



## I N D E X

---

### Numerics

10-Gigabit Ethernet interfaces [10-6](#)

---

### A

AAA down policy, NAC Layer 2 IP validation [1-10](#)

abbreviating commands [2-4](#)

ABRs [37-26](#)

access

templates [8-1](#)

access-class command [33-20](#)

access control entries

See ACEs

access-denied response, VMPS [12-29](#)

access groups

applying IPv4 ACLs to interfaces [33-21](#)

Layer 2 [33-21](#)

Layer 3 [33-21](#)

access groups, applying IPv4 ACLs to interfaces [33-21](#)

accessing stack members [5-25](#)

access lists

See ACLs

access ports

and Layer 2 protocol tunneling [16-11](#)

defined [10-3](#)

access template [8-1](#)

accounting

with 802.1x [9-39](#)

with IEEE 802.1x [9-9](#)

with RADIUS [7-28](#)

with TACACS+ [7-11, 7-17](#)

ACEs

and QoS [35-7](#)

defined [33-2](#)

Ethernet [33-2](#)

IP [33-2](#)

ACLs

ACEs [33-2](#)

any keyword [33-13](#)

applying

on bridged packets [33-37](#)

on multicast packets [33-38](#)

on routed packets [33-38](#)

on switched packets [33-36](#)

time ranges to [33-17](#)

to an interface [33-20, 34-8](#)

to IPv6 interfaces [34-8](#)

to QoS [35-7](#)

classifying traffic for QoS [35-43](#)

comments in [33-19](#)

compiling [33-22](#)

defined [33-1, 33-7](#)

examples of [33-22, 35-43](#)

extended IP, configuring for QoS classification [35-44](#)

extended IPv4

creating [33-11](#)

matching criteria [33-8](#)

hardware and software handling [33-22](#)

host keyword [33-13](#)

## ACLs (continued)

## IP

- creating 33-7
- fragments and QoS guidelines 35-32
- implicit deny 33-10, 33-14, 33-17
- implicit masks 33-10
- matching criteria 33-8
- undefined 33-21

## IPv4

- applying to interfaces 33-20
- creating 33-7
- matching criteria 33-8
- named 33-15
- numbers 33-8
- terminal lines, setting on 33-19
- unsupported features 33-7

## IPv6

- and stacking 34-3
- applying to interfaces 34-8
- configuring 34-4, 34-5
- displaying 34-9
- interactions with other features 34-4
- limitations 34-2, 34-3
- matching criteria 34-3
- named 34-2
- precedence of 34-2
- supported 34-2
- unsupported features 34-3

Layer 4 information in 33-36

logging messages 33-9

MAC extended 33-27, 35-45

matching 33-7, 33-21

monitoring 33-39, 34-9

named

IPv4 33-15

IPv6 34-2

names 34-4

number per QoS class map 35-32

port 33-2, 34-1

## ACLs (continued)

precedence of 33-2

QoS 35-7, 35-43

resequencing entries 33-15

router 33-2, 34-1

router ACLs and VLAN map configuration guidelines 33-35

standard IP, configuring for QoS classification 35-43

standard IPv4

creating 33-10

matching criteria 33-8

support for 1-9

support in hardware 33-22

time ranges 33-17

types supported 33-2

unsupported features

IPv4 33-7

IPv6 34-3

using router ACLs with VLAN maps 33-35

VLAN maps

configuration guidelines 33-30

configuring 33-29

active link 20-4, 20-5, 20-6

active links 20-2

active router 39-1

active traffic monitoring, IP SLAs 40-1

address aliasing 23-2

addresses

displaying the MAC address table 6-27

dynamic

accelerated aging 17-9

changing the aging time 6-21

default aging 17-9

defined 6-19

learning 3-15, 6-20

removing 6-22

IPv6 38-2

MAC, discovering 6-27

- addresses (continued)
  - multicast
    - group address range [43-3](#)
    - STP address management [17-9](#)
  - static
    - adding and removing [6-24](#)
    - defined [6-19](#)
- address resolution [6-27, 37-10](#)
- Address Resolution Protocol
  - See [ARP](#)
- adjacency tables, with CEF [37-81](#)
- administrative distances
  - defined [37-94](#)
  - OSPF [37-33](#)
  - routing protocol defaults [37-83](#)
- advanced IP services feature set [1-2](#)
- advertisements
  - CDP [26-1](#)
  - LLDP [27-2](#)
  - RIP [37-21](#)
  - VTP [12-20, 13-3](#)
- aggregatable global unicast addresses [38-4](#)
- aggregate addresses, BGP [37-61](#)
- aggregated ports
  - See [EtherChannel](#)
- aggregate policers [35-58](#)
- aggregate policing [1-11](#)
- aging, accelerating [17-9](#)
- aging time
  - accelerated
    - for MSTP [18-23](#)
    - for STP [17-9, 17-23](#)
  - MAC address table [6-21](#)
  - maximum
    - for MSTP [18-23, 18-24](#)
    - for STP [17-23, 17-24](#)
- alarms, RMON [30-3](#)
- allowed-VLAN list [12-22](#)
- application engines, redirecting traffic to [42-1](#)
- area border routers
  - See [ABRs](#)
- ARP
  - configuring [37-11](#)
  - defined [1-6, 6-27, 37-10](#)
  - encapsulation [37-11](#)
  - static cache configuration [37-11](#)
  - table
    - address resolution [6-27](#)
    - managing [6-27](#)
- ASBRs [37-26](#)
- AS-path filters, BGP [37-55](#)
- asymmetrical links, and IEEE 802.1Q tunneling [16-4](#)
- attributes, RADIUS
  - vendor-proprietary [7-31](#)
  - vendor-specific [7-29](#)
- authentication
  - EIGRP [37-42](#)
  - HSRP [39-11](#)
  - local mode with AAA [7-36](#)
  - NTP associations [6-4](#)
  - RADIUS
    - key [7-21](#)
    - login [7-23](#)
  - TACACS+
    - defined [7-11](#)
    - key [7-13](#)
    - login [7-14](#)
- See also [port-based authentication](#)
- authentication failed VLAN
  - See [restricted VLAN](#)
- authentication keys, and routing protocols [37-94](#)
- authoritative time source, described [6-2](#)
- authorization
  - with RADIUS [7-27](#)
  - with TACACS+ [7-11, 7-16](#)
- authorized ports with IEEE 802.1x [9-7](#)
- autoconfiguration [3-3](#)
- automatic advise (auto-advise) in switch stacks [5-13](#)

automatic copy (auto-copy) in switch stacks [5-13](#)

automatic extraction (auto-extract) in switch stacks [5-13](#)

automatic QoS  
See QoS

automatic upgrades (auto-upgrade) in switch stacks [5-13](#)

auto-MDIX  
configuring [10-21](#)  
described [10-21](#)

autonegotiation  
duplex mode [1-4](#)  
interface configuration guidelines [10-18](#)  
mismatches [46-9](#)

autonomous system boundary routers  
See ASBRs

autonomous systems, in BGP [37-49](#)

Auto-RP, described [43-7](#)

autosensing, port speed [1-4](#)

autostate exclude [10-6](#)

auxiliary VLAN  
See voice VLAN

availability, features [1-7](#)

---

## B

### BackboneFast

described [19-7](#)  
disabling [19-17](#)  
enabling [19-16](#)  
support for [1-7](#)

### backup interfaces

See Flex Links

### backup links [20-2](#)

### banners

configuring  
login [6-18](#)  
message-of-the-day login [6-18](#)  
default configuration [6-17](#)  
when displayed [6-17](#)

## BGP

aggregate addresses [37-61](#)

aggregate routes, configuring [37-61](#)

CIDR [37-61](#)

clear commands [37-64](#)

community filtering [37-58](#)

configuring neighbors [37-59](#)

default configuration [37-46](#)

described [37-45](#)

enabling [37-49](#)

monitoring [37-64](#)

multipath support [37-53](#)

neighbors, types of [37-49](#)

path selection [37-53](#)

peers, configuring [37-59](#)

prefix filtering [37-57](#)

resetting sessions [37-52](#)

route dampening [37-63](#)

route maps [37-55](#)

route reflectors [37-62](#)

routing domain confederation [37-62](#)

routing session with multi-VRF CE [37-75](#)

show commands [37-64](#)

supernets [37-61](#)

support for [1-12](#)  
Version 4 [37-46](#)

binding database  
address, DHCP server  
See DHCP, Cisco IOS server database  
DHCP snooping  
See DHCP snooping binding database

bindings  
address, Cisco IOS DHCP server [21-6](#)  
DHCP snooping database [21-7](#)  
IP source guard [21-16](#)

binding table, DHCP snooping  
See DHCP snooping binding database

blocking packets [25-7](#)

Boolean expressions in tracked lists [41-4](#)

- booting
    - boot loader, function of [3-2](#)
    - boot process [3-2](#)
    - manually [3-18](#)
    - specific image [3-19](#)
  - boot loader
    - accessing [3-20](#)
    - described [3-2](#)
    - environment variables [3-20](#)
    - prompt [3-20](#)
    - trap-door mechanism [3-2](#)
  - bootstrap router (BSR), described [43-7](#)
  - Border Gateway Protocol
    - See BGP
  - BPDU
    - error-disabled state [19-2](#)
    - filtering [19-3](#)
    - RSTP format [18-12](#)
  - BPDU filtering
    - described [19-3](#)
    - disabling [19-15](#)
    - enabling [19-14](#)
    - support for [1-8](#)
  - BPDU guard
    - described [19-2](#)
    - disabling [19-14](#)
    - enabling [19-13](#)
    - support for [1-8](#)
  - bridged packets, ACLs on [33-37](#)
  - bridge groups
    - See fallback bridging
  - bridge protocol data unit
    - See BPDU
  - broadcast flooding [37-18](#)
  - broadcast packets
    - directed [37-15](#)
    - flooded [37-15](#)
  - broadcast storm-control command [25-4](#)
  - broadcast storms [25-1, 37-15](#)
- 
- C
  - cables, monitoring for unidirectional links [28-1](#)
  - CA trustpoint
    - configuring [7-45](#)
    - defined [7-42](#)
  - CDP
    - and trusted boundary [35-39](#)
    - configuring [26-2](#)
    - default configuration [26-2](#)
    - defined with LLDP [27-1](#)
    - described [26-1](#)
    - disabling for routing device [26-3 to 26-4](#)
    - enabling and disabling
      - on an interface [26-4](#)
      - on a switch [26-3](#)
    - Layer 2 protocol tunneling [16-8](#)
    - monitoring [26-5](#)
    - overview [26-1](#)
    - support for [1-6](#)
    - switch stack considerations [26-2](#)
    - transmission timer and holdtime, setting [26-2](#)
    - updates [26-2](#)
  - CEF
    - defined [37-80](#)
    - distributed [37-81](#)
    - IPv6 [38-19](#)
  - CGMP
    - as IGMP snooping learning method [23-9](#)
    - clearing cached group entries [43-61](#)
    - enabling server support [43-44](#)
    - joining multicast group [23-3](#)
    - overview [43-9](#)
    - server support only [43-9](#)
    - switch support of [1-4](#)
  - CIDR [37-61](#)
  - CipherSuites [7-43](#)
  - Cisco 7960 IP Phone [14-1](#)

- Cisco Discovery Protocol
  - See CDP
- Cisco Express Forwarding
  - See CEF
- Cisco Group Management Protocol
  - See CGMP
- Cisco IOS DHCP server
  - See DHCP, Cisco IOS DHCP server
- Cisco IOS File System
  - See IFS
- Cisco IOS IP SLAs [40-1](#)
- Cisco StackWise Plus technology [1-3](#)
  - See also stacks, switch
- CiscoWorks 2000 [1-5, 32-4](#)
- CIST regional root
  - See MSTP
- CIST root
  - See MSTP
- civic location [27-3](#)
- classless interdomain routing
  - See CIDR
- classless routing [37-8](#)
- class maps for QoS
  - configuring [35-46](#)
  - described [35-7](#)
  - displaying [35-78](#)
- class of service
  - See CoS
- clearing interfaces [10-27](#)
- CLI
  - abbreviating commands [2-4](#)
  - command modes [2-1](#)
  - configuration logging [2-5](#)
  - described [1-5](#)
  - editing features
    - enabling and disabling [2-7](#)
    - keystroke editing [2-8](#)
    - wrapped lines [2-9](#)
  - error messages [2-5](#)
- CLI (continued)
  - filtering command output [2-10](#)
  - getting help [2-3](#)
  - history
    - changing the buffer size [2-6](#)
    - described [2-6](#)
    - disabling [2-7](#)
    - recalling commands [2-6](#)
  - no and default forms of commands [2-4](#)
- client mode, VTP [13-3](#)
- client processes, tracking [41-1](#)
- clock
  - See system clock
- CNS
  - Configuration Engine
    - configID, deviceID, hostname [4-3](#)
    - configuration service [4-2](#)
    - described [4-1](#)
    - event service [4-3](#)
  - embedded agents
    - described [4-5](#)
    - enabling automated configuration [4-7](#)
    - enabling configuration agent [4-9](#)
    - enabling event agent [4-8](#)
  - management functions [1-5](#)
- command-line interface
  - See CLI
- command modes [2-1](#)
- commands
  - abbreviating [2-4](#)
  - no and default [2-4](#)
- commands, setting privilege levels [7-8](#)
- community list, BGP [37-58](#)
- community ports [15-2](#)
- community strings
  - configuring [32-8](#)
  - overview [32-4](#)
- community VLANs [15-2, 15-3](#)
- compatibility, feature [25-12](#)

