ALL-IN-ONE

DB2
数据库管理考试指南

DB2 Administration All-in-One Exam Guide

- 完全覆盖了 DB2 认证考试 509、512 和 513 的所有内容
- 既可以作为考试指南，也可以 作为工作中的参考资源
- 每章结尾包含大量的练习，帮 助读者复习有关内容

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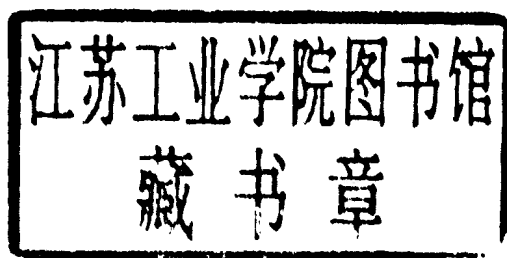
[美] Roger E. Sanders 著

专业认证考试丛书

DB2 数据库管理考试指南

（英文版）

DB2 Administration All–in–One Exam Guide

［美］ Roger E. Sanders 著

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内 容 简 介

本书主要介绍了与DB2数据库管理认证考试相关的基本概念及最新的考试信息。全书共分为三个部分，首先简介了DB2认证考试的有关内容，包括认证工具、考试过程等；并且复习了DB2 UDB的基础知识，以及数据库的具体实现和操作；书中重点讲解了DB2 UDB管理，其中的服务器管理、数据存储和访问、数据查询、安全管理等都是考试中的关键内容。本书的每一章都包含了精心设计的大量练习，并且有贯穿全书的测试提示，为应试者提供极具价值的指导与参考。本书是一本全面、权威的考试用书，适用于DB2管理认证考试的备考者及相关的技术人员使用。

FOREWORD

In my job as the DB2 Certification Program Manager, I am often asked about the value of becoming certified. To me, certification is a tool to help you increase your knowledge and skills. Certification gives you a clear goal and roadmap for learning. The goal is to pass the exam. The roadmap is to study and learn about parts of the product that you may never have learned otherwise. There are some functions that you may never need in your job, but by learning about them, you have the power to know what product features are available to help you become more effective and efficient in your job.

This is an excellent book to help you learn about DB2 Universal Database in your job as either a DB2 User or a DB2 UDB Database Administrator and will significantly enhance your ability to pass the DB2 Universal Database Certification Exams. Beyond becoming certified, this book is also an excellent source of reference information that you'll continue to use for years to come.

This book was written in a straightforward manner to take you through the certification process step-by-step. It also outlines the different levels of certification, making it simple to determine the right path for you. It helps to prepare you for the tests by providing all the information you will need and includes sample tests to ensure you are understanding the material.

Roger has done an amazing job at covering all you need to know about DB2 Universal Database, giving you hints and tips to sharpen your technical edge. I'm sure you'll find this book both a joy to read as well as helpful in your quest to improve your skills.

—Susan Visser, IBM DB2 Certification Program Manager

Today's computing environment is fast paced, competitive, and dynamic. As a computer professional, one of the most effective ways to stay ahead of the technology curve and validate your skills is through certification. Certification increases your credibility and expertise in the workplace and it represents a direct path to knowledge of the hottest technology in the market today: IBM DB2 Universal Database.

More than 20 years ago, relational database technology was invented in IBM Research, which delivered the first commercially available database in the early 1980s. This invention created the unique ability to represent data in a simple tabular form, access it through the powerful SQL query language, and make it readily available to the business community. Today, tens of thousands of business all over the world rely on DB2 databases to store their key corporate data assets and run their business both traditionally and over the Web.

The twenty-first century promises to be one of the fastest moving and challenging decades in computing history. As a computer professional, you have to keep ahead of the technology demands of tomorrow's companies who are building applications, services, and portals for e-commerce, customer relationship management, business-to-business (B2B), supply chain management, and business intelligence solutions. With the growing demand for skilled data management professionals, there is no better time to obtain your DB2 UDB certification. I wish you much success with your studies.

