COMPANION WEBSITE

WRITTEN BY
ADAM JORGENSEN
JORGE SEGARRA
PATRICK LEBLANC
JOSE CHINCHILLA
AARON NELSON

Microsoft® SQL Server® 2012 BIBLE

THE COMPREHENSIVE, TUTORIAL RESOURCE

MASTER NEW SQL SERVER AND BI SUITE FEATURES | DEVELOP SCALABLE AND FLEXIBLE DATABASES | SAFEGUARD MISSION-CRITICAL APPS AND DATA

Microsoft®
SQL Server® 2012
Bible

Microsoft® SQL Server® 2012 BIBLE

Adam Jorgensen
Patrick LeBlanc
Jose Chinchilla
Jorge Segarra
Aaron Nelson

John Wiley & Sons, Inc.

Microsoft® SQL Server® 2012 Bible

Published by
John Wiley & Sons, Inc.
10475 Crosspoint Boulevard
Indianapolis, IN 46256
www.wiley.com

Copyright © 2012 by John Wiley & Sons, Inc., Indianapolis, Indiana

Published simultaneously in Canada

ISBN: 978-1-118-10687-7

ISBN: 978-1-118-28217-5 (ebk)

ISBN: 978-1-118-28386-8 (ebk)

ISBN: 978-1-118-28682-1 (ebk)

Manufactured in the United States of America

10 9 8 7 6 5 4 3 2 1

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 Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at http://www.wiley.com/go/permissions.

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 WEB SITE 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 United States at (877) 762-2974, outside the United States at (317) 572-3993 or fax (317) 572-4002.

Wiley also publishes its books in a variety of electronic formats and by print-on-demand. Not all content that is available in standard print versions of this book may appear or be packaged in all book formats. If you have purchased a version of this book that did not include media that is referenced by or accompanies a standard print version, you may request this media by visiting http://booksupport.wiley.com. For more information about Wiley products, visit us at www.wiley.com.

Library of Congress Control Number: 2012941788

Trademarks: Wiley and the Wiley logo 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. Microsoft and SQL Server are registered trademarks of Microsoft Corporation. All other trademarks are the property of their respective owners. John Wiley & Sons, Inc. is not associated with any product or vendor mentioned in this book.

This book is dedicated to my Lord and Savior, Jesus Christ, who has blessed me with a family and fiancé, who are always my biggest supporters.
-- Adam Jorgensen

To my precious wife, Madeline, for her unconditional love and support for my career and passion for SQL Server and Business Intelligence technologies. To my two princesses, Sofia and Stephanie, for making me understand everyday how beautiful and fun life is.
-- Jose Chinchilla

To my wife, Jessica, whose love, patience, and abundant supply of caffeine helped make this book a reality.
-- Jorge Segarra

About the Authors

Adam Jorgensen (www.adamjorgensen.com), lead author for this edition of the SQL Server 2012 Bible, is the president of Pragmatic Works Consulting (www.pragmaticworks.com); a director for the Professional Association of SQL Server (PASS) (www.sqlpass.org); a SQL Server MVP; and a well-known speaker, author, and executive mentor. His focus is on helping companies realize their full potential by using their data in ways they may not have previously imagined. Adam is involved in the community, delivering more than 75 community sessions per year. He is based in Jacksonville, FL, and has written and contributed to five previous books on SQL Server, analytics, and SharePoint. Adam rewrote or updated the following chapters: 1, 53, 54, and 57.

Jose Chinchilla is a Microsoft Certified Professional with dual MCITP certifications on SQL Server Database Administration and Business Intelligence Development. His career focus has been in Database Modeling, Data Warehouse and ETL Architecture, OLAP Cube Development, Master Data Management, and Data Quality Frameworks. He is the founder and CEO of Agile Bay, Inc., and serves as president of the Tampa Bay Business Intelligence User Group. Jose is a frequent speaker, avid networker, syndicated blogger (www.sqljoe.com), and social networker and can be reached via twitter under the @SQLJoe handle or LinkedIn at www.linkedin.com/in/josechinchilla. He rewrote or updated the following chapters: 3, 24, 25, 29, 32, 33, 43, 58, and 59.

