Simple Solution Essential Skills

Using Microsoft® SQL Server™ 7.0

Brad McGehee, MCSE, MCT, MCSD
Rob Kraft, MCSD, MCT
Matthew Shepker, MCSE, MCT, et al.

QUE

Using Microsoft® SQL Server™ 7.0

Brad M. McGehee

Rob Kraft

Matthew Shepker

Eric Wilson

Simon Gallagher

Tibor Karaszi

Prentice-Hall of India
Private Limited
New Delhi - 110 001
1999

Introduction

I SQL Server Basics

1 Introduction to SQL Server 7.0
2 SQL Server and Database Fundamentals

II Installing and Configuring SQL Server

3 Planning a SQL Server Installation
4 Installing SQL Server
5 Installing SQL Client Utilities
6 Upgrading SQL Server from 6.5 to 7.0

III Administering SQL Server

7 SQL Server Tools
8 Managing Databases
9 Scheduling Tasks and Alerts
10 Maintaining SQL Server

IV SQL Server Security

11 Introduction to SQL Security
12 Managing Users
13 Assigning User Permissions

V Preventing Data Loss

14 Backing Up Databases
15 Restoring SQL Data

VI Advanced SQL Server Administration

16 Importing, Exporting, and Distributing Data
17 Setting Up and Configuring Data Replication
18 SQL Server Optimization and Tuning Fundamen
19 Troubleshooting SQL Server

Appendix A Transact-SQL Quick Reference

Glossary

Index

1741
LIBRARY
Department of Computer Science
UNIVERSITY OF KARACHI
4.1.2005

Contents

I SQL Server Basics 9

1 Introduction to SQL Server 7.0 11

SQL Server Helps You to Master Business Information 12

What Is SQL Server? 13

A Little Background on SQL Server 15

Major Features of SQL Server 7.0 15
Cost of Ownership Is Lower Than Competitors 16
Runs Under NT Server and Windows 95/98 16
Scalable to Meet Enterprise-wide Needs 16
Supports Data Replication 16
Supports Data Marts and Data Warehouses 17
Online Analytical Processing Now Built in to SQL Server 18
English Query Makes Data More Available to Casual Users 18
Data Transformation Services Enable Easy Exchange of Data 18
Supports Distributed Transactions 19
Network Independent 19
Built-In Fault Tolerance 19
Supports ANSI-92 SQL and Extensions 19
Centralized Management 20
Visual Administration Tools and Wizards 20
Supports Multiple Clients 20
Supports Many Development Tools 21
Integrates Well with Microsoft Office 21
Internet/Intranet Connectivity 21

How SQL Server Is Integrated with Windows NT Server and Microsoft BackOffice 22
NT Server Integration 22
Integration with Microsoft Back Office 24

What You Need to Know to Be a Successful SQL Server DBA 25
Skills Needed to Be a DBA 27
What Exactly Does a DBA Do? 28
Become a Microsoft Certified Professional to Enhance Your Skills 31

2 SQL Server and Database Fundamentals 35

SQL Server Fundamentals 36
What Exactly Is SQL Server? 36
What Makes SQL Server a Client/Server Database System? 38

SQL Server Administration Fundamentals 40
Managing SQL Server Using GUI-Based Tools 41

SQL Server Architecture Fundamentals 42
Client/Server Architecture 43
SQL Server Client Architecture 44
The Network Connection 46
SQL Server 47

Database Fundamentals 49
The Physical and Logical Database 49
System and User Databases 50

Database Object Fundamentals 51
Tables 51
Views 52
Roles 52
Indexes 53
Datatypes 55

Defaults 55
Stored Procedures 55
Triggers 56
Constraints 56

Database Architecture Fundamentals 56
Database Architecture 57
The Database Transaction Log 58
System Databases 59
The Model Database and the Database Catalog System Tables 61
Master Database 63
Msdb Database 65
Tempdb Database 66

