Foreword

Roger Sanders has long been a contributor to the DB2 Community through his presentations, his articles, and especially his many books and certification guides. It is with great pleasure that I write the Foreword for his twenty-fourth book, *DB2 10.1 Fundamentals: Certification Study Guide*. This book is designed to help you prepare for the DB2 10.1 Fundamentals certification examination, but it also lays out many of the capabilities of DB2 in Roger's very straightforward manner.

DB2 10 represents a major step forward for clients with major advancements in technology, function, and simplicity to provide the next-generation database capabilities to handle today's most demanding applications, as well as the applications of tomorrow. DB2 10 builds on its heritage of multi-workload and mixed-workload capabilities, enabling clients to use one database for their OLTP, OLAP, and operational reporting workloads without compromise.

Our new BLU Acceleration technology, available in DB2 10.5, provides dramatically faster reporting, analytics, and simplicity that enables our clients to "create, load and go." Imagine the power of a supercomputer with the simplicity of a spreadsheet. With its innovative columnar dynamic in-memory capabilities, BLU Acceleration dramatically speeds up even the most complex queries and raises the bar even further.

BLU Acceleration enables large volumes of information to be analyzed quickly, allowing companies to embrace Big Data and derive new value from new sources of data. With the democratization of data and the digitalization of everything, access to this new natural resource needs to be made simple. Simplicity means we need to harness the power of all the resources around us; to accelerate our insights about our world through simplified modeling; within the scope of the available skills.

At IBM, we have enhanced our big data platform for increased consumability and performance for the tasks of analyzing information in motion or at rest, and DB2 10.1—and particularly DB2 10.5—delivers on those goals with both unparalleled speed and simplicity.

With his latest book, Roger will help you and your organization embrace the wealth of capabilities in DB2 10.1, and help you lead your organization to modernize your DB2 environment and your business. I encourage you to use Roger's unique insights and his "no nonsense" approach to their full advantage.

Robert J. Picciano
Senior Vice President, Information & Analytics
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Introduction

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, many application and hardware vendors have initiated certification programs that are designed 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 enables them to deliver high levels of service and technical expertise and, more important, can lead to advancement or new job opportunities within the computer industry.

If you have bought this book (or you are thinking about buying this book), chances are you have already decided you want to acquire one or more of the IBM® DB2® Professional Certifications available. As an individual who has helped IBM develop 21 DB2 certification exams, I can assure you that the tests you must pass to become a certified DB2 professional are not easy. IBM prides itself on designing comprehensive certification exams that are relevant to the work environment 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 questions in mind:

- What are the critical tasks an individual must perform to hold a particular certification?
- What skills must an individual possess to perform each critical task identified?

- What are the consequences if an individual is unable to successfully 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 some of the more advanced certifications, you must understand many of its nuances as well.

Now for the good news. You are holding in your hands what I consider to be the best tool you can use to prepare for the *DB2 10.1 Fundamentals* exam (Exam 610). Because IBM considers me a DB2 Subject Matter Expert (SME), I was invited to participate in the Exam 610 development process. In addition to helping define key exam objectives, I authored roughly 16 exam questions, and I provided feedback on many more before the final exams went into publication. Consequently, I have seen every exam question you are likely to encounter, and I know every concept you will be tested on when you take the *DB2 10.1 Fundamentals* exam.

Armed with this knowledge and copious notes I composed during the exam development process, I created this study guide, which covers not only every concept you will need to know to pass the *DB2 10.1 Fundamentals* exam (Exam 610) but also the exam process itself and the requirements for each DB2 certification role currently available. In addition, you will find, at the end of the book, sample questions that are worded just like the questions on the actual exam. In short, if you see it in this book, count on seeing it on the exam; if you do not see it in this book, chances are, it will not be on the exam. Consequently, if you become familiar with the material presented in this book, you should do well on the *DB2 10.1 Fundamentals* exam.

About This Book

This book is divided into two parts:

- **Part 1: IBM DB2 Certification (Chapter 1)**
    This section consists of one chapter (Chapter 1), which introduces you to the IBM DB2 Professional Certification Program. 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 shows you how to prepare for a DB2 certification exam, and it concludes with a discussion on how to navigate the testing software that IBM uses to administer most of their exams.

- **Part 2: DB2 10.1 Fundamentals (Chapters 2–7)**

    This section consists of six chapters (Chapters 2 through 7), which provide you with the concepts you will need to master before you can pass the *DB2 10.1 Fundamentals* exam (Exam 610).

    Chapter 2 presents the various DB2 editions and add-on products that are currently available and shows you which editions and products you should use to create a particular type of database environment. In this chapter, you will learn about the products that make up the *DB2 Family*, the characteristics of data warehouse and OLTP databases, and which DB2 products to use to create each type of database environment. You will also learn how to store, manage, and manipulate large object (LOB) and Extensible Markup Language (XML) data.

