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PROGRAMMING

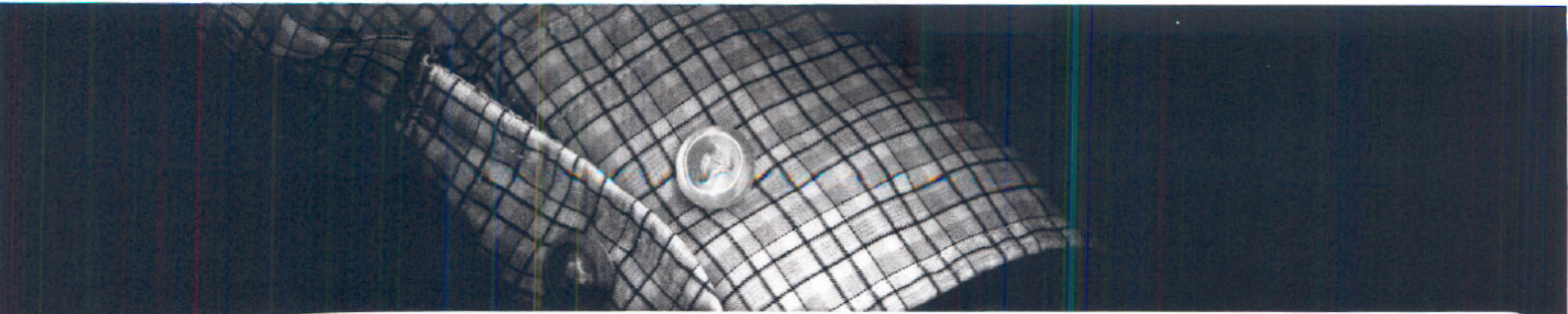
A PRIMER

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To

My mother

Saraswathi Sunderraman

for her love and hard work

My father

Sqn. Ldr. Rajagopala Sunderraman

for his love and encouragement

My wife

Radhika

for her love and caring

My children

Nandita and Naveen

for their love and innocence

PREFACE

Oracle is one of the most widely used database systems in the world. It runs on virtually all platforms ranging from Windows-based PCs to UNIX servers. It also comes with an array of programming tools and environments and provides access to the database from a variety of high-level programming languages.

In recent years, more and more universities in the United States and elsewhere are using Oracle in their database courses as the primary vehicle to illustrate database concepts and principles. This has resulted in the need for a concise book on Oracle programming to supplement the traditional text in the database courses. The main motivation for writing this book is to satisfy this need. This book can also be used by nonacademic professionals interested in learning about Oracle programming.

In this current edition, three new chapters covering PL/SQL Web Programming, Java Servlet programming, and XML have been added, while one old chapter, Embedded SQL in C and C++, has been retired. The embedded SQL chapter will be made available on the Web for download for those users of the book who still need it. Oracle's recent database servers, starting from version 8i, have provided increasing support for database access on the Internet. This support has been vital to many application developers who have, in the recent past, been developing three-tier Web applications that are invoked from a Web browser. PL/SQL, the mainstay procedural language, has been enhanced with a Web Toolkit that allows dynamic Web pages to be developed with ease. Java Servlet and Java Server Pages technology from Sun Microsystems has been embraced by Oracle, and there is strong support for developing Web applications using this technology in Oracle9i. XML, the newest technology used in current data-interchange applications, is also being well supported by Oracle9i, including built-in XML parsers, XML data type for database

columns, and support for importing XML data into and exporting XML data from an Oracle9i database. The three new chapters added in this edition cover these new technologies in detail.

The topics covered in this book are Oracle SQL, PL/SQL, Web application development using PL/SQL, database access in Java using JDBC and SQLJ, Web application development using Java Servlets and Java Server Pages, and Oracle support for XML. SQL and PL/SQL are two languages at the core of the Oracle database engine and are essential to learn before working with Oracle databases. Java has become a de facto language for many to program database applications in, and knowledge of JDBC and SQLJ is critical in developing applications that access Oracle databases. With the proliferation of the Internet, more and more applications that access Oracle databases are being made available over the Web. Learning the PL/SQL Web Toolkit and PL/SQL Server pages along with Java Servlets and Java Server Pages is becoming essential to programming such applications. The XML standard is making a major impact in current-day distributed and networked environments, and learning XML in the context of Oracle databases is proving to be an important skill for computer professionals.

Three sample databases are introduced early in the book, and most of the chapters use these databases for illustration purposes. These are the grade-book database, the mail-order database, and the portfolio database.

The grade-book database contains data typically tracked by an instructor of a course and includes information about students, courses being taught, which student is enrolled in which course, grading components for courses, and the individual's scores in these grading components. An application that allows instructors to update the database and students to access their grades is presented in the text.

The mail-order database contains data relevant to a mail-order company that sells items to customers. A variation of this database is used in the Web shopping application that allows users to shop on the Web for items. The users have the ability to search for items, add and update a shopping cart, and check out.

The portfolio database contains data about companies, their share prices, and members who have an account with the brokerage company. An application that allows members to sign on to the system, obtain stock quotes, place bids, and so on is developed in the text.

