

CONTENTS

Acknowledgments	xv
Introduction	xvii

Introduction to Firewalls and Cisco Hardware Solutions

❖ 1 Firewall Basics	3
Overview of Firewalls	4
What is a Firewall?	4
Choosing a Firewall	5
Firewall Components	6
Firewall Management	9
Controlling Traffic	9
OSI Reference Model	10
Firewall Layers	11
Types of Firewalls	11
Packet Filtering Firewalls	11
Functions of a Packet Filtering Firewall	12
Advantages of Packet Filtering Firewalls	12
Disadvantages of Packet Filtering Firewalls	14
Stateful Firewalls	15
Functions of a Stateful Firewall	15
Connection State Table	19
Packet Filtering Firewall Solution	20
Advantages of a Stateful Firewall	20
Disadvantages of a Stateful Firewall	20

Application Gateways (Proxy Firewalls)	20
Authentication Methods	21
Types of Application Gateway Firewalls	23
Address Translation Firewalls	27
Address Depletion	27
Address Translation Types	28
Address Translation Firewalls and Security	33
Advantages of Address Translation	34
Disadvantages of Address Translation	34
Host-Based Firewalls	35
Host-Based Firewall Abilities	35
Advantages of Host-Based Firewalls	35
Disadvantages of Host-Based Firewalls	36
Hybrid Firewalls	37
Firewall Design	37
Basic Guidelines	37
Segmentation and the DMZ	39
Placement of Firewall Components	43
Further Study	45
Web Sites	45
❖ 2 PIX Firewall Family	47
PIX Features	48
Finesse Operating System	48
Adaptive Security Algorithm	50
Sequence Number Randomization	53
Cut-Through Proxy	54
Policy Implementation	56
Fault Tolerance	58
PIX FOS 6.2	59
PIX Hardware	60
PIX Licensing	60
PIX 501	63
PIX 506	65
PIX 515	68
PIX 525	72
PIX 535	74
Comparison of PIX Models	77
Further Study	77
Web Sites	77

Part II PIX Setup and Traffic Filtering

❖ 3 The PIX Command-Line Interface and Basic Configuration	81
Access to the PIX	82
Console Access	82
Other Access Methods	83
Command-Line Interface	83
PIX Bootup Sequence	84
CLI Modes	86
Cisco IOS Router and PIX CLI Comparison	89
Setup Script Utility	92
Configuration Files	93
The configure Commands	94
The write Commands	94
Basic PIX Configuration Commands	95
Configuring the Passwords	95
Configuring the Interface	96
Configuring Routing	101
Management Commands	103
Configuring Host and Domain Names	104
Permitting IP Access to the PIX	104
Testing Connections	107
Viewing PIX Information	109
PIX Characteristics	109
Available Memory	110
Processes Running on the PIX	110
Network Configuration Example	111
Further Study	112
Web Sites	112
❖ 4 Traffic Flow Through the PIX and Address Translation	113
Protocol Overview	114
Overview of TCP	114
Overview of UDP	115
Translations and Connections	117
Translations	118
Connections	118
Address Translation	119
Private Addresses	119
Network Address Translation	119
Examples of Address Translation	122

Configuring Your PIX for Inside-to-Outside Access	131
Defining the Address Pool	131
Defining the Addresses to Translate	133
Verifying Address Translation	137
Address Translation Examples	138
Traffic Entering Your Network	142
Setting Up Address Translations	142
Allowing Traffic from Lower-Level to Higher-Level Interfaces	153
Examples of Using Statics and Conduits	156
Viewing the PIX's Translations and Connections	158
Viewing Active Translations	158
Clearing the Xlate Table	160
Viewing the Connection Table	160
Further Study	162
Web Sites	162
❖ 5 Filtering Traffic with Outbound Filters and Access-Lists	163
Filtering Outbound Traffic	164
Overview of Outbound Filters	164
Configuring Outbound Filters	164
Outbound Filter Processing on the PIX	166
Examples of Filtering with Outbound Filters	167
ACLs and the PIX	172
Comparing ACLs and Conduits/Outbound Filters	172
Configuring and Activating ACLs	173
ACL Configuration Examples	176
TurboACLs	189
Object Grouping	191
Advantages of Object Groups	192
Syntax for Grouping Objects	192
Object Groups for Networks	194
Object Groups for Protocols	194
Object Groups for Services	194
Object Groups for ICMP Messages	195
Examining Your Object Groups	195
Deleting Object Groups	196
Using Object Groups with ACLs	196
ICMP Traffic and the PIX	198
ICMP Traffic Through the PIX	198
ICMP Traffic Directed at the PIX	199
Further Study	201
Web Sites	201

