

Index

A

AAA (Authentication, Authorization, Accounting)

- access modes, 495-496
- components of, 495
- configuring via CLI
 - aaa accounting command*, 503-504
 - aaa authentication ppp command*, 501
 - aaa authorization command*, 502
 - aaa new-model command*, 499
 - RADIUS configuration*, 498
 - radius-server host command*, 499
 - radius-server key command*, 501
 - TACACS+ configuration*, 499
 - tacacs-server host command*, 500
 - tacacs-server key command*, 501
 - username root password command*, 501
- configuring via SDM, 504-505, 508
- debugging, 510
 - debug aaa accounting command*, 512
 - debug aaa authentication command*, 511
 - debug aaa authorization command*, 511
 - debug radius command*, 512
 - debug tacacs command*, 513

aaa accounting command, AAA configuration, 503-504

aaa authentication ppp command, AAA configuration, 501

aaa authorization command, AAA configuration, 502

aaa new-model command, AAA configuration, 499

AAL5MUX (virtual circuit multiplexed PPP over AAL5), 131-134

AAL5SNAP (LLC encapsulated PPP over AAL5), 131-135

Access Layer (hierarchical network model), 17

access link failures, 358-359

access-class command, Telnet access security, 473

ACL (Access Control Lists)

- crypto ACL, configuring for site-to-site IPsec VPN, 297
- Interface ACL, configuring for site-to-site IPsec VPN, 299

ADSL (Asymmetrical DSL) connections, 89

- CAP, 90-91
- data transmission, 93
 - PPP, 95
 - PPPoA, 101-102
 - PPPoE, 96-101
 - RFC 1483/2684 bridging*, 94
- DMT, 91-92
- G.Lite ADSL, 87
- G.Lite VDSL, 87
- physical connectivity, 151-152
- troubleshooting
 - cable pinout issues*, 154
 - data link layer*, 156-160
 - dsl operating-mode auto command*, 156
 - flapping interfaces*, 152
 - LED*, 154
 - no shutdown command*, 153
 - physical layer*, 150-156
 - RADSL*, 87
 - show dsl interface command*, 153
 - show interface command*, 153
 - show ip interface brief command*, 152
 - supported DSL operating modes*, 155-156
 - tangled wires*, 154

Advanced Firewall Wizard (SDM), 547, 550, 553-555

aggressive mode (IKE), 264

AH (Authentication Headers), 259

ALG (Application Layer Gateways), Cisco IOS Firewall, 524-526

amplifiers, cable connections, 55

amplitude, DSL connections, 84

antenna sites (cable connections), 56

anti-replay (IPsec), 258

AP (Access Points)

- DSAP, 133
- router security, 467-468
- SSAP, 133

Application Layer (SONA), 15

architectures (network)

- branch network architectures, 19-21
- cable networks, 65-66
- campus network architectures, 17-19
- data center architectures, 21
- enterprise edge architectures, 23-24
- SONA, 11-12
 - Application Layer, 15*
 - interactive services layer, 13-15*
 - ISL, 13*
 - network infrastructure layer, 13*
- teleworker architectures, 24-25, 33
 - access methods, 41*
 - authentication, 42*
 - bandwidth, 41*
 - Business-Ready Teleworker, 36*
 - cable connections, 54-69*
 - connection management, 42*
 - connection requirements, 40*
 - corporate components, 43*
 - DSL connections, 81-102*
 - DSL connections, PPPoA, 130-141*
 - DSL connections, PPPoE, 113-123*
 - enterprise architecture frameworks, 37*
 - enterprise architecture frameworks, goals of, 38*
 - home office components, 43*
 - IIN, 36*
 - IP telephony, 43*
 - IPsec VPN, 42, 46*
 - QoS, 42*
 - Remote Access VPN, 42, 46*
 - remote connectivity, 38-39, 46*
 - security, 42*
 - traditional teleworkers versus business-ready teleworkers, 45*
 - video, 43*
- WAN/MAN architectures, 25-26

ARP (Address Resolution Protocol)

- gratuitous ARP, router security threats, 440
- IP switching, MPLS, 180
- proxy ARP, router security threats, 440

asymmetric encryption, 267-269

ATM (Asynchronous Transfer Mode)

- Ethernet/ATM interfaces, PPPoE, 114-115
- pings, troubleshooting data link layers (ADSL connections), 157
- PPPoA configuration, 134-135
- PVC, 115

attack-drop.sdf ips-sdf command, IOS router IPS configuration, 573

attenuation (signal), DSL connections, 86

ATU-C (ADSL Transmission Unit-Central), DSL connections, 84

authentication. See also AAA (Authentication, Authorization, Accounting)

- data origin authentication, IPsec, 258
- GLA, Easy VPN, 382
- peer authentication, 262-263, 288
- RADIUS protocol, 497
- security authentication, logins, 469

- TACACS+ protocol, 497
- teleworker architectures, 42
- user authentication, Easy VPN, 384
- Xauth, Easy VPN, 382-383

Authentication phase (PPP), troubleshooting data link layers (ADSL connections), 157

Authentication Proxy (Cisco IOS Firewall), 529

Authentication tab (VPN Client), 419

authorization, 497. *See also* AAA (Authentication, Authorization, Accounting)

AutoSecure, router security, 441-443, 448-450

B

back office, 64

Backbone Layer (hierarchical network model). *See* Core Layer (hierarchical network model)