- compatibility, software
  - See stacks, switch
- config.text [3-17](#)
- configurable leave timer, IGMP [23-6](#)
- configuration, initial
  - defaults [1-14](#)
  - Express Setup [1-3](#)
- configuration examples, network [1-17](#)
- configuration files
  - archiving [B-20](#)
  - clearing the startup configuration [B-20](#)
  - creating and using, guidelines for [B-10](#)
  - creating using a text editor [B-11](#)
  - default name [3-17](#)
  - deleting a stored configuration [B-20](#)
  - described [B-9](#)
  - downloading
    - automatically [3-17](#)
    - preparing [B-11, B-14, B-17](#)
    - reasons for [B-9](#)
    - using FTP [B-14](#)
    - using RCP [B-18](#)
    - using TFTP [B-12](#)
  - invalid combinations when copying [B-5](#)
  - limiting TFTP server access [32-15](#)
  - obtaining with DHCP [3-9](#)
  - password recovery disable considerations [7-5](#)
  - replacing and rolling back, guidelines for [B-22](#)
  - replacing a running configuration [B-20, B-21](#)
  - rolling back a running configuration [B-20, B-21](#)
  - specifying the filename [3-17](#)
  - system contact and location information [32-15](#)
  - types and location [B-10](#)
  - uploading
    - preparing [B-11, B-14, B-17](#)
    - reasons for [B-9](#)
    - using FTP [B-15](#)
    - using RCP [B-19](#)
    - using TFTP [B-12](#)
- configuration guidelines, multi-VRF CE [37-68](#)
- configuration logging [2-5](#)
- configuration replacement [B-20](#)
- configuration rollback [B-20](#)
- configuration settings, saving [3-15](#)
- configure terminal command [10-9](#)
- configuring multicast VRFs [37-73](#)
- configuring port-based authentication violation modes [9-29 to 9-30](#)
- configuring small-frame arrival rate [25-5](#)
- config-vlan mode [2-2, 12-7](#)
- connections, secure remote [7-37](#)
- connectivity problems [46-11, 46-12, 46-14](#)
- consistency checks in VTP Version 2 [13-4](#)
- console port, connecting to [2-11](#)
- content-routing technology
  - See WCCP
- control protocol, IP SLAs [40-3](#)
- corrupted software, recovery steps with Xmodem [46-2](#)
- CoS
  - in Layer 2 frames [35-2](#)
  - override priority [14-6](#)
  - trust priority [14-6](#)
- CoS input queue threshold map for QoS [35-16](#)
- CoS output queue threshold map for QoS [35-19](#)
- CoS-to-DSCP map for QoS [35-60](#)
- counters, clearing interface [10-27](#)
- crashinfo file [46-21](#)
- critical authentication, IEEE 802.1x [9-43](#)
- cross-stack EtherChannel
  - configuration guidelines [36-12](#)
  - configuring
    - on Layer 2 interfaces [36-12](#)
    - on Layer 3 physical interfaces [36-15](#)
  - described [36-2](#)
  - illustration [36-3](#)
  - support for [1-7](#)

## cross-stack UplinkFast, STP

- described [19-5](#)
- disabling [19-16](#)
- enabling [19-16](#)
- fast-convergence events [19-7](#)
- Fast Uplink Transition Protocol [19-6](#)
- normal-convergence events [19-7](#)
- support for [1-7](#)

## cryptographic software image

- Kerberos [7-32](#)
- SSH [7-37](#)
- SSL [7-41](#)
- switch stack considerations [5-2, 5-18, 7-38](#)

customer edge devices [37-66](#)

---

**D**daylight saving time [6-13](#)dCEF in the switch stack [37-80](#)

## debugging

- enabling all system diagnostics [46-18](#)
- enabling for a specific feature [46-17](#)
- redirecting error message output [46-18](#)
- using commands [46-17](#)

default commands [2-4](#)

## default configuration

- 802.1x [9-26](#)
- auto-QoS [35-21](#)
- banners [6-17](#)
- BGP [37-46](#)
- booting [3-17](#)
- CDP [26-2](#)
- DHCP [21-8](#)
- DHCP option 82 [21-8](#)
- DHCP snooping [21-8](#)
- DHCP snooping binding database [21-9](#)
- DNS [6-16](#)
- dynamic ARP inspection [22-5](#)
- EIGRP [37-38](#)

## default configuration (continued)

- EtherChannel [36-10](#)
- Ethernet interfaces [10-16](#)
- fallback bridging [45-4](#)
- Flex Links [20-8](#)
- HSRP [39-6](#)
- IEEE 802.1Q tunneling [16-4](#)
- IGMP [43-39](#)
- IGMP filtering [23-25](#)
- IGMP snooping [23-7, 24-6](#)
- IGMP throttling [23-25](#)
- initial switch information [3-3](#)
- IP addressing, IP routing [37-6](#)
- IP multicast routing [43-11](#)
- IP SLAs [40-6](#)
- IP source guard [21-17](#)
- IPv6 [38-11](#)
- Layer 2 interfaces [10-16](#)
- Layer 2 protocol tunneling [16-11](#)
- LLDP [27-3](#)
- MAC address table [6-21](#)
- MAC address-table move update [20-8](#)
- MSDP [44-4](#)
- MSTP [18-15](#)
- multi-VRF CE [37-68](#)
- MVR [23-20](#)
- NTP [6-4](#)
- optional spanning-tree configuration [19-12](#)
- OSPF [37-27](#)
- password and privilege level [7-2](#)
- PIM [43-11](#)
- private VLANs [15-6](#)
- RADIUS [7-20](#)
- RIP [37-21](#)
- RMON [30-3](#)
- RSPAN [29-11](#)
- SDM template [8-4](#)
- SNMP [32-6](#)
- SPAN [29-11](#)



- default configuration (continued)
  - SSL [7-44](#)
  - standard QoS [35-30](#)
  - STP [17-13](#)
  - switch stacks [5-21](#)
  - system message logging [31-4](#)
  - system name and prompt [6-15](#)
  - TACACS+ [7-13](#)
  - UDLD [28-4](#)
  - VLAN, Layer 2 Ethernet interfaces [12-20](#)
  - VLANs [12-8](#)
  - VMPS [12-30](#)
  - voice VLAN [14-3](#)
  - VTP [13-7](#)
  - WCCP [42-6](#)
- default gateway [3-15, 37-13](#)
- default networks [37-84](#)
- default router preference
  - See [DRP](#)
- default routes [37-84](#)
- default routing [37-3](#)
- deleting VLANs [12-10](#)
- denial-of-service attack [25-1](#)
- description command [10-22](#)
- designing your network, examples [1-17](#)
- desktop template [5-11](#)
- destination addresses
  - in IPv4 ACLs [33-12](#)
  - in IPv6 ACLs [34-6](#)
- destination-IP address-based forwarding, EtherChannel [36-8](#)
- destination-MAC address forwarding, EtherChannel [36-8](#)
- detecting indirect link failures, STP [19-8](#)
- device discovery protocol [26-1, 27-1](#)
- device manager
  - benefits [1-3](#)
  - described [1-3, 1-5](#)
  - in-band management [1-6](#)
- DHCP
  - Cisco IOS server database
    - configuring [21-14](#)
    - default configuration [21-9](#)
    - described [21-6](#)
  - DHCP for IPv6
    - See [DHCPv6](#)
  - enabling
    - relay agent [21-11](#)
    - server [21-10](#)
  - DHCP-based autoconfiguration
    - client request message exchange [3-4](#)
    - configuring
      - client side [3-4](#)
      - DNS [3-7](#)
      - relay device [3-8](#)
      - server side [3-6](#)
      - server-side [21-10](#)
      - TFTP server [3-7](#)
    - example [3-10](#)
    - lease options
      - for IP address information [3-6](#)
      - for receiving the configuration file [3-7](#)
    - overview [3-3](#)
    - relationship to BOOTP [3-4](#)
    - relay support [1-6, 1-13](#)
    - support for [1-6](#)
  - DHCP-based autoconfiguration and image update
    - configuring [3-11 to 3-14](#)
    - understanding [3-5 to 3-6](#)
  - DHCP binding database
    - See [DHCP snooping binding database](#)
  - DHCP binding table
    - See [DHCP snooping binding database](#)
  - DHCP option 82
    - circuit ID suboption [21-5](#)
    - configuration guidelines [21-9](#)
    - default configuration [21-8](#)
    - displaying [21-15](#)

- DHCP option 82 (continued)
  - forwarding address, specifying [21-11](#)
  - helper address [21-11](#)
  - overview [21-3](#)
  - packet format, suboption
    - circuit ID [21-5](#)
    - remote ID [21-5](#)
  - remote ID suboption [21-5](#)
- DHCP server port-based address allocation
  - configuration guidelines [21-20](#)
  - default configuration [21-20](#)
  - described [21-19](#)
  - displaying [21-23](#)
  - enabling [21-20](#)
- DHCP snooping
  - accepting untrusted packets form edge switch [21-3, 21-13](#)
  - and private VLANs [21-14](#)
  - binding database
    - See DHCP snooping binding database
  - configuration guidelines [21-9](#)
  - default configuration [21-8](#)
  - displaying binding tables [21-15](#)
  - message exchange process [21-4](#)
  - option 82 data insertion [21-3](#)
  - trusted interface [21-2](#)
  - untrusted interface [21-2](#)
  - untrusted messages [21-2](#)
- DHCP snooping binding database
  - adding bindings [21-14](#)
  - binding entries, displaying [21-15](#)
  - binding file
    - format [21-7](#)
    - location [21-7](#)
  - bindings [21-7](#)
  - clearing agent statistics [21-15](#)
  - configuration guidelines [21-10](#)
  - configuring [21-14](#)
  - default configuration [21-8, 21-9](#)
- DHCP snooping binding database (continued)
  - deleting
    - binding file [21-15](#)
    - bindings [21-15](#)
    - database agent [21-15](#)
  - described [21-6](#)
  - displaying [21-15](#)
    - binding entries [21-15](#)
    - status and statistics [21-15](#)
  - displaying status and statistics [21-15](#)
  - enabling [21-14](#)
  - entry [21-7](#)
  - renewing database [21-15](#)
  - resetting
    - delay value [21-15](#)
    - timeout value [21-15](#)
- DHCP snooping binding table
  - See DHCP snooping binding database
- DHCPv6
  - configuration guidelines [38-16](#)
  - default configuration [38-16](#)
  - described [38-6](#)
  - enabling client function [38-18](#)
  - enabling DHCPv6 server function [38-16](#)
- diagnostic schedule command [47-2](#)
- Differentiated Services architecture, QoS [35-2](#)
- Differentiated Services Code Point [35-2](#)
- Diffusing Update Algorithm (DUAL) [37-36](#)
- directed unicast requests [1-6](#)
- directories
  - changing [B-4](#)
  - creating and removing [B-4](#)
  - displaying the working [B-4](#)
- Distance Vector Multicast Routing Protocol
  - See DVMRP
- distance-vector protocols [37-3](#)
- distribute-list command [37-93](#)