—Judith Escott, WW Executive, Data Management Skills Development, IBM

DEDICATION

To my long time friend, William "Bill" Lohmeyer

ABOUT THE AUTHOR

Roger Sanders is a Database Performance Engineer with Network Appliance, Inc. He has been designing and programming software applications for IBM PCs for more than 15 years, and he was worked with DB2 Universal Database and its predecessors for the past 10 years. He has written several computer magazine articles, presented at two International DB2 User's Group (IDUG) conferences, and is the author of *The Developer's Handbook to DB2 for Common Servers, ODBC 3.5 Developer's Guide, DB2 Universal Database CLI Developer's Guide, DB2 Universal Database API Developers Guide, and DB2 Universal Database SQL Developer's Guide.* His background in database application design and development is extensive, and he holds the following professional certifications: IBM Certified Advanced Technical Expert — DB2 for Clusters; IBM Certified Solutions Expert — DB2 UDB V7.1 Database Administration for UNIX, Windows, and OS/2; IBM Certified Solutions Expert — DB2 UDB V6.1 Application Development for UNIX, Windows, and OS/2; and IBM Certified Specialist — DB2 UDB V6/V7 User.

ACKNOWLEDGMENTS

A project of this magnitude requires both a great deal of time and the support of many different people. I would like to express my gratitude to the following people for their contributions:

Susan Visser — DB2 UDB Certification Program Manager

Susan's help was invaluable — without her, this book would not have been written with the level of focus it has on providing you with the information you need to pass the certification exams covered. Susan provided me with sample test questions, detailed test objectives, and paraphrased certification exam questions for each objective covered by the 512 and 513 exams. More importantly, Susan reviewed each chapter as it was written, compared the material against the actual certification exam questions, and provided me with feedback I could use to ensure that I covered all of the concepts needed in a clear and concise manner.

Paul Rivot — IBM

Paul provided me with DB2 Universal Database, Version 7.1 software and introduced me to several key contacts at the DB2 development lab in Toronto, Canada.

Sheila Richardson — IBM Toronto

Sheila was my key contact at IBM Toronto. She was instrumental in getting me in touch with Susan Visser.

I would also like to thank my wife Beth for all of her help and encouragement, and for once again overlooking the things that did not get done while I worked on yet another book.

In the world of relational database management systems (RDBMSs), DB2 Universal Database is a well-established veteran. It began as DATABASE 2 in 1983 and at that time, it was only available for IBM mainframes running MVS. Then in 1989, a version called Database Manager was bundled with IBM's newest operating system for the PC — OS/2 — to produce a product called OS/2 Extended Edition and for the first time, DB2 could be run on something besides a mainframe. Several years (and several name changes) later, DB2 Universal Database made its debut. Today, DB2 runs on a wide range of platforms and operating systems and has become one of the most powerful database products available.

DB2 certification, on the other hand, is relatively new. A few years ago, certifications like Microsoft Certified System Engineer and Certified Software Quality Engineer became the rage among network managers and systems administrators. Now it seems like every major hardware and software vendor offers some sort of certification program. But what can certification do for you? Many people believe that certification by a creditable source (such as IBM) provides individuals with credentials that validate their professional competency. Others believe that skills and on-the-job experience count the most. However, research has shown that possessing certification does have its benefits. For IT professionals who lack experience with a particular tool or technology, certification can give them an advantage over equally inexperienced individuals. For IT professionals who already have experience with a particular tool or technology, certification can help advance their careers or open doors to new opportunities.

If you've bought this book (or are thinking about buying this book), chances are you have already decided that you want to acquire the IBM Certified Solutions Expert — DB2 UDB V7.1 Database Administration for UNIX, Windows, and OS/2 certification. As an IT professional who has acquired four DB2 certifications from IBM, let me share my experience with you. The exams you must pass in order to become a certified professional are not easy. IBM prides itself on designing comprehensive certification exams that are relevant to the work environment that an individual holding a particular certification would be exposed to. To accomplish this, their certification exams are designed with the following in mind:

• What are the critical tasks that must be performed by an individual in this position?
• What skills are needed in order to perform each critical task?
• What is the frequency with which each critical task needs to be performed?

