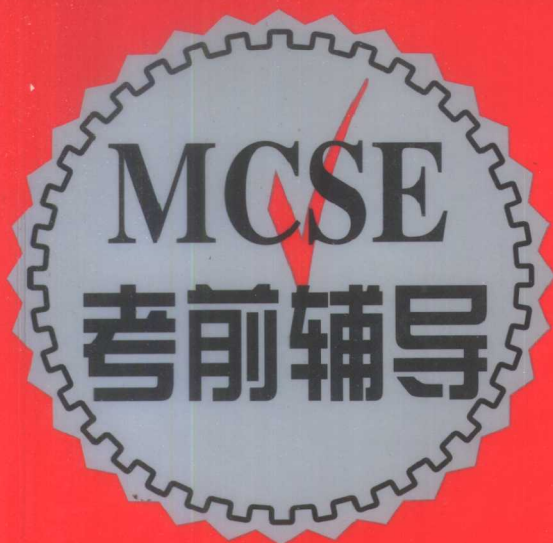




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Database Design on SQL Server 7

Exam 70-029

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Christopher Leonard, Brad Schulz, Greg
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MCSE Database Design on SQL Server 7

**Chris Leonard
Brad Schulz
Greg "Buck" Woody
Jose Amado-Blanco
Pam Barker**



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—Scott Waid, *MCSE*

***See for yourself why we're #1 and drop us a line at clpq@coriolis.com—
we look forward to hearing about your testing successes!***

To my dear wife, Margie, whose steadfast love and support have upheld me throughout the course of this project. I hope I never come to take for granted your faith in me and in God's ability to lead us through times like this. You are a praiseworthy woman, and I know that I am blessed to be sharing this Great Adventure with you. I love you!

—Chris Leonard



To my beloved wife, Donna, and my children, Austin, Alix, and Aaron, who I love dearly and are my pride and joys. You have been exceedingly understanding and patient with me for these four months during this project for which, I wholly dedicate this book to you. I can't wait to see what God's plan is for all of our lives!

—Brad Schulz



To Jo Anna, who taught me the infinite joy of learning.

—Greg "Buck" Woody



This book is dedicated to all database administrators, designers, and developers from whom I continue to learn everyday.

—Jose Amado-Blanco



To my husband, John, and sons, Ron and John Jr., who continue to support me and encourage me. Thank you for your love and encouragement and unwavering support. The three of you are the lights of my life and I am exceedingly blessed to have you.

—Pam Barker



ABOUT THE AUTHORS

Chris Leonard has worked with database technologies for over 10 years, both as a developer and as a DBA. He is currently a DBA for a Fortune 250 company in the Tampa Bay area that relies heavily on the Microsoft SQL Servers he builds and administers, using them to store hundreds of megabytes of critical information. He has worked extensively with other database servers as well, including IBM DB2, Oracle, and Sybase. Chris's background also includes broad teaching experience.

Brad Schulz is a principal consultant with Tech Data Corp. in Tampa, Florida. He has worked with SQL Server 7 for almost one-and-a-half years and participated in the beta product evaluations. He has also worked with large-scale database systems and computer technology in general for 15 years. Brad was a founder of two companies in the exciting telecommunications business and has traveled an interesting path from his Electrical Engineering background at the University of Louisville.

Greg "Buck" Woody is a database administrator (DBA) for a consulting firm in Tampa, Florida. He has worked with computer technology for 17 years, in roles as varied as a technical trainer, network administrator, manager, and DBA. He has worked with Microsoft products since DOS 2.0, and with SQL Server since version 4.2. Buck holds certifications from Microsoft (MCSE), Novell, and Sun Microsystems. He graduated with honors from Tampa College with a Business degree.

Jose Amado-Blanco is an independent database administrator consultant in Sybase and SQL Server who works in the Tampa area of Florida. He obtained his college and Master in Science degrees from the Moscow Economic-Statistic Institute. Jose has been working with computer technology for 11 years, in diverse environments such as mainframes, PCs, and client server. He has worked with Sybase since version 4.2 and with SQL Server since version 6.5. He is a Microsoft Certified Professional in SQL Server.