Patrick LeBlanc, former SQL Server MVP, is currently a SQL Server and BI Technical Specialist for Microsoft. He has worked as a SQL Server DBA for the past 9 years. His experience includes working in the educational, advertising, mortgage, medical, and financial industries. He is also the founder of TSQLScripts.com, SQLLunch.com, and the president of the Baton Rouge Area SQL Server User Group. Patrick rewrote or updated the following chapters: 6, 7, 8, 10, 11, 12, 28, 48, 49, and 51.

Aaron Nelson is a SQL Server Architect with more than 10 years' experience in architecture, Business Intelligence, development, and performance tuning. He has the distinction of being a second-generation DBA, having learned the family business at his father's knee. Aaron is the chapter leader for the PowerShell Virtual Chapter of PASS and volunteers for Atlanta MDF, the Atlanta PowerShell User Group, and SQL Saturday. He blogs at http://sqlvariant.com and can be found on Twitter as @SQLvariant. He loves walking on the beach, winding people up, and falling out of kayaks with his beautiful daughter, Dorothy. When Aaron is not busy traveling to PASS or Microsoft events, he can usually be found somewhere near Atlanta, GA. Aaron rewrote or updated the following chapters: 9, 30, 36, 37, 38, 41, and 42.

Jorge Segarra is currently a DBA consultant for Pragmatic Works and a SQL Server MVP. He also authored *SQL Server 2008 Pro Policy-Based Management* (APress, 2010). Jorge has been an active member of the SQL Server community for the last few years and is a regular presenter at events such as webinars, user groups, SQLSaturdays, SQLRally, and PASS Summit. He founded SQL University, a free community-based resource aimed at teaching people SQL Server from the ground up. SQL University can be found online at `http://sqluniversity.org`. Jorge also blogs at his own site `http://sqlchicken.com` and can be found on Twitter as @sqlchicken. He rewrote or updated the following chapters: 4, 5, 19, 20, 21, 22, 23, 26, 27, and 50.

About the Contributors

Tim Chapman is a Dedicated Support Engineer in Premier Field Engineering at Microsoft where he specializes in database architecture and performance tuning. Before coming to Microsoft, Tim Chapman was a database architect for a large financial institution and a consultant for many years. Tim enjoys blogging, teaching and speaking at PASS events, and participated in writing the second SQL Server MVP Deep Dives book. Tim graduated with a bachelor's degree in Information Systems from Indiana University. Tim rewrote or updated chapters 39, 40, 44, 45, 46, and 47.

Audrey Hammonds is a database developer, blogger, presenter, and writer. Fifteen years ago, she volunteered to join a newly formed database team so that she could stop writing COBOL. (And she never wrote COBOL again.) Audrey is convinced that the world would be a better place if people would stop, relax, enjoy the view, and normalize their data. She's the wife of Jeremy; mom of Chase and Gavin; and adoptive mother to her cats, Bela, Elmindreda, and Aviendha. She blogs at `http://datachix.com` and is based in Atlanta, Georgia. Audrey rewrote or updated the following chapters: 2, 16, 17, and 18.

Scott Klein is a Technical Evangelist for Microsoft, focusing on Windows Azure SQL Database (formerly known as SQL Azure). He has over 20 years working with SQL Server, and he caught the cloud vision when he was introduced to the Azure platform. Scott's background includes co-owning an Azure consulting business and providing consulting services to companies large and small. He speaks frequently at conferences world-wide as well as community events, such as SQL Saturday events and local user groups. Scott has authored a half-dozen books for both Wrox and APress, and co-authored the book *Professional SQL Azure* (APress, 2010). Scott is also the founder of the South Florida Geek Golf charity golf tournament, which has helped raise thousands of dollars for charities across South Florida, even though he can't play golf at all. As much as he loves SQL Server and Windows Azure, Scott also enjoys spending time with his family and looks forward to getting back to real camping in the Pacific Northwest. Scott rewrote or updated the following chapters: 13, 14, 15, and 31.

