Pro Spring 2.5

Jan Machacek, Aleksa Vukotic, Anirvan Chakraborty, and Jessica Ditt
To Marc, who still thinks that beans grow on trees
—Jan

To my parents, Andja and Slobodan, who have guided me through life and encouraged me to follow my own path
—Aleksa

To my parents, Sujata and Kalyan, for their unconditional love and support
—Anirvan

To Ioannis, for the vital nudges when I needed them most (and so much more), and to my family, just for being my family
—Jessica
Contents at a Glance

Foreword ...................................................... xxix
About the Authors .................................................. xxiii
About the Technical Reviewer .......................... xxiv
Acknowledgments .................................................. xxv
Introduction ....................................................... xxvii

PART 1 ─ Getting Started with Spring

CHAPTER 1  Introducing Spring .................................................. 3
CHAPTER 2  Getting Started .................................................. 13
CHAPTER 3  Introducing Inversion of Control .................................. 31
CHAPTER 4  Beyond the Basics .................................................. 73
CHAPTER 5  Introducing Spring AOP ........................................ 147
CHAPTER 6  Advanced AOP .................................................. 199
CHAPTER 7  Spring Schemas and Namespaces .............................. 259
CHAPTER 8  Spring Patterns .................................................. 279

PART 2 ─ Data Access

CHAPTER 9  JDBC Support .................................................. 319
CHAPTER 10  iBATIS Integration ........................................ 373
CHAPTER 11  Hibernate Support ........................................ 399

PART 3 ─ Enterprise Application Components

CHAPTER 12  Job Scheduling with Spring .................................. 445
CHAPTER 13  Mail Support in Spring ...................................... 477
CHAPTER 14  Dynamic Languages ......................................... 511
PART 4  ■  Java EE 5

CHAPTER 15  Using Spring Remoting...................................................... 533
CHAPTER 16  Transaction Management............................................... 575
CHAPTER 17  Web Applications with Spring MVC.................................. 611
CHAPTER 18  Spring Web Flow.......................................................... 711
CHAPTER 19  Spring and AJAX............................................................ 757
CHAPTER 20  JMX with Spring............................................................. 771
CHAPTER 21  Testing with Spring.......................................................... 793
CHAPTER 22  Spring Performance Tuning............................................... 829

INDEX..................................................................................................... 857
Contents

Foreword ................................................................. xxii
About the Authors ................................................... xxiii
About the Technical Reviewer ................................. xxiv
Acknowledgments ..................................................... xxv
Introduction .......................................................... xxvii

PART 1 ■ ■ ■ Getting Started with Spring

CHAPTER 1 Introducing Spring ...................................... 3
What Is Spring? ....................................................... 3
Beyond Dependency Injection .............................. 6
Aspect-Oriented Programming with Spring ............ 6
Accessing Data in Spring ........................................ 6
Simplifying and Integrating with Java EE ............. 7
Job Scheduling Support ............................................ 7
Mail Support ........................................................ 7
Dynamic Languages ................................................ 8
Remoting Support .................................................. 8
Managing Transactions .......................................... 8
The Spring MVC Framework ................................. 9
Spring Web Flow .................................................. 9
AJAX ................................................................. 9
Internationalization ............................................... 9
Simplified Exception Handling .............................. 9
The Spring Project ................................................ 10
Origins of Spring .................................................. 10
The Spring Community .......................................... 10
Spring for Microsoft .NET .................................. 10
The Spring IDE ..................................................... 11
The Spring Security (Formerly Acegi) ................... 11
Alternatives to Spring ............................................ 11
The Sample Code .................................................. 12
Summary ........................................................... 12
## CONTENTS

### CHAPTER 2  Getting Started  

Obtaining the Spring Framework ................................................................. 13  
Checking Out Spring from CVS ................................................................. 13  
Building Spring from Source Code ......................................................... 14  
Verifying Your Spring Distribution ......................................................... 15  
Spring Packaging ....................................................................................... 15  
Spring Dependencies .................................................................................. 17  
Spring Sample Applications ....................................................................... 20  
Setting Up Spring and Your IDE ............................................................... 21  
Hello, World ............................................................................................... 24  
Putting Spring Into “Hello, World” ............................................................ 27  
Dependency Injection .................................................................................. 28  
The Impact of Spring .................................................................................. 30  
Summary ...................................................................................................... 30

