
Table of Contents

| | | |
|------------|------------------------------|-----------|
| 1 | What is .NET? | 1 |
| 1.1 | The .NET Framework | 2 |
| 1.2 | What Does .NET Offer? | 9 |
| 1.3 | Differences from Java | 11 |
| 1.4 | Exercises | 13 |
| | | |
| 2 | The Language C# | 15 |
| 2.1 | Overview | 15 |
| 2.2 | Symbols | 20 |
| 2.3 | Types | 22 |
| 2.3.1 | Primitive Types | 23 |
| 2.3.2 | Enumerations | 24 |
| 2.3.3 | Arrays | 25 |
| 2.3.4 | Strings | 28 |
| 2.3.5 | Structs | 29 |
| 2.3.6 | Classes | 30 |
| 2.3.7 | object | 32 |
| 2.3.8 | Boxing and Unboxing | 32 |
| 2.4 | Expressions | 33 |
| 2.4.1 | Arithmetic Expressions | 34 |
| 2.4.2 | Relational Expressions | 34 |
| 2.4.3 | Boolean Expressions | 35 |
| 2.4.4 | Bit Expressions | 35 |
| 2.4.5 | Shift Expressions | 36 |
| 2.4.6 | Overflow Checking | 36 |
| 2.4.7 | typeof | 37 |
| 2.4.8 | sizeof | 37 |

| | | |
|------------|---|----|
| 2.5 | Declarations | 37 |
| 2.5.1 | Declarations in Namespaces | 38 |
| 2.5.2 | Declarations in Classes, Structs and Interfaces | 39 |
| 2.5.3 | Declarations in Enumeration Types | 40 |
| 2.5.4 | Declarations in Blocks | 40 |
| 2.6 | Statements | 42 |
| 2.6.1 | Empty Statement | 42 |
| 2.6.2 | Assignment | 42 |
| 2.6.3 | Method Call | 42 |
| 2.6.4 | if Statement | 43 |
| 2.6.5 | switch Statement | 44 |
| 2.6.6 | while Statement | 44 |
| 2.6.7 | do-while Statement | 45 |
| 2.6.8 | for Statement | 45 |
| 2.6.9 | foreach Statement | 46 |
| 2.6.10 | break and continue Statements | 46 |
| 2.6.11 | goto Statement | 47 |
| 2.6.12 | return Statement | 48 |
| 2.7 | Input and Output | 49 |
| 2.7.1 | Output to the Screen | 49 |
| 2.7.2 | Output to a File | 51 |
| 2.7.3 | Input from the Keyboard | 52 |
| 2.7.4 | Input from a File | 53 |
| 2.7.5 | Reading Command-line Arguments | 53 |
| 2.8 | Classes and Structs | 54 |
| 2.8.1 | Access Modifiers | 55 |
| 2.8.2 | Fields | 56 |
| 2.8.3 | Methods | 58 |
| 2.8.4 | Constructors | 62 |
| 2.8.5 | Destructors | 65 |
| 2.8.6 | Properties | 65 |
| 2.8.7 | Indexers | 67 |
| 2.8.8 | Operators | 69 |
| 2.8.9 | Nested Types | 71 |
| 2.8.10 | Differences from Java and C++ | 72 |
| 2.9 | Inheritance | 73 |
| 2.9.1 | Declaration of Subclasses | 73 |
| 2.9.2 | Compatibility Between Classes | 74 |
| 2.9.3 | Overriding and Hiding of Elements | 76 |
| 2.9.4 | Dynamic Binding | 78 |
| 2.9.5 | Constructors in Superclasses and Subclasses | 81 |
| 2.9.6 | Abstract Classes | 82 |

| | | |
|-------------|--|------------|
| 2.9.7 | Sealed Classes | 83 |
| 2.9.8 | The Class Object. | 84 |
| 2.10 | Interfaces | 87 |
| 2.11 | Delegates and Events | 91 |
| 2.12 | Exceptions | 95 |
| 2.13 | Namespaces and Assemblies | 101 |
| 2.14 | Attributes | 105 |
| 2.15 | Automatically Generated Comments | 112 |
| 2.16 | Exercises | 115 |
| | | |
| 3 | The .NET Architecture | 119 |
| | | |
| 3.1 | Why a Virtual Machine? | 120 |
| 3.2 | Common Type System (CTS) | 125 |
| 3.2.1 | Predefined Types | 127 |
| 3.2.2 | Value Types | 130 |
| 3.2.3 | Reference Types | 133 |
| 3.2.4 | From Value Type to Reference Type and Back | 139 |
| 3.3 | Common Language Specification (CLS) | 141 |
| 3.3.1 | Attribute CLSCompliant | 142 |
| 3.4 | Common Intermediate Language (CIL) | 143 |
| 3.5 | Metadata | 145 |
| 3.6 | Assemblies and Modules | 149 |
| 3.6.1 | Encapsulation | 154 |
| 3.6.2 | Versioning | 155 |
| 3.7 | Virtual Execution System (VES) | 157 |
| 3.7.1 | Application Domains | 158 |
| 3.7.2 | Loading and Execution of Managed Code | 159 |
| 3.7.3 | Verification of CIL Code | 162 |
| 3.7.4 | Translation of CIL into Machine Code | 164 |
| 3.7.5 | Code Management | 165 |
| 3.8 | Security | 172 |
| 3.8.1 | Code-based Security | 172 |