What Is Transact-SQL? 66

II Installing and Configuring SQL Server 71

3 Planning a SQL Server Installation 73

Planning Is an Important First Step 74

How Will SQL Server Be Used in Your Organization? 75
Will SQL Server Be Used Mostly to Manage Transactions? 76
Will SQL Server Be Used Mostly to Perform Decision Support? 77
Will SQL Server Be a Back End to an Internet/Intranet Server? 78
Will SQL Server Be Used for Graphics or Multimedia? 80
How Will SQL Server Applications Be Developed? 80
How Many Users Will Access SQL Server Simultaneously? 81
Where Will Users Be Located in Relation to SQL Server? 80
How Mission Critical Will the SQL Server Applications Be? 83
How Will SQL Server Fit into Your Current Network? 84
Which Network and Desktop Operating Systems Are You Currently Using? 85
How Well Will Your Current Network Infrastructure Work with SQL Server? 87
What Is the NT Server Domain Model? 90
What Is Your Windows NT Server Naming Scheme? 91

Plan How to Protect SQL Server Data 92
How Will You Secure Your Data? 92
What Type of Fault Tolerance Will You Use? 93
How Will You Back Up Your Data? 93
Do You Have a Formal Disaster Recovery Plan? 96

Plan Your SQL Server Software Requirements 97
What Clients Will Be Used to Access SQL Server? 97
What Operating System Will You Use to Deploy SQL Server? 98
What Licensing Method Will You Use? 99

Plan Your SQL Server Hardware Requirements 100
Choosing Hardware from the NT Server Hardware Compatibility List 101
Selecting the Hardware Platform 101
Selecting the CPU 102
Do You Need Multiple CPUs? 102
How Much RAM Do You Need? 103
Selecting a Fast I/O Controller 103
Selecting Hard Disk Capacity 104
Do You Need Hardware RAID? 104
Do You Need Clustered Servers? 105
Selecting a CD-ROM 105
Selecting a Backup Device 105
Selecting the Network

Selecting an NT Server Role for SQL Server 106
Selecting an NT Server File System for SQL Server 106

Formalizing and Carrying Out the Plan 107
Evaluate Your Needs 107
Training 107
Write Down the Plan 108
Cost Out the Plan 108
Get the Plan Approved 109
Implement the Plan 109

4 Installing SQL Server 111

What You Need to Know Before Installing SQL Server 7.0 112

Minimum Hardware and Software Requirements 112
Server Hardware Preparation and Settings 113
NT Server Software Settings 114

Different Ways to Install SQL Server 120
Installing from CD 120
Installing from a Network Share Point 121
Installing SQL Server With Systems Management Software 122

SQL Server Installation and Configuration Options 123
SQL Server Naming Rules 124
Entering Registration Information 124
Choosing an Installation Type 124
Choosing Network Protocols 126
Choosing a Character Set 129
Choosing a Sort Order 130
Choosing a Unicode Collation 132
Choosing Management Tools 132
Choosing Where to Install SQL Server 133
Choosing Where to Store SQL Server Data 133
Creating a Service Account 135
How to Create a Service Account 137
Choosing to Auto-Start SQL Services 142

Installing SQL Server 143

Post-Installation Issues 151
Verifying That SQL Server Was Installed Correctly 151
Registering SQL Server 156
Assigning a System Administrator Password 166

Troubleshooting a SQL Server Installation 167
How to Identify SQL Server Installation Problems 167
Common Installation Problems and Their Solutions 168
How to Remove SQL Server 170

5 Installing SQL Client Utilities 171

What Are the SQL Server Management Tools? 172

SQL Server Management Tools 172

Choosing Online Documentation to Install on Clients 174

Management Tool Hardware and Software Requirements 175
Hardware Requirements 176
Software Requirements 176

Where to Install the Management Tools From 176

How to Install the SQL Server Management Tools 177

How to Use the Client Configuration Utility 184
How to Start the Client Configuration Utility 185
General 186
Network Libraries 187
DB-Library Options 188