backup GRE tunnels, 341

Backup Servers tab (VPN Client), 422

backups (WAN), 368-369

bandwidth, telework architectures, 41

banners, 476-477

BGP (Border Gateway Protocol), IP switching, 179

biometrics, IPsec peer authentication, 262

block-for option (logins), 470

Bottom-of-Stack bit (MPLS labels), 192

bottom-up, 149-160

BPDN (Virtual Private Dialup Networks), 230

branch network architectures, 19-21

branch offices, remote network connection requirements, 27-28

bridge taps, DSL connections, 86

broadband cable connections, 54

business applications, Application Layer (SONA), 15

business-ready teleworkers versus traditional teleworkers, 45

C

C networks, MPLS VPN, 237

CA (Certification Authorities), PKI, 270

cable connections

- amplifiers, 55
- antenna sites, 56

- benefits of, 59

- broadband, 54

- cable modem provisioning process, 67-69

- CATV, 55, 58

- coaxial, 55, 58

- distribution networks, 57

- DOCSIS, 61-64

- downstream, 55

- drawbacks to, 66

- fiber optic cable, 86

- headends, 56, 65-66

- HFC, 55

- hybrid fiber-coaxial networks, 63-64

- interference, 58

- modulation, 56

- network architectures, 65-66

- nodes, 57

- NTSC cable system standard, 56

- PAL cable system standard, 56

- pinout issues, troubleshooting, ADSL connections, 154

- radio frequency signals, 59-61

- RF splitters, 66

- SECAM cable system standard, 56

- subscriber drops, 57

- taps, 55

- teleworker architectures, 41, 46

- transportation networks, 56

- upstream, 55, 66

cache-driven switching, 179

campus network architectures, 17-19

CAP (Carrierless Amplitude Phase), ADSL, 90-91

CATV (Community Antenna Television) cable connections, 55, 58

CE routers, MPLS VPN, 237-238

CEF (Cisco Express Forwarding)
frame mode MPLS, configuring for, 211-214

- IOS switching, 179

- switching, MPLS, 180

cell mode MPLS (Multiprotocol Label Switching), 192

central sites, remote network connection requirements, 27

Character mode (AAA), 495-496

Checksum Present option (GRE headers), 334

Cisco IOS Firewall, 519

- ALG, 524-526

- Authentication Proxy, 529

- capabilities of, 531
 - DMZ, 523-524
 - IPS, 529
 - layered device structure, 523-524
 - packet filtering, 524-525
 - recognized protocols list, 529-530
 - stateful packet filtering, 524-528
 - CLI (Command Line Interface)**
 - AAA configuration
 - aaa accounting command*, 503-504
 - aaa authentication ppp command*, 501
 - aaa authorization command*, 502
 - aaa new-model command*, 499
 - RADIUS configuration*, 498
 - radius-server host command*, 499
 - radius-server key command*, 501
 - TACACS+ configuration*, 499
 - tacacs-server host command*, 500
 - tacacs-server key command*, 501
 - username root password command*, 501
 - AAA via SDM, 504-505, 508
 - Easy VPN modes, 385
 - Easy VPN servers, 385
 - Easy VPN Server Wizard*, 389-395
 - SDM*, 386
 - user configuration*, 388
 - GRE tunnels, 335-336
 - intrusion systems, 571
 - commands*, 572-574
 - SDM*, 576-582
 - verification*, 574-575
 - site-to-site IPsec VPN
 - applying crypto maps to interfaces*, 298
 - configuring crypto ACL*, 297
 - configuring crypto maps*, 297
 - configuring Interface ACL*, 299
 - configuring IPsec transform sets*, 295-296
 - configuring ISAKMP policies*, 293
 - SDM*, 303-314
 - VPN Client, 414, 418-424
 - Connection Entries screen (VPN Client), 419**
 - connection signatures (intrusion systems), 570**
 - control planes (MPLS architectures), 189**
 - Core Layer (hierarchical network model), 17**
 - corporate components, teleworker architectures, 43**
 - CPE (Customer Premises Equipment), 113**
 - PPPoE on ATM interfaces configuration option, 114
 - PPPoE on Ethernet interfaces configuration option, 114
 - provider-facing interface, 114
 - router configuration, 120-122, 136-140
 - subscriber-facing interface, 114
 - crosstalk, DSL connections, 86**
 - crypto ACL (Access Control Lists), configuring, 297**
- CM (Cable Modems), 64**
- CMTS (Cable Modem Termination Systems), 64**
- coaxial cable connections, 55, 58**
- collaboration applications, Application Layer (SONA), 15**
- copy flash, 573-574**
- confidentiality (data), IPsec, 257**
- configuration mode, password configuration, 472**
- configure terminal command, 480**
- configuring**
 - AAA via CLI
 - aaa accounting command*, 503-504
 - aaa authentication ppp command*, 501
 - aaa authorization command*, 502
 - aaa new-model command*, 499
 - RADIUS configuration*, 498
 - radius-server host command*, 499
 - radius-server key command*, 501
 - TACACS+ configuration*, 499
 - tacacs-server host command*, 500
 - tacacs-server key command*, 501
 - username root password command*, 501

- crypto ipsec security-association command, configuring IPsec transform sets, 296
- crypto ipsec transform-set command, configuring IPsec transform sets, 296
- crypto isakmp identity hostname command, Easy VPN, 383
- crypto isakmp keepalive command, DPD, 361
- crypto map command
 - HSRP, 365
 - site-to-site IPsec VPN, 298
- crypto maps, 297-298

D

- data center architectures, 21
- data confidentiality (IPsec), 257
- data integrity (IPsec), 257
- data link layers (ADSL connections), troubleshooting, 156-160
- data origin authentication (IPsec), 258
- data planes (MPLS architectures), 189
- data transfers, site-to-site IPsec VPN, 292
- data transmission, ADSL, 93
 - PPP, 95
 - PPPoA, 101-102
 - PPPoE, 96-101
 - RFC 1483/2684 bridging, 94
- DDoS (Distributed Denial of Service) attacks, 568
- debug aaa accounting command, debugging AAA, 512
- debug aaa authentication command, debugging AAA, 511
- debug aaa authorization command, debugging AAA, 511
- debug atm events command, troubleshooting data link layers (ADSL connections), 156
- debug atm packets command, troubleshooting data link layers (ADSL connections), 156
- debug crypto isakmp command, troubleshooting Easy VPN servers, 398
- debug ip cef command, CEF configuration (frame mode MPLS), 214
- debug ip cef events command, CEF configuration (frame mode MPLS), 214
- debug ip inspect command, verifying firewall configurations, 544
- debug mpls ldp bindings command, frame mode MPLS, 219-220
- debug radius command, debugging AAA, 512
- debug tacacs command, debugging AAA, 513
- delay option (logins), 470
- device failures, 358-359
- DHCP (Dynamic Host Configuration Protocol), configuring DSL routers, 118-119
- dialer interfaces
 - PPPoA, configuring for, 135-136
 - PPPoE, configuring for, 115
- Dial-Up tab (VPN Client), 422
- Diffie-Hellman key exchanges
 - asymmetric encryption, 268-269
 - site-to-site IPsec VPN, 287
- digital certificates
 - IPsec peer authentication, 262-263
 - PKI, 270
- discovery phase (PPPoE), 97-98
- distributed mode CEF, configuring for frame mode MPLS, 211
- Distribution Layer (hierarchical network model), 17
- distribution networks, cable connections, 57
- DMT (Discrete Multi-Tone), ADSL, 91-92
- DMZ (Demilitarized Zones), firewalls, 435, 523-524
- DOCSIS (Data-Over-Cable Service Interface Specifications), 61-64
- DoS (Denial of Service) attacks, 568
- DoS signatures (intrusion systems), 570
- downstream
 - cable connections, 55
 - DSL connections, 84
- DPD (Dead Peer Detection), 265, 360-361
- DSAP (Destination Service Access Points), 133
- DSL (Digital Subscriber Line) connections, 81
 - ADSL, 89
 - CAP, 90-91
 - data transmission, 93-102
 - DMT, 91-92
 - G.Lite ADSL, 87
 - PPP, 95
 - PPPoA, 101-102
 - PPPoE, 96-101
 - RADSL, 87
 - RFC 1483/2684 bridging, 94
 - VDSL, 87

