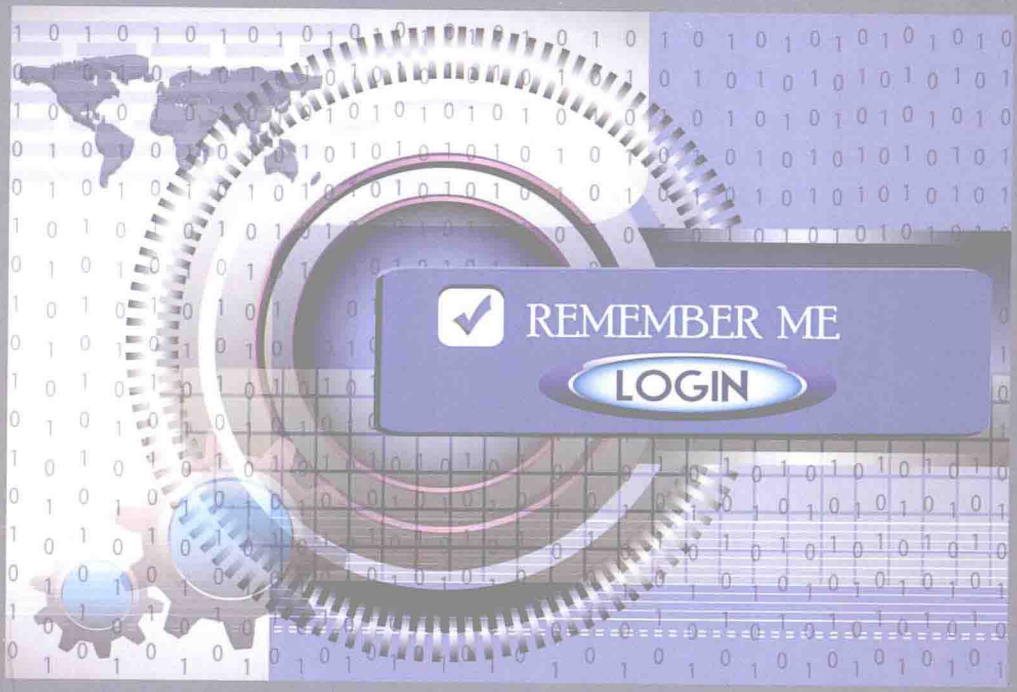
Multilevel Security for Relational Databases



Osama S. Faragallah
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CRC Press
Taylor & Francis Group
AN AUERBACH BOOK

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CRC Press
Taylor & Francis Group
Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **Informa** business
AN AUERBACH BOOK

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

Printed on acid-free paper
Version Date: 20140929

International Standard Book Number-13: 978-1-4822-0539-8 (Hardback)

Library of Congress Cataloging-in-Publication Data

Faragallah, Osama S.
Multilevel security for relational databases / Osama S. Faragallah, El-Sayed M. El-Rabaie, Fathi E. Abd El-Samie, Ahmed I. Sallam, and Hala S. El-Sayed.
pages cm
Summary: "Most database security models focus on protecting against external unauthorized users. Because multilevel secure databases provide internal security according to user access type, they are a viable option for the security needs of modern database systems. Covering key concepts in database security, this book illustrates the implementation of multilevel security for relational database models. It considers concurrency control in multilevel database security and presents encryption algorithms. It also includes simulation programs and Visual studio and Microsoft SQL Server code for the simulations covered in the text"-- Provided by publisher.
Includes bibliographical references and index.
ISBN 978-1-4822-0539-8 (hardback)
1. Database security. I. Title.

QA76.9.D314F37 2014
005.8--dc23 2014020608

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Preface

In this book we try to look at encryption-based multilevel database security through the eyes of database security researchers. Multilevel security for relational databases is an interesting information security topic. Most of the security models available for databases today protect them from outside, unauthorized users. A multilevel secure database provides internal security in relationship with the user's type of access to the database. A multilevel secure database system has been proposed to address the increased security needs of database systems. Researchers are in need of new algorithms in this area with their software implementation.

We summarize the main contributions of this book as follows:

1. This book is devoted to the issue of multilevel security in the relational database.
2. Multilevel security for relational database models is considered in this book, with a comparison between them using different evaluation metrics.
3. Modifications are presented to an existing multilevel security model in the relational database either to speed or to enhance performance.

4. Formal analysis for data manipulation operations in multilevel security database models and mathematical proofs of soundness, completeness, and security are studied.
5. Simulation experiments are presented for validation of the discussed algorithms and modifications and also for investigating the performance of multilevel database models.
6. The C# and Microsoft SQL server source codes for most of the simulation experiments in this book are included at the end of the book.

Finally, we hope that this book will be helpful for database and information security.

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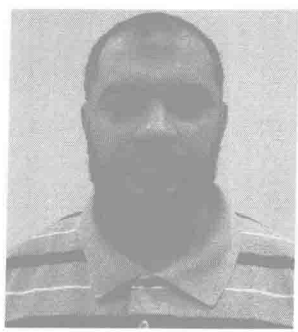

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1

Concepts of Database Security

1.1 Database Concepts

A database system is a computerized system whose overall purpose is to store and organize the data in a way that can be accessed, managed, and modified on demand. A database system becomes an important part of information management systems that enhances the ability of organizations to manage their important data in an easy way. A database system has many benefits that are described as follows:

- Reducing the amount of data redundancy by ensuring that the data are stored in one location and can be accessible to all authorized users
- Improving data access to users through use of host and query languages
- Enhancing data security
- Decreasing data entry, storage, and retrieval costs
- Allowing more flexibility for manipulating data
- Presenting greater data integrity and independence from applications programs

The interaction between the user, other applications, and the database itself can be performed through a software system called a database management system (DBMS) [1], which is specially designed to help the user to capture and analyze the stored data. The general purpose of the relational database management system is to be used as a tool to define, create, and manage the relational database.