    Chapter 3 introduces you to the authorizations and privileges that are available with DB2, and to the tools that are used to give (grant) and take away (revoke) authorizations and privileges to/from individuals, groups, and roles. In this chapter, you will learn about the two mechanisms that DB2 uses to control access to instances, databases, database objects, and data: *authorities* and *privileges*. You will also discover how to grant authorities and privileges to specific users, groups, and roles, as well as how to revoke authorities and privileges when it is appropriate to do so. And you will learn how to utilize tools like Row and Column Access Control (RCAC) and Label-Based Access Control (LBAC) to secure sensitive data in a way that meets the strictest of security requirements or that adheres to rigid government security standards.

    Chapter 4 introduces you to the various objects that are available with a DB2 environment and shows you how to create and connect to DB2 servers and databases, as well as design and create temporal tables. In this chapter, you will learn about servers, instances, and databases, along with many other different, but often related, objects that make up a DB2 database environment. You will also discover how to create new DB2 databases and how to identify and connect to DB2 servers and databases using Type 1 and Type 2 connections. Finally, you will learn about temporal data management, as well as the different types of temporal (time travel) tables that can be created in a DB2 10 (DB2 for z/OS®) and DB2 10.1 (DB2 for Linux®, UNIX®, and Windows®) database.

Chapter 5 introduces you to the SQL statements and XQuery expressions that can be used to store, modify, delete, and retrieve both relational (traditional) and XML data. In this chapter, you will learn how to use INSERT, UPDATE, and DELETE statements to store, change, and remove data, as well as how to use the SELECT statement and its associated clauses to retrieve data and format the results. You will also discover how to query temporal (time travel) tables and how to create and invoke SQL stored procedures and user-defined functions. Finally, you will learn what transactions are and how transaction boundaries are defined.

Chapter 6 introduces you to the various data types and constraints that are available with DB2 and shows you how to obtain information about existing tables, indexes, and views. In this chapter, you will learn about the various data types that can be used to store data, as well as how to constrain data with NOT NULL, default, UNIQUE, CHECK, and referential integrity constraints. You will also discover how to create base and temporary tables, as well as how to identify the characteristics of tables, views, and indexes. Finally, you will learn how to use schemas and you will be shown how to create and use triggers to supplement one or more of the data constraints available.

Chapter 7 introduces you to the concept of data consistency and to the two important mechanisms DB2 uses to maintain data consistency in both single and multiuser database environments: *isolation levels* and *locks*. In this chapter, you will learn what isolation levels are, which isolation levels are available, and how to use isolation levels to keep transactions from interfering with each other in a multiuser environment. You will also discover how DB2 provides concurrency control through the use of locking, which types of locks are available, how to acquire locks, and which factors can influence locking performance.

Audience

The book is written primarily for IT professionals who have some experience working with DB2 10 for z/OS or DB2 10.1 for Linux, UNIX, and Windows and want to take (and pass) the *DB2 10.1 Fundamentals* certification exam (Exam 610). However, any individual who would like to learn the fundamentals of DB2 10/10.1 will benefit from the information in this book.

Conventions Used

You will find many examples of DB2 commands and SQL statements throughout this book. The following conventions are used whenever a DB2 command or SQL statement is presented:

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

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

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

, ...   A comma followed by three periods (ellipsis) indicate 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, you must supply at least one *TableName* value, as the brackets ([ ]) indicate, and you can provide more than one *TableName* value, as the comma and ellipsis (, ...) characters that follow the *TableName* parameter suggest. INCREMENTAL and NON INCREMENTAL are optional, as the angle brackets (< >) signify, and you can specify either one or the other, but not both, as the vertical bar (|) indicates.

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, you must supply a *SequenceName* value, as the brackets ([ ]) indicate. However, everything else is optional, as the angle brackets (< >) signify; in many cases, a list of available option values is provided (for example, NO CYCLE and CYCLE), but you can specify only one, as the vertical bar (|) denotes. In addition, when some options are provided (for example, START WITH, INCREMENT BY, MINVALUE, MAXVALUE, and CACHE), you must supply a corresponding value for each option used, as the brackets ([ ]) that follow the option indicate.

SQL is not a case-sensitive language, but for clarity, the examples shown throughout this book use mixed case—command syntax is presented in upper case, and user-supplied elements such as table names and column names are presented in lower case. (This same format is used with all of the DB2 certification exams.)

Note: Although basic syntax is presented for most of the SQL statements covered in this book, the actual syntax supported can be much more complex. To view the complete syntax for a specific DB2 command or SQL statement or to obtain more information about a particular command or statement, refer to the IBM DB2 Version 10.1 Information Center (*publib.boulder.ibm.com/infocenter/db2help*) or the IBM Information Management Software for z/OS Solutions Information Center (*publib.boulder.ibm.com/infocenter/dzichelp/v2r2/ index.jsp*).