INDEX

A

ABR 6-5
address formats
  IPv4 2-2
  IPv6 3-2
  IPv6 (table) 3-2
address resolution protocol. See ARP
administrative distance
  description 1-7, 6-37
  static routing 13-2
aggregatable global addresses. See IPv6
  unicast addresses
areas 7-5
ARP
  caching 2-3
  configuring gratuitous ARP 2-13
  configuring Local Proxy ARP 2-12
  configuring Proxy ARP 2-11
  configuring static ARP entries 2-10
  description 2-2
  gratuitous ARP 2-5
  Local Proxy ARP 2-5
  process (figure) 2-3
  Proxy ARP 2-5
  Reverse ARP 2-4
AS. See autonomous system
ASBR 6-5
AS confederations
  configuring 11-30
  description 11-4
AS-path lists
  configuring 16-8
  description 16-3
autonomous system
  description 1-5

B

bandwidth 1-4
BDR 6-3
BFD
  BGP 11-9
  EIGRP 8-8
  HSRP 18-7
  IS-IS 9-5
  OSPF 6-12
BGP 10-7
  administrative distances (table) 10-2
  BFD 11-9
  clearing neighbors 10-17
  conditional advertisement 11-8
  conditional advertisement example 11-39
  configuration modes 10-8
  configuring conditional advertisement 11-37
  configuring dynamic capability 11-36
  configuring maximum prefixes 11-35
  configuring prefix peering 11-21
  configuring route dampening 11-34
  configuring with VRFs 11-47
  default settings 10-8, 11-13
  description 10-1, 11-1
  disable the feature 10-11
  displaying statistics 10-22, 11-50
  eBGP 11-3
  enable the feature 10-10

example configuration 10-22
generic specific extended community lists 16-4
guidelines 10-8, 11-12
high availability 11-11
iBGP 11-3
licensing requirements 10-7, 11-12
limitations 10-8, 11-12
MIBs 8-33, 10-23
modifying next-hop address 11-23
MP-BGP 11-10
next-hop address tracking 11-8
PIC core 10-7
prerequisites 10-7, 11-12
router ID 10-3
speakers 10-1
tuning 11-42
unicast RIB 10-7
verifying configuration 10-20, 11-49
virtualization support 10-7
BGP additional paths
advertising the capability of sending and receiving 11-25
configuring 11-25
configuring advertised paths 11-26
configuring path selection 11-27
configuring the sending and receiving 11-26
description 11-7
diagram 11-7
BGP aggregate addresses
configuring 11-36
BGP AS-path lists
configuring 16-8
description 16-3
BGP authentication
configuring 11-22
description 11-2
BGP autonomous systems
description 10-2
BGP capabilities negotiation
description 11-6
disabling 11-25
BGP community lists
configuring 16-9, 16-11
description 16-4
BGP extended community lists
description 16-4
BGP graceful restart
configuring 11-45
description 11-11
BGP instance
creating 10-11
deleting 10-12
restarting 10-13
BGP load balancing
configuring 11-35
BGP load sharing
description 11-6
BGP multipath. See BGP load sharing
BGP peers
authentication (note) 11-2
configuring 10-13, 10-15
description 10-3
BGP route aggregation
description 11-8
BGP route dampening 11-6
BGP route redistribution
configuring 11-39
description 11-9
BGP sessions
reset options 11-3
resetting 11-22
route policies 11-3
BGP templates
configuring peer-policy templates 11-17
configuring peer templates 11-19
configuring session templates 11-14
description 11-2
peer-policy templates 11-2

peer-session templates 11-2
peer template 11-2
Border Gateway Protocol. See BGP

C

CDP 3-12
communication cost 1-4
community lists
configuring 16-9, 16-11
description 16-4
comparing
link-state and distance vector routing algorithms 1-9

D

default gateway
description 1-8
default settings
BGP 10-8, 11-13
DNS 4-3
EIGRP 8-10
HSRP 18-9
IP 2-7
IS-IS 9-7
object tracking 20-3
OSPF 6-14
OSPFv3 7-14
RIP 12-5
Route Policy Manager 16-5
static routing 13-4
VRF 14-5
VRRP 19-7
delay 1-4
distance vector routing algorithms 1-9
distribution
RIP 12-3
DNS 3-11
configuring clients 4-4
configuring with VRFs 4-5
default settings 4-3
description 4-1
example configuration 4-7
guidelines 4-3
high availability 4-2
licensing requirements 4-3
limitations 4-3
name servers 4-2
operation 4-2
prerequisites 4-3
verifying configuration 4-7
virtualization 4-2
documentation
additional publications iv-xxvi
domain name server. See DNS
DR 6-3

