

# Microsoft SQL Server 2000 管理员指南 (影印版)

Microsoft 公司 著

北京大学出版社

## 内 容 简 介

本书面向大、中、小型机构,介绍 SQL Server 2000 的部署、管理和支持过程中涉及的各种常用技能,包括安装前的准备工作,安装和配置及其所用的工具,SQL、T-SQL、DDL 及 DML 的用途,内置的特性,用以简化 SQL Server 2000 管理的特性及工具,等等。本书配有 CD-ROM,内有全书的电子版以及关于 SQL Server 2000 部署的白页。

本书由微软公司组织权威人士编写,极具技术纵深,是一本不可多得的系统管理必备书。

Copyright (2000) by Microsoft Corporation

Original English language edition Copyright © 2000 (year of first publication by author)

By Microsoft Corporation (author)

All rights published by arrangement with the original publisher, Microsoft Press, a division of Microsoft Corporation, Redmond, Washington, U.S.A.

著作权合同登记号:图字 01-2001-0025 号

书 名: Microsoft SQL Server 2000 管理员指南 (影印版)

责任著作者: Microsoft 公司

标准书号: ISBN 7-900629-78-5/TP·57

出 版 者: 北京大学出版社

地 址: 北京市海淀区中关村北京大学校内 100871

网 址: <http://cbs.pku.edu.cn>

电 话: 出版部 62752015 发行部 62765128 62754140 编辑室 62765126

电 子 信 箱: [wdzh@mail.263.net.cn](mailto:wdzh@mail.263.net.cn)

印 刷 者: 中国科学院印刷厂

发 行 者: 北京大学出版社

经 销 者: 新华书店

787 毫米×1092 毫米 16 开本 73 印张 1770 千字

2000 年 12 月第 1 版 2000 年 12 月第 1 次印刷

定 价: 218.00 元(含光盘)

## 出版前言

如果用一个成语来概括国内计算机图书市场的现状，当谓之“汗牛充栋”。然而，如果您是一位从事计算机应用系统开发或管理的中、高级专业人士，很可能发现这貌似种类齐全的计算机图书中，为您量身定做的并不多见。

依据多年从事计算机图书工作所积累的经验，以及与 IT 领域广泛而深入的接触所获取的信息，我们认识到，具有相当的专业深度和技术前沿性的图书，是计算机专业人员的迫切需要，当然，也是我们从事计算机图书工作、服务专业领域的一大着眼点。

基于这一点，2000 年元月，我们与微软出版社(Microsoft Press)达成合作协议，成立微软图书影印中心，独家代理微软出版社图书影印版在中国大陆的出版、发行，为 IT 业界提供及时的专业技术服务。选题和策划上的匠心独运，使得我们的影印书成为计算机图书中的标新立异者。这里，有四大特色值得读者朋友予以关注：

首先，这是微软出版社第一次授权在中国大陆影印、发行它的版权书。在选题上，可以说独辟蹊径。在内容上，立足技术广度和深度，系统推介微软产品。所有这些，都是目前国内一般计算机图书所无法比拟的。

其次，我们的理念是为国内计算机专业人员学习前沿性的微软技术服务。为此，我们不但与微软公司紧密协作与沟通，及时掌握微软最新技术动向，而且组织了精干的工作人员，倾力于微软影印书的出版和发行。

再者，微软影印书主要面向中、高级专业人士，印量有限。这类书的读者对象有较强的针对性，一般来说，包括 IT 决策人员，中、高级开发人员，以及中、高级系统管理人员。因而，我们将每套书的印数控制在 1000~2000 册之间。

最后，微软图书影印版几乎与原版书保持同步发行，最大限度地满足了国内读者跟踪微软最新技术的需求。软件升级越来越快，新软件令人目不暇接。作为技术载体之一的图书，只有迅速作出反应，把新软件介绍给读者，才能赢得他们的青睐。总之，兵贵神速，这是我们的目标。