David Liebman is a developer specializing in .Net, SQL, and SSRS development for more than 5 of the 18 years he has spent in the IT industry, working for some big companies in financial, healthcare, and insurance sectors. Dave has written some custom reporting solutions and web applications for large companies in the Tampa Bay area using .NET, SSRS, and SQL. He is currently a senior developer at AgileThought located in Tampa, FL. Dave rewrote or updated the content in the following chapters: 34 and 35.

Julie Smith has spent the last 12 years moving data using various tools, mostly with SQL Server 2000–2012. She is an MCTS in SQL Server 2008 BI, and a Business Intelligence Consultant at Innovative Architects in Atlanta, GA. She is a co-founder of `http://Datachix.com`, where she can be reached. With the help of MGT (Mountain Dew, Gummy Bears, and Tic Tacs), she revised and updated the following chapters: 52, 55, and 56. She dedicates her effort on this book to her husband, Ken.

About the Technical Editors

Kathi Kellenberger is a Senior Consultant with Pragmatic Works. She enjoys speaking and writing about SQL Server and has worked with SQL Server since 1997. In her spare time, Kathi enjoys spending time with friends and family, running, and singing.

Bradley Schact is a consultant at Pragmatic Works in Jacksonville, FL and an author on the book *SharePoint 2010 Business Intelligence 24-Hour Trainer* (Wrox, 2012). Bradley has experience on many parts of the Microsoft BI platform. He frequently speaks at events like SQL Saturday, Code Camp, SQL Lunch, and SQL Server User Groups.

Mark Stacey founded Pragmatic Works South Africa, the first Pragmatic Works international franchise, and works tirelessly to cross the business/technical boundaries in Business Intelligence, working in both Sharepoint and SQL.

Credits

Executive Editor
Robert Elliott

Senior Project Editor
Ami Frank Sullivan

Technical Editors
Kathi Kellenberger
Wendy Pastrick
Mark Stacey
Bradley Schact

Production Editor
Kathleen Wisor

Copy Editor
Apostrophe Editing Services

Editorial Manager
Mary Beth Wakefield

Freelancer Editorial Manager
Rosemarie Graham

Associate Director of Marketing
David Mayhew

Marketing Manager
Ashley Zurcher

Business Manager
Amy Knies

Production Manager
Tim Tate

Vice President and Executive Group Publisher
Richard Swadley

Vice President and Executive Publisher
Neil Edde

Associate Publisher
Jim Minatel

Project Coordinator, Cover
Katie Crocker

Proofreader
Nancy Carrasco

Indexer
Robert Swanson

Cover Image
© Aleksandar Velasevic / iStockPhoto

Cover Designer
Ryan Sneed

Acknowledgments

From Adam Jorgensen:

Thank you to my team at Pragmatic Works, who are always a big part of any project like this and continue to give me the passion to see them through. I would also like to thank my furry children, Lady and Mac, for their "dogged" persistence in keeping me awake for late nights of writing. Thank you especially to the SQL Community; my fellow MVP's; and all of you who have attended a SQL Saturday, other PASS event, spoke at a user group, or just got involved. You are the reason we have such a vibrant community, the best in technology. Keep it up; your passion and curiosity drives all of us further every day.

I want to thank my incredible author and tech editing teams. This team of community experts and professionals worked very hard to take a great book and re-invent it in the spirit of the changing landscape that we are witnessing. There were so many new features, focuses, messages, and opportunities to change the way we think, do business, and provide insight that we needed an amazing team of folks. They put up with my cat herding and hit "most" of their deadlines. Their passion for the community is tremendous, and it shines throughout this book. Thank you all from the bottom of my heart. You readers are about to see why this book was such a labor of love! A special thanks to Bob and Ami over at Wiley for their support and effort in getting this title completed. What a great team!