- DNS
  - and DHCP-based autoconfiguration [3-7](#)
  - default configuration [6-16](#)
  - displaying the configuration [6-17](#)
  - in IPv6 [38-4](#)
  - overview [6-15](#)
  - setting up [6-16](#)
  - support for [1-6](#)
- DNS-based SSM mapping [43-19, 43-21](#)
- domain names
  - DNS [6-15](#)
  - VTP [13-8](#)
- Domain Name System
  - See DNS
- dot1q-tunnel switchport mode [12-18](#)
- double-tagged packets
  - IEEE 802.1Q tunneling [16-2](#)
  - Layer 2 protocol tunneling [16-10](#)
- downloading
  - configuration files
    - preparing [B-11, B-14, B-17](#)
    - reasons for [B-9](#)
    - using FTP [B-14](#)
    - using RCP [B-18](#)
    - using TFTP [B-12](#)
  - image files
    - deleting old image [B-29](#)
    - preparing [B-27, B-30, B-35](#)
    - reasons for [B-24](#)
    - using CMS [1-3](#)
    - using FTP [B-31](#)
    - using HTTP [1-3, B-24](#)
    - using RCP [B-36](#)
    - using TFTP [B-27](#)
    - using the device manager or Network Assistant [B-24](#)
- drop threshold for Layer 2 protocol packets [16-11](#)
- DRP
  - configuring [38-13](#)
  - described [38-5](#)
  - IPv6 [38-5](#)
- DSCP [1-11, 35-2](#)
- DSCP input queue threshold map for QoS [35-16](#)
- DSCP output queue threshold map for QoS [35-19](#)
- DSCP-to-CoS map for QoS [35-63](#)
- DSCP-to-DSCP-mutation map for QoS [35-64](#)
- DSCP transparency [35-39](#)
- DTP [1-8, 12-18](#)
- dual-action detection [36-6](#)
- DUAL finite state machine, EIGRP [37-37](#)
- dual IPv4 and IPv6 templates [8-2, 38-6](#)
- dual protocol stacks
  - IPv4 and IPv6 [38-6](#)
  - SDM templates supporting [38-6](#)
- DVMRP
  - autosummarization
    - configuring a summary address [43-58](#)
    - disabling [43-60](#)
  - connecting PIM domain to DVMRP router [43-51](#)
  - enabling unicast routing [43-54](#)
  - interoperability
    - with Cisco devices [43-49](#)
    - with Cisco IOS software [43-9](#)
  - mrinfo requests, responding to [43-53](#)
  - neighbors
    - advertising the default route to [43-52](#)
    - discovery with Probe messages [43-49](#)
    - displaying information [43-53](#)
    - prevent peering with nonpruning [43-56](#)
    - rejecting nonpruning [43-55](#)
  - overview [43-9](#)

## DVMRP (continued)

## routes

- adding a metric offset [43-60](#)
- advertising all [43-60](#)
- advertising the default route to neighbors [43-52](#)
- caching DVMRP routes learned in report messages [43-54](#)
- changing the threshold for syslog messages [43-57](#)
- deleting [43-61](#)
- displaying [43-62](#)
- favoring one over another [43-60](#)
- limiting the number injected into MBONE [43-57](#)
- limiting unicast route advertisements [43-49](#)

routing table [43-9](#)source distribution tree, building [43-9](#)support for [1-13](#)

## tunnels

- configuring [43-51](#)
- displaying neighbor information [43-53](#)

## dynamic access ports

- characteristics [12-4](#)
- configuring [12-31](#)
- defined [10-3](#)

## dynamic addresses

See addresses

## dynamic ARP inspection

- ARP cache poisoning [22-1](#)
- ARP requests, described [22-1](#)
- ARP spoofing attack [22-1](#)
- clearing
  - log buffer [22-15](#)
  - statistics [22-15](#)
- configuration guidelines [22-6](#)
- configuring
  - ACLs for non-DHCP environments [22-8](#)
  - in DHCP environments [22-7](#)
  - log buffer [22-12](#)
  - rate limit for incoming ARP packets [22-4, 22-10](#)
- default configuration [22-5](#)

## dynamic ARP inspection (continued)

- denial-of-service attacks, preventing [22-10](#)
- described [22-1](#)
- DHCP snooping binding database [22-2](#)
- displaying
  - ARP ACLs [22-14](#)
  - configuration and operating state [22-14](#)
  - log buffer [22-15](#)
  - statistics [22-15](#)
  - trust state and rate limit [22-14](#)
- error-disabled state for exceeding rate limit [22-4](#)
- function of [22-2](#)
- interface trust states [22-3](#)
- log buffer
  - clearing [22-15](#)
  - configuring [22-12](#)
  - displaying [22-15](#)
- logging of dropped packets, described [22-5](#)
- man-in-the middle attack, described [22-2](#)
- network security issues and interface trust states [22-3](#)
- priority of ARP ACLs and DHCP snooping entries [22-4](#)
- rate limiting of ARP packets
  - configuring [22-10](#)
  - described [22-4](#)
  - error-disabled state [22-4](#)
- statistics
  - clearing [22-15](#)
  - displaying [22-15](#)
  - validation checks, performing [22-11](#)
- dynamic auto trunking mode [12-18](#)
- dynamic desirable trunking mode [12-18](#)
- Dynamic Host Configuration Protocol
  - See DHCP-based autoconfiguration
- dynamic port VLAN membership
  - described [12-29](#)
  - reconfirming [12-32](#)
  - troubleshooting [12-33](#)
  - types of connections [12-31](#)

dynamic routing [37-3](#)  
 Dynamic Trunking Protocol  
   See DTP

---

## E

EBGP [37-44](#)

editing features

  enabling and disabling [2-7](#)  
   keystrokes used [2-8](#)  
   wrapped lines [2-9](#)

EIGRP

  authentication [37-42](#)  
   components [37-37](#)  
   configuring [37-40](#)  
   default configuration [37-38](#)  
   definition [37-36](#)  
   interface parameters, configuring [37-41](#)  
   monitoring [37-44](#)  
   stub routing [37-43](#)  
   support for [1-12](#)

elections

  See stack master

ELIN location [27-3](#)

enable password [7-3](#)

enable secret password [7-3](#)

encryption, CipherSuite [7-44](#)

encryption for passwords [7-3](#)

Enhanced IGRP

  See EIGRP

enhanced object tracking

  commands [41-1](#)  
   defined [41-1](#)  
   HSRP [41-7](#)  
   IP routing state [41-2](#)  
   IP SLAs [41-9](#)  
   line-protocol state [41-2](#)  
   tracked lists [41-3](#)

environment variables, function of [3-21](#)

equal-cost routing [1-13, 37-82](#)

error-disabled state, BPDU [19-2](#)

error messages during command entry [2-5](#)

EtherChannel

  automatic creation of [36-5, 36-6](#)  
   channel groups  
     binding physical and logical interfaces [36-4](#)  
     numbering of [36-4](#)  
   configuration guidelines [36-11](#)  
   configuring  
     Layer 2 interfaces [36-12](#)  
     Layer 3 physical interfaces [36-15](#)  
     Layer 3 port-channel logical interfaces [36-14](#)  
   default configuration [36-10](#)  
   described [36-2](#)  
   displaying status [36-22](#)  
   forwarding methods [36-8, 36-17](#)  
   IEEE 802.3ad, described [36-6](#)  
   interaction  
     with STP [36-11](#)  
     with VLANs [36-12](#)

LACP

  described [36-6](#)  
   displaying status [36-22](#)  
   hot-standby ports [36-19](#)  
   interaction with other features [36-7](#)  
   modes [36-7](#)  
   port priority [36-21](#)  
   system priority [36-20](#)

Layer 3 interface [37-5](#)

load balancing [36-8, 36-17](#)

logical interfaces, described [36-4](#)

PAgP

  aggregate-port learners [36-18](#)  
   compatibility with Catalyst 1900 [36-18](#)  
   described [36-5](#)  
   displaying status [36-22](#)  
   interaction with other features [36-6](#)  
   interaction with virtual switches [36-6](#)

## EtherChannels (continued)

## PAgP (continued)

- learn method and priority configuration [36-18](#)
- modes [36-5](#)
- support for [1-4](#)
- with dual-action detection [36-6](#)

## port-channel interfaces

- described [36-4](#)
- numbering of [36-4](#)

port groups [10-6](#)stack changes, effects of [36-9](#)support for [1-4](#)

## EtherChannel guard

- described [19-10](#)
- disabling [19-17](#)
- enabling [19-17](#)

## Ethernet management port

- and switch stacks [10-13](#)
- supported features [10-14](#)

## Ethernet management port, internal

- active link [10-13](#)
- and management module [10-13](#)
- and routing [10-14](#)
- and switch stacks [10-13](#)
- and TFTP [10-16](#)
- configuring [10-15](#)
- default setting [10-14](#)
- described [10-13](#)
- IP address [10-13](#)
- Layer 3 routing guidelines [10-15](#)
- unsupported features [10-15](#)

## Ethernet VLANs

- adding [12-9](#)
- defaults and ranges [12-8](#)
- modifying [12-9](#)

EUI [38-4](#)events, RMON [30-3](#)

## examples

- network configuration [1-17](#)

expedite queue for QoS [35-76](#)Express Setup [1-3](#)

See also getting started guide

extended crashinfo file [46-21](#)

## extended-range VLANs

- configuration guidelines [12-13](#)
- configuring [12-12](#)
- creating [12-14](#)
- creating with an internal VLAN ID [12-15](#)
- defined [12-1](#)

## extended system ID

- MSTP [18-17](#)
- STP [17-4, 17-16](#)

## extended universal identifier

See EUI

Extensible Authentication Protocol over LAN [9-1](#)

## external BGP

See EBGp

external neighbors, BGP [37-49](#)


---

**F**

## Fa0 port

See Ethernet management port, internal

failover support [1-7](#)

## fallback bridging

- and protected ports [45-4](#)

## bridge groups

- creating [45-4](#)
- described [45-2](#)
- displaying [45-11](#)
- function of [45-2](#)
- number supported [45-5](#)
- removing [45-5](#)

## bridge table

- clearing [45-11](#)
- displaying [45-11](#)

configuration guidelines [45-4](#)connecting interfaces with [10-7](#)

- fallback bridging (continued)
  - default configuration [45-4](#)
  - described [45-1](#)
  - frame forwarding
    - flooding packets [45-2](#)
    - forwarding packets [45-2](#)
  - overview [45-1](#)
  - protocol, unsupported [45-4](#)
  - stack changes, effects of [45-3](#)
  - STP
    - disabling on an interface [45-10](#)
    - forward-delay interval [45-9](#)
    - hello BPDU interval [45-8](#)
    - interface priority [45-7](#)
    - keepalive messages [17-2](#)
    - maximum-idle interval [45-9](#)
    - path cost [45-7](#)
    - VLAN-bridge spanning-tree priority [45-6](#)
    - VLAN-bridge STP [45-2](#)
  - support for [1-12](#)
  - SVIs and routed ports [45-1](#)
  - unsupported protocols [45-4](#)
  - VLAN-bridge STP [17-11](#)
- Fast Convergence [20-3](#)
- fastethernet0 port
  - See Ethernet management port, internal
- Fast Uplink Transition Protocol [19-6](#)
- features, incompatible [25-12](#)
- FIB [37-81](#)
- fiber-optic, detecting unidirectional links [28-1](#)
- files
  - basic crashinfo
    - description [46-21](#)
    - location [46-21](#)
  - copying [B-5](#)
  - crashinfo, description [46-21](#)
  - deleting [B-5](#)
  - displaying the contents of [B-8](#)
- files (continued)
  - extended crashinfo
    - description [46-21](#)
    - location [46-21](#)
  - tar
    - creating [B-7](#)
    - displaying the contents of [B-7](#)
    - extracting [B-8](#)
    - image file format [B-25](#)
- file system
  - displaying available file systems [B-2](#)
  - displaying file information [B-3](#)
  - local file system names [B-1](#)
  - network file system names [B-5](#)
  - setting the default [B-3](#)
- filtering
  - in a VLAN [33-29](#)
  - IPv6 traffic [34-4, 34-8](#)
  - non-IP traffic [33-27](#)
  - show and more command output [2-10](#)
- filtering show and more command output [2-10](#)
- filters, IP
  - See ACLs, IP
- flash device, number of [B-1](#)
- Flex Link Multicast Fast Convergence [20-3](#)
- Flex Links
  - configuration guidelines [20-8](#)
  - configuring [20-9](#)
  - configuring preferred VLAN [20-12](#)
  - configuring VLAN load balancing [20-11](#)
  - default configuration [20-8](#)
  - description [20-1](#)
  - link load balancing [20-2](#)
  - monitoring [20-14](#)
  - VLANs [20-2](#)
- flooded traffic, blocking [25-8](#)
- flow-based packet classification [1-11](#)