Pam Barker has used all of the major database management systems at one time or another in designing and constructing applications during her 17-year career as a DBA. As some of these DBMSs were in version 1.0 releases at the time, Pam is pleased to have been able to observe first-hand the evolution and development of database systems. In addition, she has authored and delivered database design and programming courses for several national training companies. Pam currently manages a DBA team for a high-tech Fortune 500 company based in the Tampa, Florida area where she lives with her husband and two sons.

ACKNOWLEDGMENTS

To my beloved children Gabe, Abby, and Nicholas Thanks for all your hugs and prayers! Daddy loves you very much To Tennessee Cabin Press. We did it! To Doug and Amy: Special thanks for helping far beyond expectations Finally, to my Lord You are my life. I hereby declare my work on this project to be solely *Soli* [SDG].

—Chris Leonard

Deep gratitude goes again to my family, and to my co-authors for inviting me to join them on this project. Many thanks to Buck for keeping us on schedule, to Mike Good for his contributions, to Rob and Ian at Microsoft, and to Jeff Kellum and Greg Balas at Coriolis. Finally, high praises go to my Lord. Selah!

—Brad Schulz

I would like to acknowledge the sacrifices and encouragement my family has given me through this process and the dedication and hard work that my co-authors have shown. I would also like to acknowledge all the professionals of the Tampa SQL User's Group who help me learn more about SQL Server each day

—Greg "Buck" Woody

I want to thank my wife, son, and daughter for their patience and support. I also want to thank Karen Brown for her special editorial work, Marty Hensler for the lengthy SQL discussions we have had, and Mark Yelton for his initial editions. Finally, thanks to my dad for teaching me that hard work pays off.

—Jose Amado-Blanco

Over the years I have worked with many exceptional DBA's and information technology professionals. The knowledge and insight that I have gleaned from them has helped me enormously both in my career and in the preparation of this book.

—Pam Barker

INTRODUCTION

Welcome to *MCSE Database Design on SQL Server 7 Exam Prep*. This new book from Certification Insider Press offers you interactive activities and numerous hands-on projects that reinforce key concepts and help you prepare for the exam. This book also features troubleshooting tips for solutions to common problems that you will encounter. We feel that this book is much more than a study-guide for an exam. It represents many years of combined SQL Server experience that will aid you in real-world activities in your professional career.

The companion interactive CD-ROM features a unique test simulation environment with two complete practice exams that allow you to test your skills and knowledge, making this the perfect study guide for the Microsoft certification exams. The exam questions have been specially written based on the content of the book to reinforce what you have learned. These materials have been specifically designed to help individuals prepare for Microsoft Certification Exam 70-029, *Designing and Implementing Databases on Microsoft SQL Server 7*. Answers to end-of-chapter review questions and projects are also found on the CD-ROM.

The big technology question for the technology professional is “Are you certified?” Certification is rapidly becoming the key to professional career enhancement for network engineers, technicians, software developers, Web designers, and even professional office workers.



If you're ready to dig right in, skip to the “About The Book” section later in this introduction.

WHY BECOME A MICROSOFT CERTIFIED PROFESSIONAL?

Becoming a Microsoft Certified Professional (MCP) can open many doors for you. Obtaining the appropriate Microsoft Certified Professional credentials can provide a formal record of your skills to potential employers. Certification can be equally effective in helping you secure a raise or promotion.

The Microsoft Certified System Engineer (MCSE) program is made up of a series of core and elective exams in several different tracks. Combinations of individual exams can lead to certification in a specific track. Most tracks require

you to pass a combination of core and elective exams. (Exam 70-029, *Designing and Implementing Databases on Microsoft SQL Server 7*, is an elective exam.) Your MCSE credentials tell a potential employer that you are an expert. You'll find that this exam is very versatile, and is valid for many certification tracks. This exam is a core requirement for the new Microsoft Certified Database Administrator (MCDBA) certification. You also earn elective credit toward (MCSE+I) certification, and elective credit toward (MCSD) certification. Passing this exam is very useful in all Microsoft certifications.