From Jose Chinchilla:

Many thanks to the team that put together this book for keeping us in line with our due dates. Thanks to my lovely family for allowing me to borrow precious time from them in order to fulfill my writing and community commitments. I also want to thank Nicholas Cain for his expert contribution to the SQL Clustering Chapter and to Michael Wells for his SQL Server deployment automation PowerShell scripts that are part of his Codeplex project named SPADE.

From Aaron Nelson:

Thank you to my parents, Michael & Julia Nelson. Thanks to my daughter, Dorothy Nelson, for being patient during this project. Finally, thank you to my Atlanta SQL Community members that helped me make this happen: Audrey Hammonds, Julie Smith, Rob Volk, and Tim Radney.

From Jorge Segarra:

First and foremost I'd like to thank my wife. There's no way I would've been able to get through the long nights and weekends without her. To our amazing editors, Ami Sullivan and Robert Elliott, and the rest of the folks at Wrox/Wiley: Your tireless efforts and ability to herd A.D.D.-afflicted cats is astounding and appreciated. Thanks to Adam Jorgensen for giving me and the rest of this author team the opportunity to write on this title.

To my fellow authoring team, Adam Jorgensen, Patrick LeBlanc, Aaron Nelson, Julie Smith, Jose Chinchilla, Audrey Hammonds, Tim Chapman, and David Liebman: Thank you all for your tireless work and contributions. To the authors of the previous edition: Paul Nielsen, Mary Chipman, Scott Klein, Uttam Parui, Jacob Sebastian, Allen White, and Michael White — this book builds on the foundation you all laid down, so thank you.

One of the greatest things about being involved with SQL Server is the community around it. It really is a like a big family, a SQLFamily! I'd love to name everyone here I've met (and haven't met yet!) at events or online, but I'd run out of room. Special thanks to Pam Shaw for introducing me to the community and giving me my first speaking opportunity.

Finally, huge thanks to the folks at Microsoft for putting together such an amazing product! SQL Server has grown by leaps and bounds over the years and this release is by far the most exciting. In addition to the product team, special thanks to the SQL Server MVP community, of which I'm honored and privileged to be a part.

Contents

Introduction. xxix

Part I: Laying the Foundations 1

Chapter 1: The World of SQL Server 3

SQL Server History 3
SQL Server in the Database Market 4
SQL Server Components 5
Editions of SQL Server 2012 12
Notable SQL Server 2012 Enhancements 12
Summary 14

Chapter 2: Data Architecture 15

Information Architecture Principle 16
Database Objectives 17
Smart Database Design 22
Summary 29

Chapter 3: Installing SQL Server 31

Preparing the Server 32
Selecting the Edition 34
The Installation Process 42
Summary 69

Chapter 4: Client Connectivity 71

Enabling Server Connectivity 72
SQL Server Native Client Features 74
Summary 79

Chapter 5: SQL Server Management and Development Tools 81

Organizing the Interface 82
Registered Servers 86
Object Explorer 89
Using the Query Editor 99
Using the Solution Explorer 105
Getting a Jumpstart on Code with Templates and Code Snippets 106
Summary 106

Part II: Building Databases and Working with Data 109

Chapter 6: Introducing Basic Query Flow 111

Understanding Query Flow 112
FROM Clause Data Sources 117
WHERE Conditions 120
(0 row(s) affected)Columns, Stars, Aliases, and Expressions 129
Ordering the Result Set 131
Select Distinct 137
TOP () 138
Summary 142

Chapter 7: Relational Database Design and Creating the Physical Database Schema 143

Database Basics 143
Data Design Patterns 154
Normal Forms 164
Strategy Considerations 170
Summary 171

