



Numerics

- 0 access-list acl_name, 165
- 0 access-list acl_name command, 165
- 3DES (triple Data Encryption Standard), 11, 47, 166

A

- aaa-server command, 329
- access rights, 299–300
- access control list. *See* ACLs
- Access VPNs, 5
- access-list command, 83, 130
- access-list global configuration command, 163
- ACLs (access control lists), 142, 300
 - crypto, 86–88
 - IPSec, 75–76
 - configuring, 67
 - PIX Firewalls, 224–225
 - troubleshooting, 149
 - PIX Firewall, 163–165
 - wildcard preshared keys, 330
- activity, monitoring, 285–294
- adaptive security algorithm (ASA), 215
- adding
 - ACLs, 300
 - IPSec LAN-to-LAN connections, 323
 - permit statements, 75
 - users, 250–251
- addresses (IP)
 - assigning, 243
 - pools, 335
- administration
 - certificates, 304
 - Cisco VPN 3000 Concentrator, 295–304
 - files, 302–303
 - sessions, 296
- Administrators, 299
- aggressive mode, IKE, 27
- agreements, D-H key agreements, 18–20
- AH (Authentication Header), 8, 72, 141
- algorithms
 - ASA, 215
 - HMAC, 20
 - HMAC-MD5-96, 21

- HMAC-SHA-1-96, 21
- IPSec, 71
 - SHA, 166
- Altiga Networks VPN command (Start menu), 254
- applications
 - IOS, 47–48
 - VPN Concentrator, 52
 - 3000 series, 52–61
 - 5000 series, 61
- applying
 - crypto maps, 92–94
 - interfaces (PIX Firewall), 174–175
- ASA (adaptive security algorithm), 215
- assignment, IP addresses, 243
- authentication, 123
 - CAs, 123, 197–198
 - certificate-based, 37–39, 270
 - HMAC, 166
 - IPSec
 - ACLs, 75–76
 - checking current configuration, 74–75
 - configuring, 67
 - defining policies, 71–74
 - preparing IKE, 68
 - selecting IKE policies, 68–70
 - testing peers, 75
 - preshare method, 160
 - SCEP, 190
 - SHA, 166
 - VPN 3000 Concentrator, 251
 - Xauth, 328–329
- Authentication Header (AH), 8, 72, 141

B

- Baltimore Technologies, 114
- Baltimore Technologies CA servers, 191
- booting Cisco VPN 3000 Concentrator, 298
- browsers. *See also* interfaces
 - Browser Manager, 236
 - VPN 3000 Concentrator, 239–251

C

- CA (Certificate Authority)
 - authentication, 197–198

- Baltimore Technologies CA, 191
- communication parameters, 196–197
- configuring, 199
- declaring, 196
- devices, 115, 192
- Entrust servers, 191
- IKE, 24
- interoperability, 125–127, 189–192
- manual enrollment, 112
- Microsoft Windows 2000 Certificate Services 5.0, 192
- requests, 124
- saving, 125
- signed certificates, 198–199
- site-to-site
 - configuring (PIX Firewall), 183, 193–201
 - IKE (PIX Firewall), 201–203
 - support (PIX Firewall), 183–191
- support, 34–39, 105–112, 128
- troubleshooting, 200–201
- VeriSign OnSite servers, 191
- ca authenticate command, 197–198
- ca configure command, 196
- ca crl request command, 200
- ca enroll command, 198–199
- ca generate rsa command, 195
- ca identity command, 196
- ca save all command, 199
- ca zeroize rsa command, 200
- CEP (Certificate Enrollment Protocol), 112
- cepsetup.exe file, 115
- Certificate Authority. *See* CA
- Certificate Enrollment Protocol (CEP), 112
- Certificate Management, 304
- Certificate Revocation List (CRL), 107
- certificates. *See also* CA
 - authentication, 37–39
 - chains, 264, 266
 - deleting, 200
 - digital (IKE), 24
 - enrollment, 260
 - signed, 198–199
 - VPN 3000 Concentrator
 - configuring support, 271–279
 - digital certificates for clients, 280–281
 - generating, 259–262
 - validating, 263–270
 - X.509v3, 189
- CET (Cisco Encryption Technology), 171, 185
- chains, certificates, 264, 266
- Cisco Secure Intrusion Detection System), 6
- Cisco VPN 3000 Concentrator
 - activity, 285–294
 - configuring, 295–304
- Cisco VPN Concentrator, 52
 - 3000 series, 52–61
 - 5000 series, 61
- Cisco Works 2000, 6
- CLI (command-line interface), 236, 287. *See also* interfaces
 - PIX Firewall, 51
 - VPN 3000 Concentrator, 235–240
- Client Config Security Policy Editor, 347
- clients
 - IPSec, 67. *See also* IPSec
 - mobile VPN, 310
 - VPN
 - configuring, 250–255
 - IKE requirements, 332
 - VPN 3000 version 2.5, 340–342
- clock set configuration command, 194
- clock set privileged EXEC command, 118
- clock timezone global configuration command, 118
- clocks, configuring PIX Firewall, 194
- command-line interface. *See* CLI
- commands, 125, 131
 - aaa-server, 329
 - access-list, 83, 130
 - access-list global configuration, 163
 - ca authenticate, 197–198
 - ca configure, 196
 - ca crl request, 200
 - ca enroll, 198–199
 - ca generate rsa, 195
 - ca identity, 196
 - ca save all, 199
 - ca zeroize rsa, 200
 - clock set configuration, 194
 - clock set privileged EXEC, 118
 - clock timezone global configuration, 118
 - crl optional, 125
 - crypto ca, 34