- amplitude, 84
 - ATU-C, 84
 - ATU-R, 84
 - bridge taps, 86
 - crosstalk, 86
 - defining, 83
 - downstream, 84
 - DSLAM, 84
 - fiber optic cable, 86
 - frequency, 84
 - impedence mismatch, 86
 - interference, 86
 - limitations of, 85
 - line code, 84
 - load coils, 85-86
 - maximum data rates, 84
 - microfilters, 84
 - modulation, 84
 - nature, 84
 - NID, 85
 - phases, 85
 - POTS, 83-85
 - PPPoA
 - AAL5MUX, 131-134*
 - AAL5SNAP, 131-135*
 - ATM interface configuration, 134-135*
 - Cisco PPPoA, 131, 134*
 - configuration elements, 141*
 - CPE router configuration, 136-140*
 - DSL dialer configuration, 135-136*
 - router configuration, 130-134*
 - virtual template configuration, 136*
 - PPPoE
 - configuration elements, 123*
 - configuring CPE routers, 120-122*
 - configuring DHCP for DSL routers, 118-119*
 - configuring dialer interfaces, 115*
 - configuring PAT, 116-118*
 - configuring static default routes for DSL routers, 119*
 - Ethernet/ATM interfaces, 114-115*
 - router configuration, 113-114*
 - SDSL, 87-88
 - signal attenuation, 86
 - teleworker architectures, 41, 46
 - topologies, 113
 - troubleshooting, 149
 - cable pinout issues, 154*
 - data link layer, 156-160*
 - dsl operating-mode auto command, 156*
 - flapping interfaces, 152*
 - LED, 154*
 - no shutdown command, 153*
 - physical layer, 150-156*
 - show dsl interface command, 153*
 - show interface command, 153*
 - show ip interface brief command, 152*
 - supported DSL operating modes, 155-156*
 - tangled wires, 154*
 - upstreams, 85
 - wavelengths, 85
 - wire gauge, 86
- DSLAM (DSL Access Multiplexers), 84, 113, 130**
- ## E
- Easy VPN (Virtual Private Networks)**
 - connection establishment, 382
 - establishing ISAKMP SA, 384*
 - GLA, 382*
 - IKE Phase 1, 383*
 - IPsec Quick mode, 385*
 - mode configuration, 385*
 - RRI, 385*
 - SA proposal acceptance, 384*
 - user authentication, 384*
 - Xauth, 382-383*
 - Remote, 379-381
 - server configuration, 385
 - Easy VPN Server Wizard, 389-395*
 - SDM, 386*
 - user configuration, 388*
 - server monitoring, 396-397
 - server requirements, 381-382
 - troubleshooting servers, 398-406
 - edge LSR (Label Switching Routers), 194**
 - edge nodes, MPLS, 175**
 - edge routers**
 - securing
 - AutoSecure, 441-443, 448-450*
 - SDM, 443-447, 450-451*

- security threats
 - common management services*, 438
 - gratuitous/proxy ARP*, 440
 - path integrity mechanisms*, 439
 - probes/scans*, 439-440
 - terminal access security*, 440
 - unnecessary services/interfaces*, 436-438
 - vulnerable services*, 436

egress nodes, MPLS, 175**EIGRP (Enhanced Interior Gateway Routing Protocol), GRE tunnels, 345**

- enable password, password configuration via**
 - configuration mode, 472
 - setup mode, 471

enable secret command, password privilege levels, 478

- enable secret password, password configuration via**
 - configuration mode, 472
 - setup mode, 471

encryption

- IPsec, 256, 266
 - asymmetric encryption*, 267-269
 - symmetric encryption*, 267
- packet encryption, 497
- passwords, 475-476

enterprise edge architectures, 23-24**ESP (Encapsulating Security Payload), 258****Ethernet/ATM interfaces, PPPoE, 114-115****exec-timeout configuraton option, 474****Experimental CoS field (MPLS labels), 192****exploit signatures (intrusion systems), 570****exploits (vulnerability), 568****export RT (Route Targets), 242****F****failed logins, 469****failover strategies (IPsec)**

- stateful strategies, 360, 366-368
- stateless strategies, 359
 - DPD*, 360-361
 - HSRP*, 363-366
 - IGP within GRE over IPsec tunnel*, 362

failures (networks), 358-359**FIB (Forwarding Information Bases)**

- CEF switching, MPLS, 180
- frame mode MPLS, 195-198

fiber optic cable

- DSL connections, 86
- teleworker architectures, 41

fiber-coaxial networks, 63-64**fiber-optic connections, teleworker architectures, 46****firewalls**

- Cisco IOS Firewall, 519
 - ALG*, 524-526
 - Authentication Proxy*, 529
 - capabilities of*, 531
 - DMZ*, 523-524
 - IPS*, 529
 - layered device structure*, 523-524
 - packet filtering*, 524-525
 - recognized protocols list*, 529-530
 - stateful packet filtering*, 524-528
- CLI, configuring via
 - applying inspection rules to interface*, 542
 - inspection rules definitions*, 541
 - interface selection*, 540
 - IP ACL configuration*, 541
 - packet direction selection*, 540
 - verifying configuration*, 543-544
- DMZ, 435
- SDM, configuring via
 - advanced firewalls*, 547, 550, 553-555
 - basic firewalls*, 544, 547

flapping interfaces, 152**forward path (cable connections). See****downstream, cable connections****frame mode MPLS (Multiprotocol Label Switching), 190, 193, 207**

- CEF configuration, 211
 - debug ip cef command*, 214
 - debug ip cef events command*, 214
 - distributed mode CEF*, 211
 - show ip cef command*, 212-213
 - show ip cef detail command*, 213

FIB, 195-198

LFIB, 195-197

LIB, 195-196, 202

- MPLS configuration
 - mpls ip command*, 214-215
 - mpls label protocol command*, 214-215
 - no mpls ip command*, 214
 - sample configuration*, 215-216
 - tag-switching commands*, 215
- MTU size configuration, 217
 - debug mpls ldp bindings command*, 219-220
 - show mpls ldp neighbor command*, 218
- show mpls forwarding-table command, 199
- Frame Type field (AAL5SNAP)**, 133
- framing physical layers (ADSL connections)**, 151
- frequency, DSL connections**, 84
- full mesh topologies, WAN**, 172

G

- G.Lite ADSL**, 87
- G.SHDSL (Symmetric High-Data-Rate DSL)**, 88
- GLA (Group Level Authentication), Easy VPN**, 382
- gratuitous ARP, router security threats**, 440
- GRE (Generic Routing Encapsulation) tunnels**, 327
 - backup tunnels, 341
 - characteristics of, 332
 - configuring, 335-336
 - creating, 340
 - EIGRP, 345
 - headers, 333-335
 - IGP within GRE over IPsec tunnel, 362
 - IP multicast, 333
 - IPsec VPN, 342-343
 - OSPF, 345
 - RIP, 344
 - routing protocols, 333
 - secure GRE tunnels, 336-337
 - security, 332-333
 - static routing, 343-344
 - validating configurations, 346
- GRE over IPsec Wizard**
 - GRE tunnels
 - backup tunnels*, 341
 - creating*, 340

- EIGRP*, 345
- OSPF*, 345
- RIP*, 344
- static routing*, 343-344
- IPsec VPN, 342-343
- launching, 339
- validating configurations, 346

H - I

- HDSL (High-Data-Rate DSL)**, 88
- HDSL2 (second-generation HDSL)**, 88
- headends (cable connections)**, 56, 65-66
- headers**
 - GRE tunnels, 333-335
 - IPsec, 261
- HFC (Hybrid Fiber-Coaxial) cable connections**, 55
- hierarchical network model**, 16-17
- home office components, teleworker architectures**, 43
- honeypots (intrusion systems)**, 570
- HSRP (Hot Standby Router Protocol), IPsec**
 - stateful failover strategies, 366
 - stateless failover strategies, 363-366
- hub-and-spoke topologies**, 170, 173
- hybrid fiber-coaxial networks**, 63-64
- IDS (Intrusion Detection Systems)**, 567-568
 - honeypots, 570
 - malicious traffic identification, 569
 - scope of, 568-569
 - signatures
 - connection*, 570
 - DoS*, 570
 - exploit*, 570
 - reactions*, 571
 - string*, 570
 - viewing via SDM*, 582
- IDSL (ISDN DSL)**, 88
- IGP within GRE over IPsec tunnels**, 362
- IIN (Intelligent Information Networks)**, 9
 - features of, 10
 - integrated applications phase, 11
 - integrated services phase, 10
 - integrated transport phase, 10
 - teleworker architectures, 36
- IKE (Internet Key Exchange)**, 258
 - aggressive mode, 264

