



Introducing **.NET**



James Conard, Patrick Dengler, Brian Francis, Jay Glynn, Burton Harvey,
Billy Hollis, Rama Ramachandran, John Schenken, Scott Short, Chris Ullman

Table of Contents

Introduction	1
Who Should Read this Book	2
How to Get the Most from this Book	2
Installing Microsoft Visual Studio.NET Beta One	3
What's Covered in this Book	4
Conventions Used	5
Customer Support	6
Source Code	6
Errata	6
p2p.wrox.com	6
Why this System Offers the Best Support	7
Chapter 1: .NET Overview	9
A Broad and Deep Platform for the Future	10
Your Introduction to .NET	10
Avoiding Confusion – the Role of the .NET Enterprise Servers	11
What's Wrong With What We Have Now?	11
The Origins of .NET	12
The .NET Framework – an Overview	12
A Common Substrate for all Development	13
The Common Language Runtime	14
Key Design Goals	14
Simpler, Faster Development	15
Getting Rid of Plumbing	15
Tool Support	15
Simpler, Safer Deployment	16
Scalability	16
Metadata	17
Multiple Language Integration and Support	18
A Common Type System	18
Namespaces	19
Deployment and Execution	19
Start with an Assembly, Build to an Application ,	19
Execution	19
The Next Layer – .NET Framework Base Classes	20

User and Program Interfaces	21
User Interfaces	21
Windows Forms	21
Web Forms	22
Console Applications	23
Program Interfaces	23
Web Services	23
XML as the .NET "Meta-language"	24
How COM/COM+ Fits In	24
Additional Benefits	25
Fewer Bugs – Whole Classes of Bugs Will Disappear	25
Potentially Better Performance	26
Some Potential Downsides	26
Language Incompatibilities	26
Transparency of "Source Code"	26
The First Step – Visual Studio.NET	26
Common IDE for All Languages	26
The Common Language Specification	27
All .NET Languages Are Not Created Equal	27
Management of Multiple Language Projects	27
Absence of Visual Interdev and J++	27
Summary of Language Changes	28
Visual Basic	28
Lots of Possible Incompatibilities	28
Object Features	28
C++	29
The New C# Language	29
Language changes affecting ASP.NET	30
"How Does .NET Affect Me?"	31
Developers	31
A Spectrum of Programming Models	31
Libraries of Pre-written Functionality	31
Infrastructure Engineers	32
End Users	32
Cautions	32
Chapter 2: Intro to the CLR	35
Why do we need a Common Runtime and Type System?	36
The Anatomy of .NET Applications	37
Assembly	37
Module	38
Type	38
Common Type System	38
Custom Types	43
Boxing and Unboxing Value Types	46
Metadata	48
Attributes	49
Custom Attributes	50
Reflection API	52
Putting It All Together	52

Managed Data	55
Managed Heap	55
Garbage Collector	56
Finalize	57
GC Optimizations	59
Pinning Objects	61
IL Disassembler	61
Summary	62

Chapter 3: An Introduction to C# **65**

Trying out Code in this Chapter **65**

The Sample Program – Life in C# **66**

C# and Microsoft.NET **67**

A Concise, Elegant .NET Language	67
C# and C++	67
C# Compiles to Managed Code	67
C# is Simpler than C++	67
C# is Safer than C++	68
Embedding C++ in C#	68
Managed C++	69
C# Installs with Visual C++	69
C# and Visual Basic	69
C# and Java	69

Datatypes in C# **70**

Namespaces	70
The System Namespace	71
Value Types and Reference Types	72
Instantiating Value Types	73
Instantiating Reference Types	75
Type Conversions	76
Boxing and Unboxing	77
Arrays	78
Enumerations	80
Constants	80
Containers	81

Control Flow in C# **81**

Functions	81
Defining Functions	81
Activating Functions	82
Function Parameters	82
Program Entry Point	85
Conditionals	85
Operators	86
If statements	86
switch...case statements	87
Loops	89
while loops	89
do...while loops	89
for loops	89
foreach loops	90
Structured Error Handling	90
Exception Classes	91

C# Classes	92
An Object-Oriented Life	92
Access Modifiers	93
Properties and Indexers	94
Simple Properties	94
An Advanced Property Example	95
Indexers	96
Constructor Functions	97
finalize() Functions	98
Inheritance	99
Abstract Classes	99
Virtual Methods	100
Abstract Methods	100
Sealed Classes	101
Operator Overloading	102
Operator Overloading Code Samples	102
Overloading Arithmetic Operators	103
Overloading the Equality Operator (==) and the Inequality Operator (!=)	104
Overloading the Conversion Operators	104
Overloading the Assignment Operator is not Permitted	105
Implementing Interfaces	105
Advanced C# Features	106
Events	106
Events Defined	106
How C# Events Work	107
Implementing Events	107
Platform Invoke Services (PInvoke)	108
PInvoke Described	108
A PInvoke Example	109
Dangers of PInvoke	109
The Future of C#	109
Technical Advances	109
C# Standardization	110
Summary	110