- crypto ca authenticate name, 123
- crypto ca certificate query, 118
- crypto ca enroll global configuration, 124
- crypto ca identity, 123–124
- crypto ca identity global configuration, 122
- crypto dynamic-map, 311, 336
- crypto ipsec security-association lifetime, 83, 130
- crypto ipsec security-association lifetime global configuration, 86, 170
- crypto ipsec transform-set, 34, 83, 130
- crypto ipsec transform-set global configuration, 83, 167
- crypto isakmp client configuration address-pool, 335
- crypto isakmp enable, 77
- crypto isakmp identity global configuration, 80
- crypto isakmp key, 77
- crypto isakmp policy, 34, 77–78, 129
- crypto key generate rsa, 120, 127
- crypto map, 34, 83, 130
- crypto map client authentication, 329–330
- crypto map client-configuration address, 333
- crypto maps, 172
- debug, 68, 96–99
- debug crypto ca, 204
- debug crypto ipsec, 131
- debug crypto isakmp, 131, 145–146, 220
- debug crypto key-exchange, 131
- debug crypto pki, 131
- enrollment mode ra command, 123
- generate RSA keys, 120
- interface, 83, 130
- ip address-pool global configuration, 335
- ip domain-name global configuration, 119
- ip local pool, 333
- ISAKMP, 144
- isakmp, 219
- isakmp client configuration address-pool local, 333
- isakmp show, 95
- no ca enroll, 199
- no ca save, 199
- no certificate, 124
- no isakmp enable interface-name, 159
- no isakmp identity hostname, 203
- no sysopt connection permit-ipsec, 163
- peer default ip address pool interface configuration, 335
- permit any, 336
- ping, 75
- Program menu, 254
- show, 68, 74, 139
 - information, 141
 - IPSec, 95–96
 - PIX Firewall, 215–217
 - viewing, 140
- show access-list, 68
- show ca mypubkey rsa, 200
- show clock, 194
- show crypto ca certificates, 127
- show crypto engine, 216
- show crypto engine connections active, 141, 150
- show crypto ipsec a, 141
- show crypto ipsec sa, 131, 216
- show crypto ipsec security-association lifetime, 176
- show crypto ipsec transform-set, 74, 140, 215
- show crypto isakmp, 147
- show crypto isakmp key, 148
- show crypto isakmp policy, 74, 77, 131, 216
- show crypto key mypubkey rsa, 127
- show crypto map, 74, 140, 174, 215, 327
- show crypto map interface serial 0, 150
- show ip route, 151
- show running-config, 74
- sysopt connection permit-ipsec, 163, 215
- vpngroup, 340, 343
- write memory, 199
- write terminal, 161
- communication, 196–197
 - monitoring, 206
 - parameters, 196–197
- components
 - IPSec crypto, 17–21
 - VPN, 45–46
- Concentrator series, 6
- configuration
 - access, 301
 - CAs
 - IKE, 201–203
 - saving, 199
 - support, 105–106, 116–127, 193–201