Chapter 8: Data Types, Expressions, and Scalar Functions 173

Data Types 173
Building Expressions 177
Scalar Functions 190
String Functions 197
Soundex Functions 203
Data-Type Conversion Functions 207
Server Environment Information 210
Summary 211

Chapter 9: Merging Data with Joins, Subqueries, and CTEs 213

Using Joins 215
Set Difference Queries 232
Using Unions 233
Subqueries 237
Summary 247

Chapter 10: Aggregating, Windowing, and Ranking Data 249

Aggregating Data 249
Grouping Within a Result Set 252
Windowing and Ranking 256
Ranking Functions 259
Summary 269

Chapter 11: Projecting Data Through Views 271

Why Use Views? 271
The Basic View 274

A Broader Point of View 279
Locking Down the View 284
Using SQL Synonyms 288
Summary 289

Chapter 12: Modifying Data In SQL Server 291

Inserting Data 292
Updating Data 302
Deleting Data 310
Merging Data 313
Returning Modified Data 318
Summary 321

Part III: Advanced T-SQL Data Types and Querying Techniques 323

Chapter 13: Working with Hierarchies 325

HierarchyID 326
HierarchyID Methods 331
Indexing Strategies 334
Hierarchical Data Alternatives 334
Summary 337

Chapter 14: Using XML Data 339

The XML Data Type 340
XML Data Type Methods 353
FOR XML 355
XQuery and FLWOR Operations 363
Summary 365

Chapter 15: Executing Distributed Queries 367

Distributed Query Overview 367
Developing Distributed Queries 377
Performance Consideration 383
Summary 386

Part IV: Programming with T-SQL 387

Chapter 16: Programming with T-SQL 389

Transact-SQL Fundamentals 390
Working with Variables 393
Procedural Flow 399
Examining SQL Server with Code 403
Temporary Tables and Table Variables 406
What's New in T-SQL for 2012 409
Error Handling 412

Bulk Operations 424
Summary 428

Chapter 17: Developing Stored Procedures 431

Managing Stored Procedures 432
Passing Data to Stored Procedures 437
Returning Data from Stored Procedures 444
Summary 451

Chapter 18: Building User-Defined Functions 453

Scalar Functions 455
Inline Table-Valued Functions 458
Multistatement Table-Valued Functions 462
Best Practices with User-Defined Functions 464
Summary 465

Part V: Enterprise Data Management 467

Chapter 19: Configuring SQL Server 469

Setting the Options 469
Configuration Options 477
Summary 529

Chapter 20: Policy Based Management 531

Defining Policies 532
Evaluating Policies 543
Summary 545

Chapter 21: Backup and Recovery Planning 547

Recovery Concepts 548
Recovery Models 549
Backing Up the Database 555
Working with the Transaction Log 563
Recovery Operations 568
System Databases Recovery 579
Performing a Complete Recovery 582
Summary 583

Chapter 22: Maintaining the Database 585

DBCC Commands 586
Managing Database Maintenance 604
Summary 614

Chapter 23: Transferring Databases 615

Copy Database Wizard 616
Working with SQL Script 620
Detaching and Attaching 624

Import and Export Wizard 627
Data-Tier Application (DAC) 630
Summary 632

Chapter 24: Database Snapshots 635

How Do Database Snapshots Work? 636
Using Database Snapshots 637
Summary 645

Chapter 25: Asynchronous Messaging with Service Broker 647

Configuring a Message Queue 649
Working with Dialogs 651
What's New in Service Broker for SQL Server 2012? 655
Monitoring and Troubleshooting Service Broker 656
Summary 659

Chapter 26: Log Shipping 661

Availability Testing 662
Warm Standby Availability 663
Defining Log Shipping 664
Checking Log Shipping Configuration 676
Monitoring Log Shipping 677
Modifying or Removing Log Shipping 678
Switching Roles 682
Summary 683