Troubleshooting a Management Tools Installation 189
How to Diagnose the Problem? 189
How to Resolve the Problem 189

6 Upgrading SQL Server From 6.5 to 7.0 191

Developing an Upgrade Strategy and Plan 192
The Word Is Out—SQL Server 7.0 Version Upgrade Wizard 193
Upgrading SQL Server 202
Switching Between SQL Server 6.5 and SQL Server 7.0 203
Step 1: Run the Version Upgrade Wizard 204
Step 2: Select Object Transfer Options 205
Step 3: Servers Logon 205
Step 4: Code Page Selection 206
Step 5: Select Databases to Upgrade 207
Step 6: 7.0 Database Creation 207
Step 7: System Configuration Options 209
Step 8: Review Upgrade Selections 210
Step 9: SQL Server 7.0 Upgrade in Progress 210

Upgrade Troubleshooting 211
Upgrade Subdirectories and Contents 212
7.0 Compatibility with 6.x Applications 212
Restoring SQL Server 213

Upgrade Planning FAQ 214

III Administering SQL Server 217

7 SQL Server Tools 219

Using the Microsoft Management Console (MMC) 220
Working with the Tree and Details Pane 222

SQL Enterprise Manager Overview 222
The SQL Enterprise Manager Screen 223
Query Designer 224

SQL Server Setup 226

SQL Server Service Manager 226

SQL Server Client Configuration Utility 228

SQL Server Performance Monitor 229

SQL Server Profiler 229
Monitoring with SQL Server Profiler 230

SQL Server Query Analyzer 232

SQL Server Books Online 234
Searching by Contents 235
Searching by Index 235
Using the Search Tab 236
Favorites Tab 236

BCP 236

ISQL Utility 236

`osql` 238

`makepipe` and `readpipe` 241

SQL Server Wizards 243

Register Server Wizard 244
Security Wizard 245
Create Database Wizard 245
Create Alert Wizard 245
Create Job Wizard 245
Database Maintenance Plan Wizard 246
Create Index Wizard 246
Create Stored Procedures Wizard 246
Create View Wizard 246
DTS Import/Export Wizard 247
Web Assistant Wizard 247
Configuring Publishing and Distribution Wizard 247
Create Publication Wizard 248
Pull Subscription Wizard 248
Push Subscription Wizard 248
Uninstalling Publishing and Distribution Wizard 249

8 Managing Databases 251

Planning SQL Server Databases 253
Estimating Database Size 253
Planning the SQL Server Database Transaction Log 255
How to Create a SQL Server Database and Transaction Log 256
How to Create a SQL Server Database Using the Create Database Wizard 261

How to Delete (Drop) a SQL Server Database 263
Things to Consider When Dropping a Database 264
Restrictions of Dropping Databases 264

Setting SQL Server Database Options 265
SQL Server Database Options 265
Set Database Options Using the `sp_dboption` 267
Database Options Using SQL Enterprise Manager 268

Files and Filegroups 268
Files 268
Filegroups 269

Documenting SQL Server Database Creation Steps 271

9 Scheduling Tasks and Alerts 275

SQL Server Agent Overview 277
The SQL Server Agent Functions 278
SQL Server Agent Configuration 278

How to Manage Jobs 284
Creating Jobs 285
How to View Jobs 290

Alerts and Operators 291
Managing Operators 292
Managing Alerts 294

How to Set Up SQL Server to Send Email 297
Creating a Mail Account for SQL Server 298
Verifying How SQL Server Logs On to NT Server 299
Installing a Mail Client on NT Server 300
Configure SQL Mail with a Logon Account 301
Starting SQL Mail 302

Troubleshooting 302
Troubleshooting SQL Server Agent 303
Troubleshooting Jobs 303
Troubleshooting Alerts 304
Troubleshooting SQL Mail 304