| | | |
|------------|---|------------|
| 3.8.2 | Role-based Security | 182 |
| 3.9 | Exercises | 183 |
| 4 | The .NET Class Library | 185 |
| 4.1 | Collections | 186 |
| 4.1.1 | IEnumerable | 186 |
| 4.1.2 | ICollection | 187 |
| 4.1.3 | ICollection | 188 |
| 4.1.4 | Array | 188 |
| 4.1.5 | ArrayList | 192 |
| 4.1.6 | BitArray | 194 |
| 4.1.7 | Queue | 195 |
| 4.1.8 | Stack | 196 |
| 4.1.9 | IDictionary | 197 |
| 4.1.10 | Hashtable | 198 |
| 4.1.11 | SortedList | 199 |
| 4.2 | Input / Output | 200 |
| 4.2.1 | Streams | 200 |
| 4.2.2 | Files and Directories | 204 |
| 4.2.3 | Isolated Storage | 209 |
| 4.3 | Threading | 211 |
| 4.3.1 | Creating Threads | 211 |
| 4.3.2 | Thread State | 212 |
| 4.3.3 | Background Threads | 214 |
| 4.3.4 | Grouping of Threads into a Thread Pool | 215 |
| 4.3.5 | Synchronization | 217 |
| 4.4 | Network Communication | 220 |
| 4.4.1 | Addressing | 221 |
| 4.4.2 | Sockets | 222 |
| 4.4.3 | NetworkStream | 226 |
| 4.4.4 | WebRequest and WebReponse | 226 |
| 4.5 | Reflection | 228 |
| 4.5.1 | System.Reflection.Assembly | 228 |
| 4.5.2 | System.Type | 230 |
| 4.5.3 | Dynamic Object Creation | 232 |
| 4.5.4 | Dynamic Execution of Methods | 233 |
| 4.5.5 | System.Reflection.Emit | 235 |
| 4.6 | Graphical User Interfaces with Windows.Forms | 236 |

| | | |
|------------|--|------------|
| 4.6.1 | Controls | 236 |
| 4.6.2 | Windows Form | 239 |
| 4.6.3 | Event-driven Programming Model | 241 |
| 4.6.4 | User-defined Controls | 244 |
| 4.7 | XML | 245 |
| 4.7.1 | XML Architecture | 246 |
| 4.7.2 | Sequential Reading with an XmlReader | 247 |
| 4.7.3 | Reading with a DOM Parser | 249 |
| 4.7.4 | XPath | 253 |
| 4.7.5 | XSL Transformation | 255 |
| 4.8 | Exercises | 257 |
| | | |
| 5 | ADO.NET | 261 |
| | | |
| 5.1 | Overview | 261 |
| 5.2 | Connection-oriented and Connectionless Access | 265 |
| 5.3 | Connection-oriented Access | 266 |
| 5.3.1 | Connections | 268 |
| 5.3.2 | Transactions, Isolation Levels, and Deadlocks | 271 |
| 5.3.3 | SQL Command Objects | 275 |
| 5.3.4 | DataReader | 281 |
| 5.4 | Connectionless Access with DataSet | 285 |
| 5.4.1 | Creating and Using DataSets | 288 |
| 5.4.2 | Database Access with DataAdapter | 296 |
| 5.5 | Integration with XML | 303 |
| 5.5.1 | DataSets and XML Data | 303 |
| 5.5.2 | DataSets and XML Schemas | 306 |
| 5.6 | Exercises | 312 |
| | | |
| 6 | ASP.NET | 315 |
| | | |
| 6.1 | Creating Dynamic Web Pages | 316 |
| 6.2 | Simple Web Forms | 324 |
| 6.3 | Event Handling in ASP.NET | 330 |
| 6.4 | Web Server Controls | 336 |

