

*Computer Security*



---

# *COMPUTER SECURITY BASICS*

---

*Deborah Russell and G. T. Gangemi Sr.*

O'Reilly & Associates, Inc.



---

# Computer Security Basics

Deborah Russell and G.T. Gangemi Sr.

O'Reilly & Associates, Inc.  
103 Morris Street, Suite A  
Sebastopol, CA 95472

# Table of Contents

	Page
Preface .....	xvii
About This Book .....	xvii
Summary of Contents .....	xviii
Acknowledgments .....	xix
Comments and Questions .....	xx
<b>Part I OVERVIEW</b> .....	<b>1</b>
Chapter 1 Introduction .....	3
Attack of the Giant Worm (and Other Tales) .....	3
What Is Computer Security? .....	8
A Broader Definition of Security .....	9
Secrecy and Confidentiality .....	9
Accuracy, Integrity, and Authenticity .....	10
Availability .....	10
Threats to Security .....	11
Vulnerabilities .....	11
Threats .....	14
Countermeasures .....	16
Why Buy Security? .....	18
Government Requirements .....	19
Information Protection .....	19
What's A User To Do? .....	20

Chapter 2 Some Security History .....	23
Information and its Controls .....	24
Computer Security: Then and Now .....	25
Early Computer Security Efforts .....	27
Tiger Teams .....	29
Research and Modeling .....	30
Secure Systems Development .....	31
Building Toward Standardization .....	31
Standards for Secure Systems .....	32
Standards for Cryptography .....	36
Standards for Emanations .....	37
Computer Security Mandates and Legislation .....	38
NSDD 145 .....	39
NTISSP 2 .....	39
Computer Fraud and Abuse Act .....	40
Computer Security Act .....	41
Searching for a Balance .....	42
Recent Government Security Initiatives .....	42
Privacy Considerations .....	44
International Security Activity .....	46
The Growth of Modern Standards .....	47

**Part II COMPUTER SECURITY .....** 53

Chapter 3 Computer System Security and Access Controls .....

What Makes a System Secure? .....	55
System Access: Logging Into Your System .....	57
Identification and Authentication .....	57
Protecting Passwords .....	62
Data Access: Protecting Your Data .....	66
Discretionary Access Control .....	67
Mandatory Access Control .....	72

Chapter 4 Viruses and Other Wildlife .....	79
Viruses .....	79
Worms .....	82
Trojan Horses .....	83
Bombs .....	84
Trap Doors .....	85
Spoofs .....	86
Other Wildlife .....	86
Remedies .....	88
Chapter 5 Secure System Planning and Administration .....	89
Administrative Security .....	89
Overall Planning and Administration .....	91
Analyzing Costs and Risks .....	91
Planning for Disaster .....	93
Setting Security Rules for Employees .....	94
Training Users .....	94
Day-to-day Administration .....	96
Performing Backups .....	96
Performing a Security Audit .....	99
Separation of Duties .....	100
Chapter 6 Inside the Orange Book .....	103
Introduction to the Orange Book .....	104
A Summary of Security Concepts .....	105
What's a Trusted System? .....	105
Measuring Trust .....	106
Trusted Computing Base .....	107
Security Policy .....	108
Security Model .....	108
Security Kernel .....	109
Security Perimeter .....	110
Orange Book Evaluation Classes .....	110
Comparison of Evaluation Classes .....	112
Complaints About the Orange Book .....	112

Evaluations of Secure Systems .....	115
Security Policy Requirements .....	115
Discretionary Access Control .....	116
Object Reuse .....	118
Labels .....	119
Mandatory Access Control .....	124
Accountability Requirements .....	124
Identification and Authentication .....	124
Trusted Path .....	126
Audit .....	128
Assurance Requirements .....	133
Operational Assurance .....	134
Life-cycle Assurance .....	141
Documentation Requirements .....	149
Security Features User's Guide .....	150
Trusted Facility Manual .....	151
Test Documentation .....	152
Design Documentation .....	153
Summary of Classes .....	155
D Systems: Minimal Security .....	155
C1 Systems: Discretionary Security Protection .....	155
C2 Systems: Controlled Access Protection .....	156
B1 Systems: Labeled Security Protection .....	157
B2 Systems: Structured Protection .....	157
B3 Systems: Security Domains .....	158
A1 Systems: Verified Design .....	159
Compartmented Mode Workstations .....	159
Government Computer Security Programs .....	161
<b>Part III COMMUNICATIONS SECURITY .....</b>	<b>163</b>
Chapter 7 Encryption .....	165
Some History .....	166
What is Encryption? .....	169
Why Encryption? .....	171
Transposition and Substitution Ciphers .....	172
Cryptographic Keys: Private and Public .....	175
Key Management and Distribution .....	177
One-time Pad .....	178
The Data Encryption Standard .....	179

What is the DES? .....	182
Future of the DES .....	185
Other Cryptographic Algorithms .....	188
Variations on the DES .....	188
Public Key Algorithms .....	188
The RSA Algorithm .....	189
Digital Signatures and Notaries .....	190
Government Algorithms .....	192
Message Authentication .....	192
Encryption in Banking and Financial Applications .....	193
Government Cryptographic Programs .....	196
NSA .....	196
NIST .....	197
Treasury .....	197
Cryptographic Export Restrictions .....	197
Chapter 8 Communications and Network Security .....	201
What Makes Communication Secure? .....	202
Communications Vulnerabilities .....	204
Communications Threats .....	204
Modems .....	205
Networks .....	207
Network Terms .....	207
Some Network History .....	210
Network Media .....	212
OSI Model .....	215
Network Security .....	218
Trusted Networks .....	218
Perimeters and Gateways .....	221
Security in Heterogeneous Environments .....	221
Encrypted Communications .....	222
The Red Book and Government Network Evaluations .....	226
TCSEC Requirements .....	228
Other Security Services .....	228
Some Network Security Projects .....	232
DISNet and Blacker .....	232
SDNS .....	232
Kerberos .....	233
Project MAX .....	233
Secure NFS .....	234

