Step by Step

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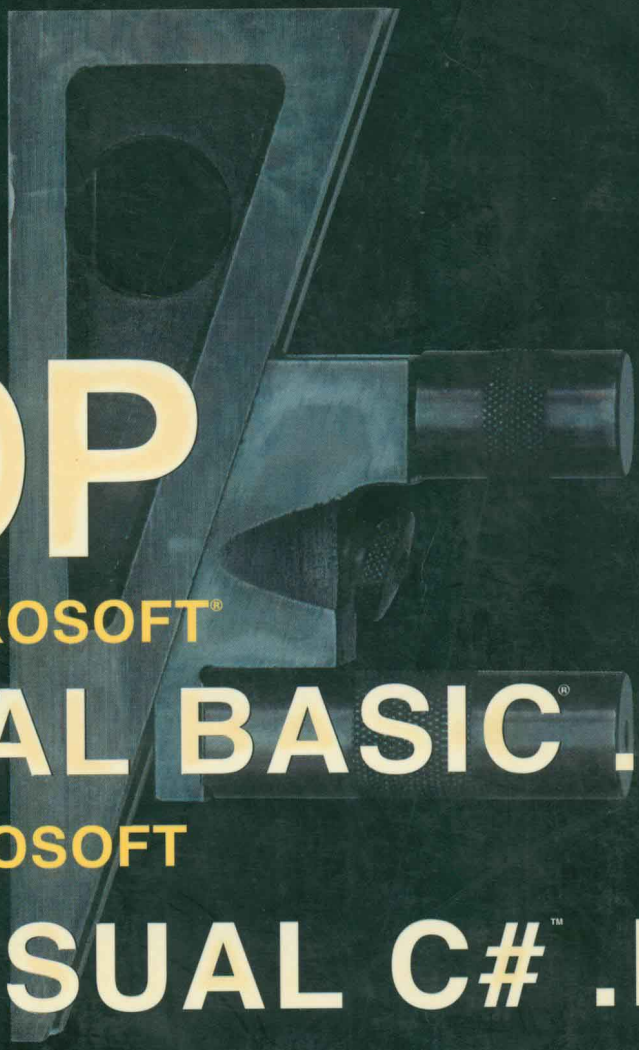

OOP WITH MICROSOFT® VISUAL BASIC® .NET AND MICROSOFT VISUAL C#™ .NET

STEP BY STEP

世界图书出版公司

Microsoft® .net™

Robin A.Reynolds-Haertle

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For Bruce

You're still the one.

owledgments

First I'd like to thank the team at Microsoft Press that turned my writing into a book. Without Jack Beaudry, the technical editor, I never would have gotten any sleep. His meticulous reviews saved me time and saved readers from much frustration. Kathleen Atkins, the project editor, kept everything running smoothly and improved my text considerably. Credit is also due to Danielle Bird, acquisitons editor; Rebecca McKay (Becka), manuscript editor; Cheryl Penner and Rebecca Wendling (Becky), copy editors; Gina Cassill, compositor; and Michael Kloepfer, electronic artist.

I also want to thank my colleagues at Microsoft who listened sympathetically to my complaints about deadlines and beta software. Editors Roger Haight and Meredith Waring made me a better writer. Mike Pope reminded me to put the reader ahead of being clever. Megan Shult and Ann Morris, my managers, were supportive even when writing consumed all my after-hours energy. Much of what I learned about .NET came from the material written by my team members Jina Chan, Seth Grossman, Steve Hoag, Steve Stein, and Matt Stoecker. And thank you to Diana Rain, my office mate.

I'd also like to thank Ruth McBride, my longtime manager, and my instructors at Seattle University. I appreciate their patience with my often experimental approaches to their assignments over the years.

I also have to mention the friends that still call to check on me, even though I haven't called them in months. Jennifer Wirt, Lisa Wiken, Molly Potteiger, and Julie Brinkley have been true friends.