WANT TO KNOW MORE ABOUT MICROSOFT CERTIFICATION?

There are many additional benefits to achieving Microsoft certified status. These benefits apply to you as well as to your potential employer. As a Microsoft Certified Professional, you will be recognized as an expert on Microsoft products, have access to ongoing technical information from Microsoft, and receive special invitations to Microsoft conferences and events. You can obtain a comprehensive, interactive tool that provides full details about the Microsoft Certified Professional Program online at www.microsoft.com/train_cert/cert. For more information on texts from Certification Insider Press that will help prepare you for certification exams, visit our site at www.certificationinsider.com.

A Microsoft Certified Professional receives the following benefits:

- Microsoft Certified Professional wall certificate. Also, within a few weeks after you have passed any exam, Microsoft sends you a Microsoft Certified Professional Transcript that shows which exams you have passed.
- License to use the Microsoft Certified Professional logo. You are licensed to use the logo in your advertisements, promotions, proposals, and other materials, including business cards, letterheads, advertising circulars, brochures, yellow page advertisements, mailings, banners, resumes, and invitations.
- Microsoft Certified Professional logo sheet. Before using the camera-ready logo, you must agree to the terms of the licensing agreement.
- Access to technical and product information directly from Microsoft through a secured area of the MCP Web site. Dedicated forums on CompuServe (GO MECFORUM) and The Microsoft Network enable Microsoft Certified Professionals to communicate directly with Microsoft and one another.
- One-year subscription to *Microsoft Certified Professional Magazine*, a career and professional development magazine created especially for Microsoft Certified Professionals.

- Invitations to Microsoft conferences, technical training sessions, and special events.

A Microsoft Certified Systems Engineer receives all the benefits mentioned above and the following additional benefits:

- Microsoft Certified Systems Engineer logos and other materials to help you identify yourself as a Microsoft Certified Systems Engineer to colleagues or clients.
- One-year subscription to the Microsoft TechNet Technical Information Network.
- One-year subscription to the Microsoft Beta Evaluation program. This benefit provides you with up to 12 free monthly beta software CDs for many of Microsoft's newest software products. This enables you to become familiar with new versions of Microsoft products before they are generally available. This benefit also includes access to a private CompuServe forum where you can exchange information with other program members and find information from Microsoft on current beta issues and product information.

CERTIFY ME!

So you are ready to become a Microsoft Certified Professional. The examinations are administered through Sylvan Prometric (formerly Drake Prometric) and Virtual University Enterprises, or VUE (a division of National Computer Systems, Inc.) and are offered at more than 1,000 authorized testing centers around the world. Microsoft evaluates certification status based on current exam records. Your current exam record is the set of exams you have passed. To maintain Microsoft Certified Professional status, you must remain current on all the requirements for your certification.

Registering for an exam is easy. To register to take an exam with Sylvan Prometric, call (800) 755-EXAM (3926). Dial (612) 896-7000 or (612) 820-5707 if you cannot place a call to an 800 number from your location. To register with VUE, contact them at (888) 837-8616 or online at their Web site at www.vue.com/ms. You must schedule the exam at least one day before the day you want to take the exam. Taking the exam automatically enrolls you in the Microsoft Certified Professional program; you do not need to submit an application to Microsoft Corporation.

When you call to register, have the following information ready:

- Your name, organization (if any), mailing address, and phone number.
- A unique ID number (for example, your Social Security number).
- The number of the exam you wish to take (70-029 for the SQL Server 7 Design exam).

- A method of payment (for example, credit card number). If you pay by check, payment is due before the examination can be scheduled. The fee to take each exam is currently \$100.

ADDITIONAL RESOURCES

One of the best sources of information about Microsoft certification tests comes from Microsoft itself. Because its products and technologies—and the tests that go with them—change frequently, the best place to go for exam-related information is online.