## flowcharts

- QoS classification [35-6](#)
- QoS egress queueing and scheduling [35-17](#)
- QoS ingress queueing and scheduling [35-15](#)
- QoS policing and marking [35-10](#)

## flowcontrol

- configuring [10-20](#)
- described [10-20](#)

## forward-delay time

- MSTP [18-23](#)
- STP [17-23](#)

## Forwarding Information Base

See FIB

forwarding nonroutable protocols [45-1](#)

## FTP

- accessing MIB files [A-4](#)
- configuration files
  - downloading [B-14](#)
  - overview [B-13](#)
  - preparing the server [B-14](#)
  - uploading [B-15](#)
- image files
  - deleting old image [B-33](#)
  - downloading [B-31](#)
  - preparing the server [B-30](#)
  - uploading [B-33](#)

## G

- general query [20-5](#)
- Generating IGMP Reports [20-3](#)
- get-bulk-request operation [32-3](#)
- get-next-request operation [32-3, 32-4](#)
- get-request operation [32-3, 32-4](#)
- get-response operation [32-3](#)
- global configuration mode [2-2](#)
- global leave, IGMP [23-13](#)
- guest VLAN and IEEE 802.1x [9-13](#)
- guide mode [1-3](#)

## GUIs

See device manager and Network Assistant

## H

hardware limitations and Layer 3 interfaces [10-23](#)

## hello time

- MSTP [18-22](#)
- STP [17-22](#)

help, for the command line [2-3](#)hierarchical policy maps [35-8](#)

- configuration guidelines [35-32](#)
- configuring [35-52](#)
- described [35-11](#)

## history

- changing the buffer size [2-6](#)
- described [2-6](#)
- disabling [2-7](#)
- recalling commands [2-6](#)

history table, level and number of syslog messages [31-10](#)

## host ports

- configuring [15-11](#)
- kinds of [15-2](#)

hosts, limit on dynamic ports [12-33](#)

## Hot Standby Router Protocol

See HSRP

HP OpenView [1-5](#)

## HSRP

- authentication string [39-11](#)
- command-switch redundancy [1-2, 1-7](#)
- configuring [39-5](#)
- default configuration [39-6](#)
- definition [39-1](#)
- guidelines [39-6](#)
- monitoring [39-12](#)
- object tracking [41-7](#)
- overview [39-1](#)
- priority [39-8](#)
- routing redundancy [1-12](#)



- HSRP (continued)
    - support for ICMP redirect messages [39-12](#)
    - switch stack considerations [39-5](#)
    - timers [39-11](#)
    - tracking [39-8](#)
  - HSRP for IPv6
    - configuring [38-25](#)
    - guidelines [38-24](#)
  - HTTP over SSL
    - see HTTPS
  - HTTPS
    - configuring [7-45](#)
    - described [7-42](#)
    - self-signed certificate [7-43](#)
  - HTTP secure server [7-42](#)
- 
- IBPG [37-44](#)
  - ICMP
    - IPv6 [38-4](#)
    - redirect messages [37-13](#)
    - support for [1-13](#)
    - time-exceeded messages [46-14](#)
    - traceroute and [46-14](#)
    - unreachable messages [33-20](#)
    - unreachable messages and IPv6 [34-4](#)
    - unreachables and ACLs [33-22](#)
  - ICMP Echo operation
    - configuring [40-11](#)
    - IP SLAs [40-10](#)
  - ICMP ping
    - executing [46-11](#)
    - overview [46-11](#)
  - ICMP Router Discovery Protocol
    - See IRDP
  - ICMPv6 [38-4](#)
  - IDS appliances
    - and ingress RSPAN [29-22](#)
    - and ingress SPAN [29-15](#)
  - IEEE 802.1D
    - See STP
  - IEEE 802.1p [14-1](#)
  - IEEE 802.1Q
    - and trunk ports [10-3](#)
    - configuration limitations [12-19](#)
    - encapsulation [12-16](#)
    - native VLAN for untagged traffic [12-24](#)
    - tunneling
      - compatibility with other features [16-6](#)
      - defaults [16-4](#)
      - described [16-1](#)
      - tunnel ports with other features [16-6](#)
  - IEEE 802.1s
    - See MSTP
  - IEEE 802.1w
    - See RSTP
  - IEEE 802.1x
    - See port-based authentication
  - IEEE 802.3ad
    - See EtherChannel
  - IEEE 802.3x flow control [10-20](#)
  - ifIndex values, SNMP [32-5](#)
  - IFS [1-6](#)
  - IGMP
    - configurable leave timer
      - described [23-6](#)
      - enabling [23-12](#)
    - configuring the switch
      - as a member of a group [43-39](#)
      - statically connected member [43-43](#)
    - controlling access to groups [43-40](#)
    - default configuration [43-39](#)
    - deleting cache entries [43-62](#)
    - displaying groups [43-62](#)
    - fast switching [43-44](#)

## IGMP (continued)

- flooded multicast traffic
  - controlling the length of time [23-13](#)
  - disabling on an interface [23-14](#)
  - global leave [23-13](#)
  - query solicitation [23-13](#)
  - recovering from flood mode [23-13](#)
- host-query interval, modifying [43-41](#)
- joining multicast group [23-3](#)
- join messages [23-3](#)
- leave processing, enabling [23-11, 24-9](#)
- leaving multicast group [23-5](#)
- multicast reachability [43-39](#)
- overview [43-3](#)
- queries [23-4](#)
- report suppression
  - described [23-6](#)
  - disabling [23-16, 24-11](#)
- supported versions [23-3](#)
- support for [1-4](#)
- Version 1
  - changing to Version 2 [43-41](#)
  - described [43-3](#)
- Version 2
  - changing to Version 1 [43-41](#)
  - described [43-3](#)
  - maximum query response time value [43-43](#)
  - pruning groups [43-43](#)
  - query timeout value [43-42](#)

## IGMP filtering

- configuring [23-25](#)
- default configuration [23-25](#)
- described [23-24](#)
- monitoring [23-29](#)
- support for [1-5](#)

## IGMP groups

- configuring filtering [23-28](#)
- setting the maximum number [23-27](#)

IGMP helper [43-6](#)

## IGMP Immediate Leave

- configuration guidelines [23-12](#)
- described [23-6](#)
- enabling [23-11](#)

## IGMP profile

- applying [23-27](#)
- configuration mode [23-25](#)
- configuring [23-26](#)

## IGMP snooping

- and address aliasing [23-2](#)
- and stack changes [23-7](#)
- configuring [23-7](#)
- default configuration [23-7, 24-6](#)
- definition [23-2](#)
- enabling and disabling [23-8, 24-7](#)
- global configuration [23-8](#)

Immediate Leave [23-6](#)in the switch stack [23-7](#)method [23-9](#)monitoring [23-16, 24-11](#)

## querier

- configuration guidelines [23-14](#)
- configuring [23-14](#)

supported versions [23-3](#)support for [1-4](#)VLAN configuration [23-8](#)

## IGMP throttling

- configuring [23-28](#)
- default configuration [23-25](#)
- described [23-25](#)
- displaying action [23-29](#)

IGP [37-26](#)

## Immediate Leave, IGMP

- described [23-6](#)
- enabling [24-9](#)

inaccessible authentication bypass [9-15](#)

## initial configuration

- defaults [1-14](#)
- Express Setup [1-3](#)

- interface
  - number [10-8](#)
  - range macros [10-11](#)
- interface command [10-8 to 10-9](#)
- interface configuration mode [2-3](#)
- interfaces
  - auto-MDIX, configuring [10-21](#)
  - configuring
    - procedure [10-9](#)
  - counters, clearing [10-27](#)
  - default configuration [10-16](#)
  - described [10-22](#)
  - descriptive name, adding [10-22](#)
  - displaying information about [10-27](#)
  - duplex and speed configuration guidelines [10-18](#)
  - flow control [10-20](#)
  - management [1-5](#)
  - monitoring [10-26](#)
  - naming [10-22](#)
  - physical, identifying [10-8](#)
  - range of [10-9](#)
  - restarting [10-28](#)
  - shutting down [10-28](#)
  - speed and duplex, configuring [10-19](#)
  - status [10-26](#)
  - supported [10-8](#)
  - types of [10-1](#)
- interfaces range macro command [10-11](#)
- interface types [10-8](#)
- Interior Gateway Protocol
  - See IGP
- internal BGP
  - See IBGP
- internal neighbors, BGP [37-49](#)
- Internet Control Message Protocol
  - See ICMP
- Internet Group Management Protocol
  - See IGMP
- Internet Protocol version 6
  - See IPv6
- Inter-Switch Link
  - See ISL
- inter-VLAN routing [1-12, 37-2](#)
- Intrusion Detection System
  - See IDS appliances
- inventory management TLV [27-6](#)
- IP ACLs
  - for QoS classification [35-7](#)
  - implicit deny [33-10, 33-14](#)
  - implicit masks [33-10](#)
  - named [33-15](#)
  - undefined [33-21](#)
- IP addresses
  - 128-bit [38-2](#)
  - classes of [37-7](#)
  - default configuration [37-6](#)
  - discovering [6-27](#)
  - for IP routing [37-6](#)
  - IPv6 [38-2](#)
  - MAC address association [37-10](#)
  - monitoring [37-19](#)
- IP base feature set [1-2](#)
- IP broadcast address [37-17](#)
- ip cef distributed command [37-81](#)
- IP directed broadcasts [37-15](#)
- ip igmp profile command [23-25](#)
- IP information
  - assigned
    - manually [3-14](#)
    - through DHCP-based autoconfiguration [3-3](#)
  - default configuration [3-3](#)
- IP multicast routing
  - addresses
    - all-hosts [43-3](#)
    - all-multicast-routers [43-3](#)
    - host group address range [43-3](#)
  - administratively-scoped boundaries, described [43-46](#)

## IP multicast routing (continued)

- and IGMP snooping [23-2](#)

## Auto-RP

- adding to an existing sparse-mode cloud [43-26](#)
- benefits of [43-26](#)
- clearing the cache [43-28](#)
- configuration guidelines [43-12](#)
- filtering incoming RP announcement messages [43-28](#)
- overview [43-7](#)
- preventing candidate RP spoofing [43-28](#)
- preventing join messages to false RPs [43-28](#)
- setting up in a new internetwork [43-26](#)
- using with BSR [43-34](#)

## bootstrap router

- configuration guidelines [43-12](#)
- configuring candidate BSRs [43-32](#)
- configuring candidate RPs [43-33](#)
- defining the IP multicast boundary [43-31](#)
- defining the PIM domain border [43-30](#)
- overview [43-7](#)
- using with Auto-RP [43-34](#)

Cisco implementation [43-2](#)

## configuring

- basic multicast routing [43-12](#)
- IP multicast boundary [43-46](#)

default configuration [43-11](#)

## enabling

- multicast forwarding [43-13](#)
- PIM mode [43-14](#)

## group-to-RP mappings

- Auto-RP [43-7](#)
- BSR [43-7](#)

## IP multicast routing (continued)

## MBONE

- deleting sdr cache entries [43-62](#)
- described [43-45](#)
- displaying sdr cache [43-63](#)
- enabling sdr listener support [43-46](#)
- limiting DVMRP routes advertised [43-57](#)
- limiting sdr cache entry lifetime [43-46](#)
- SAP packets for conference session announcement [43-45](#)
- Session Directory (sdr) tool, described [43-45](#)

## monitoring

- packet rate loss [43-63](#)
- peering devices [43-63](#)
- tracing a path [43-63](#)

multicast forwarding, described [43-8](#)PIMv1 and PIMv2 interoperability [43-11](#)protocol interaction [43-2](#)reverse path check (RPF) [43-8](#)

## routing table

- deleting [43-62](#)
- displaying [43-62](#)

## RP

- assigning manually [43-24](#)
- configuring Auto-RP [43-26](#)
- configuring PIMv2 BSR [43-30](#)
- monitoring mapping information [43-35](#)
- using Auto-RP and BSR [43-34](#)

## stacking

- stack master functions [43-10](#)
- stack member functions [43-10](#)

statistics, displaying system and network [43-62](#)