Part III Advanced PIX Features

❖ 6 Web Traffic Filtering	205
HTTP Traffic	206
Filtering Java Applets and ActiveX Scripts	207
Configuring Java Filters	207
Configuring ActiveX Filters	209
Filtering Web Content	209
Web Filtering Process	210
Configuring Web Filtering	212
URL Filtering Example	217
Further Study	218
Web Sites	218
❖ 7 Protocol Fixup Feature	219
Issues with Protocols and Applications	220
Port Numbering Issues	220
Address Translation Issues	222
Established Connections	224
Syntax of the established Command	225
Simple Example of the established Command	226
Application Inspection	226
Functions of Application Inspection	227
Limitations of Application Inspection	231
Application Inspection Configuration	232
Basic Command Syntax	232
Adding, Changing, and Removing Port Numbers	233
Verifying Your Configuration	234
Application Inspection for FTP	234
Mechanics of FTP Connections	234
Command Syntax for Application Inspection of FTP	237
Application Inspection for RSH	238
Mechanics of RSH Connections	239
Command Syntax for Application Inspection of RSH	240
Application Inspection for Skinny	240
Mechanics of Skinny Connections	241
Issues with Skinny	242
Command Syntax for Application Inspection of Skinny	243
Application Inspection for SIP	243
Mechanics of SIP Connections	244
Issues with SIP	245
Command Syntax for Application Inspection of SIP	246

Application Inspection for Multimedia Using RTSP	247
Mechanics of RTSP Connections	247
Issues with RTSP	252
Command Syntax for Application Inspection of RTSP	253
Application Inspection for H.323	253
H.323 Overview	253
Mechanics of H.323 Connections	255
CU-SeeMe	262
Netshow	263
VDOLive	264
Command Syntax for Application Inspection of H.323	264
Further Study	265
Web Sites	265
❖ 8 Attack Guards, IDS Features, and Spoofing Protection	267
Attack Guard Features	268
DNS Guard	269
Mail Guard	270
Flood Guard	273
Fragmentation Guard	277
Intrusion Detection System (IDS)	278
Definition of IDS	278
IDS Signatures	280
Signature Classes	282
Signature Categories and Types	283
The PIX and IDS	284
Configuring IDS on your PIX Firewall	285
Spoofing Protection	288
Spoofing Example	288
Spoofing Protection Feature of the PIX	289
Configuring Spoofing Protection	290
Spoofing Protection Configuration Example	291
Further Study	292
Books	292
Web Sites	292

Part IV PIX Management

❖ 9 PIX Device Manager	295
PDM Overview	296
Requirements for PDM	296
PIX Requirements	296
Desktop Requirements	297