### CHAPTER 3  Introducing Inversion of Control  

IoC and DI ..................................................................................................... 31  
Types of IoC .................................................................................................. 32  
  - Contextualized Dependency Lookup .................................................. 33  
  - Constructor DI ....................................................................................... 35  
  - Setter DI ............................................................................................... 36  
  - Injection vs. Lookup ............................................................................. 37  
  - Setter Injection vs. Constructor Injection ........................................... 38  
IoC in Spring ............................................................................................... 39  
DI with Spring ............................................................................................. 39  
  - Beans and BeanFactories .................................................................... 40  
  - BeanFactory Implementations ............................................................. 40  
  - XML Bean Definition .......................................................................... 41  
  - Using Constructor Injection .................................................................. 43  
  - Injection Parameters ............................................................................ 46  
Understanding Bean Naming ................................................................. 56  
Bean Instantiation Modes ......................................................................... 59  
Resolving Dependencies .......................................................................... 62  
Automatically Wiring Your Beans ............................................................. 65  
Checking Dependencies ........................................................................... 68  
Bean Inheritance ....................................................................................... 70  
Summary ...................................................................................................... 72
CHAPTER 4  Beyond the Basics .......................................................... 73

Spring’s Impact on Application Portability ........................................... 74
Bean Life Cycle Management .............................................................. 74
Hooking into Bean Creation ............................................................... 75
Hooking into Bean Destruction .......................................................... 82
Making Your Beans Spring Aware ....................................................... 87
Using the BeanNameAware Interface .................................................. 87
Using the BeanFactoryAware Interface .............................................. 89
Using Method Injection ........................................................................ 91
Lookup Method Injection .................................................................... 91
Method Replacement ........................................................................... 96
Using FactoryBean ............................................................................. 100
The MessageDigestFactoryBean ......................................................... 100
Accessing a FactoryBean Directly ....................................................... 102
The BeanFactoryPostProcessor .......................................................... 103
Implementing a BeanFactoryPostProcessor ....................................... 106
JavaBeans PropertyEditor ................................................................. 110
The Built-in PropertyEditors .............................................................. 110
Creating a Custom PropertyEditor ..................................................... 113
The BeanPostProcessor ..................................................................... 118
Implementing a BeanPostProcessor ................................................... 120
When to Use BeanPostProcessor ....................................................... 124
The Spring ApplicationContext ............................................................ 125
Implementations of ApplicationContext .............................................. 126
Using ApplicationContextAware .......................................................... 126
Controlling Bean Initialization ............................................................ 127
Using Annotation-Based Configuration .............................................. 129
Internationalization with MessageSource ........................................ 133
Using MessageSource in Stand-Alone Applications ............................. 141
The MessageSourceResolvable Interface .......................................... 141
Using Application Events .................................................................. 141
Considerations for Event Usage ......................................................... 143
Accessing Resources ......................................................................... 144
Summary ......................................................................................... 145

CHAPTER 5  Introducing Spring AOP ....................................................... 147

AOP Concepts .................................................................................... 148
Types of AOP .................................................................................... 149
Static AOP ......................................................................................... 149
Dynamic AOP .................................................................................... 149
Choosing an AOP Type ..................................................................... 149
AOP in Spring ................................................................. 149
   The AOP Alliance ......................................................... 150
   “Hello, World” in AOP ................................................... 150
   Spring AOP Architecture .............................................. 152
   The ProxyFactory Class .............................................. 153
   Creating Advice in Spring ............................................ 153
Advisors and Pointcuts in Spring ......................................... 169
   The Pointcut Interface .................................................. 170
   Using ComposablePointcut .......................................... 187
   Pointcutting Summary ................................................. 191
All About Proxies ................................................................ 191
   Understanding Proxies .................................................. 192
   Using JDK Dynamic Proxies .......................................... 192
   Using CGLIB Proxies .................................................... 192
   Comparing Proxy Performance ...................................... 193
   Which Proxy to Use? ...................................................... 196
Summary ............................................................................. 196