If you haven't already visited the Microsoft Certified Professional or Training and Certification pages, do so right now. As of this writing, the Microsoft Training and Certification page resides at www.microsoft.com/train_cert and the Microsoft Certified Professional page is at www.microsoft.com/mcp. Note that it may not be there by the time you read this, or it may have been replaced by something new, because the Microsoft site changes regularly. If this happens please read the next section, "Coping With Change On The Web."

The menu options in the home page's left-hand column point to important sources of information in the Training and Certification pages. Here's what to check out:

- **Train_Cert Summaries/By Product** Use this to jump to product-based summaries of all classroom education, training materials, study guides, and other information for specific products. In the Back Office section, under the heading "SQL Server 7," you'll find an entire page of information about SQL Server 7 training and certification, including links to the specific 70-029 test. This tells you a lot about your training and preparation options, and mentions all the tests that relate to SQL Server 7.
- **Search/Find an Exam** Pulls up a search tool that lets you list all Microsoft exams and locate all exams pertinent to any Microsoft certification (MCP, MCSD, MCSE, MCT, and so on), or those exams that cover a particular product. This tool is quite useful not only to examine the options, but also to obtain specific test preparation information, because each exam has its own associated preparation guide.
- **Downloads** Here, you'll find a list of the files and practice tests that Microsoft makes available to the public. These include several items worth downloading, especially the Certification Update, the Personal Exam Prep (PEP) tests, various assessment exams, and a general Exam Study Guide. Try to peruse these materials before taking your first test.

Of course, these are just the high points of what's available in the Microsoft Training and Certification pages. As you browse through them—and we strongly recommend that you do—you'll probably find other information we didn't mention here that is every bit as interesting and compelling.

COPING WITH CHANGE ON THE WEB

Sooner or later, all the specifics we've shared with you about the Microsoft Training and Certification pages, and all the other Web-based resources we mention throughout the rest of this book, will go stale or be replaced by newer information. In some cases, the URLs you find here may lead you to their replacements; in other cases, the URLs will go nowhere, leaving you with the dreaded 404 error message, *File not found*.

When that happens, please don't give up. There's always a way to find what you want on the Web, if you're willing to invest some time and energy. To begin with, most large or complex Web sites—and Microsoft's qualifies on both counts—offer a search engine. As long as you can get to the site itself, you can use this tool to help you find what you need.

The more particular or focused you can make a search request, the more likely it is that the results will include information you can use. You can search for Training and Certification will produce a lot of data about the subject in general. If you're specifically looking for, for example, the Preparation Guide for Exam 70-029, *Designing and Implementing Databases on Microsoft SQL Server 7*, you'll be more likely to get there quickly if you use a search string such as: *Exam 70-029 AND Preparation Guide*. Likewise, if you want to find the Training and Certification downloads, try a search string such as: *Training and Certification AND download page*.

Finally, don't be afraid to use general search tools like **www.search.com**, **www.altavista.com**, or **www.excite.com** to find related information. Although Microsoft offers the best information about its certification exams online, there are plenty of third-party sources of information, training, and assistance in this area that do not have to follow a party line like Microsoft does. The bottom line is: If you can't find something where the book says it lives, start looking around.

ABOUT THE BOOK

Career opportunities abound for well-prepared database designers and administrators. This book is designed as your doorway into database design and administration through Microsoft SQL Server 7. If you are new to SQL Server or database programming, this book is your beginning to an exciting future.

Others who have prior experience with SQL Server or perhaps an earlier version will find that this book adds depth and breadth to that experience. In addition, this text provides the knowledge you need to prepare for Microsoft's certification exam 70-029, *Designing and Implementing Databases on Microsoft SQL Server 7*. As of this printing, the exam is nonadaptive, and focuses on exhibits and application style questions. The practice exams in this book and on the CD are styled to prepare you for these questions.

Because SQL Server is closely tied to Windows NT Server, it is marvelously scalable and fits into both large and small organizations. It provides the cornerstone on which to build a multitier design for an application, an Internet Web site, or an Intranet. A new feature allows SQL Server to be installed on Windows 95, Windows 98 and Windows NT Workstation as well. The success of Windows SQL Server 7 is reflected in the huge number of software vendors and developers who develop in this environment or who have switched from other environments to Windows SQL Server.

