

A

ABR 54

address formats

- IPv4 4

- IPv6 24

- IPv6 (table) 24

address resolution protocol. See ARP

administrative distance

- description 7

- static routing 252

aggregatable global addresses. See IPv6

- unicast addresses

areas 99

ARP

- caching 5

- configuring gratuitous ARP 15

- configuring Local Proxy ARP 14

- configuring Proxy ARP 13

- configuring static ARP entries 12

- description 5

- gratuitous ARP 7

- Local Proxy ARP 7

- process (figure) 5

- Proxy ARP 7

- Reverse ARP 6

AS confederations

- configuring 214

- description 194

AS numbers

- 4-byte support. 5

- ranges (table) 5

AS. See autonomous system

ASBR 55

AS-path lists

- configuring 288

- description 283

autonomous system

- description 5

B

bandwidth 4

BDR 53

BFD

- BGP 198

EIGRP 143
OSPF 61, 253, 317, 349

BGP 173
 administrative distances (table) 168
 BFD 198
 clearing neighbors 183
 conditional advertisement 197
 conditional advertisement example 221
 configuration modes 174
 configuring conditional advertisement 219
 configuring dynamic capability 218
 configuring maximum prefixes 218
 configuring prefix peering 209
 configuring route dampening 217
 default settings 174, 201
 description 167–??, 191–??
 disable the feature 177
 displaying statistics 188, 229
 eBGP 193
 enable the feature 176
 example configuration 188
 generic specific extended community lists 284
 guidelines 173, 200
 iBGP 193
 licensing requirements 173, 199
 limitations 173, 200
 modifying next-hop address 211
 MP-BGP 199
 next-hop address tracking 197
 path selection 170
 prerequisites 173, 200
 router ID 169
 speakers 167
 tuning 224
 unicast RIB 173
 verifying configuration 186, 228
 virtualization support 173, 199

BGP aggregate addresses
 configuring 218

BGP AS-path lists
 configuring 288
 description 283

BGP authentication

- configuring 210
- description 192

BGP autonomous systems

- description 168

BGP capabilities negotiation

- description 195
- disabling 212

BGP community lists

- configuring 289, 291
- description 284

BGP extended community lists

- description 284

BGP instance

- creating 177
- deleting 179
- restarting 179

BGP load balancing

- configuring 217

BGP loadsharing

- description 196

BGP multipath. See BGP loadsharing

BGP peers

- authentication (note) 192
- configuring 179, 181
- description 169

BGP route aggregation

- description 197

BGP route dampening 196

BGP route redistribution

- configuring 221
- description 198

BGP sessions

- reset options 193
- resetting 210
- route policies 193

BGP templates

- configuring peer templates 206
- configuring peer-policy templates 204
- configuring session templates 202
- description 192
- peer template 192
- peer-policy templates 192
- peer-session templates 192

Border Gateway Protocol. See BGP

C

CDP 34

communication cost 4

community lists

- configuring 289, 291

- description 284

comparing

- link-state and distance vector routing algorithms 9

D

default gateway

- description 8

default settings

- BGP 174, 201

- EIGRP 144

- HSRP 319

- IP 9

- IPv6 40

- object tracking 333

- OSPF 63

- OSPFv3 106

- policy-based routing 303

- RIP 234

- Route Policy Manager 285

- static routing 254

- VRF 264

- VRRP 351

delay 4

distance vector routing algorithms 9

distribution

- RIP 233

DR 53

E

eBGP

- configuring 212

- configuring AS confederations 214

- configuring multihop 213

- description 193

- disabling fast external failover 213

- disabling single-hop checking 212

- limiting the AS-path attribute 214

eBGP AS confederations. See AS confederations

ECMP. See equal cost multipath

EIGRP

- authentication 141
- BFD 143
- configuring a summary address 153
- configuring authentication 150
- configuring hello interval 158
- configuring load balancing 157
- configuring route redistribution 153
- configuring stub routing 152
- creating an instance 146
- default settings 144
- deleting an instance 148
- description 137–??
- disabling an instance 149
- disabling split horizon 159
- disabling the feature 146
- displaying statistics 164
- DUAL algorithm 138
- ECMP 142
- enabling the feature 145
- example configuration 164
- external route metrics 140
- guidelines 144
- hold time 138
- internal route metrics 139
- licensing requirements 143
- limit redistributed routes 155
- limitations 144
- load balancing 142
- neighbor discovery 138
- prerequisites 143
- restarting an instance 148
- route redistribution 142
- route summarization 142
- route updates 139
- shutting down on an interface 149
- split horizon 142
- stub routers 141
- tuning 159
- unicast RIB 140
- verifying configuration 163
- virtualization support 143

