

Contents

CHAPTER 1 INTRODUCTION

1.1	The need for database security and integrity	1
1.2	The value of information	1
1.3	Misuse of computers	3
1.4	Security and integrity of databases	4
1.5	Definitions	5

CHAPTER 2 PRIVACY REQUIREMENTS

2.1	Introduction	11
2.2	The privacy concept in the United States	11
2.3	The history of information privacy legislation	13
2.4	Current privacy developments and issues	16
2.5	Implementation of systems for privacy	19

CHAPTER 3 DATABASE CONCEPTS

3.1	What is a database?	25
3.2	Data independence	28
3.3	Database architecture	29
3.4	Data models	29
3.5	Advantages of the database approach	34
3.6	Database security and integrity	35

3.7	Sample systems	36
3.8	Summary	37

CHAPTER 4

DATABASE SECURITY IN PERSPECTIVE

4.1	A fictional case of attempted unauthorized access	39
4.2	Security threats and defenses in computer systems	40
4.3	Estimating the costs and benefits of security measures	47
4.4	Security evaluation of a database system	50
4.5	Summary	52

CHAPTER 5

POLICIES FOR DATABASE SECURITY

5.1	Introduction	55
5.2	Policies and mechanisms	56
5.3	Policies for database security	57
5.4	Summary	64

CHAPTER 6

MODELS OF DATABASE SECURITY

6.1	Introduction	65
6.2	A basic model of database access control	66
6.3	Extensions to the basic model	71
6.4	Multilevel models	73
6.5	An information-flow model	76
6.6	Comparison of models	78

CHAPTER 7

AUTHORIZATION

7.1	Introduction	83
7.2	The authorizer	85
7.3	Subjects	85
7.4	Objects	86
7.5	Access types	90
7.6	Specifying subsets and conditions	90
7.7	Auxiliary procedures	93
7.8	Authorization language and displays	93
7.9	The use of classes	98
7.10	Consistency and effect of new rules	102
7.11	Summary	103

CHAPTER 8 DATA INTEGRITY

8.1	Introduction	107
8.2	Transactions	107
8.3	Semantic integrity	109
8.4	Concurrency control	122
8.5	Recovery	134

CHAPTER 9 AUDITING AND CONTROLS IN A DATABASE ENVIRONMENT

9.1	Introduction	149
9.2	Basic concepts	149
9.3	Common forms of computer fraud	154
9.4	Control practices	155
9.5	The audit trail	161
9.6	Computer auditing techniques	163
9.7	Developing reliable application systems	170
9.8	DBMS support of audit and control	176
9.9	Conclusion	177

CHAPTER 10 ENFORCEMENT DESIGN

10.1	Introduction	183
10.2	Design principles for secure systems	184
10.3	Detection and analysis of access requests	185
10.4	Access validation	187
10.5	IMS	191
10.6	IDMS	194
10.7	LASC proposal	195
10.8	System R	197
10.9	INGRES	199
10.10	A kernel design for a secure DBMS	203
10.11	Enforcement of multilevel security in DBMSs	205
10.12	Database machines	209
10.13	Summary	213

CHAPTER 11 PROTECTION MECHANISMS

11.1	Introduction	217
11.2	The DBMS and the operating system	218

11.3	Protection problems	219
11.4	Protection matrix	221
11.5	Mechanisms	223
11.6	Several protection systems	230
11.7	Information-flow control and trusted operating systems	239
11.8	Authentication	247
11.9	Encryption	249
11.10	Summary	258
 CHAPTER 12 SECURITY AND INTEGRITY IN DISTRIBUTED DATABASE SYSTEMS		
12.1	Introduction	267
12.2	The architecture of distributed database systems	267
12.3	Decentralized authorization	272
12.4	Distribution of access rules	275
12.5	Nondiscretionary systems	276
12.6	Integrity in a DDS	279
12.7	Summary	285
 CHAPTER 13 SECURITY OF STATISTICAL DATABASES		
13.1	Introduction	289
13.2	Compromise of a database	290
13.3	Query overlap	295
13.4	Queries that return a database value	296
13.5	Security mechanisms	296
 CHAPTER 14 THE FUTURE OF DATABASE SECURITY		
14.1	Changing needs and technology	299
14.2	Sources for the database security art	300
 ANSWERS TO SELECTED EXERCISES		
INDEX		
303		
309		