- certificates, 271–279
- Cisco VPN 3000 Concentrator, 295–304
- crypto access lists, 163–165
- crypto maps, 171–173
- dates/time, 118
- digital certificates, 280–281
- dynamic crypto maps
 - IOS, 313–314
 - PIX Firewall, 310–312
- global IPsec SA lifetimes, 170
- host names, 119
- IKE, 77–81, 106–111, 129
 - PIX Firewall, 158–162
 - policies, 129
 - verifying, 82
- IOS
 - PFS, 338
 - Secure VPN 1.1 clients, 352–353
- IPsec, 67, 82–94, 106–111, 130
 - ACLs, 75–76
 - checking current, 74–75
 - clients, 251–255
 - defining policies, 71–74
 - networks, 135–136, 138–142
 - PIX Firewall, 162, 209–217, 315–320
 - preparing IKI, 68
 - SA lifetimes, 86
 - selecting IKE policies, 68–70
 - troubleshooting, 143–152
 - testing peers, 75
 - verifying, 175–176
 - VPN 3000 Concentrator, 244–249
- ISAKMP, 68
- MTU, 255
- PIX Firewall
 - CA site-to-site, 183
 - IPsec, 157–169, 171–177
 - PFS, 337
 - preshared keys, 157
 - Secure VPN 1.1clients, 345–351
 - VPN 3000 Client version 2.5, 340–342
- preshared keys, 80–81, 160
- transform sets, 83–84, 168
- VPN 3000 Concentrator, 235–239
 - browsers, 239–251
 - PIX Firewall, 320–328
 - remote access, 233
 - testing, 177–180
- connections
 - IPsec, 141
 - LAN-to-LAN, 323
- copy running-config startup-config, 125
- copy running-config startup-config command, 125
- CRL (Certificate Revocation List), 107, 125–127, 267
- crl optional command, 125
- crypto map command, 83
- crypto access lists
 - creating, 86–88
 - PIX Firewall, 163–165
- crypto ca authenticate name command, 123
- crypto ca certificate query command, 118
- crypto ca commands, 34
- crypto ca enroll global configuration command, 124
- crypto ca identity command, 123–124
- crypto ca identity global configuration command, 122
- crypto components, IPsec, 17–21
- crypto dynamic-map command, 311, 336
- crypto ipsec security-association lifetime command, 83, 130
- crypto ipsec security-association lifetime global configuration command, 86, 170
- crypto ipsec transform-set command, 34, 83, 130
- crypto ipsec transform-set global configuration command, 83, 167
- crypto isakmp client configuration address-pool local command, 335
- crypto isakmp enable command, 77
- crypto isakmp identity global configuration command, 80
- crypto isakmp key command, 77
- crypto isakmp policy command, 34, 77–78, 129
- crypto key generate rsa command, 120, 127
- crypto map client authentication command, 329–330
- crypto map client-configuration address command, 333
- crypto map command, 34, 130
- crypto maps, 140, 172
 - applying, 92–94
 - creating, 89–91
 - dynamic, 309–310
 - IOS, 313–314
 - PIX Firewall, 310–312

- interfaces, 150, 225
- PIX Firewall, 171–175
- crypto system error messages, ISAKMP, 99
- cryptographic service provider (CSP), 115
- CSIDS (Cisco Secure Intrusion Detection System), 6
- CSP (cryptographic service provider), 115

D

- Data Encryption Standard (DES), 8, 11, 17
- databases, Security Parameter Database, 30
- date/time, Pix Firewall, 194
- dates, configuring, 118
- DDR (dial-on-demand routing), 149
- debug command, 68, 96–99
- debug crypto ca command, 204
- debug crypto ipsec command, 131
- debug crypto isakmp command, 131, 145–146, 220
- debug crypto key-exchange command, 131
- debug crypto pki command, 131
- declarations, CAs, 122, 196
- defining
 - policies
 - IKE, 70
 - IPSec, 71–74
 - traffic, 26
 - transform sets, 83–84
- deleting
 - certificates, 200
 - RSA keys, 200
- demilitarized Zone (DMZ), 174
- DES (Data Encryption Standard), 8, 11, 17
- devices, enrolling CAs, 115, 192
- D-H (Diffie-Hellman), 8, 12 18–20, 141
- dialers, VPN, 255
- dialog boxes, DUN properties, 254
- dial-on-demand routing (DDR), 149
- Diffie-Hellman (D-H), 8, 12, 18–20, 141
- digital certificates, 263. *See also* certificates
 - enrollment, 260
 - IKE, 24
 - VPN 3000 Concentrator
- digital signatures, 36
- digital subscriber line (DSL), 5
- disabling IKE, 77, 159

- DMZ (Demilitarized Zone), 174
- domain names
 - configuring, 119, 195
 - routers, 119
- DRAM (dynamic random-access memory), 30
- DSA (Directory System Agent), 259
- DSL (digital subscriber line), 5
- DUN (Dial Up Networking), 254
- dynamic crypto maps, 309–310
 - IOS, 313–314
 - PIX Firewall, 310–312
- dynamic random-access memory (DRAM), 30
- dynamap 210, 313