CHAPTER 6  Advanced AOP .................................................... 199
   @AspectJ ................................................................. 199
   @AspectJ Aspects in Detail ............................................. 203
      Pointcuts ................................................................. 203
      Pointcut Expressions ............................................... 207
      Exploring the Pointcut Expressions ............................... 208
      Using the @Pointcuts in XML ....................................... 211
      Types of Advice ...................................................... 212
      Argument Binding .................................................... 220
      Introductions .......................................................... 221
      The Aspect Life Cycle ............................................... 227
Framework Services for AOP ............................................... 228
   Creating Our First Aspect Using the aop Namespace .............. 229
   Pointcuts in the aop Namespace ...................................... 230
   Creating Advice Using the aop Namespace .......................... 231
   Introductions in the aop Namespace .................................. 237
Which Style Should You Use? ............................................... 240
Working with Spring AOP Proxies ......................................... 241
   Impact of Proxies ........................................................ 242
AspectJ Integration .......................................................... 246
   Creating Your First AspectJ Aspect .................................. 247
   Compiling the Sample Application .................................... 249
   AspectJ’s Aspect Scope ................................................ 251
PART 2  Data Access

CHAPTER 9  JDBC Support  ......................................................... 319

Key JDBC Concepts .......................................................... 319
  Using the DriverManager and Connections ...................... 322
  Using PreparedStatements ............................................. 323
  Using CallableStatements .............................................. 326
  Other JDBC Concepts .................................................... 327
Concepts in Spring Data Access Support .......................... 327
JDBC Data Access Support ................................................. 328
Using the JdbcTemplate ..................................................... 329
  JdbcTemplate.execute .................................................. 330
  JdbcTemplate.query and Friends .................................... 334
  JdbcTemplate.update .................................................... 339
  JdbcTemplate.batchUpdate .......................................... 340
RdbmsOperation Subclasses ............................................. 342
  SqlUpdate .............................................................. 343
  BatchSqlUpdate ....................................................... 348
  SqlCall and StoredProcedure ....................................... 349
  SqlQuery and Its Subclasses ...................................... 351
  JdbcTemplate or RdbmsOperation? ................................. 358
Large Binary Objects ...................................................... 358
JdbcTemplate  ............................................................ 361
Simple Spring JDBC ......................................................... 364
  SimpleJdbcTemplate ................................................... 365
  SimpleJdbcCall ........................................................ 367
  SimpleJdbcInsert ..................................................... 369
  SimpleJdbcDaoSupport .............................................. 370
Summary ................................................................. 371

CHAPTER 10  iBATIS Integration ............................................. 373

What is iBATIS? .............................................................. 373
  iBATIS Versions ....................................................... 374
  Infrastructure and Configuration ................................. 374
Mapping Files .............................................................. 375
  sqlMap Files ........................................................... 376
  Configuring iBATIS and Spring ................................. 378
Selecting Data .................................................. 380
  Simple Selects ............................................. 380
  One-to-One Selects ..................................... 384
  One-to-Many Selects .................................. 388
  Many-to-Many Selects ................................. 390
Updating Data .................................................. 391
Deleting Data .................................................. 393
Inserting Data ............................................... 394
What's Missing from iBATIS? ......................... 397
Overall Performance ................................. 397
Summary .................................................. 398

CHAPTER 11  Hibernate Support ................................. 399
  Hibernate Primer ........................................... 399
  Packaging .................................................... 400
  Introduction to Hibernate Support .................. 401
    Using Hibernate Sessions ........................ 403
    Using HibernateDaoSupport ..................... 407
    Deciding Between HibernateTemplate and Session .................................................................. 409
  Using Hibernate in Enterprise Applications .... 413
    Preventing Stale Data Updates .................... 413
    Object Equality ........................................ 416
    Transactional Behavior .................................. 419
    Lazy Loading ............................................. 424
    Dealing with Large Data Sets .................... 435
    Handling Large Objects ......................... 437
    Combining Hibernate with Other DAO Code 441
Summary .................................................. 441