You will find that in order to pass a DB2 certification exam, it is essential that you have a solid understanding of DB2 Universal Database and all of its nuances. (Having some hands-on experience is helpful too.) I can't provide you with the hands-on experience, but I can help you understand how DB2 Universal Database works and teach you the things you need to know in order to obtain the IBM Certified Solutions Expert — DB2 UDB V7.1 Database Administration for UNIX, Windows, and OS/2 certification.

Audience

This book was written for anyone who is interested in obtaining one or both of the following professional certifications:

• IBM Certified Specialist — DB2 UDB V6/V7 User Professional Certification
• IBM Certified Solutions Expert — DB2 UDB V7.1 Database Administration for UNIX, Windows, and OS/2

The book is written primarily for database administrators (DBAs) who have experience working with DB2 Universal Database and want to obtain professional certification from IBM. However, any IT professional who is familiar with a relational database management system (such as Oracle, SQL Server, or Sybase) and wants to learn how to use DB2 Universal Database will also benefit from the material covered in this book.

How This Book Is Organized

Knowing how this book is organized may help you work through the material covered more efficiently. Knowing the layout will also enable you to jump directly to the sections you are interested in most. This book is divided into the following three major parts:

Part I — DB2 Certification

This section contains one chapter (Chapter 1) that is designed to introduce you to the various paths that can be taken to obtain DB2 certification from IBM. In this chapter, you will learn about the three levels of certification that are offered by the Professional Certification Program from IBM; the levels of DB2 Universal Database professional certification available; and what's involved in the certification process. This chapter also discusses some of the benefits that professional certification provides.

Part II — DB2 UDB Fundamentals (Tests 509 and 512)

This section contains six chapters (Chapters 2 through 7) that are designed to teach you the concepts you need to know in order to pass the DB2 UDB 7.1 Family Fundamentals exam:

Chapter 2 is designed to introduce you to the various products that make up the DB2 Family and present the set of tools that come with DB2 Universal Database, Version 7.x. In this chapter, you will learn about the functionality that each edition of DB2 Universal Database provides; the functionality that each DB2 client component provides; and the purpose of each product that makes up the DB2 Family. You will also see what each component of the DB2 Administration Tools looks like (on the Windows NT operating system) and you will learn what action or actions each tool is designed to perform.

Chapter 3 is designed to introduce you to the concept of instances and provide an in-depth look at the various authorization levels and privileges that are provided by DB2 Universal Database, Version 7.x. In this chapter, you will learn what an instance is, how instances are typically used, and what purpose the DB2 Administration Server (DAS) instance serves. You will also learn how and where users are authenticated; how authorization levels and privileges determine what a user can and cannot do; and how authorization levels and privileges are given to and taken away from an individual or a group of users.

Chapter 4 is designed to provide you with everything you need to know about creating and managing DB2 Universal Database databases. This chapter is also designed to introduce you to most of the objects that are available with DB2 Universal Database and provide you with information on how each of these objects can be created and destroyed. In this chapter, you will learn what a DB2 Universal Database database is, what its underlying structure looks like, and how that structure is physically stored. You will also learn how to create and destroy a DB2 Universal Database database; how to catalog and uncatalog a DB2 Universal Database database; what kinds of objects can exist with in a DB2 Universal Database database; what those objects are used for; and how to create and destroy most of the objects available using the various tools that are provided with DB2 Universal Database.

Chapter 5 is designed to provide you with everything you need to know about creating a table object and defining its characteristics. In this chapter, you will learn which built-in data types are available with DB2 Universal Database; how user-defined data types, DataLinks, and extenders can be incorporated into a table's definition; and how to create a table object with the CREATE TABLE SQL statement. You will also learn

what constraints are; what constraints are available with DB2 Universal Database; and how constraints can be used to ensure that data adheres to business rules.

Chapter 6 is designed to introduce you to the SQL statements that are commonly used to work with DB2 Universal Database objects and user data. In this chapter, you will learn what SQL is and how SQL statements are grouped, according to their functionality. You will also learn which SQL statements make up the Data Definition Language (DDL) and the Data Manipulation Language (DML) and how those statements are used to create database objects, and store, manipulate, and retrieve data in those objects.