This book would never have been written without the support of my husband, Bruce. He completely ran my life for the seven months I was writing this book. I worked and wrote; he did everything else. My friends are still laughing about how he RSVPs for me. Lastly, I thank my sons for just being there and for being proud of me.

luction

Microsoft Visual Basic developers have long clamored for complete object-oriented language support. Microsoft Visual Basic .NET supports all the features of an object-oriented language. In addition, the entire Microsoft .NET Framework, which includes the development support for Microsoft Windows applications, Web applications, Web services, graphics, and data access, is designed according to object-oriented principles. Developers who have a firm grasp of object-oriented principles will be the strongest .NET developers.

Also new to developers is C#, a C-based language that gives developers a language choice for developing with the .NET Framework. Some C, Java, and C++ development will move to C# to take advantage of .NET's features. Visual Basic programmers looking to learn a C language might also move to C#. Visual Basic .NET and C# both support object-oriented development with the .NET Framework. No matter what language you choose for development, being able to read code in either language will double your access to Microsoft Visual Studio documentation, .NET books, magazine articles, and other developer resources.

System Requirements

You'll need the following hardware and software to complete the exercises in this book:

- Microsoft Visual Studio .NET Professional edition. The Visual Studio .NET software isn't included with this book. You must purchase it separately and install it before you can complete the exercises in this book.

- A computer capable of running Microsoft Visual Studio .NET. The following hardware configuration is recommended by the Microsoft Visual Studio .NET Web site, at *http://msdn.microsoft.com/vstudio/nextgen/*

Computer/Processor

PC with a Pentium II–class processor, 450 megahertz (MHz); Pentium III–class processor, 600 MHz recommended

Operating System

Microsoft Windows 2000, Server or Professional
Microsoft Windows XP Home or Professional
Microsoft Windows NT 4.0 Server

Memory

Windows 2000 Professional, 96 megabytes (MB) of RAM; 128 MB recommended
Windows 2000 Server, 192 MB of RAM; 256 MB recommended
Windows XP Professional, 128 MB of RAM; 160 Recommended

Hard Disk

500 MB on System Drive and 3.0 gigabyte (GB) on installation drive

Drive

CD-ROM drive

Display

VGA or higher–resolution monitor

Input Device

Microsoft Mouse or compatible pointing device

Finding Your Best Starting Point

This book is designed to teach you the fundamentals of object-oriented programming. You can use this book if you have a basic knowledge of Visual Basic 6, Visual Basic .NET, Visual C#, or another Windows programming language. The exercises in this book assume you can already perform the following tasks:

- Create a new Windows Application project, build it, and run it.
- Add Windows Forms controls to a Windows Form.
- Create a method to respond to the Click event of a Button control.
- Create a simple method (called a *Sub* or *Function* in Visual Basic .NET).
- Declare and use variables.

For an introduction to Visual Basic .NET, read *Microsoft Visual Basic .NET Step by Step* by Michael Halvorson (Microsoft Press, 2002). For an introduction to Visual C# , read *Microsoft Visual C# .NET Step by Step* by John Sharp and Jon Jagger (Microsoft Press, 2002).

Use the following table to find your best starting point in this book.

If you are	Follow these steps
New	
To object-oriented programming	Install the practice files as described in the following section, "Installing and Using the Practice Files." Work through the chapters sequentially for a complete introduction to object-oriented programming. Chapters 1 through 7, 9, and 11 concentrate on the mechanics of object-oriented programming, while the other chapters cover the concepts in more depth.
Migrating	
From Visual Basic 6	Install the practice files as described in "Installing and Using the Practice Files" on the next page. Work through the chapters sequentially for a complete introduction to object-oriented programming with Visual Basic .NET. Chapters 1 through 7, 9, and 11 concentrate on the mechanics of object-oriented programming, while the other chapters cover the concepts in more depth.