E

- editing transform sets, 84
- enabling IKE, 77, 159
- Encapsulating Security Payload (ESP), 8, 72, 141
- encryption
 - 3DES, 166
 - DES, 17
 - IPSec
 - ACLs, 75–76
 - checking current configuration, 74–75
 - configuring, 67, 82–94, 106–111
 - defining policies, 71–74
 - encrypted tunnels, 29
 - preparing IKE, 68
 - selecting IKE policies, 68–70
 - testing peers, 75
 - PIX Firewall, 157–169, 171–177
 - RSA, 24
 - traffic, 140
- enrollment
 - CA devices, 115, 192
 - certificates, 260
 - SCEP, 190
- enrollment mode ra command, 123
- entries, creating, 313
- Entrust CA servers, 113, 191
- error messages, 99
- ESP (Encapsulating Security Payload), 8, 72, 141
- Event Log, monitoring, 287
- exceptions, security gateways, 329
- execution, IOS in routers, 47–48

Extended Authentication. *See* Xauth
external authentication, 251. *See also* authentication
Extranet VPNs, 5

F

FDQN (fully qualified domain name), 23, 193
File Management, 302–303
firewalls. *See also* PIX Firewall
 ACLs, 224–225
 crypto map placement, 225
 IPsec
 differing preshared keys, 223
 troubleshooting, 209–220, 222–227
 ISAKMP policies, 218–223
 PIX, 49, 51
 routing, 225–226
Flash memory
 deleting, 200
 managing, 193
flowcharts, IPsec, 32, 34
formatting
 crypto ACLs, 86–88
 crypto maps, 89–91
 dynamic crypto map entries, 313
 policies (IKE), 78–79
fully qualified domain name (FQDN), 23, 193

G

gateways
 security, 329
 transport/tunnel modes, 13–16
general purpose keys, generating, 121
General Statistics, monitoring, 294
generate RSA keys command, 120
generation
 certificates, 259–262
 general purpose keys, 121
 RSA key pairs, 120, 195
 special usage keys, 120
global IPsec, configuring, 86
GRE (Generic Route Encapsulation), 47
groups
 IPsec, 244–249

VPN 3000 Concentrator, 250–251
GUI (graphical user interface), 238. *See also*
interfaces

H

HMAC (hashed message authentication code), 12,
20–21, 166
host names
 PIX Firewall, 195
 routers, 119

I

IE (Internet Explorer), 280. *See also* browsers
IETF (Internet Engineering Task Force), 112, 249
IKE (Internet Key Exchange), 12, 111
 CAs, 24
 certificates, 263
 configuring, 77–82, 106–111, 129
 digital certificates, 24
 IPsec
 ACLs, 75–76
 checking current configuration, 74–75
 configuring, 67
 defining policies, 71–74
 operations. 27–28
 preparing, 68
 selecting policies, 68–70
 testing peers, 75
 managing, 206
 mode configuration, 331–336
 monitoring, 206
 overview, 22–23
 PIX Firewall
 configuring, 158–162
 verifying policies, 160–162
 policies, 108–111, 129
 CAs, 186–188
 site-to-site, 202–203
 preshared keys, 23
 proposals, 279
 routers, 32, 34
 RSA
 encryption, 24