Preparing to Use PDM	298
Accessing PDM	299
Using PDM	300
Wizards	301
Configuration Tabs	301
Further Study	308
Web Sites	308
❖ 10 SNMP and Logging	309
SNMP	310
SNMP MIBs	310
SNMP Traps	312
SNMP Configuration	313
SNMP Configuration Example	315
Date and Time	316
Setting the Date and Time on the PIX	316
Using NTP	319
Logging Events	325
Supported Transport Protocols for Syslog	325
Message Categories	325
Configuring Logging	326
Further Study	330
Web Sites	330
❖ 11 Centralizing Security	333
Centralizing Security	334
AAA	335
Security Protocols	335
Server and Authentication Configuration	336
Shell Access	337
Authenticating Shell Access	337
Using Command Authorization	339
Cut-Through Proxy	341
Cut-Through Proxy Process	341
Cut-Through Proxy Authentication	342
Cut-Through Proxy Authorization	344
Other Types of Traffic	345
Using Virtual Telnet	346
Using Virtual HTTP	347
Authorizing Virtual Telnet and HTTP Connections	348
Changing Authentication Parameters	349
Limiting Proxy Connections	349
Authentication Prompts	349
Authentication Timeouts	350

Configuring Accounting	351
Testing and Troubleshooting AAA	352
Further Study	353
Web Sites	353
❖ 12 PIX Failover	355
Failover Overview	356
Failover Requirements	357
Types of Failover Configurations	359
Synchronizing Information Between PIXs	363
Failover Communication Between the PIXs	365
Detecting Failures	366
When Failover Occurs	370
Initial Bootup	372
Failover Configuration	372
Command Overview	372
Verifying Failover Configuration	374
Example Configurations	382
Cable-Based Failover Configuration	382
LAN-Based Failover Configuration	387
Further Study	396
Web Sites	396
❖ 13 Password Recovery Procedure	397
Password Recovery Overview	398
When to Use the Password Recovery Procedure	398
Approaches	399
Password Recovery for PIXs without a Floppy Drive	400
Password Recovery Requirements	400
Accessing Monitor Mode	401
Configuring Your PIX in Monitor Mode	402
Password Recovery Process	404
Password Recovery for PIXs with a Floppy Drive	405
Password Recovery Example	405
Further Study	407
Web Sites	407
❖ 14 Upgrading Your PIX Firewall	409
Upgrading Your PIX	410
Upgrading Your FOS	410
FOS Version 5.0 and Earlier	411
FOS Version 5.1 and Later	417
Upgrading Failover Configurations	420
Downgrading Your FOS	421

Auto Update Feature	422
Configuring Auto Update	422
Verifying Auto Update	424
Entering an Activation Key	425
FOS 6.1 and Earlier	425
FOS 6.2 and Later	426
Further Study	429
Web Sites	429
❖ 15 SOHO Environments: DHCP and PPPoE	431
DHCP	432
Assignable Attributes	432
Using the PIX as a DHCP Server	432
Using the PIX as a DHCP Client	437
DHCP Autoconfiguration	438
PPPoE	440
Overview of PPPoE	440
PPPoE on the PIX	440
Further Study	443
Web Sites	443

Part V VPNs and the PIX Firewall

❖ 16 IPSec Overview	447
VPN Overview	448
Functions of a VPN	448
Encapsulation Methods	450
IPSec Overview	451
Functions of IPSec	452
Main Components of IPSec	452
Keys	452
Integrity with Hashing Functions	455
Authentication with Digital Signatures	455
Methods of IPSec Data Protection	460
Authentication Header	460
Encapsulation Security Payload	462
Setting Up an IPSec VPN Connection	464
Gathering Information	464
Steps For Setting Up an IPSec Connection	465
ISAKMP and IKE	466
Overview of the Connection Setup Process	470
Further Study	472
Web Sites	472

❖ 17 IPSec Configuration	473
Preparing for IPSec Connections	474
Preparation Steps	474
Allowing IPSec Traffic into Your Network	474
Site-to-Site Connections	475
Configuring Authentication	476
Configuring IKE Phase 1	482
Configuring IKE Phase 2	484
Troubleshooting IPSec Connections	491
Example Pre-Shared Key Configuration	494
Example CA Configuration	496
Remote Access Connections	497
Dynamic Crypto Maps	498
Assigning IP Addresses to Remote Peers	501
User Authentication with XAUTH	505
Cisco VPN 3000 Client Configuration	507
The PIX as a Remote Access Client	511
Further Study	514
Web Sites	514
❖ Index	515