(continued)

continued

If you are	Follow these steps
Switching	
From another object-oriented programming language.	Install the practice files as described in "Installing and Using the Practice Files." Complete Chapter 1 to learn the basic syntax of properties and methods. Read the Quick Reference sections at the end of the chapters for information about specific class constructs.
Referencing	
The book after working through the exercises	Use the index or the Table of Contents to find information about particular subjects. Read the Quick Reference at the end of each chapter to find a brief review of the syntax and techniques presented in the chapter.

Installing and Using the Practice Files

The companion CD inside the back cover of this book contains the practice files that you'll use as you perform the exercises in the book. For example, when you're learning to create class events, you'll use a bitmap file named Train.bmp. By using the practice files, you won't waste time creating objects that aren't relevant to the exercise. Instead, you can concentrate on learning object-oriented programming with Visual Basic .NET and Visual C# .NET. The files and the step-by-step instructions in the lessons also let you learn by doing, which is an easy and effective way to acquire and remember new skills.

important

Before you break the seal on the *OOP with Microsoft Visual Basic .NET and Microsoft Visual C# Step by Step* companion CD package, be sure that this book matches your version of the software. This book is designed for use with Microsoft Visual Studio .NET Professional Edition for the Windows operating systems. To find out what software you're running, you can check the product package or you can start the software, and then click About Microsoft Development Environment in the Help menu at the top of the screen.

Install the practice files

Follow these steps to install the practice files on your computer's hard disk so that you can use them with the exercises in this book.

1. Remove the companion CD from the package inside the back cover of this book and insert the CD in your CD-ROM drive.
2. Double-click the My Computer icon on the Desktop.

> **tip**
>
> *On some computers, the startup program might run automatically when you close the CD-ROM drive. In this case, skip steps 2 through 5 and follow the instructions on the screen.*

3. Double-click the icon for your CD-ROM drive.
4. Double-click StartCD.exe
5. Click Install Sample Code.

   The setup program window appears with the recommended options preselected for you. For best results in using the practice files with this book, accept these preselected settings.
6. When the files have been installed, remove the CD from your CD-ROM drive and replace it in the package inside the back cover of the book.

   A folder called OOPVBCS has been created on your hard disk, and the practice files have been placed in that folder.

Using the Practice Files

Each lesson in this book explains when and how to use any practice files for that lesson. The practice files contain the complete source listings for all the applications created in this book, as well as any resources, such as bitmaps and databases, that you'll need to complete the exercises. For those of you who

like to know all the details, here's a list of the Visual Basic and Visual C# projects on the practice disk:

Project	Description
Chapter 1	
ReadBooks	This simple program demonstrates the basics of creating, instantiating, and using a class.
Chapter 2	
ReadMoreBooks	This program expands on the ReadBooks program and adds constructors.
Chapter 3	
CodeAnalysis CodeAnalysis2	These two applications demonstrate different approaches to using class properties, and the interaction of class properties and the DataGrid control.
Chapter 4	
DeckOfCards	This application explores class methods by using dynamic creation of Windows Forms controls and drag-and-drop operations.
Chapter 5	
TheBank	This simple application demonstrates the basics of class inheritance.
ARoundButton	This small project shows how easy it is to derive from a Windows Forms control and redefine its drawing.
Chapter 6	
ABetterBank	This adaptation of Chapter 5's TheBank application uses an abstract class as a base class.
ABetterLibrary	This improvement on Chapter 1's ReadBooks application uses a strongly typed collection.
Variations	This application contains code snippets demonstrating variations on inheritance.
Chapter 7	
TrainGame	This application introduces delegates, events, and user-drawn controls in the context of a simple game.
ThrowSystemException	This small program throws a system exception and recovers by using exception handling.
PersonList	This application creates and throws a custom application exception.