- generating, 195
- signatures, 24
- SAs, 71
- Xauth, 328–329
- information show commands, 141, 216–217
- initial configurations, routers, 137
- interface command, 83, 130
- interfaces, 299
 - crypto maps, 92–94, 174–175
 - GUI, 238
 - IP, 240
 - monitoring, 292
 - PIX Firewall, 51
 - refreshing, 299
 - troubleshooting, 150, 225
- Internet Engineering Task Force (IETF), 112
- Internet Key Exchange. *See* IKE
- Internet Protocol Security. *See* IPSec
- Internet Security Association Key Management Protocol. *See* ISAKMP
- Internet service provider (ISP), 331
- interoperability, 113–115
 - CA, 189–192
 - monitoring, 113–127
- Intranet VPNs, 5
- IOS
 - dynamic crypto maps, 313–314
 - PFS, 338
 - preshared key wildcards, 330
 - routers, 47–48
 - Secure VPN 1.1, 352–353
- IP (Internet Protocol)
 - addresses
 - assigning, 243
 - pools, 335
 - interfaces, 240
 - traffic
 - applying crypto maps, 91–94
 - creating crypto ACLs, 86–88
- ip address-pool local global configuration command, 335
- ip domain-name global configuration command, 119
- ip local pool command, 333
- IPSec (Internet Protocol Security)
 - 3DES, 11
 - ACLs
 - PIX Firewalls, 224–225
 - troubleshooting, 149
 - AH, 9
 - CAs, 13
 - configuring, 82–94, 106–111, 130, 175–176
 - crypto components, 17, 19–21
 - debug commands, 96–99
 - DES, 11
 - D-H, 12
 - encryption
 - ACLs, 75–76
 - checking current configuration, 74–75
 - configuring, 67
 - defining policies, 71–74
 - PIX Firewall, 157–167, 169–177
 - preparing IKE, 68
 - selecting IKE policies, 68–70
 - testing peers, 75
 - ESP, 10
 - flowcharts, 32, 34
 - IKE, 12, 77–81
 - LAN-to-LAN connections, 323
 - managing, 206
 - MD5, 12
 - NAT, 338–339
 - network configurations, 135–142
 - PIX Firewalls, 209–217
 - troubleshooting, 143–152
 - operations, 25
 - defining traffic, 26
 - encrypted tunnel, 29
 - IKE, 27–28
 - tunnel termination, 29
 - peers, 147–148, 223
 - PIX Firewall
 - CA site-to-site, 184–185
 - configuring, 162, 315–320
 - configuring preshared keys, 157
 - testing, 204–206
 - RSA signatures, 12
 - SAs, 30–34, 86, 279
 - SHA-1, 12
 - show commands, 95–96
 - site-to-site CA (PIX Firewall), 203
 - testing, 94–99, 131
 - transforms, 16

transport/tunnel modes, 13–16

verifying, 131, 327

VPN 3000 Concentrator

clients, 251–255

configuring, 244–249

scaling, 309

ISAKMP (Internet Security Association Key Management Protocol), 108–111, 143

configuring, 68

commands, 144

crypto system error messages, 99

policies, 143–146, 218–223

isakmp client configuration address-pool local command, 333

isakmp command, 219

isakmp show command, 95

ISP (Internet service provider), 331

J–K

keys. *See also* IKE; preshared keys

agreements, 18

general purpose

generating, 121

PFS, 337

IOS, 338

PIX Firewall, 337

preshared, 23, 80, 141

RSA

deleting, 200

generating, 120, 195

special usage, 120

wildcards, 330

L

LAN to LAN connections, adding, 323

LDAP (Lightweight Directory Access Protocol), 107, 185

LED (light emitting diode), monitoring, 289–290

length, 121

lifetimes

global IPSec SA, 170

SAs, 86

Lightweight Directory Access Protocol (LDAP), 107, 185

loading certificates, 271–276

local IPSec peers, 138

login, VPN 3000 Concentrator, 237

logs, monitoring, 287

M

main mode, IKE, 27

maintenance

CAs, 125–127

support, 200–201

management, 296

certificates, 304

Cisco VPN 3000 Concentrator, 295–304

files, 302–303

IKE, 206

IPSec, 206

memory (Flash), 193–194

NVRAM, 117

sessions, 296

manual enrollment

CAs, 112

SCEP, 190

maps, crypto. *See* crypto maps

MD5 (Message Digest 5 (MD5)), 8, 12

memory

DRAM, 30

Flash

deleting, 200

managing, 193–194

NVRAM, 117

menus (Program), VPN clients, 254–255

Message Digest 5 (MD5), 8, 12

messages, error (ISAKMP), 99

methods, preshare authentication, 160

Microsoft Windows 2000 Certificate Services 5.0, 192

mobile VPN clients, 310

modes

IKE configuration, 331–334

IOS, 336

modulus length, 121

monitoring

activity, 285–294

- CAs, 125–127
- Event Log, 287
- General Statistics, 294
- IKE, 206
- interfaces, 292
- IPSec, 206
- LED status, 289–290
- power supply status, 291
- Routing Table, 286
- Sessions, 292–293
- support, 200–201
- System Status, 288–291
- Monitoring Refresh, 299
- mscep.dll, 115
- MTU (maximum transmission unit), 255
- MyMap, 140

N

- names, PIX Firewall configuration, 195
- NAT (Network Address Translation), 15, 215, 338–339
- negotiation, transform sets, 169
- Network Address Translation. *See* NAT
- Network Auto Discovery check box, 324
- Network Time Protocol (NTP), 118
- networks
 - IPSec configurations, 135–142
 - PIX Firewalls, 209–217
 - troubleshooting, 143–152
 - topologies, 320
- no ca enroll command, 199
- no ca save command, 199
- no certificate command, 124
- no isakmp enable interface-name command, 159
- no isakmp identity hostname command, 203
- no sysopt connection permit-ipsec command, 163
- NTP (Network Time Protocol), 118
- NVRAM (Non-Volatile Random Access Memory), managing, 117