When you complete this book, you will be at the threshold of a SQL design or administration career that can be very fulfilling and challenging. This is a rapidly advancing field that offers ample opportunity for personal growth and for making a contribution to your business or organization. The book is intended to provide you with knowledge that you can apply right away and a sound basis for understanding the changes that you will encounter in the future. It also is intended to give you the hands-on skills you need to be a valued professional in your organization.

The book is filled with hands-on projects that cover every aspect of programming and designing databases using SQL Server 7. The projects are designed to make what you learn come alive through a story of a new DBA that you can follow and allows you to actually perform the tasks discussed. Also, every chapter includes a range of practice questions to help prepare you for the Microsoft certification exam. All of these features are offered to reinforce your learning, so you'll feel confident in the knowledge you have gained from each chapter.

Chapter 1, "An Overview Of Microsoft SQL Server 7" provides a brief history of Relational Database Management Systems, particularly the Microsoft SQL Server product, as well as explaining its components, hardware, and software requirements.

In Chapter 2, "SQL Database Architecture" you are given a detailed look at the architecture and SQL design for databases.

Chapter 3, "Developing A Logical Database Design" explains the process for designing the model used to create the database project, which is very important for a successful application implementation.

We continue our look at this important process in Chapter 4, “Deriving The Physical Design.” The mapping of the logical design to the physical layout is described in great detail in this chapter.

After reviewing the important building blocks of a database design, Chapter 5, “Tables” steps you through the proper planning process for designing your tables.

Chapter 6, “Indexes” steps you through configuring the Indexes you’ll need to ensure that your design is optimized for speed.

Chapter 7, “Retrieving And Modifying Data” teaches you the basics about interacting with your SQL Server data, and explains important strategies for accessing and changing data quickly.

Chapter 8, “Transact-SQL Scripting And Command Batches” discusses ways to use multiple SQL Server commands together to accomplish jobs that no single command could achieve.

In Chapter 9, “Summarizing And Transforming Data” you will learn how to develop and fine-tune queries for summarizing and accumulating data.

Chapter 10, “Views” discusses in greater detail SQL Server’s ability to create logical tables that restrict access to sensitive data and can simplify a programmer’s interaction with the database.

Creating batches of database entries, as well as how to manage locks is discussed in Chapter 11, “Transactions And Locking”. You will learn about the types of SQL Server locks, as well as the different methods for handling transactions here.

In Chapter 12, “Stored Procedures” we begin to look at some of the issues involving database programming. Chapter 12 provides a detailed discussion of stored procedures and their use.

Chapter 13, “Triggers” continues the discussion of database integrity, focusing on triggers, as well as the advantages and disadvantages associated with them.

In Chapter 14, “Creating The Physical Database” we will complete the process begun in Chapters 3 and 4. We will discuss the proper way to build your database using Microsoft’s tools for SQL Server 7.

Often data resides outside a SQL Server. Chapter 15, “Remote Data Sources” discusses the process of accessing data from other database platforms such as Oracle. You’ll also learn to attach spreadsheets and other office automation products and access them within SQL Server.

Chapter 16, “Data Transfers” discusses the process for importing data into your database. A powerful new tool, Microsoft’s Data Transformation Services, is explained in this chapter.

Another new feature is the Full-Text capabilities in SQL Server 7. Chapter 17, “Implementing Full-Text Search” discusses the methods of implementing this exciting innovation.

Chapter 18, “Maintaining A Database” discusses the tricks of the trade for maintaining your database so that it runs with peak efficiency and shows you how to perform preventative maintenance to help avoid system downtime.

Chapter 19, “Diagnosing Problems And Improving Query Performance” completes our study of SQL Server 7 by examining the techniques used to examine the performance of your queries.

We also have included some helpful appendixes and a glossary.