10 Maintaining SQL Server 307

Maintaining SQL Server Over the Long Haul 308

Document Your SQL Servers 308

Create a Formal SQL Server Maintenance Plan 311

Monitor Log Files 313
How to View the MSSQLServer Log Using SQL Enterprise Manager 314
How to View the SQLServerAgent Log Using SQL Enterprise Manager 315
Examining the NT Server Event Viewer Logs 316
How to View NT Server Event Viewer Messages 316

Monitor Security 317
Audit Current Accounts and Permissions 317
Use NT Server's Audit Capability to Monitor Use 318

Monitor User Activity 325
Current Activity Window 325
SQL Server Profiler 325
NT Server Performance Monitor 327

Monitor SQL Server Performance 327
NT Server's Performance Monitor 328
SNMP Monitoring 329

Manage Current and Create New Databases 330
Size and Create New Databases 330
Monitor Database and Transaction Size 330
Scheduled Data Imports or Exports 330
Managing Replication 331
Scheduling Events and Alerts 331

Maintaining SQL Server Software 331
Updating SQL Server with Service Packs 331
Upgrading Your Software 332
Manage User Accounts and Permissions 333

Verify the Integrity of SQL Server Databases 333

Maintain Database Indexes 334

Backup Databases and Transaction Logs 336

NT Server-Related Maintenance Tasks 336

Working with Developers 338

How to Use the Database Maintenance Plan Wizard 338
How to Use the Database Maintenance Plan Wizard 340
How to Change a Database Maintenance Plan 349

SQL Server Maintenance Checklist 352
Daily Tasks 352
Weekly Tasks 353
Monthly Tasks 353
Other Scheduled Tasks 354

IV SQL Server Security 355

11 Introduction to SQL Security 357

SQL Server Security Basics 358

Planning SQL Server Security 359

The SQL Server Security Architecture 360
SQL Server Security Building Blocks 360
Barriers to Accessing SQL Server Data 362
User Authentication 364

What Is a Security Mode? 366

SQL Server Mixed Authentication Security Mode 367
How a User Is Authenticated Using the SQL Server Mixed Authentication Security Mode 367

How to Implement the SQL Server Mixed Authentication Security Mode 368

Using the Windows NT Authentication Security Mode 371
How a User Is Authenticated Under the Windows NT Authentication Security Mode 371
How to Configure the Windows NT Authentication Security Mode 372

12 Managing Users 375

How Do Users Gain Access to SQL Server? 376

Introduction to SQL Server Accounts 376

How to Create and Manage Login IDs 378
Creating Login IDs Under Windows NT Authentication 379
Creating Login IDs Under SQL Server Authentication 381

How to Create and Manage Database User IDs 382

How to Manage SQL Server Roles 383
Predefined Server Roles 383
Predefined Database Roles 384
The Public Role 386
Custom Database Roles 386

How to Manage Users Using SQL Enterprise Manager 387

How to Use the SQL Server Create Login Wizard to Manage SQL Server Accounts 388

How to Manually Create, Modify, and Delete SQL Server Login IDs and Database User IDs 393
How to Display SQL Server Account Information 394

How to Create and Configure Login IDs 404
How to Delete a Login ID 409
How to Create and Configure Database User IDs 410
How to Create and Configure Database Roles 412
How to Delete a Database User ID or Database Role 413
How to Configure a Server Role 415

13 Assigning User Permissions 419

Permissions Determine Who Can Access Data 420

Statement Permissions 422

Object Permissions 423

Implied Permissions 424
Server Roles 425
Database Roles 426
Database Object Owners 427

Understanding Permission Precedence 428

Using Views and Stored Procedures to Enforce Security 431

Understanding Ownership Chains 432
Non-Broken Ownership Chains 433
A Broken Ownership Chain 433
How to Prevent Broken Ownership Chains 434

Best Practices for Managing Permissions 435

How to Display Information on Permissions 436
How to View Statement Permissions 437
How to View Object Permissions 438

