

Contents

Acknowledgments	ix
Introduction	xxi
Chapter 1: RDBMS Basics: What Makes Up a SQL Server Database?	1
An Overview of Database Objects	2
The Database Object	2
The Transaction Log	6
The Most Basic Database Object: Table	6
Filegroups	8
Diagrams	8
Views	9
Stored Procedures	10
User-Defined Functions	10
Users and Roles	11
Rules	11
Defaults	11
User-Defined Data Types	11
Full-Text Catalogs	12
SQL Server Data Types	12
NULL Data	17
SQL Server Identifiers for Objects	17
What Gets Named?	17
Rules for Naming	18
Summary	18
Chapter 2: Tools of the Trade	19
Books Online	20
The SQL Server Configuration Manager	21
Service Management	22
Network Configuration	22
The Protocols	23
On to the Client	26

Contents

The SQL Server Management Studio	28
Getting Started	28
Query Window	33
SQL Server Integration Services (SSIS)	38
Bulk Copy Program (bcp)	39
SQL Server Profiler	40
sqlcmd	40
Summary	40
Chapter 3: The Foundation Statements of T-SQL	41
Getting Started with a Basic SELECT Statement	42
The SELECT Statement and FROM Clause	42
The WHERE Clause	45
ORDER BY	49
Aggregating Data Using the GROUP BY Clause	52
Placing Conditions on Groups with the HAVING Clause	61
Outputting XML Using the FOR XML Clause	63
Making Use of Hints Using the OPTION Clause	63
The DISTINCT and ALL Predicates	64
Adding Data with the INSERT Statement	66
The INSERT INTO . . . SELECT Statement	70
Changing What You've Got with the UPDATE Statement	72
The DELETE Statement	75
Summary	77
Exercises	77
Chapter 4: JOINS	79
JOINS	79
INNER JOINS	81
How an INNER JOIN Is Like a WHERE Clause	85
OUTER JOINS	89
The Simple OUTER JOIN	90
Dealing with More Complex OUTER JOINS	95
Seeing Both Sides with FULL JOINS	99
CROSS JOINS	100
Exploring Alternative Syntax for Joins	102
An Alternative INNER JOIN	102
An Alternative OUTER JOIN	103
An Alternative CROSS JOIN	104

The UNION	104
Summary	109
Exercises	110
Chapter 5: Creating and Altering Tables	111
<hr/>	
Object Names in SQL Server	111
Schema Name (aka Ownership)	112
The Database Name	114
Naming by Server	114
Reviewing the Defaults	114
The CREATE Statement	115
CREATE DATABASE	115
CREATE TABLE	121
The ALTER Statement	133
ALTER DATABASE	133
ALTER TABLE	137
The DROP Statement	140
Using the GUI Tool	142
Creating a Database Using the Management Studio	142
Backing into the Code: The Basics of Creating Scripts with the Management Studio	148
Summary	149
Exercises	149
Chapter 6: Constraints	151
<hr/>	
Types of Constraints	152
Domain Constraints	152
Entity Constraints	153
Referential Integrity Constraints	154
Constraint Naming	154
Key Constraints	155
PRIMARY KEY Constraints	155
FOREIGN KEY Constraints	158
UNIQUE Constraints	169
CHECK Constraints	170
DEFAULT Constraints	171
Defining a DEFAULT Constraint in Your CREATE TABLE Statement	172
Adding a DEFAULT Constraint to an Existing Table	173
Disabling Constraints	173
Ignoring Bad Data When You Create the Constraint	174
Temporarily Disabling an Existing Constraint	176