- DPD, 265
- ISAKMP, 263
 - main mode, 264
 - mode configuration, 266
 - NAT traversal, 265-266
 - Oakley protocol, 263
 - phases of, 263
 - quick mode, 265
 - transform sets, site-to-site IPsec VPN, 286-287
 - Xauth, 266
- impedance mismatch, DSL connections, 86**
- import RT (Route Targets), 242**
- ingress nodes, MPLS, 175**
- inside local/global addresses, PAT configuration, 116**
- Installation Directory (VPN Client), 417**
- integrated applications phase (IIN), 11**
- integrated services, remote network connection requirements, 28-29**
- integrated services phase (IIN), 10**
- integrated transport phase (IIN), 10**
- integrity (data), IPsec, 257**
- interactive services layer (SONA), 13-15**
- Interface ACL (Access Control Lists), configuring, 299**
- interference**
 - cable connections, 58
 - DSL connections, 86
- intrusion systems**
 - IDS, 567
 - anomaly-based malicious traffic identification, 569*
 - connection signatures, 570*
 - DoS signatures, 570*
 - exploit signatures, 570*
 - honeypots, 570*
 - policy-based malicious traffic identification, 569*
 - scope of, 568-569*
 - signature-based malicious traffic identification, 569*
 - signatures, reactions to, 571*
 - signatures, viewing via SDM, 582*
 - string signatures, 570*
 - IPS, 567
 - anomaly-based malicious traffic identification, 569*
 - connection signatures, 570*
 - DoS signatures, 570*
 - exploit signatures, 570*
 - honeypots, 570*
 - IOS router configuration, 571-575*
 - policy-based malicious traffic identification, 569*
 - scope of, 568-569*
 - SDM configuration, 576-582*
 - signature-based malicious traffic identification, 569*
 - signatures, reactions to, 571*
 - signatures, viewing via SDM, 582*
 - string signatures, 570*
- IOS routers**
 - as NIPS devices, 570
 - IPS configuration, 571
 - commands, 572-574*
 - verification, 574-575*
- IOS switching (CEF), 179**
- IP addresses, sockets, 117**
- ip inspect command, defining firewall inspection rules, 541**
- ip ips fail closed command, IOS router IPS configuration, 572**
- ip ips name command, IOS router IPS configuration, 574**
- ip ips name testips list 123 command, IOS router IPS configuration, 572**
- ip ips sdf builtin command, IOS router IPS configuration, 572**
- ip ips testips in command, IOS router IPS configuration, 573**
- IP multicast, GRE tunnels, 333**
- IP switching, MPLS**
 - ARP, 180
 - BGP, 179
- IP telephony, teleworker architectures, 43**
- ipc zone default command, IPsec stateful failover strategies, 368**
- IPS (Intrusion Prevention Systems), 529, 567-568**
 - honeypots, 570
 - IOS router configuration, 571
 - commands, 572-574*
 - verification, 574-575*
 - malicious traffic identification, 569
 - scope of, 568-569
 - SDM configuration, 576-582

- signatures
 - connection*, 570
 - DoS*, 570
 - exploit*, 570
 - reactions*, 571
 - string*, 570
 - viewing via SDM*, 582

IPS Wizard (SDM), 577-582

IPsec (IP Security), 251

- AH, 259
- anti-replay, 258
- data confidentiality, 257
- data integrity, 257
- data origin authentication, 258
- encryption, 256, 266-269
- ESP, 258
- GRE tunnels, 327
 - backup tunnels*, 341
 - characteristics of*, 332
 - configuring*, 335-336
 - creating*, 340
 - EIGRP*, 345
 - headers*, 333-335
 - IP multicast*, 333
 - IPsec VPN*, 342-343
 - launching GRE over IPsec Wizard*, 339
 - OSPF*, 345
 - RIP*, 344
 - routing protocols*, 333
 - secure GRE tunnels*, 336-337
 - security*, 332-333
 - static routing*, 343-344
 - validating configurations*, 346
- headers, 261
- IKE, 258
 - agressive mode*, 264
 - DPD*, 265
 - ISAKMP*, 263
 - main mode*, 264
 - mode configuration*, 266
 - NAT traversal*, 265-266
 - Oakley protocol*, 263
 - phases of*, 263
 - quick mode*, 265
 - Xauth*, 266

- peer authentication, 262-263
- PKI, 270-271
- Quick mode, Easy VPN, 385
- site-to-site IPsec VPN, 283-285
 - applying crypto maps to interfaces*, 298
 - configuring crypto ACL*, 297
 - configuring crypto maps*, 297
 - configuring Interface ACL*, 299
 - configuring IPsec transform sets*, 295-296
 - configuring ISAKMP policies*, 293
 - Diffie-Hellman key exchanges*, 287
 - IKE transform sets*, 289-291
 - IPsec tunnel termination*, 292
 - monitoring tunnels*, 314-316
 - peer authentication*, 288
 - SA*, 291-292
 - SDM*, 300-314
 - secure data transfers*, 292
 - specifying interesting traffic*, 284
- stateful failover strategies, 360, 366-368
- stateless failover strategies, 359
 - DPD*, 360-361
 - HSRP*, 363-366
 - IGP within GRE over IPsec tunnels*, 362
- transform sets
 - configuring for site-to-site IPsec VPN*, 295-296
 - site-to-site IPsec VPN*, 289-291
- transport mode, 259-260
- tunnel mode, 260
- VPN, 251
 - GRE tunnels*, 342-343
 - teleworker architectures*, 42, 46
 - WAN backups*, 368-369

ISAKMP (Internet Security Association and Key Management Protocol), 263, 293

ISL (Infrastructure Services Layer), SONA, 13

J - K - L**Key Present option (GRE headers), 334****labels (MPLS architectures), 175-177, 190**

- Bottom-of-Stack bit, 192
- distributing, 199
 - interim packet propagation, 201*
 - label allocation, 201*
 - LDP, 199-200*
 - packet propagation, 200*
- Experimental CoS field, 192
- frame-mode MPLS, 193
- Label field, 191
- label stacks, 175, 192-193
- label swaps, 175
- PHP, 201
- structures of, 190
- TTL field, 192

LAN (Local Area Networks), VLAN, 230**layer 1 (ADSL connections). *See* physical layers (ADSL connections)****layer 1 VPN overlays, 230****Layer 2 remote connections, teleworker architectures, 38****layer 2 VPN overlays, 231****Layer 3 remote connections. *See* service provider MPLS VPN****layer 3 VPN overlays, 232****LCP (Link Control Protocol) phase (PPP), troubleshooting data link layers (ADSL connections), 157****LDP (Label Distribution Protocol), MPLS architectures, 189, 199-200****LED (light emitting diodes), troubleshooting ADSL connections, 154****LFIB (Label Forwarding Information Base), MPLS architectures, 189, 195-197****LHE (Local Headends), 65-66****LIB, frame mode MPLS, 195-196, 202****licensing agreements, VPN Client, 416****line code**