正应验了前人的预言，21 世纪是一个信息时代。软件作为信息系统的神经，在我们生活的这个时代里发挥着举足轻重的作用，而微软公司和它推出的各种软件，更是令世人为之瞩目。我们将立足图书，继续并扩大与微软公司的合作，在中国信息产业的发展道路上留下自己的足迹。

出版者

2000 年 10 月

# Acknowledgments

There are a number of people who played important roles in making this book possible. First of all, we would each like to thank our co-authors. We hope that by pooling our experience and our knowledge, we have made the book stronger. Next, we would like to thank the editorial team at Microsoft Press for their dedication and skill: David Clark, Anne Taussig, Kathleen Atkins, Alice Turner, Elizabeth Cate, Dail Magee Jr., and Marzena Makuta. You did an excellent job of organizing, scheduling, providing necessary materials, offering feedback, and asking the right questions to make this book better—and you did it in a kind and professional manner. It was great working with you all!

We owe a special thank you to Mitchell Schreoter for contributing to this book by writing Chapter 23, “Accessing Microsoft SQL Server from the Internet.” We appreciate his expertise and his willingness to participate in the book, and we look forward to collaborating with him on future projects.

The author Marcilina S. (Frohock) Garcia would also like to thank Ed Whalen for being the lead on this book and for being so great to work with. Thanks to Jamie Reding for always answering our picky SQL Server questions. And thanks to Steve DeLuca for his great contribution to the book. I would like to thank my husband, Luis Garcia, and my 8-year-old stepdaughter, Marilyn Nicole Garcia, for their encouragement in writing this book. Hayabusa Luis? I also would like to thank my dear parents, Ron and Twila Jean Frohock, for their continuing prayers and support. And a special thank you to my grandparents, Benjamin and Wilma Frohock, for always being so proud of me, and to Vernon and Twila Harris, who are looking down from heaven. And of course, I would like to thank God, who made all of this possible.

The author Jamie Reding would like to thank Ed Whalen and Marci Garcia. As always, it has been great working with you both. I would also like to thank Steve DeLuca for his insight and contributions to this book. I would like to extend my thanks to my parents, Jack and Karen Reding. Thank you for all your support throughout the years. Finally, a very special thank you to my wife, Sharon, and my sons, Alex and Jackson, for their patience and support during the long process of writing this book. Hey guys, you are the best!

The author Edward Whalen would like to extend many thanks to Marci Garcia, who has been great to collaborate with on books. I would also like to thank Jamie Reding for taking the time to contribute to this book. In addition I would like to thank Steve DeLuca for his contribution to this effort and for the previous books he has worked on with me. And I would especially like to thank Mitch Schroeter for his work on Chapter 23. I would also like to thank my parents, John and Lilly Whalen, for their continuing support, and to mention my brother Robert, his wife Annette, and my very special nieces: Michelle, Valerie, and Natalie. Finally, I would like to thank my wife, Felicia, for putting up with me during the time I wrote this book.

The author Steve Adrien DeLuca would like to first thank the people on the management staff at Microsoft and the great Distributed Management Division, which I am extremely glad to be part of: people like Brian Valentine, Deborah Black, and Casey Kiernan (thanks for the help on our latest patent). I always felt lucky to work in this environment because I get to work with the best engineers in the industry, and I am lucky enough to call some of these people my friends. I would like to extend my thanks to those very talented engineers and friends that I work with such as Kevin Hodge, Juhan Lee, Paul Darcy, Sally Martin (my co-inventors on many different patents that we have applied for, all sponsored by Microsoft), Chad Verbowski, Iain Frew, Vij Rajarajan, Kishnan Nedungadi, James Johnston, Sheela Word, Cary Rohwer, Lauren Gallagher, Jenny Lehman, and Edward Williams. I can never adequately express the feeling I have for close friends such as Ed Whalen, Marci Garcia, and Jamie Reding, whom I have worked with for many years and co-authored with in previous writings. I also would like to thank friends that have supported me through the years such as Pat Beadles, Kathryn B. Hodge, Chef Guido and Cheryl D'Ambrosio, and Tony and Kris Vanacore. And last, but first in my thoughts, thanks to my family, especially my wife, Jean; my daughter, Tina; my sister, Sue; my brother, Nick; and my mother, Esther. I would like to dedicate this writing to the memory of my constant companion of 17 years, and one of the sweetest beings ever to grace the earth, Asta. A special thanks to the editing and publishing teams at Microsoft Press for so often turning my writing into English, and making my English understandable.