E

eBGP
configuring 11-25, 11-28
configuring AS confederations 11-30
configuring multihop 11-28
description 11-3
disabling fast external fallover 11-28
disabling single-hop checking 11-28
limiting the AS-path attribute 11-29
eBGP AS confederations. See AS confederations
ECMP. See equal cost multipath
EIGRP
authentication 8-6
BFD 8-8
configuring a summary address 8-18
configuring authentication 8-16
configuring graceful restart 8-24
configuring hello interval 8-26
configuring load balancing 8-23
configuring route redistribution 8-19

configuring stub routing 8-18
configuring with VRFs 8-29
creating an instance 8-12
default settings 8-10
deleting an instance 8-13
description 8-1
disabling an instance 8-14
disabling split horizon 8-26
disabling the feature 8-11
displaying statistics 8-31
DUAL algorithm 8-2
ECMP 8-7
enabling the feature 8-11
example configuration 8-31
external route metrics 8-4
graceful restart 8-8
guidelines 8-9
high availability 8-8
hold time 8-2
internal route metrics 8-3
licensing requirements 8-9
limitations 8-9
limit redistributed routes 8-21
load balancing 8-7
neighbor discovery 8-2
prerequisites 8-9
restarting an instance 8-14
route redistribution 8-7
route summarization 8-6
route updates 8-3
shutting down on an interface 8-15
split horizon 8-7
stub routers 8-6
tuning 8-27
unicast RIB 8-5
verifying configuration 8-31
eigrp
passive interface 8-15
equal cost multipath 1-6
extended community lists
description 16-4
external BGP. See eBGP

F

FIB
clearing routes 15-7
description 1-12
displaying 15-3
licensing requirements 15-2
verifying 15-10
VRFs 1-12
forwarding
adjacency manager 1-11
architecture 1-10, 15-1
FIB 1-11
unicast forwarding distribution module 1-11
forwarding information base. See FIB

G

glean throttling
configuring 2-14
configuring maximum drop adjacencies 2-15
configuring timeout 2-16
described 2-5
graceful restart
BGP 11-11
configuring in BGP 11-45
configuring in EIGRP 8-24
configuring in IS-IS 9-24
configuring in OSPF 6-42
configuring in OSPFv3 7-40
EIGRP 8-8
gratuitous ARP
configuring 2-13
description 2-5

H

high availability
- BGP 11-11
- DNS 4-2
- EIGRP 8-8
- object tracking 20-3
- RIP 12-4

Hot Standby Router Protocol. See HSRP

HSRP
- addressing 18-4
- BFD 18-7
- configuring a group 18-11
- configuring an IPv6 group 18-12
- configuring extended hold timers 18-22
- configuring priority 18-23
- customizing 18-21
- default settings 18-9
- description 18-2 to ??
- enabling the feature 18-10
- example configuration 18-23
- extended NSF 18-7
- guidelines 18-8
- hold timers 18-7
- licensing requirements 18-8
- limitations 18-8
- load sharing 18-6
- messages 18-5
- standby router 18-2
- verifying configuration 18-23
- virtualization support 18-8
- vPC support 18-7

HSRP authentication
- configuring 18-15, 18-16
- description 18-5

HSRP versions
- configuring 18-10
- description 18-3

HSRP virtual MAC address
- configuring 18-14
- description 18-2

I

iBGP
- configuring route reflector 11-30
- description 11-3

iBGP route reflector. See route reflector

ICMP
- description 2-6
- with local proxy ARP (note) 2-6

Intermediate System-to-Intermediate System. See IS-IS

internal BGP. See iBGP

Internet Control Message Protocol. See ICMP

IP
- addresses 2-2
- ARP. See ARP
- configuring addresses 2-7
- configuring secondary addresses 2-8
- default settings 2-7
- guidelines 2-7
- ICMP. See ICMP
- licensing requirements 2-6
- limitations 2-7
- packet header 3-8
- prerequisites 2-6
- secondary addresses (note) 2-2
- subnet masks 2-1
- verifying configuration 2-16
- virtualization support 2-6