- DSL connections, 84
- physical layers (ADSL connections), 151

load coils, DSL connections, 85-86**logins**

- failed logins, 469
- password checks, 473
- routers, banners, 476-477

security, 469-470

show login command, 470

LSH (Label-Switched Hops), MPLS, 175**LSP (Label-Switched Paths)**

- MPLS, 175
- MPLS VPN, 237

LSR (Label Switching Routers)

- edge LSR, 194
- MPLS, 175, 177-178

M**main mode (IKE), 264****malicious traffic identification (intrusion systems), 569****maximum data rates, DSL connections, 84****microfilters, DSL connections, 84****modems (cable), provisioning process, 67-69****modulation**

- cable connections, 56
- DSL connections, 84

MPLS (Multiprotocol Label Switching)**architectures, 170, 174, 185**

- CEF switching, FIB, 180
- cell mode MPLS, 192
- control planes, 189
- data planes, 189
- domains, 175
- edge nodes, 175
- egress nodes, 175
- frame mode MPLS, 190, 207
 - CEF configuration, 211-214*
 - FIB, 195, 197-198*
 - LFIB, 195-197*
 - LIB, 195-196, 202*
 - MPLS configuration, 214-216*
 - MTU size configuration, 217-220*
 - show mpls forwarding-table command, 199*

ingress nodes, 175

labels, 176-177, 190

- Bottom-of-Stack bit, 192*
- distributing, 199-200*
- distributing, interim packet propagation, 201*
- distributing, label allocation, 201*
- distributing, packet propagation, 200*
- Experimental CoS field, 192*

- frame-mode MPLS*, 193
- Label field*, 191
- label stacks*, 175, 192-193
- label swaps*, 175
- PHP*, 201
- structures of*, 190
- TTL field*, 192
- LDP, 189
- LFIB, 189
- LSH, 175
- LSP, 175
- LSR, 175-178, 194
- nodes, 175
- packets, role of, 176
- routers, role of, 176
- RSVP, 189
- standard IP switching
 - ARP*, 180
 - BGP*, 179
- TDP, 189
- TE, 192
- terminology of, 175
- VPN, 177, 192, 225, 229, 236
 - C networks*, 237
 - CE routers*, 237-238
 - end-to-end routing updates*, 242-243
 - LSP*, 237
 - P networks*, 237
 - P routers*, 237-239
 - packet forwarding*, 243-244
 - PE routers*, 237-239
 - PHP*, 237, 244
 - PoP*, 237
 - RD*, 237-241
 - RT*, 237, 242
 - teleworker architecture remote connections*, 39
 - terminology of*, 237
 - VLAN*, 230
 - VPDN*, 230
 - VRF*, 237
- VPN with TE, 192
- mpls ip command, MPLS configuration (frame mode MPLS), 214-215**
- mpls label protocol command, MPLS configuration (frame mode MPLS), 214-215**
- MTU (Maximum Transmission Units), sizing, 217-220**

N

- NAT (Network Address Translation), PAT, 116-118**
- NAT traversal, 265-266**
- nature, DSL connections, 84**
- NCP (Network Control Protocol) phase (PPP), troubleshooting data link layers (ADSL connections), 157**
- networked infrastructure layer (SONA), 13**
- networks, 5**
 - branch network architectures, 19-21
 - cable network architectures, 65-66
 - campus network architectures, 17-19
 - data center architectures, 21
 - distribution networks, cable connections, 57
 - enterprise edge architectures, 23-24
 - failures, 358-359
 - hierarchical network model, 16-17
 - hybrid fiber-coaxial networks, 63-64
 - IIN, 9
 - features of*, 10
 - integrated applications phase*, 11
 - integrated services phase*, 10
 - integrated transport phase*, 10
 - remote connection requirements
 - branch offices*, 27-28
 - central sites*, 27
 - integrated services*, 28-29
 - SOHO sites*, 28
 - requirements, 9
 - SONA, 11-12
 - Application Layer*, 15
 - interactive services layer*, 13-15
 - ISL*, 13
 - networked infrastructure layer*, 13
 - teleworker architectures, 24-25, 33
 - access methods*, 41
 - authentication*, 42
 - bandwidth*, 41
 - Business-Ready Teleworker*, 36
 - cable connections*, 54-69
 - connection management*, 42
 - connection requirements*, 40
 - corporate components*, 43
 - DSL connections*, 81-102
 - DSL connections, PPPoA*, 130-141
 - DSL connections, PPPoE*, 113-123
 - enterprise architecture frameworks*, 37

- enterprise architecture frameworks,*
 - goals of, 38*
- home office components, 43*
- IIN, 36*
- IP telephony, 43*
- IPsec VPN, 42, 46*
- QoS, 42*
- Remote Access VPN, 42, 46*
- remote connectivity, 38-39, 46*
- security, 42*
- traditional teleworkers versus*
 - business-ready teleworkers, 45*
 - video, 43*
- transportation networks, cable connections, 56
- VPN, MPLS, 177
- WAN/MAN architectures, 25-26
- newsignatures.sdf command, IOS router IPS configuration, 573-574**
- NID (Network Interface Devices), DSL connections, 85**
- NIPS devices, IOS routers as, 570**
- NLPID (Network Layer Protocol Independent) field (SNAP headers), 133**
- no mpls ip command, MPLS configuration (frame mode MPLS), 214**
- no shutdown command, troubleshooting physical layer (ADSL connections), 153**
- nodes**
 - cable connections, 57
 - MPLS, 175
- NTSC (National Television Standards Committee) cable system standards, 56**

O - P

- Oakley protocol, 263**
- on-failure option (logins), 470**
- on-success option (logins), 470**
- orthogonal waveforms, 91**
- OSPF (Open Shortest Path First), GRE tunnels, 345**
- OTP (One-Time Passwords), IPsec peer authentication, 262**
- OUI (Organizationally Unique Identifier) field (SNAP headers), 133**
- outside local/global addresses, PAT configuration, 116**
- P networks, MPLS VPN, 237**
- P routers, MPLS VPN, 237-239**
- Packet mode (AAA), 495-496**
- packets**
 - encryption, 497
 - filtering, 524-528
 - forwarding, MPLS VPN, 243-244
 - MPLS, role in, 176
- PAL (Phase Alternating Line) cable system standards, 56**
- partial mesh topologies, WAN, 171**
- passwords**
 - best practices, 467
 - CLI, 472-473
 - configuration mode, configuring via, 472
 - encryption, 475-476
 - IPsec peer authentication, 262
 - length restrictions, 474
 - login command, checking via, 473
 - OTP, IPsec peer authentication, 262
 - privilege levels, 478-479
 - router AP, 467-468
 - setup mode, configuring via, 471-472
 - unique passwords, 477-478
- PAT (Port Address Translation), PPPoE, 116-118**
- path failures, 358-359**
- path-retransmit command, IPsec stateful failover strategies, 368**
- PE routers, MPLS VPN, 237-239**
- Peer-to-Peer VPN (Virtual Private Networks), 232-236**
- peers**
 - authentication, 262-263, 288
 - DPD, 360-361
 - PKI, 270
- phases, DSL connections, 85**
- PHP (Penultimate Hop Pop)**
 - MPLS labels, 201
 - MPLS VPN, 237, 244
- physical layers (ADSL connections)**
 - dsl operating-mode auto command, 156
 - framing, 151
 - line coding, 151
 - physical connectivity, 151-152
 - PMD sublayers, 151
 - supported DSL operating modes, 155-156
 - TC sublayers, 151