PART 3  Enterprise Application Components

CHAPTER 12  Job Scheduling with Spring ................. 445
  Scheduling Jobs Using JDK Timer .................... 446
    Trigger Types with Timer .......................... 446
    Creating a Simple Job .................................. 447
    Spring Support for JDK Timer Scheduling .... 449
  Scheduling Jobs Using OpenSymphony Quartz .... 455
    Introducing Quartz ................................. 455
    Quartz Support in Spring ....................... 464
CHAPTER 13 Mail Support in Spring .................................................. 477
The Spring Mail API Structure ..................................................... 479
Configuring Mail Settings Using Spring ........................................ 479
Sending Simple E-mails .............................................................. 479
Constructing and Sending E-mail Programmatically ................. 479
Constructing E-mail Declaratively ............................................. 482
Constructing and Sending MIME Messages ............................... 485
Insight into Enterprise-Level E-mail Handling ......................... 500
Summary .................................................................................. 509

CHAPTER 14 Dynamic Languages ............................................... 511
Supported Languages Primer ..................................................... 511
BeanShell .............................................................................. 511
Groovy .................................................................................. 513
JRuby ................................................................................... 514
Using Dynamic Languages As Spring Beans ......................... 515
Behind the Scenes of Dynamic Language Support .................. 517
Proxying Dynamic Language Beans ........................................ 518
Performance ......................................................................... 519
Refreshable Beans .................................................................. 521
BeanShell Beans ................................................................ 523
JRuby Beans ........................................................................ 525
Groovy Beans ...................................................................... 526
Typical Usage for Dynamic Languages in Spring Applications .... 526
Summary ................................................................................ 530

PART 4 Java EE 5

CHAPTER 15 Using Spring Remoting ............................................ 533
Spring Remoting Architecture .................................................... 535
Remote Method Invocation ......................................................... 535
Exposing Arbitrary Services ...................................................... 536
Accessing an RMI Service Using Proxies ................................. 538
Exposing CORBA Services ....................................................... 540
Accessing a CORBA Service ..................................................... 543
Web Services with JAX-RPC ........................................ 544
  Introducing Apache Axis ........................................ 545
  Creating a Web Service with ServletEndpointSupport ........ 545
  Accessing RPC-Style Web Services using Proxies .............. 549
  Working with JavaBeans in Axis Services ....................... 552
Using JAX-WS Web Services ........................................ 556
  Exposing Web Services Using SimpleJaxWsServiceExporter ...... 556
  Exposing a Web Service Using XFire ............................. 557
  Accessing JAX-WS Web Services .................................. 559
  Accessing Java Web Services from Other Clients ............... 560
Creating Web Services with HTTP Invoker ......................... 563
  Exposing Simple Services ...................................... 564
  Accessing an HTTP Invoker Service Using Proxies ............. 567
  Using Arbitrary Objects in HTTP Invoker Services ............ 567
  Using HTTP Basic Authentication ................................ 569
Choosing a Remoting Architecture ................................. 573
Summary .................................................................... 574

**CHAPTER 16**  
**Transaction Management** ........................................ 575
Exploring the Spring Transaction Abstraction Layer .............. 575
Analyzing Transaction Properties ................................... 576
    Exploring the TransactionDefinition Interface ............... 576
    Using the TransactionStatus Interface ....................... 578
    Implementations of the PlatformTransactionManager ........ 579
Exploring a Transaction Management Sample ....................... 579
    Nontransactional Code ........................................... 580
Programmatic Transaction Management ............................... 588
    Using the TransactionTemplate Class ......................... 590
    Programmatic Transaction Management Summary ............ 591
Declarative Transaction Management ................................ 591
    Using the TransactionProxyFactoryBean ...................... 591
    Implications of Using Proxies in Transaction Management .. 593
AOP Transaction Management ......................................... 594
    Using Annotation-Based AOP Transaction Management ...... 594
    Using XML AOP Transaction Management ........................ 596
Working with Transactions Over Multiple Transactional Resources 599
Implementing Your Own Transaction Synchronization ............ 601
Summary .................................................................... 610
CHAPTER 17  Web Applications with Spring MVC  