Chapter 4: What's New in Visual Basic.NET **113**

New Object Capabilities in Visual Basic	114
Full Inheritance	114
What is Inheritance?	114
Putting Inheritance in Visual Basic	115
Parameterized Constructors	117
Overriding	119
Overloading	122
Shared Members	122
Web Interfaces in Visual Basic.NET	122
Web Services	123
Modern Language Capabilities added to Visual Basic.NET	124
Structured Exception Handling	124
Threading	125
Fitting Visual Basic into the .NET Framework	125
A Recap of .NET Advantages for Visual Basic	125
Replacing Standard Visual Basic Forms with WinForms	126
A Common Type System	126

Summary of Visual Basic Language Changes	127
Lots of Possible Incompatibilities	127
No More Default Methods or Properties	128
SET and LET No Longer Supported	128
Different Syntax for Class Properties	129
Required Parentheses on Methods, Functions, and Subroutines	130
Parameters are ByVal by Default	130
New Declaration Capabilities	130
Changes in Declaring Arrays	131
No Implicit Loading of Forms	132
Many Keywords Move to Shared Class Members	132
Bitwise Operations	132
User Defined Types Replaced by Structures	133
Scope Changes for Variables	134
Miscellaneous Changes	134
Retired Keywords	135
Additional Impact on Current Projects	135
Designing for Web Forms	135
Calling Controls Directly	136
The Visual Basic Migration Tool	136
Dealing with DHTML pages and WebClasses	137
Dealing with Data	137
Problems Converting Late-bound Objects	137
Use Intrinsic Named Constants instead of Values	137
Problems with Fixed Length Strings in Structures	138
Upgrade Report and Comments	139
Recommendations	139
Syntax Conventions in Visual Basic Projects	139
Get the Latest Beta of Visual Studio .NET	139
Start using the SOAP toolkit for Visual Studio 6	140
Summary	140
Chapter 5: New Features in Visual Studio.NET	143
The Visual Studio IDE	143
A Tour of the Visual Studio.NET IDE	144
Profiles	145
Selecting Help Options	145
The Home Page	145
A Place for News and Information	146
Creating a New Project	146
Working on a Windows Form	147
Tabbed Windows	148
The Solution Explorer	148
The Properties Window and Dynamic Help	149
The New Code Window	150
The Task List	152
The Server Explorer	153
Some Differences when Developing WebForms	154
The Web Page Editor	155
Layout of WebForms	156
Toolbars in Visual Studio.NET	157

The Component Designer	158
Visual Modeler Placed in the Visual Studio.NET IDE	159
The Menu Structure of Visual Studio.NET	160
Macros in Visual Studio.NET	161
The New Deployment Tools	162
Visual Editors for XML, XSD Schemas, and XSLT files	163
Debugging across Projects and Processes	163
C++ In Visual Studio.NET	164
Other Features and Comments	164
Extended IntelliSense	164
Source Control	164
Summary	165
Chapter 6: .NET Class Framework	167
Problems with Unmanaged Applications	168
Introducing the .NET Class Framework	169
Inside the .NET Class Framework	173
System Namespace	173
The System Types	174
System.Object Class	177
System.Exception Class	179
System.Collections	186
System.Collections Interfaces	187
ArrayList Class	190
Summary	195
Chapter 7: ASP.NET	197
Why Do We Need a New Version of ASP?	198
Less Code	198
Compiled Code	199
Strong Typing	199
Easier Use of Components	199
Better Tools Support	200
Separation of HTML from ASP Code	200
Works on any Client	200
Better Integration with XML	200
And Other Advantages...	201
How Different are ASP.NET Pages to ASP Pages?	201
.aspx Instead of .asp	201
Placing ASP.NET Code in Your Pages	201
Server Controls	202
Getting Started with ASP.NET Beta	203

What Might Change in the ASP.NET Final Release?	203
XHTML Compliance	203
Client-Specific Output Formats	204
Features of ASP.NET	204
ASP.NET Pages	204
HTML Server Controls	204
Server-side Processing of Client-side Events	206
Programming with Code-Behind	223
Adding a Code-Behind Page	223
ASP.NET Web Services	224
ASP.NET Configuration	224
Configuration Files – Config.web	225
Configuration Section Handlers and Settings	225
Application Configuration Files – Global.asax	226
ASP.NET Application and Session State	227
Application State	228
Session State	228
ADO.NET	228
Data in Web Applications	229
Caching	230
The Output Cache	230
The ASP.NET Cache	230
Error Handling and Debugging Techniques	231
Custom Error Pages	231
Error Handling	231
The ASP.NET Debugger	231
Tracing in ASP.NET Pages	232
Security	234
Forms Based Authentication	234
Impersonation	235
Creating Your Own Custom Controls	235
When to Use Custom Controls?	235
The Example Time Control	236
Control Builders	240
Summary	241
Chapter 8: Web Services	243
What are Web Services Anyway?	243
So, How Do Web Services Work?	246
The Three Musketeers of Web Services	247
Getting Started with Web Services	249
Writing a Web Service	249
A Very Simple Web Service	249
Compiling the Web Service	252
Consuming the Web Service	253
Developing a Weather Information Web Service	255
Writing our Web Service with Visual Studio.NET	257
Writing the Code Within the Web Service	260
Writing a Web Service Consumer Application with Visual Studio.Net	264
Designing Web Services	269
Design for Stateless Environments	269
Security Issues with Web Services	269
Summary	270