# Introduction

Those of you who are currently using Microsoft SQL Server 7 might not notice significant changes on the surface when you move to Microsoft SQL Server 2000. You will soon observe, however, that SQL Server 2000 includes many enhancements. One major enhancement is increased support for larger memory models. In fact, when you use SQL Server 2000 in conjunction with Microsoft Windows 2000 Datacenter Server, you can access up to 64 gigabytes (GB) of physical memory. You might also be able to take advantage of enhanced Extensible Markup Language (XML) support, indexed views, and user-defined functions. As you begin using SQL Server 2000, you will also discover improvements in the tools, such as Enterprise Manager, Query Analyzer, and Profiler. SQL Server 2000 improves on SQL Server 7 in almost every area.

To those of you who are already familiar with SQL Server 7, this book will serve as a guide to the enhancements included in SQL Server 2000. To those of you who are new database administrators (DBAs) but are not necessarily familiar with SQL Server, this book will serve as an introduction to SQL Server technology. This book will help the novice get started.

---

## What This Book Is About

We'll begin with the fundamentals of SQL Server and then build on those basics as we look at more advanced topics. As we go, we'll work through many examples of performing particular tasks. This book is divided into five parts:

- **Part I: Introduction to Microsoft SQL Server** This part provides an overview of SQL Server 2000. The chapters in Part I cover topics such as new SQL Server features, the relationship between SQL Server and Windows 2000, and the duties performed by DBAs. This information might be a review for some of you, but it works as the foundation for the remainder of the book. Chapter 1 was authored by Marcilina S. (Frohock) Garcia, Chapter 2 was authored by Jamie Reding, and Chapter 3 was authored by Edward Whalen.

- **Part II: Installation and Setup** This part covers topics related to the installation and setup of SQL Server, including planning your SQL Server installation, installing SQL Server, and using SQL Server Enterprise Manager. You'll also learn how to create databases and tables and how to use SQL Server networking and Microsoft Cluster Services (MSCS). Chapters 8, 9, and 10 were authored by Marcilina S. (Frohock) Garcia; Chapters 7, 11, and 12 were authored by Jamie Reding; Chapters 4 and 5 were authored by Edward Whalen; and Chapter 6 was authored by Steve Adrien DeLuca.
- **Part III: Using Microsoft SQL Server** This part describes how to use SQL Server and includes topics such as retrieving data by using Transact-SQL (T-SQL) and creating and managing tables by using T-SQL. You'll also learn how to create and use rules, defaults, and constraints as well as indexes, views, and transactions. Later chapters cover using advanced T-SQL, creating and managing stored procedures and triggers, loading the database, and accessing SQL Server from the Internet. Chapters 14, 15, 18, 21, 22, and 24 were authored by Jamie Reding; Chapters 13, 16, 17, 19, and 20 were authored by Marcilina S. (Frohock) Garcia; and Chapter 23 was authored by Mitchell Schreoter.
- **Part IV: Built-In Server Features** This part looks at server-side features, devoting three chapters to database replication. You'll learn what replication is, how to configure it, and how to use it. Part IV also includes a chapter about Microsoft Distributed Transaction Coordinator (MS DTC) and a chapter about SQL Server 2000 Analysis Services. Chapters 25, 26, 27, and 28 were authored by Edward Whalen; and Chapter 29 was authored by Jamie Reding.
- **Part V: Management, Tuning, Maintenance, and Troubleshooting** This part consists of a series of chapters that explain how to manage, tune, maintain, and troubleshoot a SQL Server system. The chapters in Part V cover SQL Server administration, backing up and restoring SQL Server, and user and security management. You'll also learn about query optimization and how to identify and solve common performance problems. Chapters 30, 31, and 36 were authored by Marcilina S. (Frohock) Garcia; Chapters 32, 33, and 35 were authored by Edward Whalen; and Chapter 34 was authored by Jamie Reding.