How to Grant and Revoke Permission 443

How to Grant and Revoke Statement Permissions Using SQL Enterprise Manager 443

How to Grant and Revoke Object Permissions Using SQL Enterprise Manager 446

V Preventing Data Loss 451

14 Backing Up Databases 453
Possible Causes of Data Loss 454

Ways to Prevent Data Loss 455
Maintaining Redundant Data 456
Periodic Data Backup 460
SQL Server Backups 462

Establishing a Backup Strategy 466
Considerations for a Backup Strategy 467
Considerations for Immediate Backups 472
Examples of Backup Strategies 474

Implementing SQL Server Backups 476
How to Create a Backup Device 476
How to Perform an Immediate Backup 478
How to Schedule Automatic Backups 479

15 Restoring SQL Data 483

Restore Overview 484
Ways to Restore Databases 485
Important Restoration Considerations 494

How to Restore Data 496
Restoring a Database and Its Log Using Enterprise Manager 496
Restoring a Database and Its Log Using Transact-SQL 500

How to Restore System Databases 501
How to Restore the Master Database 502
How to Recover the Master Database Without a Backup 503
Testing Restore Procedures 505

VI Advanced SQL Server Administration 507

16 Importing, Exporting, and Distributing Data 509

Data Transformation Service (DTS) 510
Microsoft Repository 511
Scripting 511
Transformations 512
Using the DTS 513

Bulk Copy Program (BCP) 520
Logged and Non-logged Operations 520
Parallel Loading 521
BCP Switches 521
Batches 523
File Datatypes 524
The Format File 525
Using Views 530
Loading Image Data 530
Supplying Hints to BCP 531

BULK INSERT 532

Improving Load Performance 534

Working with Batch Files 535

Distributing Databases on Removable Media 537
Setting Up a Removable Database 538
Creating a Removable Database 539
Installing a Removable Database 540

17 Setting Up and Configuring Data Replication 541

SQL Server Replication Overview 542
How SQL Server Replicates Data 542
Publisher-Subscriber Model 543

Publications and Art 544
Vertical Versus H tal Filtering 544
Push Versus Pull ibing 546
Anonymous Subs ons 546
Initial Synchroni 547
Manual Synchro n 547

SQL Server Replic Architecture 547
Replication Tec gies 548
Types of Replic 549
The Distributio tabase 552

How to Use Wiza Configure
Replication 553

Setting Up Repli Using the SQL
Enterprise Mana 553
Installing or ging the Distribution
Database 5
Configuring ons for the Publishing
Server 556
Configuring ions for the Subscribing
Server 55

18 SQL Server Opization and Tuning Fundamentals 63

Advances in Thg for SQL Server 7.0 564

Why Should I Tune Your Server? 564

Monitoring a Establishing a Baseline 565
Establishia Baseline 565
Monitorii Server Performance 565
Monitorii User Activity 567
Monitori the Logs 568
Viewing e Windows NT Event
Log 57

Using the QL Server Profiler 572
What toTrace 573
Identifying Problem Queries and Users
Using QL Server Profiler 576

Using the SQL Server Performance
Monitor 577
Monitoring Counters 577

Analyzing Data 579
Using Graphical Showplan 579
Using the Index Tuning Wizard 580

What Options to Tune 581
Affinity Mask 582
Allow Updates 582
Cost Threshold for Parallelism 583
Cursor Threshold 583
Default Language 584
Default Sort Order ID 584
Extended Memory Size (MB) 584
Fill Factor (%) 584
Index Create Memory (KB) 585
Language in Cache 585
Language Neutral Full-Text 585
Lightweight Pooling 586
Locks 586
Max Async IO 586
Max Degree of Parallelism 587
Max Server Memory (MB) 587
Max Text Repl Size 588
Max Worker Threads 588
Media Retention 588
Min Memory Per Query (KB) 589
Min Server Memory (MB) 589
Nested Triggers 589
Network Packet Size 589
Open Objects 590
Priority Boost 590
Query Governor Cost Limit 590
Query Wait (s) 591
Recovery Interval (min) 591
Remote Access 591
Remote Login Timeout (s) 592
Remote Proc Trans 592
Remote Query Timeout (s) 592
Resource Timeout (s) 592