IPv4. See IP

IPv6
- addresses compatible with IPv4 3-5
- address formats 3-2
- address formats (table) 3-2
- anycast addresses 3-6
- CDP 3-12
- configuring addresses 3-13

DNS 3-11
EUI-64 format 3-4
example configuration 3-16
guidelines 3-12
interface ID 3-4
licensing requirements 3-12
limitations 3-12
link-local addresses 3-4
loopback address (note) 3-2
multicast addresses 3-7
packet header 3-8
path MTU discovery 3-11
prerequisites 3-12
RFC 3-3, 3-4
site-local address 3-6
subnet ID 3-4
unicast addresses 3-3
unique local addresses 3-5
unspecified address (note) 3-3
verifying configuration 3-16
virtualization support 3-12
IS-IS
address families 9-8
BFD 9-5
clearing statistics 9-31
configuration modes 9-8
configuring dynamic host exchange 9-17
configuring on an interface 9-12
configuring with VRFs 9-26
default settings 9-7
description 9-1 to 9-6
disabling strict adjacency mode 9-23
disabling the feature 9-9
displaying statistics 9-31
enabling the feature 9-9
example configuration 9-32
guidelines 9-6
IPv6 support 9-1
licensing requirements 9-6
limitations 9-6
limit redistributed routes 9-21
LSPs 9-2
NET 9-3
prerequisites 9-6
shut down an interface 9-14
system ID 9-3
tuning 9-28
verifying configuration 9-30
IS-IS areas
description 9-2
IS-IS authentication
configuring in an area 9-14
configuring on an interface 9-15
description 9-3
IS-IS designated intermediate system 9-3
configuring 9-17
IS-IS graceful restart
configuring 9-24
IS-IS instances
configuring optional parameters 9-11
creating 9-9
deleting 9-10
multiple instance support 8-9, 9-6
restarting 9-12
IS-IS load balancing
configuring 9-11
description 9-5
IS-IS mesh group
configuring 9-17
IS-IS mess group
description 9-4
IS-IS overload bit
configuring 9-17
description 9-4
IS-IS route redistribution
configuring 9-20
description 9-5
IS-IS route summarization

configuring 9-18
description 9-4

L

Layer 3 consistency checker
description 15-2
triggering 15-6
Layer 3 routing, configuring using a mixed chassis 13-8
licensing requirements 10-7
BGP 11-12
DNS 4-3
EIGRP 8-9
FIB 15-2
HSRP 18-8
IP 2-6
IPv6 3-12
IS-IS 9-6
object tracking 20-3
OSPF 6-13
OSPFv3 7-13
RIP 12-4
Route Policy Manager 16-5
static routing 13-3
uRIB 15-2
VRF 14-4
VRRP 19-6
link-state advertisements 6-1
link-state routing algorithms 1-9
load 1-4
load balancing 1-6
Local Proxy ARP
configuring 2-12
description 2-5
LSAs 7-6
for OSPFv3 (table) 7-6

M

MAC lists
description 16-2
maximum routes for unicast RIB, configuring 15-7
MD5 authentication, configuring for prefix-based neighbors 11-51
MIBs
BGP 8-33, 10-23
OSPF 6-48, 18-24
OSPFv3 7-46
MP-BGP 11-10
configuring 11-41
Multiple Group Optimization for HSRP 18-3
Multiprotocol BGP
see MP-BGP

N

new and changed features (table) iii-xxiii
next hop 1-2
next-hops
configuring on reflected routes using an outbound route-map 11-32
NSSA 6-9
configuring 6-27
description for OSPFv3 7-10