eigrp

- passive interface 149
- equal cost multipath 6
- extended community lists
 - description 284
- external BGP. See eBGP
- F
- FIB
 - clearing routes 277
 - description 11, 273
 - displaying 275
 - licensing requirements 274
 - verifying 279
 - VRFs 11
- forwarding
 - adjacency manager 11
 - architecture 10, 273
 - FIB 11
 - unicast forwarding distribution module 11
- forwarding information base. See FIB
- G
- graceful restart
 - configuring in OSPFv3 130
- gratuitous ARP
 - configuring 15
 - description 7
- H
- Hot Standby Router Protocol. See HSRP
- HSRP
 - addressing 313
 - configuring a group 320
 - configuring an IPv6 group 322
 - configuring priority 326
 - customizing 327
 - default settings 319
 - description 312–317
 - disabling the feature 320
 - enabling the feature 319
 - example configuration 328
 - guidelines 318
 - licensing requirements 317
 - limitations 318
 - load sharing 316
 - messages 315

- prerequisites 318
- standby router 312
- verifying configuration 328
- virtualization support 317
 - vPC support 317
- HSRP authentication
 - configuring 324
 - description 315
- HSRP object tracking
 - description 316
- HSRP versions
 - configuring 320
 - description 315
- HSRP virtual MAC address
 - configuring 324
 - description 312

I

- iBGP
 - configuring route reflector 215
 - description 193
- iBGP route reflector. See route reflector
- ICMP
 - description 8
 - with local proxy ARP (note) 8
- ICMPv6 35
 - packet header format (figure) 35
- IDS, enabling 46
- internal BGP. See iBGP
- Internet Control Message Protocol. See ICMP
- IP
 - addresses 4
 - ARP. See ARP
 - configuring addresses 10
 - configuring secondary addresses 11
 - default settings 9
 - description 3–8
 - example configuration 20
 - guidelines 9
 - ICMP. See ICMP
 - licensing requirements 8
 - limitations 9
 - packet header 31
 - prerequisites 9

secondary addresses (note) 4
subnet masks 3
verifying configuration 20
virtualization support 8

IPv4. See IP

IPv6

- address formats 24
- address formats (table) 24
- addresses compatible with IPv4 27
- anycast addresses 28
- CDP 34
- configuring addresses 41
- configuring neighbor discovery 43
- default settings 40
- description 23–39
- enabling IDS checks 46
- enabling packet verification 46
- EUI-64 format 26
- example configuration 46
- guidelines 40
- ICMP 35
- interface ID 26
- licensing requirements 39
- limitations 40
- link-local addresses 27
- loopback address (note) 25
- multicast addresses 29
- neighbor discovery 35
- neighbor redirect message 38
- neighbor solicitation message 36
- packet header 32
- path MTU discovery 34
- prerequisites 40
- RFC 25, 26
- router advertisement message 37
- site-local address 28
- subnet ID 26
- unicast addresses 25
- unique local addresses 28
- unspecified address (note) 25
- verifying configuration 46
- virtualization support 39

L

- licensing requirements 173
 - BGP 199
 - EIGRP 143
 - FIB 274
 - HSRP 317
 - IP 8
 - IPv6 39
 - object tracking 333
 - OSPF 62
 - OSPFv3 105
 - policy-based routing 302
 - RIP 234
 - Route Policy Manager 285
 - static routing 253
 - uRIB 274
 - VRF 263
 - VRRP 350
- link-state advertisements 51
- link-state routing algorithms 9
- load 4
 - load balancing 6
- Local Proxy ARP
 - configuring 14
 - description 7
- LSAs 99
 - for OSPFv3 (table) 100
- M
- MAC lists
 - description 282
- MIBs
 - OSPFv3 136
- MP-BGP 199
 - configuring 222
- Multiprotocol BGP
 - see MP-BGP
- N
- ND
 - configuring 43
 - description 35
- neighbor discovery. See ND
- neighbor redirect message 38
- new and changed features (table) 1