MVC Architecture .................................................. 611
Spring MVC .......................................................... 613
  MVC Implementation ............................................... 613
Using Handler Mappings .......................................... 614
Spring Controllers .................................................. 616
  AbstractController ............................................... 616
  ParameterizableViewController ............................... 617
  MultiActionController ........................................ 618
Interceptors ....................................................... 621
Views, Locales, and Themes ...................................... 622
  Using Views Programmatically ................................ 622
  Using View Resolvers .......................................... 625
  Using Localized Messages ..................................... 629
  Using Locales ................................................... 630
  Using Themes .................................................... 630
Command Controllers ............................................ 633
  Using Form Controllers ........................................ 633
  Exploring the AbstractWizardFormController ............ 640
File Upload .................. Web Applications with Spring MVC
Handling Exceptions ............................................... 647
Spring and Other Web Technologies ......................... 650
  Using JSP ......................................................... 651
  Using Velocity .................................................. 669
  FreeMarker ....................................................... 674
  Using XSLT Views ............................................... 678
  Using PDF Views ................................................ 680
  Using Excel Views ............................................... 682
  Using Tiles ....................................................... 684
  JasperReports .................................................... 696
Spring Conventions Over Configuration .................... 701
  Controller Conventions ........................................ 701
  MultiActionController Conventions ......................... 702
  Model Conventions ............................................. 703
  View Conventions ............................................... 704
Using Annotations for Controller Configuration ............ 705
  @Controller ...................................................... 705
  @RequestMapping ................................................ 706
  @RequestParam .................................................. 707
  @ModelAttribute ................................................ 707
Using Annotations with the Command Controller ............ 708
Summary ........................................................... 709
CHAPTER 18  Spring Web Flow

Introducing Spring Web Flow .......................... 712
  Core Concepts ........................................ 713
  Obtaining Spring Web Flow .......................... 716
  Spring Web Flow Dependencies ......................... 718
Hello, Web Flow! ........................................ 719
Exploring States .......................................... 723
  View State ............................................ 724
  Decision State ........................................ 724
  End State ............................................. 725
Working with Transitions ................................. 725
Advanced Concepts ....................................... 727
  Expression Languages and Scopes ...................... 727
  Implementing Actions ................................. 731
  Model Data Binding .................................. 732
  Partial Rendering of Views ........................... 736
  Mapping Flow Input and Output Parameters ........... 736
  Using Subflows ...................................... 737
Spring Web Flow Behind the Scenes ...................... 738
  Flow Execution Architecture ......................... 739
  Flow Executor ........................................ 741
  Flow Definition Registry ............................ 742
  Flow Execution Repository ........................... 745
Integration with Spring MVC ............................. 746
  Flow Handling ....................................... 746
  View Resolving ...................................... 747
Securing Flows with Spring Security ...................... 747
  Step 1: Adding the SecurityFlowExecutionListener .. 748
  Step 2: Basic Authentication and Authorization Handling . 748
  Step 3: Defining Security Rules in Flow Definitions .... 750
Problem Solver .......................................... 752
  Stateful Navigational Control ....................... 753
  Browser Navigation Bar Support and Double Submit ... 753
Testing Flow Definitions ................................ 753
Summary .............................................. 754
CHAPTER 19  Spring and AJAX ........................................... 757
  DWR .............................................................. 758
  Installing DWR ................................................. 758
  Spring Configuration for DWR ................................. 758
  About the Complete Example ................................ 760
  Testing the DWR Configuration .............................. 764
  Running the Complete Example ............................. 765
  DWR Scripting Basics ......................................... 766
    Using Simple Callback Functions .......................... 766
    Calling Metadata Objects ................................ 767
  engine.js ...................................................... 767
  Call Batching ................................................ 767
  Call Ordering ............................................... 768
  Handling Errors and Warnings .............................. 768
  util.js ......................................................... 768
  Security in DWR .............................................. 768
  Advantages and Disadvantages of DWR ..................... 770
  Summary ....................................................... 770