- troubleshooting, 150-151
 - cable pinout issues, 154*
 - dsl operating-mode auto command, 156*
 - flapping interfaces, 152*
 - LED, 154*
 - no shutdown command, 153*
 - show dsl interface command, 153*
 - show interface command, 153*
 - show ip interface command, 152*
 - supported DSL operating modes, 155-156*
 - tangled wires, 154*
 - physical security, routers, 483**
 - pings (ATM), troubleshooting data link layers (ASDL connections), 157**
 - PKI (Public Key Infrastructure)**
 - CA, 270
 - digital certificates, 270
 - distribution mechanism, 270
 - message exchange process, 271
 - peers, 270
 - RA, 270
 - PMD (physical medium dependent) sublayers (physical layers), 151**
 - PoP (Post Office Protocol), MPLS VPN, 237**
 - ports**
 - numbers, sockets, 117
 - PAT, PPPoE, 116-118
 - POTS (Plain Old Telephone Service), DSL connections, 83-85**
 - PPP (Point-to-Point Protocol)**
 - ASDL, 95
 - PPPoA, 101-102*
 - PPPoE, 96-101*
 - data link layers (ADSL connections), troubleshooting, 157-160
 - PPPoA (Point-to-Point Protocol over ATM)**
 - AAL5MUX, 131-134
 - AAL5SNAP, 131-135
 - ASDL, 101-102
 - Cisco PPPoA, 131, 134
 - DSL connections
 - ATM interface configuration, 134-135*
 - configuration elements, 141*
 - CPE router configuration, 136-140*
 - DSL dialer configuration, 135-136*
 - router configuration, 130-134*
 - virtual template configuration, 136*
 - PPPoE (Point-to-Point Protocol over Ethernet)**
 - ASDL, 96-101
 - configuration elements, 123
 - discovery phase, 97-98
 - DSL connections
 - configuring CPE routers, 120-122*
 - configuring DHCP for DSL routers, 118-119*
 - configuring dialer interfaces, 115*
 - configuring PAT, 116-118*
 - configuring static default routes for DSL routers, 119*
 - DSL topologies, 113*
 - Ethernet/ATM interfaces, 114-115*
 - router configuration, 113-114*
 - framing components, 100
 - optimizing MTU, 100-101
 - session phase, 99
 - session variables, 99-100
 - PPPoE on ATM interfaces configuration option (CPE), 114**
 - PPPoE on Ethernet interfaces configuration option (CPE), 114**
 - preempt command, HSRP, 364**
 - preshared keys, IPsec peer authentication, 262**
 - privilege levels (passwords), 478-479**
 - process switching, 179**
 - provider-facing interface (CPE), 114**
 - proxy ARP, router security threats, 440**
 - PVC (Permanent Virtual Circuits), 115**
- ## Q - R
- QoS (Quality of Service), teleworker architectures, 42**
 - quick mode (IKE), 265**
 - Quick Setup option (Site-to-Site VPN Wizard), 306-307**
 - quiet-mode option (logins), 470**
- RA (Registration Authorities), PKI, 270**
 - radio frequency signals, cable connections, 59-61**
 - RADIUS protocol, 496**
 - authentication, 497

- authorization, 497
- debugging AAA, 512
- interoperability, 498
- multiprotocol support, 497
- packet encryption, 497
- router management, 497
- UDP, 496
- radius-server host command, AAA configuration, 499**
- radius-server key command, AAA configuration, 501**
- RADSL (Rate-Adaptive DSL), 87**
- RD (Route Distinguishers), MPLS VPN, 237-241**
- recon attacks, 569**
- redundancy**
 - costs of, 174
 - WAN, 173
- redundancy inter-device command, IPsec stateful failover strategies, 368**
- redundant hub-and spoke topologies, WAN, 173**
- Remote Access VPN, teleworker architectures, 42, 46**
- remote connectivity**
 - network requirements
 - branch offices, 27-28*
 - central sites, 27*
 - integrated services, 28-29*
 - SOHO sites, 28*
 - teleworker architectures, 46
 - Layer 2 connections, 38*
 - service provider MPLS VPN, 39*
 - site-to-site VPN, 39*
- remote peer failures, 358-359**
- retransmit-timeout command, IPsec stateful failover strategies, 368**
- returns (cable connections). See upstream (cable connections)**
- reverse paths (cable connections). See upstream (cable connections)**
- RF splitters, cable connections, 66**
- RFC 1483/2684 bridging, ASDL, 94**
- RFC 2364**
 - AAL5MUX option, 131-132
 - AAL5SNAP option, 131-133
 - PPPoA option, 131, 134
- RIP, GRE tunnels, 344**
- RJ-11 connectors, troubleshooting, 154**
- role-based CLI, 480**
 - root view access, 482
 - superview configuration, 483
- root view access (role-based CLI), 482**
- routers**
 - access, security, 466
 - AP, security, 467-468
 - banners, 476-477
 - CE routers, MPLS VPN, 237-238
 - CPE configuration
 - PPPoA, 136-140*
 - routers 120-122*
 - DSL routers, configuring, 118-119
 - IOS
 - IPS configuration, 571-575*
 - routers as NIPS devices, 570*
 - switching, 179*
 - LSR
 - edge LSR, 194*
 - MPLS, 175-178*
 - MPLS, role in, 176
 - P routers, MPLS VPN, 237-239
 - PE routers, MPLS VPN, 237-239
 - physical security, 483
 - RADIUS protocol, 497
 - securing
 - AutoSecure, 441-443, 448-450*
 - SDM, 443-447, 450-451*
 - security threats
 - common management services, 438*
 - gratuitous/proxy ARP, 440*
 - path integrity mechanisms, 439*
 - probes/scans, 439-440*
 - terminal access security, 440*
 - unnecessary services/interfaces, 436-438*
 - vulnerable services, 436*
 - TACACS+ protocol, 497
- routing protocols, GRE tunnels, 333**
- RRI (Reverse Route Injection), Easy VPN, 385**
- RSA, asymmetric encryption, 267**
- RSVP (Resource Reservation Protocol), MPLS architectures, 189**
- RT (Route Targets)**
 - export RT, 242
 - import RT, 242
 - MPLS VPN, 237, 242

S

SA (Security Associations), site-to-site IPsec VPN, 291-292

scope (intrusion systems), 568-569

SDM (Security Device Manager)

- AAA configuration, 504-505, 508
- Advanced Firewall Wizard, 547, 550, 553-555
- Easy VPN server configuration, 386
- firewall configurations
 - advanced firewalls, 547, 550, 553-555*
 - basic firewalls, 544, 547*
- intrusion system configuration, 576-582
- IPS Wizard, 577-582
- One-Step Lockdown Wizard, router security, 447, 450-451
- router security, 443
 - access security, 466*
 - SDM One-Step Lockdown Wizard, 447, 450-451*
 - SDM Security Audit Wizard, 444-447*
- Security Audit Wizard, router security, 444-447
- site-to-site IPsec VPN, 300-304
 - Site-to-Site VPN Wizard, 305-314*
 - testing IPsec VPN tunnels, 314*