O

- operations (IPSec), 25
 - defining traffic, 26
 - encrypted tunnel, 29
 - IKE, 27–28
 - tunnel termination, 29
 - verifying, 327
- optimization
 - IPSec algorithms, 71
 - VPN routers, 48
- options
 - IPSec clients, 252–253
 - isakmp command, 219
- output, show ca mypubkey rsa command, 200
- overview
 - CAs, 34–39
 - IKE, 22–23
 - VPN, 5–6

P

- parameters
 - CA, 196–197
 - crypto maps, 171
 - IKE
 - CA site-to-site (PIX Firewall), 187
 - configuring, 77–81
 - defining, 70
 - PIX Firewall, 158–162
 - policies, 109
 - IPSec
 - client options, 252–253
 - configuring, 71
 - ISAKMP, 110
 - SAs, 32
 - VPN 3000 Concentrator, 235–239
- peer default ip address pool interface configuration command, 335
- peers
 - IPSec, 71, 138
 - differing preshared keys between, 147–148, 223
 - testing, 75
- perfect forward secrecy. *See* PFS
- permit any command, 336

- PERMIT statements, 75, 142
- PFS (perfect forward secrecy), 29, 150, 173
 - IOS, 338
 - PIX Firewall, 337
- Ping, 75
 - Cisco VPN 3000 Concentrator, 299
 - remote IPSec peers, 138
- PIX Firewall, 6, 49
 - ACLs, 224–225
 - CA site-to-site
 - configuring, 183, 193–201
 - IKE, 201–203
 - support, 183–191
 - crypto access lists, 163–165
 - crypto maps, 171, 173
 - applying to interfaces, 174–175
 - placement, 225
 - date/time, 194
 - dynamic crypto maps, 309–312
 - global IPSec SA lifetimes, 170
 - IKE
 - configuring, 158–162
 - modes, 333–334
 - IPSec
 - configuring, 157–169, 171–177, 315–320
 - differing preshared keys between peers, 223
 - networks, 209–218
 - preparing, 158
 - site-to-site CA, 203
 - testing, 204–206
 - verifying, 175–176
 - troubleshooting, 218–227
 - ISAKMP policies, 218–223
 - PFS, 337
 - preshared keys, 157
 - routing, 225–226
 - Secure VPN 1.1, 345–347, 349, 351
 - VPN, 51, 177–180
 - VPN 3000 Client version 2.5, 340
 - VPN 3000 Concentrator, 320–328
 - Xauth, 328–329
- PKCS #10 (Public-Key Cryptography Standard #10), 189
- PKCS #7 (Public-Key Cryptography Standard #7), 189
- PKCS (Public Key Cryptography Standards), 259
- PKI (public key infrastructure), 38, 251
- PL2 (Private Link), 51
- placement of crypto maps, troubleshooting, 150, 225
- policies
 - IKE, 108, 110–111, 129
 - CA site-to-site (PIX Firewall), 186, 188
 - creating, 78–79
 - PIX Firewall, 159
 - selecting, 68–70
 - site-to-site CA (PIX Firewall), 202–203
 - verifying, 160–162
 - IPSec, 68–74
 - ISAKMP, 143–146, 218–223
 - security, 83–84
- pools, IP addresses, 335
- power supplies, monitoring, 291
- PPP (Point-to-Point Protocol), 331
- PPTP (Point-to-Point Tunneling Protocol), 51, 294
- preparation
 - IKE, 68
 - IPSec, 158
- preshare authentication method, 160
- preshared keys, 141. *See also* IKE
 - configuring, 80–81
 - IKE, 23
 - IPSec, 147–148, 223
 - PIX Firewall, 157, 160
 - VPN 3000, 233
 - wildcards, 330
- private LANs, configuring, 235–237, 239
- processes
 - certificate authentication, 270
 - certificate loading, 271–276
 - D-H, 19–20
- products, VPN, 45–46
- Program menu
 - commands, 254
 - VPN clients, 254–255
- properties
 - DUN, 254
 - IPSec, 253
 - VPN Concentrator 3000, 240
- proposals, IKE, 279
- protection suites, 187
- protocols
 - CEP, 112
 - IPSec
 - 3DES, 11