Chapter 27: Database Mirroring 685

Database Mirroring Overview 686
Defining and Configuring Database Mirroring 688
Checking Database Mirroring Configuration 701
Monitoring Database Mirroring 703
Pausing or Removing Database Mirroring 708
Role Switching 709
High Availability/AlwaysOn 711
Summary 725

Chapter 28: Replicating Data 727

Moving Data Between Servers 727
Replication Concepts 730
Configuring Replication 732
Summary 744

Chapter 29: Clustering 745

What Does Clustering Do? 745
Configuring Clustering 748
Summary 768

Chapter 30: Configuring and Managing SQL Server with PowerShell 769
Why Use PowerShell? 770
Basic PowerShell 770
SQL Server PowerShell Extensions 781
Communicating with SQL Server via SMO 785
Scripting SQL Server Tasks 793
Summary 799

Chapter 31: Managing Data in Windows Azure SQL Database 801
Overview of Azure SQL Database 801
Managing Windows Azure SQL Database 802
High Availability and Scalability 806
Migrating Data to SQL Database 807
Summary 829

Part VI: Securing Your SQL Server 831

Chapter 32: Authentication Types in SQL Server 833
Windows Authentication 835
SQL Authentication 836
Differences Between SQL and Windows Authentication 837
Kerberos and Windows Authentication Delegation 838
Summary 839

Chapter 33: Authorizing Securables 841
Permission Chains 841
Object Ownership 842
Securables Permissions 843
Object Security 844
A Sample Security Model 850
Views and Security 851
Summary 852

Chapter 34: Data Encryption 853
Introducing Data Encryption 853
Summary 859

Chapter 35: Row-Level Security 861
The Security Table 862
Assigning Permissions 863
Checking Permissions 870
Summary 875

Part VII: Monitoring and Auditing 877

Chapter 36: Creating Triggers 879

Trigger Basics 879
Working with the Transaction 886
Multiple-Trigger Interaction 891
Transaction-Aggregation Handling 896
DDL Triggers 901
Managing DDL Triggers 901
Developing DDL Triggers 904
Summary 907

Chapter 37: Performance Monitor and PAL 909

Using PerfMon 909
Summary 917

Chapter 38: Using Profiler and SQL Trace. 919

Features of SQL Server Profiler 919
Running Profiler 920
Using SQL Trace 927
Summary 929

Chapter 39: Wait States 931

The SQL Server OS 931
Examining Wait Statistics 932
Common Red-Flag Wait Types 935
Other Ways to Gather Wait data 936
Summary 936

Chapter 40: Extended Events. 937

The Extended Events Object Model 937
The system_health Session 941
The Extended Events Profiler 942
Summary 944

Chapter 41: Data Change Tracking and Capture 945

Configuring Change Tracking 946
Querying Change Tracking 950
Removing Change Tracking 953
Change Data Capture 954
New in SQL Server 2012 955
Enabling CDC 955
Working with Change Data Capture 957

Removing Change Data Capture 964
Summary 965

Chapter 42: SQL Audit 967
SQL Audit Technology Overview 967
Creating an Audit 968
Server Audit Specifications 971
Database Audit Specifications 973
Viewing the Audit Trail 974
Summary 974

Chapter 43: Management Data Warehouse 977
Using the Management Data Warehouse 977
Configuring MDW 978
Setting Up Data Collection 983
Viewing MDW Reports 985
Creating Custom Data Collector Sets 989
Summary 992

Part VIII: Performance Tuning and Optimization 993

Chapter 44: Interpreting Query Execution Plans 995
Viewing Query Execution Plans 996
Understanding Execution Plan Operators 1001
Summary 1002

Chapter 45: Indexing Strategies 1005
Zen and the Art of Indexing 1006
Indexing Basics 1006
The Path of the Query 1014
A Comprehensive Indexing Strategy 1032
Specialty Indexes 1035
Summary 1039