See also CGMP

See also DVMRP

See also IGMP

See also PIM

- IP phones
  - and QoS [14-1](#)
  - automatic classification and queueing [35-20](#)
  - configuring [14-4](#)
  - ensuring port security with QoS [35-38](#)
  - trusted boundary for QoS [35-38](#)
- IP precedence [35-2](#)
- IP-precedence-to-DSCP map for QoS [35-61](#)
- IP protocols
  - in ACLs [33-12](#)
  - routing [1-12](#)
- IP protocols in ACLs [33-12](#)
- IP routes, monitoring [37-96](#)
- IP routing
  - connecting interfaces with [10-7](#)
  - disabling [37-20](#)
  - enabling [37-20](#)
- IP Service Level Agreements
  - See IP SLAs
- IP service levels, analyzing [40-1](#)
- IP services feature set [1-2](#)
- IP SLAs
  - benefits [40-2](#)
  - configuration guidelines [40-6](#)
  - configuring object tracking [41-9](#)
  - Control Protocol [40-3](#)
  - default configuration [40-6](#)
  - definition [40-1](#)
  - ICMP echo operation [40-10](#)
  - measuring network performance [40-2](#)
  - monitoring [40-13](#)
  - multioperations scheduling [40-5](#)
  - object tracking [41-9](#)
  - operation [40-3](#)
  - reachability tracking [41-9](#)
  - responder
    - described [40-3](#)
    - enabling [40-7](#)
  - response time [40-4](#)
- IP SLAs (continued)
  - scheduling [40-5](#)
  - SNMP support [40-2](#)
  - supported metrics [40-2](#)
  - threshold monitoring [40-5](#)
  - track state [41-9](#)
  - UDP jitter operation [40-8](#)
- IP source guard
  - and DHCP snooping [21-16](#)
  - and EtherChannels [21-18](#)
  - and hardware entries [21-18](#)
  - and IEEE 802.1x [21-18](#)
  - and port security [21-17](#)
  - and private VLANs [21-18](#)
  - and routed ports [21-17](#)
  - and trunk interfaces [21-17](#)
  - and VRF [21-18](#)
  - binding configuration
    - automatic [21-16](#)
    - manual [21-16](#)
  - binding table [21-16](#)
  - configuration guidelines [21-17](#)
  - default configuration [21-17](#)
  - described [21-16](#)
  - disabling [21-19](#)
  - displaying
    - bindings [21-19](#)
    - configuration [21-19](#)
  - enabling [21-18](#)
  - filtering
    - source IP address [21-16](#)
    - source IP and MAC address [21-17](#)
  - source IP address filtering [21-16](#)
  - source IP and MAC address filtering [21-17](#)
  - static bindings
    - adding [21-18](#)
    - deleting [21-19](#)

- IP traceroute
  - executing [46-15](#)
  - overview [46-14](#)
- IP unicast routing
  - address resolution [37-10](#)
  - administrative distances [37-83, 37-94](#)
  - ARP [37-10](#)
  - assigning IP addresses to Layer 3 interfaces [37-7](#)
  - authentication keys [37-94](#)
  - broadcast
    - address [37-17](#)
    - flooding [37-18](#)
    - packets [37-15](#)
    - storms [37-15](#)
  - classless routing [37-8](#)
  - configuring static routes [37-83](#)
  - default
    - addressing configuration [37-6](#)
    - gateways [37-13](#)
    - networks [37-84](#)
    - routes [37-84](#)
    - routing [37-3](#)
  - directed broadcasts [37-15](#)
  - disabling [37-20](#)
  - dynamic routing [37-3](#)
  - enabling [37-20](#)
  - EtherChannel Layer 3 interface [37-5](#)
  - IGP [37-26](#)
  - inter-VLAN [37-2](#)
  - IP addressing
    - classes [37-7](#)
    - configuring [37-6](#)
  - IPv6 [38-3](#)
  - IRDP [37-13](#)
  - Layer 3 interfaces [37-5](#)
  - MAC address and IP address [37-10](#)
  - passive interfaces [37-92](#)
- IP unicast routing (continued)
  - protocols
    - distance-vector [37-3](#)
    - dynamic [37-3](#)
    - link-state [37-3](#)
  - proxy ARP [37-10](#)
  - redistribution [37-85](#)
  - reverse address resolution [37-10](#)
  - routed ports [37-5](#)
  - static routing [37-3](#)
  - steps to configure [37-5](#)
  - subnet mask [37-7](#)
  - subnet zero [37-8](#)
  - supernet [37-8](#)
  - UDP [37-16](#)
  - unicast reverse path forwarding [1-13, 37-80](#)
  - with SVIs [37-5](#)
  - See also BGP
  - See also EIGRP
  - See also OSPF
  - See also RIP
- IPv4 ACLs
  - applying to interfaces [33-20](#)
  - extended, creating [33-11](#)
  - named [33-15](#)
  - standard, creating [33-10](#)
- IPv6
  - ACLs
    - displaying [34-9](#)
    - limitations [34-2](#)
    - matching criteria [34-3](#)
    - port [34-1](#)
    - precedence [34-2](#)
    - router [34-1](#)
    - supported [34-2](#)
  - addresses [38-2](#)
  - address formats [38-2](#)
  - and switch stacks [38-9](#)
  - applications [38-5](#)

IPv6 (continued)

- assigning address [38-11](#)
- autoconfiguration [38-5](#)
- CEFv6 [38-19](#)
- configuring static routes [38-20](#)
- default configuration [38-11](#)
- default router preference (DRP) [38-5](#)
- defined [38-1](#)
- Enhanced Interior Gateway Routing Protocol (EIGRP) IPv6 [38-7](#)
  - EIGRP IPv6 Commands [38-7](#)
  - Router ID [38-7](#)
- feature limitations [38-9](#)
- features not supported [38-8](#)
- forwarding [38-11](#)
- ICMP [38-4](#)
- monitoring [38-27](#)
- neighbor discovery [38-4](#)
- OSPF [38-7](#)
- path MTU discovery [38-4](#)
- SDM templates [8-2, 24-1, 34-1](#)
- stack master functions [38-10](#)
- supported features [38-2](#)
- switch limitations [38-9](#)
- understanding static routes [38-6](#)

IPv6 traffic, filtering [34-4](#)

IRDP

- configuring [37-14](#)
- definition [37-13](#)
- support for [1-13](#)

ISL

- and IPv6 [38-3](#)
- and trunk ports [10-3](#)
- encapsulation [1-8, 12-16](#)
- trunking with IEEE 802.1 tunneling [16-5](#)

isolated port [15-2](#)

isolated VLANs [15-2, 15-3](#)

---

## J

join messages, IGMP [23-3](#)

---

## K

### KDC

described [7-32](#)

See also Kerberos

keepalive messages [17-2](#)

### Kerberos

authenticating to

boundary switch [7-34](#)

KDC [7-34](#)

network services [7-35](#)

configuration examples [7-32](#)

configuring [7-35](#)

credentials [7-32](#)

cryptographic software image [7-32](#)

described [7-32](#)

KDC [7-32](#)

operation [7-34](#)

realm [7-33](#)

server [7-33](#)

support for [1-11](#)

switch as trusted third party [7-32](#)

terms [7-33](#)

TGT [7-34](#)

tickets [7-32](#)

key distribution center

See KDC

---

## L

l2protocol-tunnel command [16-13](#)

### LACP

Layer 2 protocol tunneling [16-9](#)

See EtherChannel

Layer 2 frames, classification with CoS [35-2](#)

- Layer 2 interfaces, default configuration [10-16](#)
- Layer 2 protocol tunneling
  - configuring [16-10](#)
  - configuring for EtherChannels [16-14](#)
  - default configuration [16-11](#)
  - defined [16-8](#)
  - guidelines [16-12](#)
- Layer 2 traceroute
  - and ARP [46-13](#)
  - and CDP [46-13](#)
  - broadcast traffic [46-12](#)
  - described [46-12](#)
  - IP addresses and subnets [46-13](#)
  - MAC addresses and VLANs [46-13](#)
  - multicast traffic [46-13](#)
  - multiple devices on a port [46-13](#)
  - unicast traffic [46-12](#)
  - usage guidelines [46-13](#)
- Layer 3 features [1-12](#)
- Layer 3 interfaces
  - assigning IP addresses to [37-7](#)
  - assigning IPv4 and IPv6 addresses to [38-14](#)
  - assigning IPv6 addresses to [38-12](#)
  - changing from Layer 2 mode [37-7, 37-71, 37-72](#)
  - types of [37-5](#)
- Layer 3 packets, classification methods [35-2](#)
- LDAP [4-2](#)
- Leaking IGMP Reports [20-4](#)
- LEDs, switch
  - See hardware installation guide
- Lightweight Directory Access Protocol
  - See LDAP
- line configuration mode [2-3](#)
- Link Aggregation Control Protocol
  - See EtherChannel
- Link Failure, detecting unidirectional [18-8](#)
- Link Layer Discovery Protocol
  - See CDP
- link local unicast addresses [38-4](#)
- link redundancy
  - See Flex Links
- links, unidirectional [28-1](#)
- link state advertisements (LSAs) [37-31](#)
- link-state protocols [37-3](#)
- link-state tracking
  - configuring [36-24](#)
  - described [36-22](#)
- LLDP
  - configuring
    - characteristics [27-4](#)
    - default configuration [27-3](#)
    - globally [27-5](#)
    - on an interface [27-5](#)
  - disabling and enabling
    - globally [27-5](#)
    - on an interface [27-5](#)
  - monitoring and maintaining [27-8](#)
  - overview [27-1](#)
  - supported TLVs [27-2](#)
  - switch stack considerations [27-2](#)
  - transmission timer and holdtime, setting [27-4](#)
- LLDP-MED
  - configuring [27-3](#)
  - configuring TLVs [27-6](#)
  - monitoring and maintaining [27-8](#)
  - overview [27-1, 27-2](#)
  - supported TLVs [27-2](#)
- LLDP Media Endpoint Discovery
  - See LLDP-MED
- load balancing [39-4](#)
- local SPAN [29-2](#)
- location TLV [27-3, 27-6](#)
- logging messages, ACL [33-9](#)
- login authentication
  - with RADIUS [7-23](#)
  - with TACACS+ [7-14](#)
- login banners [6-17](#)



## log messages

See system message logging

Long-Reach Ethernet (LRE) technology [1-18](#)

## loop guard

described [19-11](#)

enabling [19-18](#)

support for [1-8](#)

---

**M**

## MAC addresses

aging time [6-21](#)

and VLAN association [6-20](#)

building the address table [6-20](#)

default configuration [6-21](#)

disabling learning on a VLAN [6-26](#)

discovering [6-27](#)

displaying [6-27](#)

displaying in the IP source binding table [21-19](#)

## dynamic

learning [6-20](#)

removing [6-22](#)

in ACLs [33-27](#)

IP address association [37-10](#)

manually assigning IP address [3-15](#)

## static

adding [6-24](#)

allowing [6-26, 6-27](#)

characteristics of [6-24](#)

dropping [6-25](#)

removing [6-24](#)

MAC address learning [1-6](#)

MAC address learning, disabling on a VLAN [6-26](#)

MAC address notification, support for [1-13](#)

## MAC address-table move update

configuration guidelines [20-8](#)

configuring [20-12](#)

default configuration [20-8](#)

description [20-6](#)

monitoring [20-14](#)

MAC address-to-VLAN mapping [12-28](#)

MAC authentication bypass [9-10](#)

## MAC extended access lists

applying to Layer 2 interfaces [33-28](#)

configuring for QoS [35-45](#)

creating [33-27](#)

defined [33-27](#)

for QoS classification [35-5](#)

## macros

See Smartports macros

magic packet [9-18](#)

manageability features [1-6](#)

## management access

## in-band

browser session [1-6](#)

CLI session [1-6](#)

device manager [1-6](#)

SNMP [1-7](#)

out-of-band console port connection [1-7](#)

## management options

CLI [2-1](#)

CNS [4-1](#)

Network Assistant [1-3](#)

overview [1-5](#)

switch stacks [1-3](#)