CHAPTER 20  JMX with Spring ........................................ 771
  JMX Refresher ................................................ 771
  Exposing Your Beans ......................................... 772
    MBeanExporter ............................................. 772
    MBeanServerFactoryBean ................................ 774
  Exposing Your Beans in an Existing MBean Server ....... 775
  Bean Registration Behavior ................................ 776
  Controlling Object Names .................................. 776
  Controlling the Management Interface ..................... 777
    MBeanInfoAssembler Interface ............................ 777
    MethodNameBasedMBeanInfoAssembler Interface ....... 777
  Using Java Interfaces to Control the Management Interface .... 780
  Using Source-Level Metadata ................................ 782
  Remoting with Spring JMX ................................... 785
    Exposing Remote MBeans ................................ 785
    Accessing Remote MBeans ................................ 786
    Proxying MBeans .......................................... 786
  Notifications in Spring JMX ................................ 787
    Notification Listeners .................................... 787
    Publishing Notifications .................................. 788
  Summary ....................................................... 792
It was with a heavy heart that I made the decision not to participate in writing *Pro Spring 2.5*. I am deeply thankful that Jan was around to pick up this book and run with it. *Pro Spring* has been a big part of my life for over three years, and I didn't relinquish the reins lightly. When Juergen and I set out working on Spring Framework 2.0, I knew that I wouldn't have the time to participate in the writing process and write the software at the same time. Fortunately, Jan was there to step into the breach.

Jan and Apress had additionally planned to release *Pro Spring 2.0*, but Juergen and I inadvertently made it impossible for them to keep up by making many changes to the Spring Framework. I vividly remember cringing when updating all the JSP form tags, knowing that I was creating yet more work for Jan.

With the 2.5 release just on the horizon, Jan made the sensible choice to forego a 2.0 edition and head straight for 2.5. This was a wise move. The Spring Framework 2.5 release reflects the state of the art in both the Spring Framework and in enterprise Java frameworks as a whole. A guide book to this critical tool is necessary reading for any conscientious Java developer.

I recall, back in the early days of running Cake Solutions, when we decided we needed to hire another programmer. We were very inexperienced at hiring in general, and hiring programmers is fraught with problems. We knew that we wanted to get a graduate, but we never imagined that we would get someone as accomplished as Jan.

I remember, in his first week, he wrote a complete desktop mailing package from scratch—and it worked. Over the last five years, Jan has been at the center of most of the projects run at Cake, many of which are large-scale Java products based on the Spring Framework. His knowledge of Spring comes from an immense amount of practical experience: he has been in the trenches with Spring since version 1.0 and has delivered successful systems on top of it.

To his credit, Jan realized that writing *Pro Spring 2.5* was too big a job for just one man, so he roped in the rest of the Cake Solutions team to help him. This prospect excited me greatly—a team of real programmers, with real experience in Spring, passing along that knowledge. There is no doubt that many will find this book to be an indispensable reference.

And so, although I am disappointed at being unable to work on this book myself, I am glad that Jan was there to deliver what so many people have been asking for, an updated version of *Pro Spring*. Enjoy.

Rob Harrop

*Principal Software Engineer and Lead Engineer of the SpringSource Application Platform*
About the Authors

**JAN MACHACEK** is the chief software architect at Cake Solutions, which places him at the center of all architectural decisions in all projects. Apart from the architecture, Jan is often called on to help with some of the most complex and challenging areas of the implementation. Since joining Cake, Jan has proven his expertise in Java not only by taking on a wide variety of complex projects but also through his collection of published works. In his free time, Jan is a keen cyclist and a member of the Manchester Wheelers’ Club. He tries his best in various time trials and road races.

Jan authored Chapters 1–4, 6, 9, 11, 14, 16, and 22.

**ALEKSA VUKOTIC** is a software architect at Cake Solutions. He oversees the architecture as well as the implementation of most of Cake's projects. He has extensive experience with most Java EE technologies, particularly Spring MVC and Security. He also has the knack, which means he can solve virtually any technical problem. He is an excellent tutor and is in charge of directing a team of Cake Solutions developers, helping the team in solving the most complex problems. As well as his interest in Java and .NET platforms, Aleksa enjoys sports, music, and nights out. Aleksa works with Jan on all of the major projects at Cake Solutions.