SDSL (Symmetrical DSL), 87-88

SECAM (System Electronic Couleur avec Memoire) cable system standards, 56

secure GRE tunnels, 336-337

security

- authentication, logins, 469
- GRE tunnels, 332-333
- logins
 - block-for option, 470*
 - delay option, 470*
 - failed logins, 469*
 - on-failure option, 470*
 - on-success option, 470*
 - quiet-mode option, 470*
 - security authentication, 469*
- passwords
 - best practices, 467*
 - checking via login command, 473*
 - CLI, 472-473*
 - configuring via configuration mode, 472*
 - configuring via setup mode, 471-472*

- encryption, 475-476*
- length restrictions, 474*
- privilege levels, 478-479*
- router AP, 467-468*
- unique passwords, 477-478*

routers

- access, 466*
- physical security, 483*
- teleworker architectures, 42
- Telnet, accessing, 473
- timeout options, configuring, 474

Sequence Number option (GRE headers), 334

service password-encryption utility, 476

service provider MPLS VPN, teleworker architecture remote connections, 39

session phase (PPPoE), 99

session variables (PPPoE), 99-100

setup mode, password configuration, 471-472

show crypto isakmp sa command, monitoring Easy VPN servers, 396

show dsl interface command, troubleshooting physical layer (ADSL connections), 153

show interface command, troubleshooting physical layer (ADSL connections), 153

show ip cef command, CEF configuration (frame mode MPLS), 212-213

show ip cef detail command, CEF configuration (frame mode MPLS), 213

show ip inspect all command, verifying firewall configurations, 543

show ip inspect command, verifying firewall configurations, 543

show ip interface brief command, troubleshooting physical layers (ADSL connections), 152

show ip ips configuration command, IOS router IPS configuration, 574

show login command, 470

show mpls forwarding-table command, 199

show mpls ldp neighbor command, frame mode MPLS, 218

show running-config, password privilege levels, 479

signal attenuation, DSL connections, 86

signatures (intrusion systems)

- connection, 570
- DoS, 570
- exploit, 570
- reactions, 571

- string, 570
- viewing via SDM, 582
- site-to-site VPN (Virtual Private Networks)**
 - IPsec VPN, 283-285
 - applying crypto maps to interfaces*, 298
 - configuring crypto ACL*, 297
 - configuring crypto maps*, 297
 - configuring Interface ACL*, 299
 - configuring IPsec transform sets*, 295-296
 - configuring ISAKMP policies*, 293
 - Diffie-Hellman key exchanges*, 287
 - IKE transform sets*, 286-287
 - IPsec transform sets*, 289-291
 - IPsec tunnel termination*, 292
 - monitoring tunnels*, 314-316
 - peer authentication*, 288
 - SA*, 291-292
 - SDM*, 300-314
 - secure data transfers*, 292
 - specifying interesting traffic*, 284
 - teleworker architecture remote connections*, 39
 - testing tunnels*, 314
 - overview of, 282
- Site-to-Site VPN Wizard, 305**
 - Quick Setup option, 306-307
 - Step-by-Step Setup option, 307
 - define connection settings*, 308
 - define IKE proposals*, 309
 - define IPsec transform sets*, 310-311
 - define protected traffic*, 311-314
- SNAP headers, 133**
- SNMP (Simple Network Management Protocol), router access security, 466**
- sockets, 117
- SOHO sites, remote network connection requirements, 28**
- SONA (Service-Oriented Network Architecture), 11-12**
 - Application Layer, 15
 - interactive services layer, 13-15
 - ISL, 13
 - networked infrastructure layer, 13
- splitters**
 - POTS splitters, DSL connections, 85
 - RF splitters, cable connections, 66
- SSAP (Source Service Access Points), 133**

- SSO (Stateful Switchover), stateful failover strategies (IPsec), 366**
- stateful failover strategies (IPsec), 360, 366-368**
- stateful packet filtering, Cisco IOS Firewall, 524**
- stateless failover strategies (IPsec), 359**
 - DPD, 360-361
 - HSRP, 363-366
 - IGP within GRE over IPsec tunnels, 362
- static default routes, configuring for DSL routers, 119**
- static routing, GRE tunnels, 343-344**
- Step-by-Step Setup option (Site-to-Site VPN Wizard), 307**
 - define connection settings, 308
 - define IKE proposals, 309
 - define IPsec transform sets, 310-311
 - define protected traffic, 311-314
- string signatures (intrusion systems), 570**
- subscriber drops, cable connections, 57**
- subscriber-facing interface (CPE), 114**
- superviews (role-based CLI), 483**
- symmetric encryption, IPsec, 267**

T

- TACACS+ protocol**
 - authentication, 497
 - authorization, 497
 - debugging AAA, 513
 - interoperability, 498
 - multiprotocol support, 497
 - packet encryption, 497
 - router management, 497
 - TCP, 496
- tacacs-server host command, AAA configuration, 500**
- tacacs-server key command, AAA configuration, 501**
- tag-switching commands, MPLS configuration (frame mode MPLS), 215**
- tangled wires, troubleshooting ADSL connections, 154**
- taps, cable connections, 55**
- TC (transmission convergence) sublayers (physical layers), 151**

- TCP (Transfer Control Protocol), TACACS+ protocol, 496**
- TDP (Tag Distribution Protocol), MPLS architectures, 189**
- TE (Traffic Engineering), MPLS TE, 192**
- teleworker architectures, 24-25, 33**
 - Business-Ready Teleworker, 36
 - cable connections
 - amplifiers, 55*
 - antenna sites, 56*
 - benefits of, 59*
 - broadband, 54*
 - cable modem provisioning process, 67-69*
 - CATV, 55, 58*
 - coaxial, 55, 58*
 - distribution networks, 57*
 - DOCSIS, 61-64*
 - downstream, 55*
 - drawbacks to, 66*
 - headends, 56, 65-66*
 - HFC, 55*
 - hybrid fiber-coaxial networks, 63-64*
 - interference, 58*
 - modulation, 56*
 - network architectures, 65-66*
 - nodes, 57*
 - NTSC cable system standard, 56*
 - PAL cable system standard, 56*
 - radio frequency signals, 59-61*
 - RF splitters, 66*
 - SECAM cable system standard, 56*
 - subscriber drops, 57*
 - taps, 55*
 - transportation networks, 56*
 - upstream, 55, 66*
 - connection management, 42
 - connection requirements, 40
 - access methods, 41*
 - authentication, 42*
 - bandwidth, 41*
 - IPsec VPN, 42*
 - QoS, 42*
 - Remote Access VPN, 42*
 - security, 42*
 - corporate components, 43
 - DSL connections, 81
 - ADSL, 87-91*
 - amplitude, 84*
 - ATU-C, 84*
 - ATU-R, 84*
 - bridge taps, 86*
 - crosstalk, 86*
 - defining, 83*
 - downstream, 84*
 - DSLAM, 84*
 - fiber optic cable, 86*
 - frequency, 84*
 - impedance mismatch, 86*
 - interference, 86*
 - limitations of, 85*
 - line code, 84*
 - load coils, 85-86*
 - maximum data rates, 84*
 - microfilters, 84*
 - modulation, 84*
 - nature, 84*
 - NID, 85*
 - phases, 85*
 - POTS, 83*
 - POTS splitters, 85*
 - PPPoA, 130-141*
 - PPPoE, 113-123*
 - SDSL, 87*
 - signal attenuation, 86*
 - upstreams, 85*
 - wavelengths, 85*
 - wire gauge, 86*
 - enterprise architecture frameworks, 37-38
 - home office components, 43
 - IIN, 36
 - IP telephony, 43
 - remote connectivity
 - IPsec VPN, 46*
 - Layer 2 connections, 38*
 - Remote Access VPN, 46*
 - service provider MPLS VPN, 39*
 - site-to-site VPN, 39*
 - traditional teleworkers versus
 - business-ready teleworkers, 45
 - video, 43
- Telnet, 473**
- testing IPsec VPN tunnels, 314**
- timeout options, configuring, 474**
- topologies**
 - DSL, 113
 - full mesh, WAN, 172

