Contents

Preface ix

1 Introduction **1**
1.1 The Scope of System Administration 1
1.2 Is System Administration a Discipline? 2
1.3 A Jigsaw Puzzle 2
1.4 The Goals of System Administration 3
1.5 A Philosophy 3
1.6 The Challenges of System Administration 4
1.7 Common Practice and Good Practice 5
1.8 Bugs 6
1.9 Information Sources for Sysadms 6
Exercises 7

2 The System Components **8**
2.1 What is 'The System'? 8
2.2 Operating Systems 9
2.3 File Systems 16
2.4 Processes and Job control 32
2.5 Logs and Audits 34
2.6 Privileged Accounts 35
2.7 Hardware Awareness 36
2.8 System Uniformity 38

3 Networked Communities **40**
3.1 Communities 40
3.2 User Sociology 41
3.3 Client-Server Cooperation 42
3.4 Host Identities and Name Services 43
3.5 Common Network Sharing Models 46
3.6 Physical Network 49
3.7 TCP/IP Networks 55
3.8 Network Analysis 62
3.9 Planning Network Resources 70

4 Host Management 78
4.1 Choices 78
4.2 Start-up and Shutdown 80
4.3 Configuring and Personalizing Workstations 81
4.4 Installation of the Operating System 88
4.5 Software Installation 95
4.6 Installing a Unix Disk 104
4.7 Kernel Customization 106

5 User Management 111
5.1 User Registration 111
5.2 Account Policy 116
5.3 Login Environment 117
5.4 User Support Services 124
5.5 Controlling User Resources 124
5.6 User Well-being 129

6 Models of Network Administration 134
6.1 Administration Models 134
6.2 Immunity and Convergence 136
6.3 Network Organization 137
6.4 Bootstrapping Infrastructure 139
6.5 Cfengine: Policy Automation 144
6.6 SNMP Network Management 145
6.7 Integrating Multiple OSes 146
6.8 A Model Checklist 149

7 Configuration and Maintenance 151
7.1 System Policy 151
7.2 Synchronizing Clocks 153
7.3 Executing Jobs at Regular Times 153
7.4 Automation 155
7.5 Preventative Maintenance 161
7.6 Fault Report and Diagnosis 164
7.7 System Performance Tuning 171

8 Services 181
8.1 High Level Services 181
8.2 Proxies and Agents 182
8.3 Installing a New Service 183
8.4 Summoning Daemons 183
8.5 Setting up the DNS Name Service 187
8.6 Setting up a WWW Server 203
8.7 E-mail Configuration 215
8.8 Mounting NFS Disks 226
8.9 The Printer Service 229

9 Principles of Security 235
9.1 Physical Security 236
9.2 Four Independent Issues 236
9.3 Trust Relationships 237
9.4 Security Policy 237
9.5 Protecting from Loss 239
9.6 System and Network Security 241
9.7 Social Engineering 243
9.8 TCP/IP Security 244
9.9 Attacks 259

10 Security Implementation 265
10.1 The Recovery Plan 265
10.2 Data Integrity 265
10.3 Analysing Network Security 274
10.4 VPNs: Secure Shell and FreeS/WAN 282
10.5 WWW Security 282
10.6 Firewalls 284
10.7 Intrusion Detection and Forensics 290

11 Analytical System Administration 292
11.1 Science vs Technology 292
11.2 Studying Complex Systems 293
11.3 The Purpose of Observation 295
11.4 Evaluation Methods and Problems 295
11.5 Evaluating a Hierarchical System 297
11.6 Faults 298
11.7 Deterministic and Stochastic Behaviour 315
11.8 Observational Errors 326
11.9 Strategic Analyses 334
11.10 Summary 335

12 Summary and Outlook 337
12.1 The Next Generation Internet Protocol (IPv6) 338
12.2 Never-dos in System Administration 338
12.3 Information Management in the Future 339
12.4 Collaboration with Software Engineering 340
12.5 The Future of System Administration 340

A Summary 342
A.1 Summary of Principles 342
A.2 Summary of Suggestions 346

B Some Useful Unix Commands 349

C Programming and Compiling 355
C.1 Make 355
C.2 Perl 359

C.3 WWW and CGI Programming 377
C.4 PHP and the Web 383
C.5 Cfengine 385

D Glossary **393**

E Recommended Reading **397**

Bibliography **398**

Index **410**