Chapter 7 is designed to introduce you to the concept of data consistency and the various mechanisms that are used by DB2 Universal Database to maintain database consistency in both single- and multiuser environments. In this chapter, you will learn what data consistency is; what transactions are and how they are initiated and terminated; and how transactions are isolated from each other in a multiuser environment. You will also learn how DB2 Universal Database provides concurrency control through the use of locks; what types of locks are available; and how locks are acquired.

Part III — DB2 UDB Administration (Test 513)

This section contains seven chapters (Chapters 8 through 14) that are designed to teach you the concepts you need to know in order to pass the DB2 UDB 7.1 for UNIX, Windows, and OS/2 Database Administration exam.

Chapter 8 is designed to introduce you to the concept of instances, provide you with information about configuring communications for client and server workstations, and provide a second in-depth look at the various authorization levels and privileges that are provided by DB2 Universal Database, Version 7.x. In this chapter, you will learn what an instance is and how instances are used; how distributed connections enable clients to communicate with servers; how to configure communications for a client and a server workstation; and what DB2 Discovery is and how it is used. You will also review information on how (and where) users are authenticated; how authorization levels and privileges determine what a user can and cannot do; and how authorization levels and privileges are given to (granted) and taken away from (revoked) an individual or a group of users.

Chapter 9 is designed to provide you with everything you need to know about how data in a database is stored and accessed. In this chapter, you will learn what buffer pools are, how buffer pools are created, and how they are used; what table spaces are, how table spaces are created, and how they are used; and the differences between system managed space (SMS) and database managed space (DMS) table spaces. You will also learn how a table space's page size, extent size, and prefetch size affect a database's performance as well as how to obtain information about existing table spaces without querying the system catalog tables.

Chapter 10 is designed to enforce and enhance your knowledge of views, indexes, and constraints and provide in-depth coverage of the tools that are available for viewing the contents of tables and views, performing repetitive operations against database objects, and reverse-engineering a database to produce DDL script files. In this chapter, you will learn how to use views to control what data a user can and cannot access; what types of indexes are available and how to choose the right type for a given situation; and what referential integrity constraints are and how they can be used to maintain data consistency between two tables. You will also learn what the system catalog tables and views are used for; what the purpose of the Script Center is; how to examine the contents of tables and views without using queries; and how to use the DB2LOOK tool.

Chapter 11 is designed to introduce you to the tools that are available for monitoring events that take place in a database system and the tool that enables you to analyze SQL operations to locate weaknesses in applications or database design that results in poor performance. In this chapter, you will learn how to capture and analyze snapshots; how to create and manipulate event monitors; how to analyze event monitor output;

and how to capture and analyze Explain information. You will also learn how to obtain and modify configuration information for a specific database or for the DB2 Database Manager.

Chapter 12 is designed to introduce you to the data movement and data management utilities that are provided by DB2 Universal Database, Version 7.x. In this chapter, you will learn what file formats are recognized by DB2 Universal Database's data movement utilities; how to use the Export utility to extract specific portions of data from a database and externalize it to a file; and how to use the Import utility to make data stored in external files available to a database. You will also learn how to use the Load utility to bulk load a table using data stored in external files; how to use the DB2MOVE utility to copy a database from one platform to another; how to optimize the physical distribution of all data stored in a table; and how to update the information stored in the system catalog tables so that the DB2 Optimizer can choose the best data access path available when resolving a query.

Chapter 13 is designed to introduce you to the concept of transaction logging and provide an in-depth look at the various tools that are used to return an inconsistent database to a consistent state and a corrupted database to the state it was in at a specific point in time. In this chapter, you will learn what transaction logging is and how it is performed; how to return a database that has been placed in an inconsistent state to a consistent state; and how to create a backup image of a database. You will also learn how to return a database to the state it was in when a backup image was made; how to reapply (or roll-forward) some or all changes made to a database since the last backup image was made; and which database configuration parameters affect logging and data recovery.

Chapter 14 is designed to introduce you to the common types of errors than can be encountered when using DB2 Universal Database and introduce you to some of the tools that are available to help identify the source of problems and provide resolutions for them when they occur. In this chapter, you will learn about some of the common types of problems and errors that can be encountered when using DB2 Universal Database and what error codes are, how they are categorized, and how they are interpreted. You will also learn how First Failure Data Capture (FFDC) information is collected, where that information is stored, and how that information is interpreted.