- hub-and-spoke
 - redundant hub-and-spoke*, 173
 - WAN, 170
- partial mesh, WAN, 171
- topology-driven switching**, 179
- transferring data, site-to-site IPsec VPN**, 292
- transport mode (IPsec)**, 259-260
- Transport tab (VPN Client)**, 420-421
- transportation networks, cable connections**, 56
- Trojan horses**, 568
- troubleshooting**
 - ADSL connections
 - cable pinout issues*, 154
 - data link layer*, 156-160
 - dsl operating-mode auto command*, 156
 - flapping interfaces*, 152
 - LED*, 154
 - no shutdown command*, 153
 - physical connectivity*, 151-152
 - physical layer*, 150-156
 - show dsl interface command*, 153
 - show interface command*, 153
 - show ip interface brief command*, 152
 - supported DSL operating modes*, 155-156
 - tangled wires*, 154
 - data link layers (ADSL connections), 156-160
 - DSL connections, 149
 - cable pinout issues*, 154
 - data link layer*, 156-160
 - dsl operating-mode auto command*, 156
 - flapping interfaces*, 152
 - LED*, 154
 - no shutdown command*, 153
 - physical layer*, 150-156
 - show dsl interface command*, 153
 - show interface command*, 153
 - show ip interface brief command*, 152
 - supported DSL operating modes*, 155-156
 - tangled wires*, 154
 - Easy VPN servers, 398-406
 - physical layers (ADSL connections), 150-151
 - cable pinout issues*, 154
 - dsl operating-mode auto command*, 156
 - flapping interfaces*, 152
 - LED*, 154
 - no shutdown command*, 153
 - show dsl interface command*, 153
 - show interface command*, 153
 - show ip interface brief command*, 152
 - supported DSL operating modes*, 155-156
 - tangled wires*, 154
 - RJ-11 connectors, 154
- TTL field (MPLS labels)**, 192
- tunnel mode (IPsec)**, 260
- tunnels**
 - IPsec VPN tunnels, monitoring, 314-316
 - site-to-site IPsec VPN, IPsec tunnel termination, 292

U - V

- UDP (User Datagram Protocol), RADIUS protocol**, 496
- unique passwords**, 477-478
- Unity protocol**, 381
- upstream (cable connections)**, 55, 66, 85
- user authentication, Easy VPN**, 384
- user configuration, Easy VPN server configuration**, 388
- username root password command, AAA configuration**, 501
- usernames, IPsec peer authentication**, 262
- validating GRE over IPsec configurations**, 346
- VDSL (Very-High-Bit-Rate DSL)**, 87
- video, teleworker architectures**, 43
- virtual templates, configuring for PPPoA**, 136
- virtual terminal password (password configuration via setup mode)**, 471
- viruses**, 567
- VLAN (Virtual Local-Area Networks)**, 230
- VPN (Virtual Private Networks)**
 - Easy VPN, 379
 - connection establishment*, 382-385
 - Remote*, 379-381
 - server configuration*, 385-395

- server monitoring, 396-397
- server requirements, 381-382
- troubleshooting servers, 398-406
- IPsec VPN, 251
 - GRE tunnels, 342-343
 - teleworker architectures, 42, 46
 - WAN backups, 368-369
- layer 1 VPN overlays, 230
- layer 2 VPN overlays, 231
- layer 3 VPN overlays, 232
- MPLS VPN, 177, 192, 225, 229-230, 236
 - C networks, 237
 - CE routers, 237-238
 - end-to-end routing updates, 242-243
 - LSP, 237
 - P networks, 237
 - P routers, 237, 239
 - packet forwarding, 243-244
 - PE routers, 237-239
 - PHP, 237, 244
 - PoP, 237
 - RD, 237-241
 - RT, 237, 242
 - terminology of, 237
 - VPDN, 230
 - VRF, 237
- MPLS VPN with TE, 192
- Peer-to-Peer VPN, 232
 - benefits of, 234
 - drawbacks of, 234-236
 - redundant connections, 235
- Remote Access VPN, teleworker architectures, 42, 46
- site-to-site IPsec VPN, 283-285
 - applying crypto maps to interfaces, 298
 - configuring crypto ACL, 297
 - configuring crypto maps, 297
 - configuring Interface ACL, 299
 - configuring IPsec transform sets, 295-296
 - configuring ISAKMP policies, 293
 - Diffie-Hellman key exchanges, 287
 - IKE transform sets, 286-287
 - IPsec transform sets, 289-291
 - IPsec tunnel termination, 292
 - monitoring tunnels, 314-316
 - peer authentication, 288
 - SA, 291-292

- SDM, 300-314
- secure data transfers, 292
- specifying interesting traffic, 284
- site-to-site VPN
 - overview of, 282
 - teleworker architecture remote connections, 39

VPN Client

- Authentication tab, 419
- Backup Servers tab, 422
- configuring, 414, 418-424
- Connection Entries screen, 419
- Dial-Up tab, 422
- Installation Directory, 417
- installing, 414-417
- licensing agreements, 416
- Transport tab, 420-421
- Welcome screen, 415

VRF (Virtual Routing and Forwarding)

tables, MPLS VPN, 237

vulnerabilities (networks), 358-359

vulnerability exploits, 568

W

WAN (Wide Area Networks)

- backups, IPsec VPN, 368-369
- full mesh topologies, 172
- hub-and-spoke topologies, 170, 173
- MPLS, 170, 174
 - CEF switching, 180
 - domains, 175
 - edge nodes, 175
 - egress nodes, 175
 - ingress nodes, 175
 - label stacks, 175
 - label swaps, 175
 - labels, 175-177
 - LSH, 175
 - LSP, 175
 - LSR, 175-178
 - nodes, 175
 - packets, 176
 - routers, 176
 - standard IP switching, 179-180
 - terminology of, 175
 - VPN, 177
- partial mesh topologies, 171
- redundancy, 173-174

**WAN/MAN (wide-area network/
metropolitan-area network) architectures,
25-26**

**waveforms. *See* modulation, cable
connections**

wavelengths, DSL connections, 85

Web interfaces, router access security, 466

Welcome screen (VPN Client), 415

wire gauge, DSL connections, 86

wizards

Advanced Firewall Wizard (SDM), 547,
550, 553-555

Easy VPN Server Wizard, 389-395

GRE over IPsec Wizard

backup GRE tunnels, 341

creating GRE tunnels, 340

EIGRP, 345

IPsec VPN, 342-343

launching, 339

OSPF, 345

RIP, 344

static routing, 343-344

validating configurations, 346

IPS Wizard (SDM), 577-582

SDM One-Step Lockdown Wizard, router
security, 447, 450-451

SDM Security Audit Wizard, router
security, 444-447

Site-to-Site VPN Wizard, 305

Quick Setup option, 306-307

Step-by-Step Setup option, 307-314

worms, 568

X - Y - Z

Xauth, 266, 382-383