| | | |
|-------------|--|------------|
| 6.4.1 | Control | 336 |
| 6.4.2 | WebControl | 338 |
| 6.4.3 | Button | 341 |
| 6.4.4 | TextBox | 343 |
| 6.4.5 | Label | 345 |
| 6.4.6 | CheckBox | 345 |
| 6.4.7 | RadioButton | 346 |
| 6.4.8 | ListControl | 348 |
| 6.4.9 | ListBox | 349 |
| 6.4.10 | DropDownList | 353 |
| 6.4.11 | DataGrid | 354 |
| 6.4.12 | Calendar | 362 |
| 6.5 | Validating User Input | 364 |
| 6.5.1 | BaseValidator | 364 |
| 6.5.2 | RequiredFieldValidator | 365 |
| 6.5.3 | RangeValidator | 366 |
| 6.5.4 | CompareValidator | 366 |
| 6.5.5 | CustomValidator | 367 |
| 6.5.6 | Example | 367 |
| 6.6 | User-defined Controls | 369 |
| 6.6.1 | User Controls | 369 |
| 6.6.2 | Custom Controls | 373 |
| 6.7 | State Management | 379 |
| 6.7.1 | Class Page | 380 |
| 6.7.2 | Page State | 383 |
| 6.7.3 | Session State | 384 |
| 6.7.4 | Application State | 385 |
| 6.8 | ASP.NET Application Layer (Global.asax) | 386 |
| 6.9 | Configuration | 388 |
| 6.9.1 | Definition of Configuration Sections | 389 |
| 6.9.2 | Data of the Configuration Sections | 389 |
| 6.9.3 | Overview of the Configuration Sections for ASP.NET | 391 |
| 6.10 | Programming Web Pages with Visual Studio .NET | 396 |
| 6.11 | Exercises | 400 |
| 7 | Web Services | 403 |
| 7.1 | Overview | 403 |

| | | |
|------------|---|-----|
| 7.2 | A Simple Web Service under .NET | 407 |
| 7.2.1 | A Simple .NET Client | 410 |
| 7.2.2 | A Simple Java Client | 411 |
| 7.3 | SOAP | 413 |
| 7.3.1 | SOAP Message Formats for Web Services | 415 |
| 7.3.2 | HTTP Binding | 418 |
| 7.4 | SOAP and .NET | 419 |
| 7.4.1 | Determining the SOAP Message Format | 420 |
| 7.4.2 | SOAP Encoding of .NET Data Types | 421 |
| 7.4.3 | Developing and Using SOAP Headers Entries | 426 |
| 7.4.4 | Life Cycle of a Web Service | 429 |
| 7.5 | Web Services Description Language | 430 |
| 7.6 | Discovery of Web Services | 433 |
| 7.7 | Configuration of Web Services under .NET | 437 |
| 7.8 | Tools and Resources | 439 |
| 7.8.1 | .NET Web Service Studio | 439 |
| 7.8.2 | Helpful Web Addresses | 439 |
| 7.9 | Exercises | 441 |
| 8 | Working with the .NET Framework SDK | 445 |
| 8.1 | Overview of the .NET Tools | 445 |
| 8.2 | The C# Compiler (csc.exe) | 449 |
| 8.3 | Configuration | 452 |
| 8.4 | Debugging | 454 |
| 8.4.1 | Command-line Debugger (cordbg.exe) | 454 |
| 8.4.2 | GUI Debugger (dbgclr.exe) | 455 |
| 8.4.3 | System.Diagnostics.Debug | 456 |
| 8.5 | Further Tools | 461 |
| 8.5.1 | IL Disassembler (ildasm.exe) | 461 |
| 8.5.2 | Strong Name Tool (sn.exe) | 463 |
| 8.5.3 | Assembly Cache Viewer (shfusion.dll) | 466 |
| 8.5.4 | Global Assembly Cache Utility (gacutil.exe) | 467 |
| 8.6 | Exercises | 470 |

| | |
|---|------------|
| 9 A Preview of .NET 2.0 | 473 |
| 9.1 New Features in C# | 473 |
| 9.1.1 Generics | 473 |
| 9.1.2 Anonymous Methods | 479 |
| 9.1.3 Iterators | 480 |
| 9.1.4 Partial Types | 482 |
| 9.2 New Features in the Base Class Library | 483 |
| 9.2.1 Generic Collections | 483 |
| 9.2.2 New Features of Class Console | 485 |
| 9.2.3 New Network Protocols | 486 |
| 9.2.4 Data Protection API (DPAPI) | 488 |
| 9.2.5 Graphics and Windows Forms Improvements | 490 |
| 9.3 New Features in ADO.NET | 491 |
| 9.3.1 Bulk Copy Operations | 492 |
| 9.3.2 Multiple Active Result Sets and Asynchronous Operations | 493 |
| 9.3.3 Batch processing | 494 |
| 9.3.4 Paging | 495 |
| 9.3.5 ObjectSpaces | 495 |
| 9.4 New Features in ASP.NET | 497 |
| 9.4.1 Master Pages | 497 |
| 9.4.2 Navigation with Site Maps | 498 |
| 9.4.3 Themes and Skins | 499 |
| 9.4.4 Personalization | 501 |
| 9.4.5 Authentication and Membership Management | 502 |
| 9.4.6 New Controls for Database Access | 505 |
| 9.5 New Features for Web Services | 509 |
| 9.5.1 What is Indigo? | 509 |
| 9.5.2 Indigo Architecture | 510 |
| 9.5.3 Indigo Web Service Example | 512 |
| 9.5.4 Security | 515 |
| 9.5.5 Reliability and Durability | 515 |
| 9.5.6 Transactions | 516 |
| | |
| References | 517 |
| | |
| Index | 525 |