing a delete	245
Using Concurrency Checks and Resolving Errors.....	247
Resolving conflicts at the object level	248
Resolving conflicts at the member level.....	251

Chapter 12: LINQ to Active Directory253

Working with Specific Active Directory Objects	254
Defining Active Directory Variables.....	256
Obtaining the LINQ to Active Directory Provider	257
Creating the Simple Active Directory Query Example.....	260
Performing the project setup	260
Defining an Active Directory object class.....	262
Creating a root node pointer	264
Reading user information	265
Writing user information.....	266
Understanding the Limitations of Active Directory Interaction.....	268
Some LINQ methods aren't implemented.....	268
Defining the need for LDAP patience	269

Chapter 13: Other LINQ to Strategies271

Understanding the Qualifications for a LINQ to Solution.....	271
Accessing COM+ Using LINQ.....	273
COM+ accessed as a Web service.....	276
COM+ accessed using interop functionality.....	281

Creating the Resource Description Format (RDF) Files Example.....	282
A quick overview of RDF	283
A quick overview of SPARQL.....	283
Starting the project.....	284
Configuring the project	285
Creating the host application.....	288
Creating the application class definition	292
Reading RDF files	293
Creating the MySQL Example.....	294
Getting the MySQL ADO.NET connector.....	295
Compiling the DbLinq.DLL and DbLinq.MySQL.DLL files	295
Configuring the database.....	296
Defining the MySQL project.....	296
Developing the query code.....	297

***Part IV: The Part of Tens*..... 299**

Chapter 14: Ten Ways to Improve LINQ Development. 301

Using LINQ Tools to Simplify Coding	302
Getting the VLinq add-in application	302
Creating a VLinq query	303
Using a VLinq query in an application	308
Using LINQ to Create Self Documenting Code	309
Analyzing Code Patterns.....	311
Querying a Code Snippet Database.....	314
Locating Other Development Resources.....	316
Using LINQ to Query Data Formats	316
Finding Usage Trends.....	317
Developing a LINQ Library	318
Sharing LINQ Queries with Others	319
Analyzing Compiler and IDE Output	319

Chapter 15: Ten Ways to Reduce Application Support Costs 321

Creating Self-Modifying Queries	322
Using LINQ to Create Reports	323
Addressing User Search Needs.....	325
Creating User-Friendly Mashups	326
Making Help More Accessible.....	326
Organizing and Querying Support Requests and Responses	327
Developing Fast Searches from Multiple Sources	328
Helping Users Locate Existing Resources	331
Performing Support Task Automation.....	331
Improving Application and System Management.....	333

Chapter 16: Ten LINQ Resources	335
Starting with the Microsoft Developer Network.....	336
Getting Tips from the Microsoft Blogs.....	338
Finding Help in Third-Party Web Sites.....	339
Finding Help in Third-Party Newsletters and Blogs	340
Using Other Sources for LINQ to Objects Projects	342
Using Other Sources for LINQ to SQL Server Projects	342
Using Other Sources for LINQ to XML Projects.....	343
Considering Other LINQ to Sources Projects	344
Getting Help with Visual Basic Projects	345
Getting Help with C# Projects	346
<i>Index</i>	347

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 `monospace` 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.

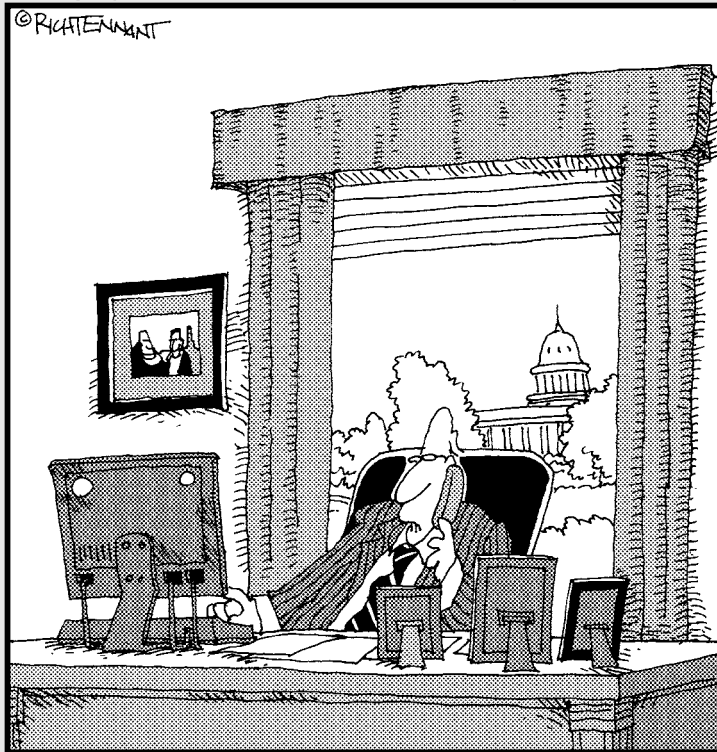
If you already have some LINQ experience, move right to Chapter 6. It is important to know about the four LINQ providers that come with .NET Framework. Otherwise, you might find that it's hard to understand how the third-party LINQ providers described in Part III work. If you desperately need LINQ on 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

The 5th Wave

By Rich Tennant



"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