- AH, 9
- CAs, 13
- crypto components, 17–21
- DES, 11
- D-H, 12
- ESP, 10
- IKE, 12
- MD5, 12
- RSA signatures, 12
- SHA-1, 12
- transforms, 16
- transport/tunnel modes, 13–16
- ISAKMP, 68
- LDAP, 107, 185
- NTP, 118
- PPP, 331
- PPTP, 51
- SCEP, 112, 185–190
- SNMP, 288
- TFTP, 302
- public interfaces, configuring, 240
- public IP interfaces, 241
- public key infrastructure. *See* PKI
- Public-Key Cryptography Standard #10 (PKCS #10), 111
- Public-Key Cryptography Standard #7 (PKCS #7), 111

Q

- Quick Configuration, VPN 3000 Concentrator, 239

R

- RA (registration authority), 107
- ranges, validating, 266
- RAS (Rivest, Shamir, and Adelman) signatures, 8
- rebooting Cisco VPN 3000 Concentrator, 298
- refreshing, 299
- registration authority (RA), 107
- remote access, VPN 3000, 233
- remote IPsec peers, pinging, 138
- remote users, 254
- requests, CA signed certificates, 198–199
- requirements, VPN client IKE, 332

- revisions, transform sets, 84
- rights, access, 299–300
- Rivest, Shamir, and Adelman. *See* RSA
- ROBO (remote office, branch office), 49
- routers, 6
 - CA interoperability, 113–115
 - date/time, 118
 - domain names, 119
 - dynamic crypto maps, 309–310
 - IOS, 313–314
 - PIX Firewall, 310–312
 - host names, 119
 - IKE, 32, 34
 - initial configurations, 137
 - IOS, 47–48
 - IPSec
 - configuring, 139–142
 - troubleshooting, 143–152
 - PIX Firewall, 315–320
- routing
 - DDR, 149
 - PIX Firewalls, 225–226
 - troubleshooting, 151–152
- Routing Table, monitoring, 286
- RSA (Rivest, Shamir, and Adelman), 259
 - deleting keys, 200
 - encryption, 24
 - generating keys, 120, 195
 - signatures, 12, 24

S

- SAs (security associations), 22, 141
 - global IPSec lifetimes, 170
 - IKE, 71
 - IPSec, 30–34, 279
 - lifetimes, 86
- scaling IPSec-based VPNs, 309
- SCEP (Simple Certificate Enrollment Protocol), 112, 185–190
- Secure Hash Algorithm-1 (SHA-1), 8
- Secure PIX Firewall. *See* PIX Firewall
- Secure Policy Manage, 6
- Secure VPN 1.1
 - IOS, 352–353
 - PIX Firewall, 345–351

- Secure VPN clients, 6
- security
 - gateways, 329
 - IPSec
 - 3DES, 11
 - AH, 9
 - CAs, 13
 - crypto components, 17, 19–21
 - DES, 11
 - D-H, 12
 - ESP, 10
 - IKE, 12
 - MD5, 12
 - RSA signatures, 12
 - SHA-1, 12
 - transforms, 16
 - transport/tunnel modes, 13–16
 - PIX Firewall, 49–51
 - policies, 83–84
- Security Associate Program, 190
- security associations. *See* SAs
- Security Parameter Database, 30
- Security Policy editor, 349
- selection
 - CA servers, 185
 - policies, 68–74
 - transforms, 71
- SEP (Scalable Encryption Processing), 52
- seq-num (sequence number), 171
- servers
 - Baltimore Technologies CA, 191
 - CA
 - router interoperability, 113–115
 - selecting, 185
 - Entrust CA, 113, 191
 - Microsoft Windows 2000 Certificate Services, 192
 - VeriSign OnSite CA, 113, 191
 - Windows 2000 CA, 114
- sessions, monitoring, 292–296
- sets, transforms, 16
- setting date/time, PIX Firewall, 194
- SHA (Secure Hash Algorithm), 166
- SHA-1 (Secure Hash Algorithm-1), 8, 12
- show access-lists command, 68
- show ca mypubkey rsa command, 200
- show clock command, 194
- show commands, 68, 74, 139
 - information, 141
 - IPsec, 95–96
 - PIX Firewall, 215–217
 - viewing, 140
- show crypto ca certificates command, 127
- show crypto engine command, 216
- show crypto engine connections active command, 141, 150
- show crypto ipsec sa command, 131, 141, 216
- show crypto ipsec security-association lifetime command, 176
- show crypto ipsec transform set, 131
- show crypto ipsec transform set command, 131
- show crypto ipsec transform-set command, 74, 215
- show crypto isakmp command, 147
- show crypto isakmp key command, 148
- show crypto isakmp policy command, 74, 131, 216
- show crypto isakmp policy map command, 140
- show crypto key mypubkey rsa command, 127
- show crypto map command, 74, 131, 140, 174, 215
- show crypto map interface serial 0 command, 150
- show ip route command, 151
- show running-config command, 74
- shutdown, Cisco VPN 3000 Concentrator, 298
- signatures
 - digital, 36
 - requesting certificates, 198–199
 - validating, 265
- Simple Certificate Enrollment Protocol (SCEP), 112
- Simple Network Management Protocol (SNMP), 288
- site-to-site CA, 190–191
 - configuring, 183, 193–201
 - IKE, 201, 203
 - support, 183–189
- site-to-site preshared keys. configuring, 157. *See also* preshared keys
- site-to-site VPNs, configuring, 320–328
- small office, home office (SOHO), 5
- SNMP (Simple Network Management Protocol), 288
- software
 - IOS, 47
 - VPN Concentrator, 52
 - 3000 series, 52–61
 - 5000 series, 61