The authors of this book truly hope that you enjoy it and that it is useful in your daily work. And now, let's get started learning how to use SQL Server 2000.

---

## About the Companion CD

The companion CD contains the fully searchable electronic version of this book, and additional reading material you might find useful. To view the electronic book, you must have Microsoft Internet Explorer 4.01 or later installed on your system. If you don't have Internet Explorer 4.01 or later, the setup program will offer to install the minimum files necessary and will not change the user's current settings or associations.

### System Requirements

To install and run an electronic book, your system must meet the following requirements:

- 486/66 or higher processor
- One of the following operating systems:
  - Microsoft Windows 95
  - Microsoft Windows 98
  - Microsoft Windows NT 4 with Service Pack 3 or later
  - Microsoft Windows 2000 (any edition)
- Disk space:
  - To install and run an electronic book from a network (network installation): 10 MB
  - To install an electronic book to the hard drive (local installation): 20–31 MB
  - To install Microsoft Internet Explorer to the hard drive (local installation) and install and run an electronic book from a network (network installation): 110 MB
  - To install Microsoft Internet Explorer to the hard drive (local installation) and install and run an electronic book from the hard drive (local installation): 120–131 MB



# Contents at a Glance

## Part I

### **Introduction to Microsoft SQL Server**

---

- 1 Overview of Microsoft SQL Server 2000 2**
- 2 The Microsoft Windows 2000 Platform 14**
- 3 Roles and Responsibilities of the Microsoft SQL Server DBA 34**

## Part II

### **Installation and Setup**

---

- 4 Designing a Microsoft SQL Server System 54**
- 5 I/O Subsystem Configuration and Planning 70**
- 6 Capacity Planning 104**
- 7 Installing Microsoft SQL Server 144**
- 8 Managing Microsoft SQL Server Services 162**
- 9 Creating Databases 178**
- 10 Creating Database Tables 204**
- 11 Configuring Microsoft SQL Server on the Network 228**
- 12 Microsoft SQL Server and Microsoft Cluster Services 248**

## Part III

### **Using Microsoft SQL Server**

---

- 13 Introduction to Transact-SQL and SQL Query Analyzer 276**
- 14 Retrieving Data Using Transact-SQL 292**
- 15 Managing Tables Using Transact-SQL and Enterprise Manager 334**
- 16 Creating and Using Defaults, Constraints, and Rules 356**
- 17 Creating and Using Indexes 398**
- 18 Creating and Using Views 434**
- 19 Understanding Transactions and Transaction Locking 466**

- 20 Understanding Advanced T-SQL 492**
- 21 Creating and Managing Stored Procedures 512**
- 22 Creating and Using Triggers 540**
- 23 Accessing Microsoft SQL Server from the Internet 568**
- 24 Loading the Database 578**

## Part IV

### **Built-In Server Features**

---

- 25 Component Services and Microsoft Distributed Transaction Coordinator 616**
- 26 Microsoft SQL Server Replication: Overview and Snapshot Replication 634**
- 27 Transactional Replication 694**
- 28 Merge Replication 738**
- 29 Using Microsoft SQL Server Analysis Services 770**

## Part V

### **Management, Tuning, Maintenance, and Troubleshooting**

---

- 30 Microsoft SQL Server Administration 808**
- 31 Automating Administrative Tasks 836**
- 32 Backing Up Microsoft SQL Server 872**
- 33 Restoring and Recovering the Database 910**
- 34 User and Security Management 926**
- 35 Using SQL Query Analyzer and SQL Profiler 958**
- 36 Solving Common Performance Problems 986**

## Part VI

### **Appendixes**

---

- A Microsoft SQL Server Configuration Parameters 1012**
- B Microsoft SQL Server Monitoring 1030**
- C DBCC Commands 1042**