next hop 2

NSSA 59

 configuring 76

 description for OSPFv3 103

O

object tracking

 configuring a delay 340

 configuring a track list with boolean expression 336

 configuring a track list with percentage 337, 338

 configuring for a nonDefault VRF 342

 configuring for route reachability 335

 configuring on an interface 334

 default settings 333

 description 331

 example configuration 343

 guidelines 333

 licensing requirements 333

 limitations 333

 track list 332

 verifying configuration 343

 virtualization support 332

Open Shortest Path First version 3. See OSPFv3

Open Shortest Path First. See OSPF

OSPF

 adjacency 51, 53

 area border router 54

 areas 51, 54

 AS border router 55

 authentication 57

 backup designated router 53

 BFD 61, 253, 317, 349

 configuring a totally stubby area 75

 configuring area authentication 69

 configuring authentication 68

 configuring authentication on an interface 70

 configuring DR priority 68

 configuring ECMP 66

 configuring filter lists 72

 configuring load balancing 66

 configuring MD5 authentication 70

 configuring networks 66

 configuring NSSA 76

 configuring on an interface 66

configuring optional parameters on an interface 67
configuring redistribution 80
configuring route summarization 84
configuring simple password authentication 70
configuring stub areas 74
configuring stub route advertisements 85
configuring the hello interval 68
configuring virtual links 78
configuring with VRFs 89
creating an instance 64
dead interval 52
default settings 63
delete an instance 65
description 51–??
designated router 53
disable the feature 64
displaying statistics 92
enable the feature 63
example configuration 92
guidelines 62
hello interval 52
hello packet 52
licensing requirements 62
limitations 62
link cost 56
link-state database 57
LSA 51
LSA flooding 56
LSA pacing 56
LSA types (table) 56
LSAs 55–57
modifying default timers 86
multiple instances 61
neighbors 52
not-so-stubby area 59
NSSA 59
opaque LSAs 57
prerequisites 62
redistributed routes 82
restarting an instance 89
route redistribution
 description 60
route summarization

- description 60
- shutting down an instance 68
- SPF optimization 61
- stub area 58
- stub area (figure) 59
- stub router advertisements
 - description 61
- unicast RIB 57
- verifying configuration 91
- virtual link 59
- virtual link (figure) 60
- virtualization support 62

OSPFv2 (Open Shortest Path First Version 2)

- description 95

OSPFv2. See OSPF

OSPFv3

- address families 102
- adjacency 97
- areas 99
- comparison to OSPFv2 96
- configuring ECMP 110
- configuring filter lists 113
- configuring graceful restart 130
- configuring load balancing 110
- configuring networks 111
- configuring NSSA 117
- configuring redistribution 122
- configuring route summarization 126
- configuring stub areas 115
- configuring totally stubby areas 116
- configuring virtual links 120
- configuring with VRFs 132
- creating an instance 108
- default settings 106
- description 95–??
- displaying statistics 134
- enabling the feature 107
- example configuration 135
- guidelines 106
- licensing requirements 105
- limitations 106
- link cost 100
- link-state database 101

LSA flooding 101
LSA pacing 101
LSA types (table) 100
LSAs 99
MIBs 136
modifying default timers 128
multiple instances 105
neighbors 97
NSSA 103
prerequisites 106
redistributed routes 124
restarting an instance 131
RFC 96
route redistribution 104
route summarization 104
SPF optimization 105
unicast RIB 102
verifying configuration 134
virtual links 104
virtualization support 105

P

path length 4
path MTU discovery 34
policy route maps
 description 302
policy-based routing
 configuring a route policy 304
 configuring match parameters 305
 configuring set parameters 306
 default settings 303
 description 301
 disabling 304
 enabling 303
 example configuration 307
 guidelines 303
 licensing requirements 302
 limitations 303
 prerequisites 302
 route maps 302
 set criteria 302
 verifying configuration 306
prefix lists
 configuring 286