Contents

Rules and Defaults — Cousins of Constraints	178
Rules	178
Defaults	180
Determining Which Tables and Datatypes Use a Given Rule or Default	181
Triggers for Data Integrity	181
Choosing What to Use	181
Summary	183
Chapter 7: Adding More to Our Queries	185
What Is a Subquery?	186
Building a Nested Subquery	186
Correlated Subqueries	190
How Correlated Subqueries Work	190
Correlated Subqueries in the WHERE Clause	190
Dealing with NULL Data — the ISNULL Function	194
Derived Tables	195
The EXISTS Operator	197
Using EXISTS in Other Ways	199
Mixing Datatypes: CAST and CONVERT	201
Performance Considerations	204
JOINS vs. Subqueries vs. ?	204
Summary	205
Exercises	206
Chapter 8: Being Normal: Normalization and Other Basic Design Issues	207
Tables	208
Keeping Your Data “Normal”	208
Before the Beginning	209
The First Normal Form	211
The Second Normal Form	214
The Third Normal Form	216
Other Normal Forms	218
Relationships	219
One-to-One	219
One-to-One or Many	221
Many-to-Many	223
Diagramming	227
Tables	230
Adding and Deleting Tables	230
Relationships	237

De-Normalization	241
Beyond Normalization	241
Keep It Simple	242
Choosing Datatypes	242
Err on the Side of Storing Things	242
Drawing Up a Quick Example	243
Creating the Database	243
Adding the Diagram and Our Initial Tables	244
Adding the Relationships	248
Adding Some Constraints	251
Summary	252
Exercises	252
Chapter 9: SQL Server Storage and Index Structures	255
<hr/>	
SQL Server Storage	255
The Database	255
The Extent	256
The Page	256
Rows	257
Understanding Indexes	257
B-Trees	258
How Data Is Accessed in SQL Server	262
Creating, Altering, and Dropping Indexes	270
The CREATE INDEX Statement	270
Creating XML Indexes	276
Implied Indexes Created with Constraints	277
Choosing Wisely: Deciding What Index Goes Where and When	277
Selectivity	277
Watching Costs: When Less Is More	278
Choosing That Clustered Index	278
Column Order Matters	281
Dropping Indexes	281
Use the Database Engine Tuning Wizard	282
Maintaining Your Indexes	282
Fragmentation	282
Identifying Fragmentation vs. Likelihood of Page Splits	283
Summary	286
Exercises	288

Chapter 10: Views	289
Simple Views	289
Views as Filters	293
More Complex Views	295
Using a View to Change Data — Before INSTEAD OF Triggers	298
Editing Views with T-SQL	301
Dropping Views	302
Creating and Editing Views in the Management Studio	302
Editing Views in the Management Studio	306
Auditing: Displaying Existing Code	306
Protecting Code: Encrypting Views	308
About Schema Binding	309
Making Your View Look Like a Table with VIEW_METADATA	310
Indexed (Materialized) Views	310
Summary	313
Exercises	314
Chapter 11: Writing Scripts and Batches	315
Script Basics	315
The USE Statement	316
Declaring Variables	317
Using @@IDENTITY	320
Using @@ROWCOUNT	324
Batches	325
Errors in Batches	327
When to Use Batches	327
SQLCMD	330
Dynamic SQL: Generating Your Code On-the-Fly with the EXEC Command	334
The Gotchas of EXEC	335
Summary	339
Exercises	340
Chapter 12: Stored Procedures	341
Creating the Sproc: Basic Syntax	342
An Example of a Basic Sproc	342
Changing Stored Procedures with ALTER	343
Dropping Sprocs	344

Parameterization	344
Declaring Parameters	344
Control-of-Flow Statements	349
The IF . . . ELSE Statement	349
The CASE Statement	360
Looping with the WHILE Statement	366
The WAITFOR Statement	367
TRY/CATCH Blocks	368
Confirming Success or Failure with Return Values	369
How to Use RETURN	369
Dealing with Errors	371
The Way We Were . . .	372
Handling Errors Before They Happen	378
Manually Raising Errors	381
Adding Your Own Custom Error Messages	385
What a Sproc Offers	388
Creating Callable Processes	389
Using Sprocs for Security	390
Sprocs and Performance	391
Extended Stored Procedures (XPs)	393
A Brief Look at Recursion	393
Debugging	396
Setting Up SQL Server for Debugging	396
Starting the Debugger	397
Parts of the Debugger	400
Using the Debugger Once It's Started	402
.NET Assemblies	406
Summary	407
Exercises	407
Chapter 13: User Defined Functions	409
What a UDF Is	409
UDFs Returning a Scalar Value	410
UDFs That Return a Table	414
Understanding Determinism	421
Debugging User-Defined Functions	423
.NET in a Database World	423
Summary	424
Exercise	424