- mapping tables for QoS
  - configuring
    - CoS-to-DSCP [35-60](#)
    - DSCP [35-60](#)
    - DSCP-to-CoS [35-63](#)
    - DSCP-to-DSCP-mutation [35-64](#)
    - IP-precedence-to-DSCP [35-61](#)
    - policed-DSCP [35-62](#)
  - described [35-12](#)
- marking
  - action in policy map [35-48](#)
  - action with aggregate policers [35-58](#)
  - described [35-4, 35-8](#)
- matching IPv4 ACLs [33-7](#)
- maximum aging time
  - MSTP [18-23](#)
  - STP [17-23](#)
- maximum hop count, MSTP [18-24](#)
- maximum number of allowed devices, port-based authentication [9-29](#)
- maximum-paths command [37-53, 37-82](#)
- MDA
  - configuration guidelines [9-20 to 9-21](#)
  - described [1-10, 9-20](#)
  - exceptions with authentication process [9-4](#)
- membership mode, VLAN port [12-3](#)
- messages, to users through banners [6-17](#)
- metrics, in BGP [37-53](#)
- metric translations, between routing protocols [37-88](#)
- metro tags [16-2](#)
- MHSRP [39-4](#)
- MIBs
  - accessing files with FTP [A-4](#)
  - location of files [A-4](#)
  - overview [32-1](#)
  - SNMP interaction with [32-4](#)
  - supported [A-1](#)
- mirroring traffic for analysis [29-1](#)
- mismatches, autonegotiation [46-9](#)
- module number [10-8](#)
- monitoring
  - access groups [33-39](#)
  - BGP [37-64](#)
  - cables for unidirectional links [28-1](#)
  - CDP [26-5](#)
  - CEF [37-81](#)
  - EIGRP [37-44](#)
  - fallback bridging [45-11](#)
  - features [1-13](#)
  - Flex Links [20-14](#)
  - HSRP [39-12](#)
  - IEEE 802.1Q tunneling [16-18](#)
  - IGMP
    - filters [23-29](#)
    - snooping [23-16, 24-11](#)
  - interfaces [10-26](#)
  - IP
    - address tables [37-19](#)
    - multicast routing [43-61](#)
    - routes [37-96](#)
  - IP SLAs operations [40-13](#)
  - IPv4 ACL configuration [33-39](#)
  - IPv6 [38-27](#)
  - IPv6 ACL configuration [34-9](#)
  - Layer 2 protocol tunneling [16-18](#)
  - MAC address-table move update [20-14](#)
  - MSDP peers [44-18](#)
  - multicast router interfaces [23-17, 24-12](#)
  - multi-VRF CE [37-79](#)
  - MVR [23-24](#)
  - network traffic for analysis with probe [29-2](#)
  - object tracking [41-10](#)
  - OSPF [37-35](#)
  - port
    - blocking [25-19](#)
    - protection [25-19](#)
  - private VLANs [15-15](#)
  - RP mapping information [43-35](#)

- monitoring (continued)
  - SFP status [10-27, 46-10](#)
  - source-active messages [44-18](#)
  - speed and duplex mode [10-19](#)
  - SSM mapping [43-22](#)
  - traffic flowing among switches [30-1](#)
  - traffic suppression [25-19](#)
  - tunneling [16-18](#)
  - VLAN
    - filters [33-40](#)
    - maps [33-40](#)
  - VLANs [12-16](#)
  - VMPS [12-33](#)
  - VTP [13-16](#)
- mrouter Port [20-3](#)
- mrouter port [20-5](#)
- MSDP
  - benefits of [44-3](#)
  - clearing MSDP connections and statistics [44-18](#)
  - controlling source information
    - forwarded by switch [44-11](#)
    - originated by switch [44-8](#)
    - received by switch [44-13](#)
  - default configuration [44-4](#)
  - dense-mode regions
    - sending SA messages to [44-16](#)
    - specifying the originating address [44-17](#)
  - filtering
    - incoming SA messages [44-14](#)
    - SA messages to a peer [44-12](#)
    - SA requests from a peer [44-10](#)
  - join latency, defined [44-6](#)
  - meshed groups
    - configuring [44-15](#)
    - defined [44-15](#)
  - originating address, changing [44-17](#)
  - overview [44-1](#)
  - peer-RPF flooding [44-2](#)
- MSDP (continued)
  - peers
    - configuring a default [44-4](#)
    - monitoring [44-18](#)
    - peering relationship, overview [44-1](#)
    - requesting source information from [44-8](#)
    - shutting down [44-15](#)
  - source-active messages
    - caching [44-6](#)
    - clearing cache entries [44-18](#)
    - defined [44-2](#)
    - filtering from a peer [44-10](#)
    - filtering incoming [44-14](#)
    - filtering to a peer [44-12](#)
    - limiting data with TTL [44-13](#)
    - monitoring [44-18](#)
    - restricting advertised sources [44-9](#)
  - support for [1-13](#)
- MSTP
  - boundary ports
    - configuration guidelines [18-16](#)
    - described [18-6](#)
  - BPDU filtering
    - described [19-3](#)
    - enabling [19-14](#)
  - BPDU guard
    - described [19-2](#)
    - enabling [19-13](#)
  - CIST, described [18-3](#)
  - CIST regional root [18-3](#)
  - CIST root [18-5](#)
  - configuration guidelines [18-15, 19-12](#)
  - configuring
    - forward-delay time [18-23](#)
    - hello time [18-22](#)
    - link type for rapid convergence [18-24](#)
    - maximum aging time [18-23](#)
    - maximum hop count [18-24](#)
    - MST region [18-16](#)

## MSTP (continued)

## configuring (continued)

neighbor type [18-25](#)path cost [18-21](#)port priority [18-19](#)root switch [18-17](#)secondary root switch [18-19](#)switch priority [18-21](#)

## CST

defined [18-3](#)operations between regions [18-4](#)default configuration [18-15](#)default optional feature configuration [19-12](#)displaying status [18-26](#)enabling the mode [18-16](#)

## EtherChannel guard

described [19-10](#)enabling [19-17](#)

## extended system ID

effects on root switch [18-17](#)effects on secondary root switch [18-19](#)unexpected behavior [18-18](#)

## IEEE 802.1s

implementation [18-6](#)port role naming change [18-7](#)terminology [18-5](#)instances supported [17-10](#)interface state, blocking to forwarding [19-2](#)interoperability and compatibility among modes [17-11](#)

interoperability with IEEE 802.1D

described [18-9](#)restarting migration process [18-25](#)

## IST

defined [18-3](#)master [18-3](#)operations within a region [18-3](#)

## MSTP (continued)

## loop guard

described [19-11](#)enabling [19-18](#)mapping VLANs to MST instance [18-16](#)

## MST region

CIST [18-3](#)configuring [18-16](#)described [18-2](#)hop-count mechanism [18-5](#)IST [18-3](#)supported spanning-tree instances [18-2](#)optional features supported [1-8](#)overview [18-2](#)

## Port Fast

described [19-2](#)enabling [19-12](#)preventing root switch selection [19-10](#)

## root guard

described [19-10](#)enabling [19-18](#)

## root switch

configuring [18-18](#)effects of extended system ID [18-17](#)unexpected behavior [18-18](#)shutdown Port Fast-enabled port [19-2](#)stack changes, effects of [18-8](#)status, displaying [18-26](#)

## MTU

system [10-25](#)system jumbo [10-25](#)system routing [10-25](#)

## multicast groups

Immediate Leave [23-6](#)joining [23-3](#)leaving [23-5](#)static joins [23-10, 24-8](#)

multicast packets

- ACLs on [33-38](#)
- blocking [25-8](#)

multicast router interfaces, monitoring [23-17, 24-12](#)

multicast router ports, adding [23-10, 24-8](#)

Multicast Source Discovery Protocol

- See MSDP

multicast storm [25-1](#)

multicast storm-control command [25-4](#)

multicast television application [23-18](#)

multicast VLAN [23-18](#)

Multicast VLAN Registration

- See MVR

multidomain authentication

- See MDA

multioperations scheduling, IP SLAs [40-5](#)

Multiple HSRP

- See MHSRP

multiple VPN routing/forwarding in customer edge devices

- See multi-VRF CE

multi-VRF CE

- configuration example [37-75](#)
- configuration guidelines [37-68](#)
- configuring [37-67](#)
- default configuration [37-68](#)
- defined [37-65](#)
- displaying [37-79](#)
- monitoring [37-79](#)
- network components [37-67](#)
- packet-forwarding process [37-67](#)
- support for [1-12](#)

MVR

- and address aliasing [23-20](#)
- and IGMPv3 [23-21](#)
- configuration guidelines [23-20](#)
- configuring interfaces [23-22](#)
- default configuration [23-20](#)
- described [23-18](#)

MVR (continued)

- example application [23-18](#)
- in the switch stack [23-20](#)
- modes [23-21](#)
- monitoring [23-24](#)
- multicast television application [23-18](#)
- setting global parameters [23-21](#)
- support for [1-5](#)

---

## N

### NAC

- AAA down policy [1-10](#)
- critical authentication [9-15, 9-43](#)
- IEEE 802.1x authentication using a RADIUS server [9-47](#)
- IEEE 802.1x validation using RADIUS server [9-47](#)
- inaccessible authentication bypass [1-10, 9-43](#)
- Layer 2 IEEE 802.1x validation [1-10, 9-47](#)
- Layer 2 IP validation [1-10](#)

named IPv4 ACLs [33-15](#)

named IPv6 ACLs [34-2](#)

NameSpace Mapper

- See NSM

native VLAN

- and IEEE 802.1Q tunneling [16-4](#)
- configuring [12-24](#)
- default [12-24](#)

neighbor discovery, IPv6 [38-4](#)

neighbor discovery/recovery, EIGRP [37-37](#)

neighbors, BGP [37-59](#)

Network Admission Control

- See NAC

Network Assistant

- benefits [1-3](#)
- described [1-5](#)
- downloading image files [1-3](#)
- guide mode [1-3](#)
- management options [1-3](#)

## Network Assistant (continued)

- managing switch stacks [5-2, 5-17](#)
- upgrading a switch [B-24](#)
- wizards [1-3](#)

## network configuration examples

- data center [1-18](#)
- expanded data center [1-19](#)
- increasing network performance [1-17](#)
- providing network services [1-18](#)
- small to medium-sized network [1-20](#)

## network design

- performance [1-17](#)
- services [1-18](#)

## network management

- CDP [26-1](#)
- RMON [30-1](#)
- SNMP [32-1](#)

network performance, measuring with IP SLAs [40-2](#)network policy TLV [27-6](#)

## Network Time Protocol

See NTP

no commands [2-4](#)

## nonhierarchical policy maps

- configuration guidelines [35-32](#)
- configuring [35-48](#)
- described [35-9](#)

non-IP traffic filtering [33-27](#)nonrunking mode [12-18](#)normal-range VLANs [12-4](#)

- configuration guidelines [12-6](#)
- configuration modes [12-7](#)
- configuring [12-4](#)
- defined [12-1](#)

no switchport command [10-4](#)

## not-so-stubby areas

See NSSA

NSM [4-3](#)NSSA, OSPF [37-31](#)

## NTP

## associations

- authenticating [6-4](#)
- defined [6-2](#)
- enabling broadcast messages [6-6](#)
- peer [6-5](#)
- server [6-5](#)

default configuration [6-4](#)displaying the configuration [6-11](#)overview [6-2](#)

## restricting access

- creating an access group [6-8](#)
- disabling NTP services per interface [6-10](#)

source IP address, configuring [6-10](#)stratum [6-2](#)support for [1-6](#)synchronizing devices [6-5](#)

## time

- services [6-2](#)
- synchronizing [6-2](#)

## O

## OBFL

- configuring [46-22](#)
- described [46-22](#)
- displaying [46-23](#)

## object tracking

- HSRP [41-7](#)
- IP SLAs [41-9](#)
- IP SLAs, configuring [41-9](#)
- monitoring [41-10](#)

offline configuration for switch stacks [5-9](#)

## on-board failure logging

See OBFL

## online diagnostics

- described [47-1](#)
- overview [47-1](#)
- running tests [47-5](#)