**Glossary 1047**

**Index 1063**

# Table of Contents

Acknowledgments xxv

Introduction xxvii

## Part I

### Introduction to Microsoft SQL Server

---

<b>1</b>	<b>Overview of Microsoft SQL Server 2000</b>	<b>2</b>
	SQL Server Systems	3
	New Features and Enhancements of SQL Server 2000	6
	Summary	13

---

<b>2</b>	<b>The Microsoft Windows 2000 Platform</b>	<b>14</b>
	The Windows 2000 Family	15
	Windows 2000 Professional	15
	Windows 2000 Server	16
	Windows 2000 Advanced Server	16
	Windows 2000 Datacenter Server	16
	Windows 2000 Operating System Family Differences	17
	Windows 2000 Components and Features	17
	Reliability	17
	Security	19
	Ease of Use	20
	System Administration and Deployment	22
	The Mobile Experience	26
	Performance	27
	Internet Access	29
	Active Directory	30
	Summary	33

---

<b>3</b>	<b>Roles and Responsibilities of the Microsoft SQL Server DBA</b>	<b>34</b>
	Basic and Optional Duties of the SQL Server DBA	35
	Installation and Configuration	36
	Security	37
	Operations	38
	Service Levels	39
	System Uptime	40
	Documentation	42
	Design and Development	45
	Miscellaneous	47
	DBA Tips and Techniques	48
	Dealing with the User Community	48
	System Tuning	49
	Dealing with a Crisis	50
	Summary	51

## Part II

### **Installation and Setup**

---

<b>4</b>	<b>Designing a Microsoft SQL Server System</b>	<b>54</b>
	System Requirements	55
	System Application	56
	Service Level Requirements	58
	System Components and Options	59
	Windows 2000 Versions	59
	SQL Server Versions	61
	Version Comparison	62
	System Options	62
	Database Layout	64
	Transaction Log	64
	Data Files	65
	Application	65
	Architecture	66
	Performance and Scalability	68
	Summary	68

---

<b>5</b>	<b>I/O Subsystem Configuration and Planning</b>	<b>70</b>
	Disk Drive Performance Characteristics	71
	Disk Drive Construction	72
	Disk Drive Characteristics	73
	Disk Drive Specifications	75
	Disk Drive Performance	76
	Solutions to the Disk Performance Limitation Problem	78
	RAID Overview	78
	I/O Subsystem Concepts	79
	Caching Controllers	79
	Disk Drive Caches	80
	Internal vs. External RAID	80
	Storage Area Networks	81
	Controller and Bus Bandwidth Issues	82
	High-End I/O Subsystems	82
	Elevator Sorting	82
	Disk Reliability	84
	Overview of Common RAID Levels	84
	RAID 0	85
	RAID 1	86
	RAID 5	88
	RAID 10	91
	RAID Level Performance Comparison	92
	Read Performance	92
	Write Performance	93
	Disk Calculations	94
	RAID Comparison	95
	I/O Latencies and SQL Server	96
	Planning the SQL Server Disk Layout	97
	Determine I/O Requirements	97
	Plan the Disk Layout	99
	Implement the Configuration	100
	I/O Subsystem Tips and Recommendations	102
	Summary	103

---

**6 Capacity Planning 104**

Types of Capacity Planning	105
History of Capacity Planning	107
Transaction Processing	109
OLTP Transactions	109
DSS Transactions	110
Principles of Capacity Planning	111
CPU Utilization	112
Page Faulting	116
Capacity Planning for Memory	118
Collecting Memory Usage Data	120
Analyzing Memory Data	121
Capacity Planning for the Processor	123
Fault Tolerance	124
Collecting Usage Data for a Single CPU	129
Collecting Usage Data for Multiple CPUs	130
Capacity Planning for the Disk Subsystem	131
Disk Drives for Windows 2000 and SQL Server	132
Disk Drives for the Log Files	133
Disk Drives for the Database	134
Disk Drives Needed for the System	136
Collecting Disk Usage Data	136
Analyzing Disk Usage Data	137
Capacity Planning for the Network	138
Collecting Network Usage Data	139
Analyzing Network Usage Data	139
Choosing the Data to Collect	140
Collecting Process Data	140
Analyzing Process Data	141
Summary	143