Several application programs are developed in their entirety in the different programming environments discussed in the text.¹ Other application programs are

Book Use

This book is suitable as a supplemental text for an introductory database course that covers the relational model and uses Oracle as the database system for the course projects and assignments. Course projects can be developed using Embedded SQL in C or C++, JDBC or SQLJ. Web projects can be developed using the PL/SQL Web Toolkit, PL/SQL Server Pages, Java Servlets, or Java Server Pages. An entire chapter is devoted to suggestions for course projects. These course projects are typically assigned in introductory database courses where a team of students start with a problem statement, write the problem specifications, design the database, create the database in Oracle, and write application programs that access the database. Some of the chapters also have review problems for readers to go over to consolidate their understanding of the concepts presented in these chapters.

This book is also appropriate for nonacademic individuals interested in learning about Oracle. They can find materials on SQL, PL/SQL, PL/SQL Web Toolkit, PL/SQL Server Pages, Pro*C/C++, JDBC, Java Servlets, Java Server Pages, SQLJ, and XML all in one text. This book can be considered a starting point in the exploration of what Oracle has to offer.

Supplements

The supplements for this book can be found at the following URL:

<http://www.aw.com>

Please follow the link to Supplements Central. These supplements include:

- Pro*C/C++ chapter that will not be in the book.
- All the code to the three running examples in the book (Grade Book, Mail Order, and Portfolio Database). In the book, there are mostly code fragments.
- All the code to a couple of other projects to be assigned as exam/homework/quizzes.
- Solutions to end-of-chapter exercises.

All of the code to a couple of other projects and solutions to end-of-chapter exercises are available online for qualified instructors. Please contact your Addison-Wesley representative for information.

Acknowledgments

First of all, I would like to acknowledge Maite Suarez-Rivas, Katherine Harutunian, and Jeffrey Holcomb at Addison-Wesley for working with me closely and diligently to get this book out in time. The staff at Addison-Wesley is always a pleasure to work with. The reviewers for the Oracle8 edition, Akira Kawaguchi (City College of New York), Louis Mazzucco (SUNY Cobleskill), Mark Barnard (Marquette University), Willie Favero (Professional) and Ashesh Parekh (Professional) deserve special mention, as they made very useful and critical observations to improve the presentation and content of this book.

Special thanks also go out to Laurian Chirica at CalPoly, San Luis Obispo; James Geller, New Jersey Institute of Technology; Chad Peiper, University of Illinois at Urbana-Champaign; Bina Ramamurthy, Suny at Buffalo; Ahmet Ugur, Central Michigan University; and X. Sean Wang, George Mason University, for providing useful criticism in the newer chapters in the current Oracle9i edition.

I would also like to acknowledge all my students who have diligently worked on various projects using Oracle over the past several years at Wichita State University and Georgia State University. In particular, I would like to acknowledge the effort put forth by Krissy Echols, Veena Pujari and Radhika Venkataraman, in designing and implementing the investment portfolio database application discussed in the SQLJ chapter and to Radhika Venkataraman in particular for her effort in designing and implementing the Web Shopping application discussed in the Java Servlets chapter. I would also like to express my appreciation to my colleague, Erdogan Dogdu, for helping me with the PSP and JSP sections.

Finally, I would like to acknowledge the support my family has shown to me during the writing of this edition of the book. Thank you, Radhu, for all the hard work and understanding and thanks, Nannu and Nammi, for your excellent cooperation and constant encouragement during the writing of this book.

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ORACLE9i™ PROGRAMMING: A PRIMER

Rajshekhar Sunderraman, Georgia State University

“Oracle9i Programming is well written, technically sound, and to the point. There are no meandering explanations that go over the head of the reader.”

—LAURIAN M. CHIRICA, California Polytechnic State University

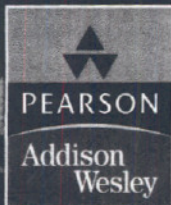
Concise and streamlined, *Oracle9i Programming: A Primer* provides students and professionals with the ideal introduction to Oracle programming. Updated to incorporate Oracle9i, this easily accessible primer is divided into two sections that act as a detailed guide for new users of this application. The first section offers readers a review of the relational model and an introduction to Oracle SQL and PL/SQL. The second section builds on this foundation by introducing related technologies that facilitate Oracle web functionality. In addition, the final chapter presents readers with a number of sample projects and programming applications that solidify the Oracle concepts they have learned.

HIGHLIGHTS

- A complete need-to-know guide of Oracle9i for students in their first database course or professionals adding SQL to their base of knowledge.
- Includes concise coverage of basic SQL programming and web connectivity.
- Covers advanced topics such as SQLJ, PL/SQL Web Toolkit, JDBC, PSP, Java Servlets, JSP, and Oracle XML.
- A Case Study approach allows readers to test their knowledge through three illustrative databases: The Grade Book, Mail Order/Shopping Cart, and Portfolio.

ABOUT THE AUTHOR

Rajshekhar Sunderraman is an associate professor of computer science at Georgia State University in Atlanta, Georgia. Professor Sunderraman received his Ph.D. in computer science from Iowa State University and has been teaching for more than 15 years. He has published numerous articles on a wide range of topics, including deductive databases and logic programming; incompleteness, inconsistency, and negation in databases; deductive and object-oriented databases; web access to databases; and semi-structured data on the web.



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