Syntax Conventions Used in This Book

You will find information that describes the basic syntax to use when executing a DB2 Universal Database command or a Structured Query Language (SQL) statement throughout this book. The following conventions are used wherever a command or SQL statement syntax is presented:

[Parameter]	Parameters that are shown inside of brackets are required parameters and must be specified.
<Parameter>	Parameters that are shown inside of angle brackets are optional parameters and do not have to be specified.
Parameter | Parameter	Parameters or other items that are separated by vertical bars indicate that you must select one item from the list of items presented.
Parameter, . . .	Parameters that are followed by a comma and three periods (ellipsis) indicate that multiple instances of the parameter can be included in the statement.

The following examples illustrate these syntax conventions:

Example 1

```
CONNECT TO [ServerName] <ConnectionMode> <USER [AuthorizationID]
USING [Password]
```

In this example, both *ConnectionMode* and USER [*AuthorizationID*] USING [*Password*] are optional parameters, as indicated by the angle brackets (< >). The *ServerName, AuthorizationID*, and *Password* parameters are required, as indicated by the brackets ([ ]). However, *AuthorizationID* and *Password* are only required parameters if the USER [*AuthorizationID*] USING [*Password*] option is specified.

Example 2

```
RELEASE [ServerName | CURRENT | ALL <SQL>]
```

In this example, *ServerName*, CURRENT, or ALL ,SQL. can be specified, as indicated by the vertical bar (|). One of these items must be specified, as indicated by the brackets ([ ]). If ALL is selected, the keyword SQL can be added (ALL SQL); however, it is not required, as indicated by the angle brackets (< >).

Example 3

```
CREATE <UNIQUE> INDEX [IndexName] ON [TableName] ([ColumnName<ASC | DESC>], . . .)
```

In this example, *IndexName, TableName*, and at least one *ColumnName* must be specified, as indicated by the brackets ([ ]). UNIQUE, ASC, and DESC are options, as indicated by the angle brackets (< >). Either ASC or DESC can be specified as an option, but not both as indicated by the vertical bar (|). More than one *ColumnName*<ASC | DESC>. option can be specified, as indicated by the comma-ellipsis (, . . .) characters that follow the [*ColumnName*<ASC | DESC>] parameter. (The list of column parameters is enclosed in parenthesis.)

FOREWORD

In my job as the DB2 Certification Program Manager, I am often asked about the value of becoming certified. To me, certification is a tool to help you increase your knowledge and skills. Certification gives you a clear goal and roadmap for learning. The goal is to pass the exam. The roadmap is to study and learn about parts of the product that you may never have learned otherwise. There are some functions that you may never need in your job, but by learning about them, you have the power to know what product features are available to help you become more effective and efficient in your job.

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—Susan Visser, IBM DB2 Certification Program Manager

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—Judith Escott, WW Executive, Data Management Skills Development, IBM

DEDICATION

To my long time friend, William "Bill" Lohmeyer

ABOUT THE AUTHOR

Roger Sanders is a Database Performance Engineer with Network Appliance, Inc. He has been designing and programming software applications for IBM PCs for more than 15 years, and he was worked with DB2 Universal Database and its predecessors for the past 10 years. He has written several computer magazine articles, presented at two International DB2 User's Group (IDUG) conferences, and is the author of *The Developer's Handbook to DB2 for Common Servers, ODBC 3.5 Developer's Guide, DB2 Universal Database CLI Developer's Guide, DB2 Universal Database API Developers Guide, and DB2 Universal Database SQL Developer's Guide.* His background in database application design and development is extensive, and he holds the following professional certifications: IBM Certified Advanced Technical Expert — DB2 for Clusters; IBM Certified Solutions Expert — DB2 UDB V7.1 Database Administration for UNIX, Windows, and OS/2; IBM Certified Solutions Expert — DB2 UDB V6.1 Application Development for UNIX, Windows, and OS/2; and IBM Certified Specialist — DB2 UDB V6/V7 User.