<b>Part IV OTHER TYPES OF SECURITY</b> .....	235
Chapter 9 Physical Security and Biometrics .....	237
Physical Security .....	238
Natural Disasters .....	238
Risk Analysis and Disaster Planning .....	241
Locks and Keys: Old and New .....	241
Types of Locks .....	243
Tokens .....	243
Challenge-response Systems .....	244
Cards: Smart and Dumb .....	244
Biometrics .....	246
Fingerprints .....	249
Handprints .....	250
Retina Patterns .....	250
Voice Patterns .....	251
Signature and Writing Patterns .....	251
Keystrokes .....	252
Chapter 10 TEMPEST .....	253
The Problem of Emanations .....	254
The TEMPEST Program .....	255
How To Build TEMPEST Products .....	257
TEMPEST Standards and Restrictions .....	259
TEMPEST Standards .....	259
TEMPEST Export Restrictions .....	260
Who Cares About TEMPEST? .....	261
Is TEMPEST Needed? .....	262
Changing TEMPEST Concepts .....	263
Government TEMPEST Programs .....	265

<b>Part V APPENDICES</b> .....	267
Appendix A Acronyms .....	269
Appendix B Computer Security Legislation .....	277
Appendix C Orange Book and Other Summaries .....	289
Orange Book (TCSEC) Requirements .....	289
Compartmented Mode Workstation (CMW) Requirements .....	313
System High Workstation (SHW) Requirements .....	315
International Security (ITSEC) Requirements .....	318
Appendix D Government Security Programs .....	323
Computer Security Programs .....	323
The Role of the NCSC .....	324
The Role of NIST .....	325
Trusted Product Evaluation Program (TPEP) .....	326
Evaluation of Network Products .....	331
Evaluations of Database Management Systems .....	332
Evaluations of Security Subsystem Products .....	333
Formal Verification Systems Evaluation Program (FVSEP) .....	336
Degausser Products List .....	338
Rating Maintenance Phase (RAMP) Program .....	338
System Certification and Accreditation .....	339
DOCKMASTER .....	340
Technical Vulnerability Reporting Program .....	341
Communications Security Programs .....	341
Commercial COMSEC Endorsement Program .....	342
CCEP Eligibility .....	343
CCEP Program Steps .....	344
Government Endorsed DES Equipment Program .....	345
EFT Certification Program .....	346
Protected Network Services List .....	346
Off-line Systems List (OLSL) .....	347

Restrictions on Cryptographic Products .....	347
TEMPEST Security Programs .....	348
Industrial TEMPEST Program and Preferred Products List .....	349
Endorsed TEMPEST Products Program .....	351
Endorsed TEMPEST Test Services Program .....	356
Endorsed TEMPEST Test Instrumentation Program .....	357
Appendix E A Security Source Book .....	359
Government Publications .....	360
The Rainbow Series .....	360
Other NSA Publications .....	369
FIPS PUBS .....	370
NIST Special Publications .....	374
Other NIST Publications .....	385
Compartmented Mode Workstation (CMW) Publications .....	385
COMSEC Program Publications .....	386
TEMPEST Program Publications .....	386
Other Security-relevant Government Publications .....	387
Government Program Contact Points .....	387
Computer Security (COMPUSEC) Programs .....	388
Communications Security (COMSEC) Programs .....	389
TEMPEST Programs .....	390
Other Government Contacts .....	390
Emergency Organizations .....	391
Standards Organizations .....	391
Security User Groups .....	393
Electronic Groups .....	397
USENET .....	397
Commercial Bulletin Boards .....	397
NCSC DOCKMASTER .....	398
NIST Computer Security Bulletin Board .....	398
Computer Security Periodicals .....	399
Computer Security Books .....	401
Conference Proceedings .....	401
Computer Security Textbooks .....	401
Viruses and Other Programmed Threats .....	402
Computer Crime and Ethics .....	402
Of General Interest .....	403

Glossary ..... 405

Index ..... 429

## COMPUTER SECURITY BASICS

There's a lot more consciousness of security today, but not a lot of understanding of what it means and how far it should go. Nobody loves security, but most people—users, system administrators, and managers alike—are starting to feel that they'd better accept it, or at least try to understand it.

This handbook describes security concepts like trusted systems, cryptography, mandatory access control, and biometrics in simple terms. It gives you the basic security concepts you need to know to be able to protect your system and your data. It also explains the government and industry security standards that affect today's computer systems and vendors.

For example, most U.S. government equipment acquisitions now require "Orange Book" (Trusted Computer System Evaluation Criteria) certification. *Computer Security Basics* contains a more readable introduction to the Orange Book than any other book or government publication.

Contents include:

- Introduction—basic computer security terms and concepts, what security is good for, the Internet worm and other security breaches
- Access controls—logins, passwords, discretionary and mandatory access controls on data
- A summary of Orange Book classes and security requirements
- Communications, network, and encryption security
- Physical security, biometric devices, and TEMPEST
- Appendices—a complete security glossary, reference tables, other sources of security information

ISBN 0-937175-71-4		US \$29.95
		CAN \$42.95
		9 0000 >
EAN		
	9 780937 175712	

RepKover<sub>®</sub>



Printed on Recycled Paper

ISBN 0-937175-71-4