Features

To aid you in fully understanding SQL Server 7 concepts, there are many features in this book designed to improve its value:

- **Chapter objectives** Each chapter in this book begins with a detailed list of the concepts to be mastered within that chapter. This list provides you with a quick reference to the contents of that chapter, as well as a useful study aid.
- **Illustrations and tables** Numerous illustrations of screenshots and components aid you in the visualization of common setup steps, theories, and concepts. In addition, many tables provide details and comparisons of both practical and theoretical information.
- **Hands-on projects** Although it is important to understand the theory behind server and networking technology, nothing can improve upon real-world experience. To this end, along with theoretical explanations, each chapter provides numerous hands-on projects aimed at providing you with real-world implementation experience.
- **Chapter summaries** Each chapter’s text is followed by a summary of the concepts it has introduced. These summaries provide a helpful way to recap and revisit the ideas covered in each chapter.
- **Review questions** End-of-chapter assessment begins with a set of review questions that reinforce the ideas introduced in each chapter. These questions not only ensure that you have mastered the concepts, but are also written to help prepare you for the Microsoft certification examination.

Text And Graphic Conventions

Wherever appropriate, additional information and exercises have been added to this book to help you better understand what is being discussed in the chapter. Icons throughout the text alert you to additional materials. The icons used in this book are as follows:



The Note icon is used to present additional helpful material related to the subject being described.



Each hands-on activity in this book is preceded by the Hands-On Project icon and a description of the exercise that follows.



Tips are included from the author's experience that provide extra information about how to attack a problem, how to set up Proxy Server for a particular need, or what to do in certain real-world situations.

WHERE SHOULD YOU START?

This book is intended to be read in sequence, from beginning to end. Each chapter builds upon those that precede it, to provide a solid understanding of SQL Server 7. After completing the chapters, you may find it useful to go back through the book and use the review questions and projects to prepare for the Microsoft certification test for Designing and Implementing Databases on Microsoft SQL Server 7 *SQL* (Exam 70-029). Readers are also encouraged to investigate the many pointers to online and printed sources of additional information that are cited throughout this book. You'll find that much of the information in this book will serve as a good reference throughout your experience with SQL Server 7.

SYSTEM REQUIREMENTS

To complete the projects and assignments in the book, you will need access to SQL Server 7. These projects are not mandatory; however, the projects will give you experience using this resource as a prospective server administrator.

The recommended software and hardware configurations are described in the following sections.

SQL Server 7

SQL Server 7 system requirements include the following:

- Windows 95, 98, Windows NT Workstation 4 or Windows NT Server 4
- Pentium class computer with 32MB of RAM minimum
- VGA monitor
- Mouse or pointing device
- Hard disk with at least 125MB free
- CD-ROM drive

System Requirements For Exam Prep Software

System requirements for the software include the following:

- 8MB RAM (16MB recommended)
- VGA/256 Color display or better
- 6X CD-ROM Drive
- Windows NT 4 or Windows 95

ABOUT THE CD-ROM

To become certified, you must pass rigorous certification exams that provide a valid and reliable measure of technical proficiency and expertise. The CD-ROM that comes with this book can be used in conjunction with the book to help you assess your progress in the event you choose to pursue Microsoft Professional Certification. The CD-ROM contains specially designed test simulation software that features practice exams. These content-based questions were expertly prepared to test your readiness for the official Microsoft certification examination on SQL Server 7 (Exam 70-029).

Practice Exam Features

The practice exams include the following features:

- Two complete tests.
- 80 questions on each test.
- 120-minute timed test to ensure exam readiness.
- Questions that can be marked and answered later.
- Graphical representation of your test grade.
- Grades are categorized by chapter.

Solutions To End-Of-Chapter Questions And Projects

For further help in making sure you are prepared for the SQL Server 7 certification exam, we have included solutions for the end-of-chapter review questions and hands-on projects on the CD-ROM.

Berg Software

This software includes an evaluation version of *ProcedurePro*, which allows users to generate commonly required stored procedures easily for tables on Microsoft SQL Server versions 6.5 and 7.

Hands-On Projects Sample Databases And Source Code

Certain projects and examples from the book are included for reference.