- description 281
- Proxy ARP
 - configuring 13
 - description 7
- R
- redistribution
 - description 6
- redistribution 5
 - BGP 198
 - configuring for OSPF 80
 - configuring for OSPFv3 122
 - configuring in BGP 221
 - configuring in RIP 242
 - configuring on EIGRP 153
 - EIGRP 142
 - maximum limit for EIGRP 155
 - maximum limit for OSPF 82
 - maximum limit for OSPFv3 124
 - with route maps 284
- reliability 4
- Reverse ARP
 - description 6
 - limitations 7
 - RFC 6
- RIB
 - description 10, 274
 - see uRIB
- RIP
 - clearing statistics 247
 - configuring a passive interface 241
 - configuring on an interface 238
 - default settings 234
 - description 232
 - disable the feature 236
 - displaying statistics 247
 - enabling the feature 235
 - example configuration 248
 - guidelines 234
 - licensing requirements 234
 - limitations 234
 - prerequisites 234
 - route filtering 233
 - tuning 246

- verifying configuration 247
- virtualization support 234

- RIP authentication
 - configuring 239
 - description 232
- RIP instance
 - creating 236
 - deleting 237
 - optional parameters 237
 - restarting 238
- RIP load balancing
 - configuring 237
 - description 233
- RIP route distribution
 - description 233
- RIP route redistribution
 - configuring 242
- RIP route summarization
 - configuring 241
 - description 233
- RIP split horizon
 - configuring with poison reverse 241
 - description 232
- route maps
 - configuring 292
 - configuring match parameters 293
 - configuring set parameters 295
 - description 282
 - example configuration 298
 - for policy -based routing 302
 - match criteria 282
 - redistribution 284
 - set changes 283
- route metric
 - bandwidth 4
 - communication cost 4
 - delay 4
 - load 4
 - path length 4
 - reliability 4
- route policy
 - configuring 304
 - configuring match parameters 305

- configuring set parameters 306
- description 301
- example configuration 307
- Route Policy Manager
 - default settings 285
 - example configuration 298
 - guidelines 285
 - licensing requirements 285
 - limitations 285
- route policy manager
 - description 281–??
 - verifying configuration 297
- route redistribution
 - OSPFv3 104
- route reflector
 - configuring 215
 - description 195
- route summarization
 - configuring 84
 - configuring on EIGRP 153
 - EIGRP 142
 - OSPFv3 104, 126
 - RIP 233
- route table
 - description 2
- router advertisement message 37
- router ID
 - description 5
- routes, estimating memory requirements 278
- routing algorithms
 - distance vector 8, 9
 - link-state 9
- Routing Information Protocol. See RIP
- routing metrics
 - description 2
- routing protocols
 - administrative distance 7
 - comparing link-state algorithms to distance vector algorithms 9
 - convergence, convergence 6
 - description 1–7
 - distance vector 9
 - link-state 9
 - next hop 2

redistribution 5, 6
virtualization 9

S

static routes
 description 8
 virtualization support 253
 with ARP 6
static routing
 administrative distance 252
 configuring 254
 configuring with VRFs 255
 default settings 254
 description 251
 example configuration 256, 257
 guidelines 253
 licensing requirements 253
 limitations 253
 prerequisites 253
 verifying configuration 256
stub routing
 description 7

U

uRIB
 clearing routes 278
 description 273
 displaying 276
 displaying (example) 277
 licensing requirements 274
 verifying 279

V

Virtual Router Redundancy Protocol. See VRRP

virtualization
 description 9

VRF
 assigning an interface to a VRF 266
 configuring routing parameters 267
 creating 264
 default settings 264
 deleting 265
 example configuration 271
 guidelines 263
 licensing requirements 263
 limitations 263

- setting the routing context 270
- setting the scope 270
- verifying configuration 271
- VRF filtering
 - description 262
 - example configuration 270
- VRF reachability
 - description 262
 - example configuration 270
- VRF-aware services
 - configuring 269
 - description 261
- VRF-Lite
 - description 260
 - guidelines 263
 - limitations 263
- VRRP
 - benefits 347
 - configuring time intervals for advertisement packets 357
 - default settings 351
 - description 345–350
 - disabling the feature 352
 - displaying statistics 361
 - enabling the feature 351
 - example configuration 362
 - guidelines 350
 - licensing requirements 350
 - limitations 350
 - verifying configuration 361
 - virtualization support 350
 - vPC support 349
- VRRP advertisements
 - description 349
- VRRP authentication
 - configuring 355
 - description 349
- VRRP groups
 - configuring 352
 - description 347
- VRRP priority
 - configuring 353
 - description 348
 - disabling preemption 358

preemption 348

VRRP tracking

configuring 359

description 349