SOHO (small office, home office), 5, 49
 special usage keys, generating, 120
 statements, PERMIT, 75, 142
 statistics, PPTP, 294
 status
 LED, 289–290
 power supplies, 291
 System Status, 288–291
 support
 CAs, 34–39, 107–112, 128
 configuring, 105–106, 119–127
 troubleshooting, 200–201
 configuring, 116–127
 PIX Firewall, 183–189
 VPN 3000 Concentrator, 271–279
 sysopt connection permit-ipsec command, 163, 215
 System Reboot, Cisco VPN 3000 Concentrator, 298
 System Status, monitoring, 288–291
 systems properties, VPN Concentrator 3000, 240

T

tables, monitoring, 286
 tasks, configuring, 105–106
 technologies
 Baltimore, 114
 Entrust, 113
 VPN, 5–6
 termination of tunnels, 29
 testing
 IPSec, 94–99, 131
 peers, 75
 PIX Firewall, 204–206
 VPN, 177–180
 TFTP (Trivial File Transfer Protocol), 302
 time, 118, 194
 topologies, 320
 traffic
 defining, 26
 IP
 applying crypto maps, 89–94
 creating crypto ACLs, 86–88
 IPSec, 140
 transform sets
 configuring, 83–84
 IPSec, 16

PIX Firewall, 166–169
 selecting, 71
 transport modes, 13, 15–16
 Triple DES (3DES), 8
 Trivial File Transfer Protocol (TFTP), 302
 troubleshooting
 ACLs
 IPSec, 149
 PIX Firewalls, 224–225
 CA support, 200–201
 IPSec, 94–97, 99, 204–206
 network configurations, 135–136, 138–152
 routing, 151–152, 225–226
 VPN, 177–180
 Tunnel Endpoint Discovery, 336
 tunnels
 GRE, 47
 IPSec encrypted tunnel, 29
 mode, 13–16
 terminating, 29

U

UniCERT CA module, 114
 unistallation of VPN 3000 Concentrator clients, 255
 Universal Time Code (UTC), 118
 update, 297
 users
 adding250–251
 remote, 254
 UTC (Universal Time Code), 118

V

VACs (VPN Accelerator Cards), 48
 validation
 certificates, 263–270
 ranges, 266
 verification
 CA support configuration, 199
 IKE, 82, 160–162
 IPSec, 94–99, 131, 327
 VPN, 177–180
 VeriSign OnSite CA server, 113, 191
 viewing show commands, 140, 215

- VPN (virtual private network)
 - 3000 series, 52–61
 - 5000 series, 61
 - clients, 332
 - components, 45–46
 - dialers, 255
 - IOS, 47–48
 - IPSec, 309
 - mobile clients, 310
 - overview of, 5–6
 - PIX Firewall
 - testing, 177–180
 - troubleshooting, 204–206
- VPN 3000 Client version 2.5, configuring, 340–342
- VPN 3000 Concentrator
 - adding users, 250–251
 - browsers, 239–251
 - certificates
 - configuring support, 271–279
 - generating, 259–262
 - validating, 263–270
 - configuring, 235–239
 - digital certificates, 280–281
 - IP addresses, 243
 - IPSec
 - configuring, 244–249
 - configuring clients, 251–255
 - PIX Firewall, 320–328
 - Quick Configuration, 239
 - remote access, 233
- vpngroup command, 340, 343

W

- wildcards, preshared keys, 330
- Windows 2000 CA server, 114
- write memory command, 199
- write terminal command, 161

X–Z

- X.509v3 certificates, 111, 189
- Xauth (Extended Authentication), 328–329