- Open Shortest Path First
    - See OSPF
  - optimizing system resources 8-1
  - options, management 1-5
  - OSPF
    - area parameters, configuring 37-31
    - configuring 37-29
    - default configuration
      - metrics 37-33
      - route 37-33
      - settings 37-27
    - described 37-26
    - for IPv6 38-7
    - interface parameters, configuring 37-30
    - LSA group pacing 37-34
    - monitoring 37-35
    - router IDs 37-35
    - route summarization 37-32
    - support for 1-12
    - virtual links 37-33
  - out-of-profile markdown 1-11
- 
- P
  - packet modification, with QoS 35-19
  - PAgP
    - Layer 2 protocol tunneling 16-9
    - See EtherChannel
  - parallel paths, in routing tables 37-82
  - passive interfaces
    - configuring 37-92
    - OSPF 37-33
  - passwords
    - default configuration 7-2
    - disabling recovery of 7-5
    - encrypting 7-3
    - for security 1-9
    - overview 7-1
    - recovery of 46-4
  - passwords (continued)
    - setting
      - enable 7-3
      - enable secret 7-3
      - Telnet 7-6
      - with usernames 7-6
    - VTP domain 13-8
  - path cost
    - MSTP 18-21
    - STP 17-20
  - path MTU discovery 38-4
  - PBR
    - defined 37-88
    - enabling 37-90
    - fast-switched policy-based routing 37-91
    - local policy-based routing 37-91
  - peers, BGP 37-59
  - percentage thresholds in tracked lists 41-6
  - performance, network design 1-17
  - performance features 1-4
  - persistent self-signed certificate 7-43
  - per-VLAN spanning-tree plus
    - See PVST+
  - PE to CE routing, configuring 37-75
  - physical ports 10-2
  - PIM
    - default configuration 43-11
    - dense mode
      - overview 43-4
      - rendezvous point (RP), described 43-5
      - RPF lookups 43-9
    - displaying neighbors 43-62
    - enabling a mode 43-14
    - overview 43-4
    - router-query message interval, modifying 43-38
    - shared tree and source tree, overview 43-35
    - shortest path tree, delaying the use of 43-37

## PIM (continued)

## sparse mode

- join messages and shared tree [43-5](#)

- overview [43-5](#)

- prune messages [43-5](#)

- RPF lookups [43-9](#)

## stub routing

- enabling [43-23](#)

- overview [43-5](#)

support for [1-13](#)

## versions

- interoperability [43-11](#)

- troubleshooting interoperability problems [43-35](#)

- v2 improvements [43-4](#)

PIM-DVMRP, as snooping method [23-9](#)

## ping

- character output description [46-12](#)

- executing [46-11](#)

- overview [46-11](#)

policed-DSCP map for QoS [35-62](#)

## policers

## configuring

- for each matched traffic class [35-48](#)

- for more than one traffic class [35-58](#)

- described [35-4](#)

- displaying [35-78](#)

- number of [35-33](#)

- types of [35-9](#)

## policing

- described [35-4](#)

## hierarchical

- See hierarchical policy maps

- token-bucket algorithm [35-9](#)

## policy-based routing

- See PBR

## policy maps for QoS

- characteristics of [35-48](#)

- described [35-7](#)

- displaying [35-79](#)

- hierarchical [35-8](#)

## hierarchical on SVIs

- configuration guidelines [35-32](#)

- configuring [35-52](#)

- described [35-11](#)

## nonhierarchical on physical ports

- configuration guidelines [35-32](#)

- configuring [35-48](#)

- described [35-9](#)

## port ACLs

- defined [33-2](#)

- types of [33-3](#)

## Port Aggregation Protocol

- See EtherChannel

## port-based authentication

- accounting [9-9](#)

## authentication server

- defined [9-3](#)

- RADIUS server [9-3](#)

- client, defined [9-2](#)

- configuration guidelines [9-27](#)

## configuring

- 802.1x authentication [9-30](#)

- guest VLAN [9-40](#)

- host mode [9-35](#)

- inaccessible authentication bypass [9-43](#)

- manual re-authentication of a client [9-36](#)

- periodic re-authentication [9-36](#)

- quiet period [9-37](#)

- RADIUS server [9-35](#)

- RADIUS server parameters on the switch [9-34](#)

- restricted VLAN [9-41](#)

- switch-to-client frame-retransmission

- number [9-38](#)

- switch-to-client retransmission time [9-37](#)



- port-based authentication (continued)
  - configuring (continued)
    - violation mode [9-18](#)
    - violation modes [9-29 to 9-30](#)
  - default configuration [9-26](#)
  - described [9-1](#)
  - device roles [9-2](#)
  - displaying statistics [9-52](#)
  - EAPOL-start frame [9-5](#)
  - EAP-request/identity frame [9-5](#)
  - EAP-response/identity frame [9-5](#)
  - encapsulation [9-3](#)
  - guest VLAN
    - configuration guidelines [9-14, 9-15](#)
    - described [9-13](#)
  - host mode [9-8](#)
  - inaccessible authentication bypass
    - configuring [9-43](#)
    - described [9-15](#)
    - guidelines [9-28](#)
  - initiation and message exchange [9-5](#)
  - magic packet [9-18](#)
  - maximum number of allowed devices per port [9-29](#)
  - method lists [9-30](#)
  - multiple-hosts mode, described [9-9](#)
  - per-user ACLs
    - AAA authorization [9-30](#)
    - configuration tasks [9-13](#)
    - described [9-12](#)
    - RADIUS server attributes [9-12](#)
  - ports
    - authorization state and dot1x port-control command [9-7](#)
    - authorized and unauthorized [9-7](#)
    - critical [9-15](#)
    - voice VLAN [9-16](#)
- port-based authentication (continued)
  - port security
    - and voice VLAN [9-18](#)
    - described [9-17](#)
    - interactions [9-17](#)
    - multiple-hosts mode [9-9](#)
  - readiness check
    - configuring [9-31](#)
    - described [9-10, 9-31](#)
  - resetting to default values [9-51](#)
  - stack changes, effects of [9-8](#)
  - statistics, displaying [9-52](#)
  - switch
    - as proxy [9-3](#)
    - RADIUS client [9-3](#)
  - VLAN assignment
    - AAA authorization [9-30](#)
    - characteristics [9-11](#)
    - configuration tasks [9-12](#)
    - described [9-11](#)
  - voice aware 802.1x security
    - configuring [9-33](#)
    - described [9-21, 9-32](#)
  - voice VLAN
    - described [9-16](#)
    - PVID [9-16](#)
    - VVID [9-16](#)
  - wake-on-LAN, described [9-18](#)
- port blocking [1-4, 25-7](#)
- port-channel
  - See EtherChannel
- Port Fast
  - described [19-2](#)
  - enabling [19-12](#)
  - mode, spanning tree [12-30](#)
  - support for [1-8](#)
- port membership modes, VLAN [12-3](#)

- port priority
  - MSTP 18-19
  - STP 17-18
- ports
  - 10-Gigabit Ethernet 10-6
  - access 10-3
  - blocking 25-7
  - dynamic access 12-4
  - protected 25-6
  - routed 10-4
  - secure 25-8
  - static-access 12-3, 12-11
  - switch 10-2
  - trunks 12-3, 12-16
  - VLAN assignments 12-11
- port security
  - aging 25-17
  - and private VLANs 25-18
  - and QoS trusted boundary 35-38
  - and stacking 25-18
  - configuring 25-13
  - default configuration 25-11
  - described 25-8
  - displaying 25-19
  - enabling 25-18
  - on trunk ports 25-14
  - sticky learning 25-9
  - violations 25-10
  - with other features 25-11
- port-shutdown response, VMPS 12-29
- power management TLV 27-6
- preemption, default configuration 20-8
- preemption delay, default configuration 20-8
- preferential treatment of traffic
  - See QoS
- prefix lists, BGP 37-57
- preventing unauthorized access 7-1
- primary links 20-2
- primary VLANs 15-1, 15-3
- priority
  - HSRP 39-8
  - overriding CoS 14-6
  - trusting CoS 14-6
- private VLAN edge ports
  - See protected ports
- private VLANs
  - across multiple switches 15-4
  - and SDM template 15-4
  - and SVIs 15-5
  - and switch stacks 15-5
  - benefits of 15-1
  - community ports 15-2
  - community VLANs 15-2, 15-3
  - configuration guidelines 15-7, 15-8
  - configuration tasks 15-6
  - configuring 15-10
  - default configuration 15-6
  - end station access to 15-3
  - IP addressing 15-3
  - isolated port 15-2
  - isolated VLANs 15-2, 15-3
  - mapping 15-14
  - monitoring 15-15
  - ports
    - community 15-2
    - configuration guidelines 15-8
    - configuring host ports 15-11
    - configuring promiscuous ports 15-13
    - isolated 15-2
    - promiscuous 15-2
  - primary VLANs 15-1, 15-3
  - promiscuous ports 15-2
  - secondary VLANs 15-2
  - subdomains 15-1
  - traffic in 15-5
- privileged EXEC mode 2-2

- privilege levels
  - changing the default for lines [7-9](#)
  - exiting [7-9](#)
  - logging into [7-9](#)
  - overview [7-2, 7-7](#)
  - setting a command with [7-8](#)
- promiscuous ports
  - configuring [15-13](#)
  - defined [15-2](#)
- protected ports [1-9, 25-6](#)
- protocol-dependent modules, EIGRP [37-37](#)
- Protocol-Independent Multicast Protocol
  - See PIM
- provider edge devices [37-66](#)
- provisioning new members for a switch stack [5-9](#)
- proxy ARP
  - configuring [37-12](#)
  - definition [37-10](#)
  - with IP routing disabled [37-13](#)
- proxy reports [20-3](#)
- pruning, VTP
  - disabling
    - in VTP domain [13-14](#)
    - on a port [12-24](#)
  - enabling
    - in VTP domain [13-14](#)
    - on a port [12-23](#)
  - examples [13-5](#)
  - overview [13-4](#)
- pruning-eligible list
  - changing [12-23](#)
  - for VTP pruning [13-5](#)
  - VLANs [13-14](#)
- PVST+
  - described [17-10](#)
  - IEEE 802.1Q trunking interoperability [17-11](#)
  - instances supported [17-10](#)

---

## Q

### QoS

- and MQC commands [35-1](#)
- auto-QoS
  - categorizing traffic [35-21](#)
  - configuration and defaults display [35-29](#)
  - configuration guidelines [35-25](#)
  - described [35-20](#)
  - disabling [35-26](#)
  - displaying generated commands [35-26](#)
  - displaying the initial configuration [35-29](#)
  - effects on running configuration [35-25](#)
  - egress queue defaults [35-21](#)
  - enabling for VoIP [35-26](#)
  - example configuration [35-27](#)
  - ingress queue defaults [35-21](#)
  - list of generated commands [35-22](#)
- basic model [35-4](#)
- classification
  - class maps, described [35-7](#)
  - defined [35-4](#)
  - DSCP transparency, described [35-39](#)
  - flowchart [35-6](#)
  - forwarding treatment [35-3](#)
  - in frames and packets [35-3](#)
  - IP ACLs, described [35-5, 35-7](#)
  - MAC ACLs, described [35-5, 35-7](#)
  - options for IP traffic [35-5](#)
  - options for non-IP traffic [35-5](#)
  - policy maps, described [35-7](#)
  - trust DSCP, described [35-5](#)
  - trusted CoS, described [35-5](#)
  - trust IP precedence, described [35-5](#)
- class maps
  - configuring [35-46](#)
  - displaying [35-78](#)

## QoS (continued)

- configuration guidelines
  - auto-QoS [35-25](#)
  - standard QoS [35-32](#)
- configuring
  - aggregate policers [35-58](#)
  - auto-QoS [35-20](#)
  - default port CoS value [35-37](#)
  - DSCP maps [35-60](#)
  - DSCP transparency [35-39](#)
  - DSCP trust states bordering another domain [35-40](#)
  - egress queue characteristics [35-70](#)
  - ingress queue characteristics [35-66](#)
  - IP extended ACLs [35-44](#)
  - IP standard ACLs [35-43](#)
  - MAC ACLs [35-45](#)
  - policy maps, hierarchical [35-52](#)
  - policy maps on physical ports [35-48](#)
  - port trust states within the domain [35-35](#)
  - trusted boundary [35-38](#)
- default auto configuration [35-21](#)
- default standard configuration [35-30](#)
- displaying statistics [35-78](#)
- DSCP transparency [35-39](#)
- egress queues
  - allocating buffer space [35-71](#)
  - buffer allocation scheme, described [35-18](#)
  - configuring shaped weights for SRR [35-75](#)
  - configuring shared weights for SRR [35-76](#)
  - described [35-4](#)
  - displaying the threshold map [35-74](#)
  - flowchart [35-17](#)
  - mapping DSCP or CoS values [35-73](#)
  - scheduling, described [35-4](#)
  - setting WTD thresholds [35-71](#)
  - WTD, described [35-19](#)
- enabling globally [35-34](#)