O

object tracking
configuring a delay 20-11
configuring a track list with boolean expression 20-7
configuring a track list with percentage 20-8, 20-9
configuring for a nonDefault VRF 20-13
configuring for route reachability 20-6
configuring on an interface 20-4
default settings 20-3
description 20-1

example configuration 20-14
guidelines 20-3
high availability 20-3
licensing requirements 20-3
limitations 20-3
track list 20-2
verifying configuration 20-14
virtualization support 20-3
Open Shortest Path First. See OSPF
Open Shortest Path First version 3. See OSPFv3
OSPF
adjacency 6-1, 6-3
area border router 6-5
areas 6-1, 6-4
AS border router 6-5
authentication 6-7
backup designated router 6-3
BFD 6-12
configuring area authentication 6-21
configuring a totally stubby area 6-27
configuring authentication 6-20
configuring authentication on an interface 6-21
configuring DR priority 6-19
configuring ECMP 6-17
configuring filter lists 6-24
configuring graceful restart 6-42
configuring load balancing 6-17
configuring MD5 authentication 6-21
configuring networks 6-18
configuring NSSA 6-27
configuring on an interface 6-18
configuring optional parameters on an interface 6-19
configuring redistribution 6-31
configuring route summarization 6-35
configuring simple password authentication 6-21
configuring stub areas 6-25
configuring stub route advertisements 6-36
configuring the hello interval 6-19
configuring virtual links 6-29
configuring with VRFs 6-44
creating an instance 6-16
dead interval 6-2
default settings 6-14
description 6-1
designated router 6-3
disable the feature 6-15
displaying statistics 6-47
enable the feature 6-15
example configuration 6-47
guidelines 6-13
hello interval 6-2
hello packet 6-2
licensing requirements 6-13
limitations 6-13
link cost 6-6
link-state database 6-7
LSA 6-1
LSA flooding 6-6
LSA pacing 6-6
LSAs 6-5 to 6-7
LSA types (table) 6-6
MIBs 6-48, 18-24
modifying default timers 6-40
multiple instances 6-12
neighbors 6-3
not-so-stubby area 6-9
NSSA 6-9
opaque LSAs 6-7
prerequisites 6-13
redistributed routes 6-33
restarting an instance 6-44
route redistribution
description 6-10
route summarization
description 6-10
shutting down an instance 6-19
SPF optimization 6-12
stub area 6-8

stub area (figure) 6-9
stub router advertisements
description 6-12
unicast RIB 6-7
verifying configuration 6-46
virtual link 6-9
virtual link (figure) 6-10
OSPFv2
administrative distance guidelines 6-13
configuring the administrative distance of routes 6-37
OSPFv2 (Open Shortest Path First Version 2)
description 7-1
OSPFv2. See OSPF
OSPFv3
address families 7-9
adjacency 7-3
administrative distance guidelines 7-14
areas 7-5
comparison to OSPFv2 7-2
configuring ECMP 7-18
configuring filter lists 7-22
configuring graceful restart 7-40
configuring load balancing 7-18
configuring networks 7-19
configuring NSSA 7-25
configuring redistribution 7-30
configuring route summarization 7-34
configuring stub areas 7-23
configuring the administrative distance of routes 7-35
configuring totally stubby areas 7-24
configuring virtual links 7-28
configuring with VRFs 7-42
creating an instance 7-16
default settings 7-14
description 7-1
displaying statistics 7-45
enabling the feature 7-15
example configuration 7-45
guidelines 7-14
licensing requirements 7-13
limitations 7-14
link cost 7-7
link-state database 7-8
LSA flooding 7-7
LSA pacing 7-7
LSAs 7-6
LSA types (table) 7-6
MIBs 7-46
modifying default timers 7-38
multiple instances 7-12
neighbors 7-3
NSSA 7-10
prerequisites 7-13
redistributed routes 7-32
restarting an instance 7-42
RFC 7-2
route redistribution 7-11
route summarization 7-11
SPF optimization 7-13
unicast RIB 7-8
verifying configuration 7-44
virtual links 7-10
outbound route-map 11-32

P

path length 1-4
path MTU discovery 3-11
prefix-based neighbors, configuring MD5 authentication 11-51
prefix lists
configuring 16-6
description 16-1
Proxy ARP
configuring 2-11
description 2-5

R

redistribution
- BGP 11-9
- configuring for OSPF 6-31
- configuring for OSPFv3 7-30
- configuring in BGP 11-39
- configuring in IS-IS 9-20
- configuring in RIP 12-11
- configuring on EIGRP 8-19
- description 1-6
- EIGRP 8-7
- IS-IS 9-5
- maximum limit for EIGRP 8-21
- maximum limit for IS-IS 9-21
- maximum limit for OSPF 6-33
- maximum limit for OSPFv3 7-32
- with route maps 16-4

related documents iv-xxvii
reliability 1-4
Reverse ARP
- description 2-4
- limitations 2-4
- RFC 2-4