Chapter 46: Maximizing Query Plan Reuse 1041
Query Compiling 1041
Query Recompiles 1044
Summary 1046

Chapter 47: Managing Transactions, Locking, and Blocking 1047
The ACID Properties 1048
Programming Transactions 1049
Default Locking and Blocking Behavior 1054
Monitoring Locking and Blocking 1057
Dealing with Deadlocks 1060

Understanding SQL Server Locking 1066
Transaction Isolation Levels 1070
Application Locks 1087
Application Locking Design 1088
Transaction-Log Architecture 1089
Transaction Performance Strategies 1093
Summary 1095

Chapter 48: Data Compression 1097

Understanding Data Compression 1097
Applying Data Compression 1103
Summary 1108

Chapter 49: Partitioning 1109

Partitioning Strategies 1109
Partitioned Views 1110
Partitioned Tables and Indexes 1117
Summary 1129

Chapter 50: Resource Governor 1131

Exploring Fundamentals of Resource Governor 1132
Performance Monitoring of Resource Governor 1138
Views and Limitations 1140
Summary 1140

Part IX: Business Intelligence 1141

Chapter 51: Business Intelligence Database Design 1143

Data Warehousing 1144
Designing a Data Warehouse Using a Star Schema 1144
Designing your Data Warehouse using a Snowflake Schema 1146
Ensuring Consistency within a Data Warehouse 1147
Loading Data 1147
Summary 1153

Chapter 52: Building, Deploying, and Managing ETL Workflows in Integration Services 1155

Exploring the SSIS Environment in Brief 1157
Exploring the SSIS Environment in More Detail 1167
Deploying and Executing Projects and Packages 1188
Summary 1194

Chapter 53: Building Multidimensional Cubes in Analysis Services with MDX 1195

Analysis Services Quick Start 1195
Analysis Services Architecture 1196

Building a Database 1198
Dimensions 1204
Cubes 1210
Data Storage 1219
Cube Processing 1219
Summary 1222

Chapter 54: Configuring and Administering Analysis Services 1223

Installing Analysis Services 1223
Configuring Basic Analysis Services Settings 1227
Advanced SSAS Deployments 1230
Reviewing Query Performance with SQL Profiler 1230
Summary 1232

Chapter 55: Authoring Reports in Reporting Services 1233

Report Authoring Environments 1234
The Basic Elements of a Report 1235
Building a Report with the Report Wizard 1237
Authoring a Report from Scratch 1239
Exploring the Report Designer 1240
Using Reporting Services Features to Visualize Your Data 1244
Designing the Report Layout 1251
Building Reports with Report Builder 1255
Summary 1259

Chapter 56: Configuring and Administering Reporting Services 1261

Installing Reporting Services 1261
Deploying Reporting Services Reports 1265
Managing Security with Reporting Services 1271
Disaster Recovery 1277
Summary 1280

Chapter 57: Data Mining with Analysis Services 1281

The Data Mining Process 1282
Modeling with Analysis Services 1283
Algorithms 1289
Cube Integration 1296
Summary 1297

Chapter 58: Creating and Deploying BI Semantic Models 1299

What Is a BI Semantic Model? 1299
The Development Environment 1301
Creating BI Semantic Models Using PowerPivot 1303
Extending a BI Semantic Model with PowerPivot 1307

Deploying BI Semantic Models to SharePoint 1317
Managing Automatic Data Refresh of PowerPivot Workbooks in SharePoint 2010 ... 1318
Creating BI Semantic Models Using SQL Server Data Tools 1319
Extending a BI Semantic Model with SQL Server Data Tools 1322
Deploying BI Semantic Models to an Analysis Services Instance 1324
Summary 1326

Chapter 59: Creating and Deploying Power View Reports 1327

Power View Requirements 1327
Creating and Deploying Reports with Power View 1328
Deploying Power View Reports 1344
Summary 1345

Index 1347