Chapter 14: Transactions and Locks **425**

Transactions	425
BEGIN TRAN	426
COMMIT TRAN	427
ROLLBACK TRAN	427
SAVE TRAN	427
How the SQL Server Log Works	428
Failure and Recovery	429
Implicit Transactions	431
Locks and Concurrency	431
What Problems Can Be Prevented by Locks	432
Lockable Resources	435
Lock Escalation and Lock Effects on Performance	435
Lock Modes	436
Lock Compatibility	438
Specifying a Specific Lock Type — Optimizer Hints	439
Setting the Isolation Level	440
Dealing with Deadlocks (aka “A 1205”)	442
How SQL Server Figures Out There’s a Deadlock	443
How Deadlock Victims Are Chosen	443
Avoiding Deadlocks	443
Summary	445

Chapter 15: Triggers **447**

What Is a Trigger?	448
ON	449
WITH ENCRYPTION	450
The FOR AFTER vs. the INSTEAD OF Clause	450
WITH APPEND	452
NOT FOR REPLICATION	453
AS	453
Using Triggers for Data Integrity Rules	453
Dealing with Requirements Sourced from Other Tables	454
Using Triggers to Check the Delta of an Update	455
Using Triggers for Custom Error Messages	457
Other Common Uses for Triggers	457
Other Trigger Issues	458
Triggers Can Be Nested	458
Triggers Can Be Recursive	458

Triggers Don't Prevent Architecture Changes	458
Triggers Can Be Turned Off Without Being Removed	459
Trigger Firing Order	459
INSTEAD OF Triggers	461
Performance Considerations	462
Triggers Are Reactive Rather Than Proactive	462
Triggers Don't Have Concurrency Issues with the Process That Fires Them	462
Using IF UPDATE() and COLUMNS_UPDATED	463
Keep It Short and Sweet	465
Don't Forget Triggers When Choosing Indexes	465
Try Not to Roll Back Within Triggers	465
Dropping Triggers	466
Debugging Triggers	466
Summary	468
Chapter 16: A Brief XML Primer	469
<hr/>	
XML Basics	470
Parts of an XML Document	471
Namespaces	479
Element Content	481
Being Valid vs. Being Well Formed — Schemas and DTDs	481
What SQL Server Brings to the Party	482
Retrieving Relational Data in XML Format	483
RAW	484
AUTO	486
EXPLICIT	487
PATH	503
OPENXML	508
A Brief Word on XSLT	514
Summary	516
Chapter 17: Reporting for Duty, Sir!: A Look At Reporting Services	517
<hr/>	
Reporting Services 101	518
Building Simple Report Models	518
Data Source Views	523
Report Creation	529
Report Server Projects	532
Deploying the Report	537
Summary	538

Contents

Chapter 18: Getting Integrated With Integration Services	539
Understanding the Problem	539
Using the Import/Export Wizard to Generate Basic Packages	540
Executing Packages	547
Using the Execute Package Utility	547
Executing Within the Business Intelligence Development Studio	549
Executing Within the Management Studio	549
Editing the Package	550
Summary	553
Chapter 19: Playing Administrator	555
Scheduling Jobs	556
Creating an Operator	557
Creating Jobs and Tasks	558
Backup and Recovery	567
Creating a Backup: a.k.a. "A Dump"	567
Recovery Models	570
Recovery	571
Index Maintenance	572
ALTER INDEX	573
Archiving Data	575
Summary	576
Exercises	576
Appendix A: Exercise Solutions	577
Appendix B: System Functions	587
Appendix C: Finding the Right Tool	639
Appendix D: Very Simple Connectivity Examples	647
Appendix E: Installing and Using the Samples	651
Index	655