---

**7 Installing Microsoft SQL Server 144**

Server Installation	145
Local Installation	145
Remote Installation	150
Unattended Installation	152

Upgrading from Earlier Versions	153
Upgrading from SQL Server 7 to SQL Server 2000	153
Upgrading from SQL Server 6.5 to SQL Server 2000	154
Client Installation	161
Summary	161
<b>8 Managing Microsoft SQL Server Services 162</b>	
SQL Server Services	163
Using SQL Server Service Manager	165
Using Windows 2000 Service Control Manager	166
Using SQL Server Enterprise Manager	168
Managing SQL Server	168
Managing Other Services	175
Summary	177
<b>9 Creating Databases 178</b>	
Database Structure	179
Files	179
Filegroups	180
Rules and Recommendations	184
Automatic File Growth	185
System Databases	186
Database Creation	187
Using the Create Database Wizard	188
Using Enterprise Manager	193
Using T-SQL Commands	195
Database Viewing	198
Using Enterprise Manager	198
Using SQL	200
Database Deletion	200
Using Enterprise Manager	200
Using SQL	201
Summary	202

---

<b>10</b>	<b>Creating Database Tables</b>	<b>204</b>
	Laying the Groundwork	205
	Reviewing Table Basics	206
	Defining a Database Table	206
	Using System Data Types	207
	Working with User-Defined Data Types	212
	Creating Tables in a Filegroup	218
	Creating the <i>Product_Info</i> Table in a Filegroup	219
	Using Null Values	220
	Creating the <i>Product_Info</i> Table Using <i>NULLS</i>	221
	Adding the IDENTITY Property	222
	Adding the IDENTITY Property to the <i>Product_Info</i> Table	222
	Creating a Table Using Enterprise Manager	223
	Summary	227
<b>11</b>	<b>Configuring Microsoft SQL Server on the Network</b>	<b>228</b>
	Overview of Network Services	229
	SQL Server APIs	232
	DB-LIB Connectivity	232
	ODBC Connectivity	232
	ODBC Connection Pooling	232
	Other APIs	233
	Network Libraries	233
	The SQL Server 2000 Server Network Utility	234
	The SQL Server 2000 Client Network Utility	235
	SQL Server Net-Libraries and Protocols	239
	Network Components and SQL Server Performance	240
	The Software Layer—Network Protocols	241
	The Hardware Layer	242
	Network Monitoring	244
	Monitoring Performance	244
	Determining Whether You Have a Problem	245
	Finding Solutions to Network Problems	246
	Summary	247



---

<b>12</b>	<b>Microsoft SQL Server and Microsoft Cluster Services</b>	<b>248</b>
	Types of Failure	249
	Overview of MSCS	250
	Basic Concepts	252
	Cluster Components	253
	Cluster Application Types	260
	MSCS Modes	260
	Examples of Clustered Systems	263
	Example 1—High-Availability System with Static Load Balancing	263
	Example 2—Hot Spare System with Maximum Availability	264
	Example 3—Partial Server Cluster	265
	Example 4—Virtual Server Only, with No Failover	266
	SQL Server Cluster Configuration	266
	Planning Your Configuration	267
	Installing SQL Server for Clustering	268
	Using a Three-Tier Application	273
	Beyond MSCS	273
	Summary	274

## Part III

### Using Microsoft SQL Server

---

<b>13</b>	<b>Introduction to Transact-SQL and SQL Query Analyzer</b>	<b>276</b>
	What Is SQL?	277
	DDL	278
	DML	279
	What Is T-SQL?	281
	A Review of New T-SQL Features	281
	System Stored Procedures	281
	System Tables	282
	Functions	283
	Data Types	284
	Statements	285