

Foreword

Data is moving faster than ever, the volume of data is exploding, the expectation is moving rapidly toward real-time, all the time, and users want access to data quicker and more easily.

Yesterday's data is no longer good enough, and business decisions are moving from being made day to day, to minute by minute and even down to milliseconds in the case of leading edge stream and event processing.

A new generation of data is being unleashed, from XML to Web Services to Stream and Event processing. So how do we stay ahead of this tidal wave of data?

At IBM, we continue to invest in DB2 to stay ahead of your needs. The revolutionary pureXML capabilities we first shipped in DB2 9 continue to be extended, and are enabling the rapid and easy development of a whole new generation of pureXML applications. We continue to enhance our already industry leading compression and performance.

In years past, the primary purpose of a relational database management system was to reliably store data in a machine independent manner. With the demands of today's global businesses, the demands on data to be available 24 x 7 x 365 are greater than ever, and increasingly we live in an Internet connected, "Always on, always available" world. Today, data has to be secure and privacy must be preserved, while at the same time making it more available than ever to a broader audience of users than ever.

Data must flow more easily and dynamically to applications, processes and people than ever before. It must support flexible architectures, like Services Oriented Architecture, provide optimized support for new data types, like XML, and embrace new developer communities and development paradigms, like Ruby or PHP. And it must do all of this while reducing the cost of operations to allow people to create business value in other ways.

DB2 9.5 continues to advance the goals of providing high performance, optimized access to data, and the new challenges of ever higher availability, ease of use, security and privacy, as well. And as DB2 celebrates its 25th year, it is only fitting

that two of the most prolific DB2 authors, Roger Sanders and Dwaine Snow, come to together to guide you through this latest version of DB2. I encourage you to take advantage of the tremendous insights that these two authors provide into DB2 9.5. You will be learning skills you can both leverage across many technology settings and use to deliver more value to your business. Enjoy the experience and the insights herein.



*IBM Corporation
Vice President*

Data Servers and Information Management Development

Preface

One of the biggest challenges computer professionals face today is keeping their skill sets current with the latest changes in technology. When the computing industry was in its infancy, it was possible to become an expert in several different areas because the scope of the field was relatively small. Today, our industry is both widespread and fast paced, and the skills needed to master a single software package can be quite complex. Because of this complexity, many application and hardware vendors have initiated certification programs to evaluate and validate an individual's knowledge of their technology. Businesses benefit from these programs because professional certification gives them confidence that an individual has the expertise needed to perform a specific job. Computer professionals benefit because professional certification allows them to deliver high levels of service and technical expertise, and more importantly, professional certification can lead to advancement and/or new job opportunities within the computer industry.

If you bought this book (or if you are thinking about buying this book), chances are you have already decided you want to acquire the most advanced IBM DB2 Professional Certification available. Let me assure you that the exams you must pass in order to become a certified DB2 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 will have had some exposure to. As a result, all of IBM's certification exams are designed with the following items in mind:

- What are the critical tasks that must be performed by an individual who holds a particular professional certification?
- What skills must an individual possess in order to perform each critical task identified?
- How frequently will an individual perform each critical task identified?

You will find that to pass a DB2 certification exam, you must possess a solid understanding of DB2—and for the Advanced Database Administrator certification, you must understand many of its nuances as well.

Now for the good news. You are holding in your hands what we consider to be the best tool you can use to prepare for the DB2 9 for Linux, UNIX, and Windows Advanced Database Administration exam (Exam 734). When IBM began work on the DB2 9 certification exams, both of the authors of this book were invited once again to participate in the exam development process. In addition to helping define the exam objectives, we authored several exam questions and provided feedback on many more before the final exams went into production. Consequently, we have seen every exam question you are likely to encounter, and we know every concept you will be tested on when you take the DB2 9 for Linux, UNIX, and Windows Advanced Database Administration exam (Exam 734). Using this knowledge, along with copies of the actual exam questions, we developed this study guide, which not only covers every concept you must know in order to pass the DB2 9 for Linux, UNIX, and Windows Advanced Database Administration exam (Exam 734) but also covers the exam process itself and the requirements for each DB2 9 certification role available. In addition, you will find at the end of each chapter sample questions that are worded just like the actual exam questions. In short, if you see it in this book, count on seeing it on the exam; if you don't see it in this book, it won't be on the exam. If you become familiar with the material presented in this book, you should do well on the exam.

About this Book

This book is divided into two parts:

- Part 1—DB2 UDB Certification (Chapter 1)

This section consists of one chapter (Chapter 1), which is designed to introduce you to the DB2 Professional Certification Program that is available from IBM. In this chapter you will learn about the different certification roles available, along with the basic prerequisites and requirements for each role. This chapter also explains what's involved in the certification process, and it includes a tutorial on the IBM Certification Exam testing software, which you will encounter when you go to take any IBM certification exam.

- Part 2—DB2 9 for Linux, UNIX, and Windows Advanced Database Administration (Chapters 2–7)

This section consists of six chapters (Chapters 2 through 7), which are designed to provide you with the concepts you will need to master before you can pass the DB2 9 for Linux, UNIX, and Windows Advanced Database Administration exam (Exam 734).

Chapter 2 is designed to introduce you to the various aspects of database design. In this chapter you will learn how to create both a non-partitioned and a partitioned DB2 9 database, as well as how to design, create, and manage buffer pools and table spaces. You will also be introduced to the concept of federated databases and you will be shown how to configure federated database access.