RIB
- description 1-11, 15-1

RIP
- clearing statistics 12-19
- configuring a passive interface 12-11
- configuring for compatibility with Cisco IOS RIP 12-13
- configuring on an interface 12-8
- configuring with VRFs 12-14
- default settings 12-5
- description 12-2
- displaying statistics 12-18
- enabling the feature 12-5
- example configuration 12-19
- guidelines 12-4
- high availability 12-4
- licensing requirements 12-4
- limitations 12-4
- prerequisites 12-4
- route filtering 12-3
- tuning 12-17
- verifying configuration 12-18
- virtualization support 12-4

RIP authentication
- configuring 12-9
- description 12-2

RIP instance
- creating 12-6
- optional parameters 12-8
- restarting 12-8

RIP load balancing
- configuring 12-8
- description 12-4

RIP route distribution
- description 12-3

RIP route redistribution
- configuring 12-11

RIP route summarization
- configuring 12-11
- description 12-3

RIP split horizon
- configuring with poison reverse 12-11
- description 12-2

route maps
- configuring 16-12
- configuring match parameters 16-13
- configuring set parameters 16-15
- description 16-2
- example configuration 16-19
- match criteria 16-2
- redistribution 16-4
- set changes 16-3

route metric
- bandwidth 1-4

communication cost 1-4
delay 1-4
load 1-4
path length 1-4
reliability 1-4
Route Policy Manager
default settings 16-5
example configuration 16-19
guidelines 16-5
licensing requirements 16-5
limitations 16-5
route policy manager
description 16-1
verifying configuration 16-19
route redistribution
OSPFv3 7-11
route reflector
configuring 11-30
description 11-5
router ID
description 1-5
routes, estimating memory requirements 15-9
route summarization
configuring 6-35
configuring in IS-IS 9-18
configuring on EIGRP 8-18
EIGRP 8-6
ISIS 9-4
OSPFv3 7-11, 7-34
RIP 12-3
route table
description 1-2
routing algorithms
distance vector 1-9
link-state 1-9
Routing Information Protocol. See RIP
routing metrics
description 1-2
routing protocols
administrative distance 1-7, 6-37
comparing link-state algorithms to distance vector algorithms 1-9
convergence. convergence 1-6
description 1-1 to 1-8
distance vector 1-9
link-state 1-9
next hop 1-2
redistribution 1-6
virtualization 1-10

S

static routes
description 1-8
virtualization support 13-3
static routing
administrative distance 13-2
configuring 13-4
configuring with VRFs 13-7
default settings 13-4
description 13-1
example configuration 13-9
licensing requirements 13-3
prerequisites 13-3
stub routing
description 1-7

U

uRIB
clearing routes 15-9
displaying 15-5
displaying (example) 15-6
Layer 3 consistency checker 15-2
licensing requirements 15-2
verifying 15-10

V

virtualization
- description 1-10

Virtual Router Redundancy Protocol. See VRRP

VRF
- assigning an interface to a VRF 14-7
- configuring routing parameters 14-8
- creating 14-5
- default settings 14-5
- deleting 14-6
- example configuration 14-11
- guidelines 14-4
- licensing requirements 14-4
- limitations 14-4
- setting the routing context 14-10
- setting the scope 14-10
- verifying configuration 14-11

VRF-aware services
- configuring 14-9
- description 14-2

VRF filtering
- description 14-3
- example configuration 14-10

VRF reachability
- description 14-3
- example configuration 14-10

VRRP
- benefits 19-3
- clearing statistics 19-17
- configuring time intervals for advertisement packets 19-12
- default settings 19-7
- description 19-1 to ??
- displaying statistics 19-17
- enabling the feature 19-8
- example configuration 19-17
- guidelines 19-7
- licensing requirements 19-6
- limitations 19-7
- verifying configuration 19-16
- virtualization support 19-6
- vPC support 19-5

VRRP advertisements
- description 19-5

VRRP authentication
- configuring 19-11
- description 19-5

VRRP groups
- configuring 19-8

VRRP priority
- configuring 19-9
- description 19-4
- disabling preemption 19-14
- preemption 19-4

VRRP tracking
- configuring 19-15
- description 19-5