Project	Description
Chapter 8	
GamesLibrary Memory	The GamesLibrary project creates a component library containing objects used to develop the simple Memory card game.
Chapter 9	
MoveIt	This application covers the basics of creating and implementing an interface.
Points	The Points project contains objects that implement the IComparable, IFormattable, and IEnumerable interfaces.
Chapter 10	
PatternMaker	Moving beyond the basics of inheritance, the PatternMaker program makes extensive use of inheritance and polymorphism.
Chapter 11	
BetterCard	This improvement on the Card class from Chapter 4 uses static methods to eliminate the project's dependency on file locations.
SortablePoint	The SortablePoint application from Chapter 10 is made more flexible through static properties.
Singleton	Static fields are used to implement the Singleton design pattern.
Chapter 12	
VectorAlgebra	The mathematical concept of vectors is used to demonstrate the definition and use of operator overloading in Visual C#.
Chapter 13	
Serialize	The Serialize application demonstrates the use of binary and XML serialization of data.
DataSetExercise	This very simple ADO.NET application reads data from an Access database.
Chapter 14	
PatternMaker	This example uses the PatternMaker exercise from Chapter 10 to demonstrate the way to make design changes after the initial development of an application.

Uninstall the practice files

If you are using the Windows XP Professional operating system, follow these steps to remove the practice files from your computer. If you are using a different version of Windows, refer to your Windows Help documentation for removing programs.

1. Click Start, and then click Control Panel.
2. In Control Panel, click Add Or Remove Programs.
3. In the Add Or Remove Programs window, click OOP Visual Basic And C# .NET Code in the Currently Installed Programs list.
4. Click Change/Remove. The Confirm File Deletion dialog appears.
5. Click Yes to delete the practice files.
6. Click Close to close the Add Or Remove Programs window.
7. Close Control Panel.

Conventions and Features in this Book

This book uses conventions designed to make the information more readable and easier to follow. The book also includes features that contribute to a deeper understanding of the material.

Conventions

- Each exercise is a series of tasks. Each task is presented as a series of numbered steps. If a task has only one step, the step is indicated by a round bullet.
- Notes labeled "tip" provide more information for completing a step successfully.
- Notes labeled "important" alert you to information you need to check before continuing.
- The book uses typographic styles to help organize the information presented. The following table describes the styles used.

Style	Used for	Example

Code	Code that you type in	`' Visual Basic`
		`Public Class Book`
		`End Class`
		`// Visual C#`
		`public class Book {`
		`}`

Italics	Method argument or parameter	*aBook*
	Event Procedure	*showPage_Click*
	Field	*m_shelf*
	Fully Qualified Name	*SomeBook.Text*
	Keyword	*Public, public, If, if*
	Method	*GetPage*
	Property value	*listOfBooks*
Roman	Boolean values	True, true, False, false
	Class name	Book, Library, Train
	Control type	ListBox, TextBox
	Data type	String, string, Integer, int
	Event	Click
	Form	Form1
	Namespace	ReadBooks
	Parameter type	String, string, Integer, int
	Property	Name

Other Features

Shaded sidebars throughout the book provide more in-depth information about the exercise. The sidebars might contain debugging tips, design tips, or topics you might want to explore further.

Each chapter ends with a Quick Reference section. The Quick Reference provides a brief review of the syntax and techniques presented in the chapter.

Corrections, Comments, and Help

Every effort has been made to ensure the accuracy of this book and the contents of the practice files on the companion CD. Microsoft Press provides corrections and additional content for its books through the World Wide Web at

http://www.microsoft.com/mspress/support/

If you have problems, comments, or ideas regarding this book or the companion CD, please send them to Microsoft Press.

Send e-mail to

mspinput@microsoft.com

Or send postal mail to

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Attn: Step by Step Series Editor
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Please note that support for the Visual Studio .NET software product itself is not offered through the preceding address. For help using Visual Studio .NET, visit *http://support.microsoft.com.*

Visit the Microsoft Press World Wide Web Site

You are also invited to visit the Microsoft Press World Wide Web site at

http://www.microsoft.com/mspress/

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