Chapter 3 is designed to teach you everything you need to know about data partitioning and clustering. In this chapter you will learn about parallelism and partitioned databases and you will learn about partition groups, partitioning keys, and partitioning maps, as well as the process used to add new database partitions to an existing partitioned database. You will also learn how to design and construct range-clustered tables, range-partitioned tables, and multi-dimensional clustered tables, as well as use the Design Advisor to identify indexes, materialized query tables (MQTs), and multidimensional clustering tables that could help improve query performance in your database environment. This chapter concludes with an introduction to the IBM InfoSphere Balanced Warehouse—also known as the Balanced Configuration Unit or BCU.

Chapter 4 is designed to introduce you to the concept of database backup and recovery and to the various tools available with DB2 9 that can be used to return a damaged or corrupted database to a useable and consistent state. In this chapter you will learn what transaction logging is, how transaction logging is performed, and how log files are used to restore a damaged database. You will also learn how to make backup images of a database or a table space using the Backup utility, how to perform version recovery using the Restore utility, how to reapply transaction records stored in logs to perform a roll-forward recovery operation using the Rollforward utility, and how to restore a database using information stored in the recovery history log file using the Recover utility. You will also learn how to set up a High

Availability Disaster Recovery (HADR) environment and how to configure a database for log mirroring.

Chapter 5 is designed to provide you with an inside-out look at performance tuning, starting with the DB2 registry variables and configuration parameters that have the greatest impact on performance. In this chapter, you will learn how to use the self-tuning memory manager, how to take advantage of parallelism, how to create appropriate indexes, how to control locking at the application level, and how to take control of a server. You will also learn how the DB2 optimizer works, how to analyze data access plans created by the optimizer, and how to take advantage of Deep Compression.

Chapter 6 is designed to introduce you to the concept of database security and to the various authorization levels and privileges that are recognized by DB2. In this chapter, you will learn how and where users are authenticated, how authorities and privileges determine what a user can and cannot do while working with a database, and how authorities and privileges are given to and taken away from individual users and/or groups of individual users. You will also learn how to use encryption to further protect sensitive data, how to implement Label-Based Access Control (LBAC) to control access to columns and rows in a table, and how to track all data access using an audit trail.

Chapter 7 is designed to provide you with everything you need to know about configuring communications. In this chapter, you will learn how to catalog remote databases, remote servers (nodes), and Database Connection Services (DCS) databases. You will also learn how to configure and use DB2 Discovery and how to manage connections to System z and System i host databases. And finally, you will learn how the fast communications manager (FCM) is used to handle communications between database partitions in a partitioned database environment.

This book is written primarily for IT professionals who have a great deal of experience working with DB2 9, have already acquired the DB2 9 for Linux, UNIX, and Windows Database Administration certification, and would like to take (and pass) the DB2 9 for Linux, UNIX, and Windows Advanced Database Administration exam (Exam 734). However, any individual who would like to

learn some of the more complex skills needed to administer one or more DB2 9 databases will benefit from the information found in this book.

Conventions Used

Many examples of DB2 9 administrative commands and SQL statements can be found throughout this book. The following conventions are used whenever a DB2 command or SQL statement is presented:

[] Parameters or items shown inside of brackets are required and must be provided.

< > Parameters or items shown inside of angle brackets are optional and do not have to be provided.

| Vertical bars are used to indicate that one (and only one) item in the list of items presented can be specified

,... A comma followed by three periods (ellipsis) indicates that multiple instances of the preceding parameter or item can be included in the DB2 command or SQL statement

The following examples illustrate each of these conventions:

Example 1

```
REFRESH TABLE [TableName ,...]  
<INCREMENTAL | NON INCREMENTAL>
```

In this example, at least one *TableName* value must be provided, as indicated by the brackets ([]), and more than one *TableName* value can be provided, as indicated by the comma-ellipsis (, . . .) characters that follow the *TableName* parameter. INCREMENTAL and NON INCREMENTAL are optional, as indicated by the angle brackets (< >), and either one or the other can be specified, but not both, as indicated by the vertical bar (|).

Example 2

```
CREATE SEQUENCE [SequenceName]
<AS [SMALLINT | INTEGER | BIGINT | DECIMAL]>
<START WITH [StartingNumber]>
<INCREMENT BY [1 | Increment]>
<NO MINVALUE | MINVALUE [MinValue]>
<NO MAXVALUE | MAXVALUE [MaxValue]>
<NO CYCLE | CYCLE>
<NO CACHE | CACHE 20 | CACHE [CacheValue]>
<NO ORDER | ORDER>
```

In this example, a *SequenceName* value must be provided, as indicated by the brackets ([]). However, everything else is optional, as indicated by the angle brackets (<>), and in many cases, a list of available option values is provided (for example, NO CYCLE and CYCLE); however, only one can be specified, as indicated by the vertical bar (|). In addition, when some options are provided (for example, START WITH, INCREMENT BY, MINVALUE, MAXVALUE, and CACHE), a corresponding value must be provided, as indicated by the brackets ([]) that follow the option.

SQL is not a case-sensitive language, but for clarity, the examples provided are shown in mixed case—command syntax is presented in uppercase whereas user-supplied elements such as table names and column names are presented in lowercase. However, the examples shown can be entered in any case.



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Although basic syntax is presented for most of the DB2 commands and SQL statements covered in this book, the actual syntax supported may be much more complex. To view the complete syntax for a specific command or to obtain more information about a particular command, refer to the *IBM DB2, Version 9 Command Reference* product documentation. To view the complete syntax for a specific SQL statement or to obtain more information about a particular statement, refer to the *IBM DB2, Version 9 SQL Reference, Volume 2* product documentation.

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