Scan For Startup Procs 593
Set Working Set Size 593
Show Advanced Options 593
Spin Counter 593
Time Slice (ms) 594
Unicode Comparison Style 594
Unicode Local ID 594
User Connections 595
User Options 595

Setting Configuration Options 596
Setting Options with SQL Enterprise Manager 596
Setting Options with sp_configure 597

19 Troubleshooting SQL Server 599

The Troubleshooting Process 600
Documentation 600
Find the Facts 601
Identify the Problem 601
Attempt a Fix 602

SQL Server Information Sources 602
SQL Server Error Log 603
Windows NT Application Log 604

SQL Server Error Messages 607
Severity Levels 608
Nonfatal Errors 608
Fatal Errors 609

Using the Database Consistency Checker 611
CHECKALLOC 612
CHECKCATALOG 613
CHECKDB 613
CHECKFILEGROUP 615
CHECKIDENT 615
CHECKTABLE 615
DBREPAIR 616
DBREINDEX 616
dllname (FREE) 617
INPUTBUFFER 617
MEMUSAGE
NEWALLOC
OPENTRAN
OUTPUTBUFFER
PERFMON 62
PINTABLE 6
PROCACHE 62
ROWLOCK 62
SHOWCONTIG
SHOW_STATISTICS 622
SHRINKDATABASE
SHRINKFILE 62
SQLPERF 624
TEXTALL and TEXT 624
TRACEOFF 625
TRACEON 625
TRACESTATUS 625
UNPINTABLE 625
UPDATEUSAGE 625
USEROPTIONS 626

Using Trace Flags 626
Setting Trace Flags
Informational Trace F 628
Compatibility and Beh r Changing Flags 628
Special Trace Flags 62

Dealing with Corrupted Da ses 630
Fixing Corrupted User T s 630
Fixing Corrupted System les 63

Preventive Maintenance 63

Other Common Problems 63
Full Transaction Log 633
Blocking 634

Other Sources of Information 635
Online Knowledge Base 635
Microsoft's Newsgroups 635
TechNet and MSDN 635
Technical Support 636

Transact-SQL Quick Reference 639

New in SQL Server 7.0 639
Unicode Support 639
ALTER TABLE, ALTER PROCEDURE, ALTER TRIGGER, ALTER VIEW 640
T-SQL and ANSI/ISO SQL-92 640
Cursor Enhancements 641

Creating Database Objects 641

Tables 642
SQL Server Object Names 643
Column Properties 644
Notes on Identity Columns 645

Renaming Objects 646

Adding Columns to a Table 646

Temporary Tables 647
Global and Permanent Temporary Tables 647
SELECT, INSERT, UPDATE, and DELETE 648
The SELECT Statement 648
GROUP BY and HAVING 651
CUBE, ROLLUP, and the GROUPING Function 652
Joining Tables 655
Subqueries 656
Adding Rows with INSERT 657
Modifying Rows with UPDATE 658
Removing Rows with DELETE 659

SQL Server Functions 659
String Functions 660
Mathematical Functions 662
Date Functions 663
System Functions 665
Niladic Functions 670
Aggregate Functions 671

Programming Constructs 674
The IF Statement 674
WHILE, BREAK, and CONTINUE 675
RETURN 675
GOTO 675
WAITFOR 676
EXECute 676
Batches 677
Comments 678
Local Variables 679
Functions That Were Called Global Variables in Earlier Releases 680
RAISERROR 685
SET Options 689

Cursors 697
Some Approaches 699
Cursor Example and Some Syntax 700
Updating with Cursors 706
Scrolling Capabilities 707
INSENSITIVE Cursors 707
Cursors and Concurrency 708
API Cursors 708
Avoiding Cursors 709

Glossary 713

Index 721