Alekza authored Chapters 5, 8, 10, 15, 17, and 21.

**ANIRVAN CHAKRABORTY** is a senior developer at Cake Solutions. His extensive experience with the Spring Framework and attention to detail puts him in charge of the implementation of some of the challenging aspects of Cake Solutions’s projects. Anirvan takes great pride in his code and always makes sure the code can be used as an example to others. When he does not have his head buried in Java EE and Linux, he enjoys good food and drink with his friends. He is also an ardent follower of the sport of cricket and enjoys reading detective novels.

Anirvan authored Chapters 7, 13, 19, and 20.

**JESSICA DITT** has been a developer at London-based Avenue A | Razorfish since early 2008. Prior to that, she was part of the Cake Solutions team for 2.5 years. She has been working on numerous enterprise-level projects, all of which were written using the Spring Framework and Spring Web Flow. Jessica has acquired significant expertise in efficient indexing using Lucene and has efficiently addressed Java EE application scalability issues using Gigaspaces. Out of the office, Jessica is a keen volleyball player and enjoys spending time in the gym.

Jessica authored Chapters 12 and 18.
About the Technical Reviewer

**RICK EVANS** is an independent contractor based in the UK with many years of experience working in the health, financial, and retail sectors. Over the years, Rick has committed to a number of open source projects, including Spring and Spring.NET. A polished teacher and mentor, Rick often speaks professionally about technology and delivers training on a wide range of enterprise technologies and disciplines.
Acknowledgments

When writing a book, a substantial amount of work goes on behind the scenes, and authors are backed by an excellent team of editors, proofreaders, and technical reviewers. This book was no exception, and we would like to thank everyone who worked on the book. Our thanks goes to Rick, the technical reviewer, who has done enormous amounts of work to ensure that this book is of the highest quality. The great editorial team at Apress also deserves our thanks: most importantly, Sofia Marchant; our editor, Tom Welsh; Heather Lang; Kelly Winquist; and many others. Without their help, we would not have been able to complete this book. I would also like to thank Rob Harrop for agreeing to write the Foreword. Finally, we all wish to thank the managing director of Cake Solutions, Guy Remond; he gave some of Cake Solutions’s time to us to work on the book.
Introduction

Recently, the Java world has witnessed a dramatic shift away from so-called “heavyweight” architectures such as Enterprise JavaBeans (EJB) toward lighter weight frameworks such as Spring. Complex and container-dependent services, such as CMP and transaction management systems have been replaced with simpler alternatives such as Hibernate and aspect-oriented programming (AOP). At the core, Spring provides a comprehensive, lightweight container based on the principle of Inversion of Control (IoC), on which you can build your own applications. On top of this container, Spring provides a myriad of useful services, bringing together a large range of highly competent open source projects into a single cohesive framework.

The quality of the Spring Framework has seen it replacing traditional Java EE architectures in many cases; as a result, more and more developers see the need for comprehensive Spring skills. Despite Spring having quite an extensive suite of documentation and examples, we feel that many developers are still struggling to understand how to use Spring and, more importantly, how to use it effectively. Because of this, we decided to write a new edition of *Pro Spring*.

At first, we thought we would just update a few chapters and call it *Pro Spring 2.5*. However, we quickly realized that Spring 2.5 brought so many new features and improvements that, although we kept the old *Pro Spring* name, this is a completely new book.

Through this book, you will learn how to use Spring to build better web and stand-alone applications and how to sift through the many choices available to you through the framework. Our aim is to provide you with all the knowledge you need to use Spring effectively in your own applications and to give you insight into what is happening behind the scenes in Spring.

For example, you will

- Learn the fundamentals of IoC in the context of AOP.
- Become aware of the seamlessness and power of Spring by referencing the easy-to-understand sample applications we provide.
- Learn how to replace common EJB features with Spring alternatives, including Spring’s comprehensive AOP-based transaction management framework.
- Effectively manage your Spring components and applications using Spring’s built-in JMX engine.
- Learn how to add scheduling to your Spring application with Quartz.

After reading this book, you will be equipped with all the knowledge you need to build applications effectively using Spring and its related open source projects.