Chapter 9: Windows Forms**273**

Class Hierarchy	274
The Form Class	276
Adding Controls	279
Events	282
Layout Enhancements	285
Changes and Additions	285
Properties Changes	286
Method Changes	287
GDI+	288
Menus	293
Inheritance	296

Summary **303****Chapter 10: Building .NET Components****305**

What are Assemblies	306
The End of DLL Hell	307
Assembly Manifest	308
Metadata	308
Self-Describing Components	309
Side-by-Side Execution	310

Writing Business Objects **310**

Creating the Object	310
Class Design Guidelines	311
Using Attributes	312
Our Sample Object	313
C# Class Example	313
VB.NET Class Example	318
Compiling the Classes	321
Compiling the C# Class	321
Compiling the VB.NET Class	323
Testing the Class	324

Cross-Language Inheritance **329**

Cross-Language Inheritance Example	330
------------------------------------	-----

Working with Unmanaged Components **332**

Using COM Components in a .NET application	332
Generating Metadata	332
Using the COM Component	333
Compiling and Deploying COM Components	333
Using .NET Components in a COM Application	333

Summary **333****Chapter 11: ADO.NET****337****ADO to ADO.NET** **338**

The ADO.NET Object Model	339
So Why Has an SQL Managed Provider Been Created?	340
ADOConnection/SQLConnection	340
ADOCommand/SQLCommand	341
ADODataReader/SQLDataReader	341
ADODataSetCommand/SQLDataSetCommand	341
The DataSet	342

ADO.NET's Capabilities, using VS.NET

Creating the Data Component	343
Creating the Publishable XML	348
UpdateDataSource	353
Creating the Web Service	354
Building the Consumer	356
Updating Data	359

Summary 360**Chapter 12: Enterprise Servers** 363**The .NET Enterprise Server Family** 363**What's Common between all the .NET Enterprise Servers** 365

Support for XML and other Internet Protocols/Standards	365
Software Scaling and Availability	365
Interoperability	365
Focus on Business Logic, not on Deployment	366
Ease of Management	366

Application Center 2000 366

Product Availability	366
What's the Focus?	366
What's New?	367

BizTalk Server 2000 368

Product Availability	368
What's the Focus?	369
What's New	369

Commerce Server 2000 370

Product Availability	370
What's the Focus	370
What's New	370

Exchange 2000 371

Product Availability	371
What's the Focus	371
What's New	371

SQL Server 2000 372

Product Availability	372
What's the Focus	372
What's New	372

Other .NET Enterprise Servers 374

Host Integration Server 2000	374
Product Availability	374
What's the Focus	375
Internet Security and Acceleration Server 2000	375
Product Availability	375
What's the Focus	375
Mobile Information Server 2001	375
Product Availability	375
What's the Focus	375

Summary 378

Building a .NET Solution	379
BeautifulParts.Com Requirements	381
BeautifulParts Database	381
BPLib.DLL	382
BeautifulDatabase Class	384
OrderItem Class	386
OrderInfo Class	387
BillingInfo Class	389
BPLib.DLL Summary	390
QueueWatcherService Application	390
QueueWatcher.cs	390
QueueProcessor Class	394
QueueWatcher.cs Summary	397
ProjectInstaller.cs	397
QueueWatcherService Summary	398
BPOrderService WebService	398
BPOrderService Summary	400
BeautifulParts Web Site	400
User Login and Validation	401
Config.Web	401
Login.aspx	402
Login and Validation Summary	404
Listing Inventory Items	404
InventoryList.aspx	405
InventoryList.VB	406
InventoryList Summary	408
List Inventory Item Details	409
InventoryDetail.aspx	409
InventoryDetail.vb	410
InventoryDetail Summary	413
Checkout.aspx	413
Checkout.VB	415
Checkout Summary	417
Summary	417

Appendix A: .NET Framework Reference**421****Appendix B: Using Classic COM Components in ASP.NET****429**

Type Library Importer	429
Using a VB6 Component in ASP.NET (Early Binding)	430
Using a Tlbimp-created Assembly	432
Performance	434
Calling into Unmanaged Code from Managed Code	435
Calling into Managed Code from Unmanaged Code	435
ASP.NET is Built on an MTA Thread Pool	436

A Guide to the Index**439**