## QoS (continued)

- flowcharts
  - classification [35-6](#)
  - egress queueing and scheduling [35-17](#)
  - ingress queueing and scheduling [35-15](#)
  - policing and marking [35-10](#)
- implicit deny [35-7](#)
- ingress queues
  - allocating bandwidth [35-68](#)
  - allocating buffer space [35-68](#)
  - buffer and bandwidth allocation, described [35-16](#)
  - configuring shared weights for SRR [35-68](#)
  - configuring the priority queue [35-69](#)
  - described [35-4](#)
  - displaying the threshold map [35-67](#)
  - flowchart [35-15](#)
  - mapping DSCP or CoS values [35-67](#)
  - priority queue, described [35-16](#)
  - scheduling, described [35-4](#)
  - setting WTD thresholds [35-67](#)
  - WTD, described [35-16](#)
- IP phones
  - automatic classification and queueing [35-20](#)
  - detection and trusted settings [35-20, 35-38](#)
- limiting bandwidth on egress interface [35-77](#)
- mapping tables
  - CoS-to-DSCP [35-60](#)
  - displaying [35-78](#)
  - DSCP-to-CoS [35-63](#)
  - DSCP-to-DSCP-mutation [35-64](#)
  - IP-precedence-to-DSCP [35-61](#)
  - policed-DSCP [35-62](#)
  - types of [35-12](#)
- marked-down actions [35-50, 35-55](#)
- marking, described [35-4, 35-8](#)
- overview [35-2](#)
- packet modification [35-19](#)

## QoS (continued)

## policers

- configuring [35-50, 35-55, 35-58](#)

- described [35-8](#)

- displaying [35-78](#)

- number of [35-33](#)

- types of [35-9](#)

- policies, attaching to an interface [35-8](#)

## policing

- described [35-4, 35-8](#)

- token bucket algorithm [35-9](#)

## policy maps

- characteristics of [35-48](#)

- displaying [35-79](#)

- hierarchical [35-8](#)

- hierarchical on SVIs [35-52](#)

- nonhierarchical on physical ports [35-48](#)

- QoS label, defined [35-4](#)

## queues

- configuring egress characteristics [35-70](#)

- configuring ingress characteristics [35-66](#)

- high priority (expedite) [35-19, 35-76](#)

- location of [35-13](#)

- SRR, described [35-14](#)

- WTD, described [35-13](#)

- rewrites [35-19](#)

- support for [1-11](#)

## trust states

- bordering another domain [35-40](#)

- described [35-5](#)

- trusted device [35-38](#)

- within the domain [35-35](#)

## quality of service

- See QoS

- queries, IGMP [23-4](#)

- query solicitation, IGMP [23-13](#)

## R

## RADIUS

## attributes

- vendor-proprietary [7-31](#)

- vendor-specific [7-29](#)

## configuring

- accounting [7-28](#)

- authentication [7-23](#)

- authorization [7-27](#)

- communication, global [7-21, 7-29](#)

- communication, per-server [7-20, 7-21](#)

- multiple UDP ports [7-20](#)

- default configuration [7-20](#)

- defining AAA server groups [7-25](#)

- displaying the configuration [7-31](#)

- identifying the server [7-20](#)

- limiting the services to the user [7-27](#)

- method list, defined [7-20](#)

- operation of [7-19](#)

- overview [7-18](#)

- suggested network environments [7-18](#)

- support for [1-10](#)

- tracking services accessed by user [7-28](#)

## range

- macro [10-11](#)

- of interfaces [10-10](#)

- rapid convergence [18-10](#)

- rapid per-VLAN spanning-tree plus

- See rapid PVST+

- rapid PVST+

- described [17-10](#)

- IEEE 802.1Q trunking interoperability [17-11](#)

- instances supported [17-10](#)

- Rapid Spanning Tree Protocol

- See RSTP

- RARP [37-10](#)

- RCP
  - configuration files
    - downloading [B-18](#)
    - overview [B-16](#)
    - preparing the server [B-17](#)
    - uploading [B-19](#)
  - image files
    - deleting old image [B-38](#)
    - downloading [B-36](#)
    - preparing the server [B-35](#)
    - uploading [B-38](#)
- reachability, tracking IP SLAs IP host [41-9](#)
- readiness check
  - port-based authentication
    - configuring [9-31](#)
    - described [9-10, 9-31](#)
- reconfirmation interval, VMPS, changing [12-32](#)
- reconfirming dynamic VLAN membership [12-32](#)
- recovery procedures [46-1](#)
- redundancy
  - EtherChannel [36-2](#)
  - HSRP [39-1](#)
  - STP
    - backbone [17-8](#)
    - multidrop backbone [19-5](#)
    - path cost [12-27](#)
    - port priority [12-25](#)
- redundant links and UplinkFast [19-15](#)
- reliable transport protocol, EIGRP [37-37](#)
- reloading software [3-22](#)
- Remote Authentication Dial-In User Service
  - See RADIUS
- Remote Copy Protocol
  - See RCP
- Remote Network Monitoring
  - See RMON
- Remote SPAN
  - See RSPAN
- remote SPAN [29-3](#)
- report suppression, IGMP
  - described [23-6](#)
  - disabling [23-16, 24-11](#)
- resequencing ACL entries [33-15](#)
- resets, in BGP [37-52](#)
- resetting a UDLD-shutdown interface [28-6](#)
- responder, IP SLAs
  - described [40-3](#)
  - enabling [40-7](#)
- response time, measuring with IP SLAs [40-4](#)
- restricted VLAN
  - configuring [9-41](#)
  - described [9-14](#)
  - using with IEEE 802.1x [9-14](#)
- restricting access
  - NTP services [6-8](#)
  - overview [7-1](#)
  - passwords and privilege levels [7-2](#)
  - RADIUS [7-17](#)
  - TACACS+ [7-10](#)
- retry count, VMPS, changing [12-32](#)
- reverse address resolution [37-10](#)
- Reverse Address Resolution Protocol
  - See RARP
- RFC
  - 1112, IP multicast and IGMP [23-2](#)
  - 1157, SNMPv1 [32-2](#)
  - 1166, IP addresses [37-7](#)
  - 1305, NTP [6-2](#)
  - 1587, NSSAs [37-26](#)
  - 1757, RMON [30-2](#)
  - 1901, SNMPv2C [32-2](#)
  - 1902 to 1907, SNMPv2 [32-2](#)
  - 2236, IP multicast and IGMP [23-2](#)
  - 2273-2275, SNMPv3 [32-2](#)
- RIP
  - advertisements [37-21](#)
  - authentication [37-23](#)
  - configuring [37-22](#)

- RIP (continued)
  - default configuration 37-21
  - described 37-21
  - for IPv6 38-7
  - hop counts 37-21
  - split horizon 37-24
  - summary addresses 37-24
  - support for 1-12
- RMON
  - default configuration 30-3
  - displaying status 30-6
  - enabling alarms and events 30-3
  - groups supported 30-2
  - overview 30-1
  - statistics
    - collecting group Ethernet 30-5
    - collecting group history 30-5
  - support for 1-13
- root guard
  - described 19-10
  - enabling 19-18
  - support for 1-8
- root switch
  - MSTP 18-17
  - STP 17-16
- route calculation timers, OSPF 37-33
- route dampening, BGP 37-63
- routed packets, ACLs on 33-38
- routed ports
  - configuring 37-5
  - defined 10-4
  - IP addresses on 10-23, 37-5
- route-map command 37-91
- route maps
  - BGP 37-55
  - policy-based routing 37-88
- router ACLs
  - defined 33-2
  - types of 33-4
- route reflectors, BGP 37-62
- router ID, OSPF 37-35
- route selection, BGP 37-53
- route summarization, OSPF 37-32
- route targets, VPN 37-67
- routing
  - default 37-3
  - dynamic 37-3
  - redistribution of information 37-85
  - static 37-3
- routing domain confederation, BGP 37-62
- Routing Information Protocol
  - See RIP
- routing protocol administrative distances 37-83
- RSPAN 29-3
  - and stack changes 29-10
  - characteristics 29-9
  - configuration guidelines 29-17
  - default configuration 29-11
  - destination ports 29-8
  - displaying status 29-28
  - in a switch stack 29-2
  - interaction with other features 29-9
  - monitored ports 29-6
  - monitoring ports 29-8
  - overview 1-13, 29-1
  - received traffic 29-5
  - session limits 29-12
  - sessions
    - creating 29-18
    - defined 29-4
    - limiting source traffic to specific VLANs 29-20
    - specifying monitored ports 29-18
    - with ingress traffic enabled 29-22
  - source ports 29-6
  - transmitted traffic 29-6
  - VLAN-based 29-7

## RSTP

- active topology [18-10](#)
  - BPDU
    - format [18-12](#)
    - processing [18-13](#)
  - designated port, defined [18-9](#)
  - designated switch, defined [18-9](#)
  - interoperability with IEEE 802.1D
    - described [18-9](#)
    - restarting migration process [18-25](#)
    - topology changes [18-13](#)
  - overview [18-9](#)
  - port roles
    - described [18-9](#)
    - synchronized [18-11](#)
  - proposal-agreement handshake process [18-10](#)
  - rapid convergence
    - cross-stack rapid convergence [18-11](#)
    - described [18-10](#)
    - edge ports and Port Fast [18-10](#)
    - point-to-point links [18-10, 18-24](#)
    - root ports [18-10](#)
  - root port, defined [18-9](#)
  - See also MSTP
- running configuration
- replacing [B-20, B-21](#)
  - rolling back [B-20, B-21](#)
  - saving [3-15](#)

## S

- scheduled reloads [3-22](#)
- scheduling, IP SLAs operations [40-5](#)
- SDM
  - described [8-1](#)
  - switch stack consideration [5-11](#)
  - templates
    - configuring [8-5](#)
    - number of [8-1](#)

## SDM template

- configuring [8-4](#)
- dual IPv4 and IPv6 [8-2](#)
- types of [8-1](#)
- secondary VLANs [15-2](#)
- secure HTTP client
  - configuring [7-47](#)
  - displaying [7-48](#)
- secure HTTP server
  - configuring [7-46](#)
  - displaying [7-48](#)
- secure MAC addresses
  - and switch stacks [25-18](#)
  - deleting [25-16](#)
  - maximum number of [25-10](#)
  - types of [25-9](#)
- secure ports
  - and switch stacks [25-18](#)
  - configuring [25-8](#)
- secure remote connections [7-37](#)
- Secure Shell
  - See SSH
- Secure Socket Layer
  - See SSL
- security, port [25-8](#)
- security features [1-9](#)
- sequence numbers in log messages [31-8](#)
- server mode, VTP [13-3](#)
- service-provider network, MSTP and RSTP [18-1](#)
- service-provider networks
  - and customer VLANs [16-2](#)
  - and IEEE 802.1Q tunneling [16-1](#)
  - Layer 2 protocols across [16-8](#)
  - Layer 2 protocol tunneling for EtherChannels [16-9](#)
- set-request operation [32-4](#)
- severity levels, defining in system messages [31-9](#)



## SFPs

- monitoring status of 10-27, 46-10
- numbering of 10-9
- security and identification 46-10
- status, displaying 46-10

## shaped round robin

See SRR

- show access-lists hw-summary command 33-22
- show and more command output, filtering 2-10
- show cdp traffic command 26-5
- show configuration command 10-22
- show forward command 46-18
- show interfaces command 10-19, 10-22
- show interfaces switchport 20-4
- show l2protocol command 16-13, 16-15, 16-16
- show lldp traffic command 27-8
- show platform forward command 46-18
- show running-config command
  - displaying ACLs 33-20, 33-21, 33-31, 33-34
  - interface description in 10-22
- shutdown command on interfaces 10-28
- shutdown threshold for Layer 2 protocol packets 16-11

## Simple Network Management Protocol

See SNMP

- small-frame arrival rate, configuring 25-5
- Smartports macros
  - applying Cisco-default macros 11-6
  - applying global parameter values 11-5, 11-6
  - applying macros 11-5
  - applying parameter values 11-5, 11-7
  - configuration guidelines 11-2
  - creating 11-4
  - default configuration 11-2
  - defined 11-1
  - displaying 11-8
  - tracing 11-3
- SNAP 26-1

## SNMP

- accessing MIB variables with 32-4
- agent
  - described 32-4
  - disabling 32-7
- and IP SLAs 40-2
- authentication level 32-10
- community strings
  - configuring 32-8
  - overview 32-4
- configuration examples 32-16
- default configuration 32-6
- engine ID 32-7
- groups 32-6, 32-9
- host 32-6
- ifIndex values 32-5
- in-band management 1-7
- informs
  - and trap keyword 32-11
  - described 32-5
  - differences from traps 32-5
  - disabling 32-15
  - enabling 32-14
- limiting access by TFTP servers 32-15
- limiting system log messages to NMS 31-10
- manager functions 1-5, 32-3
- MIBs
  - location of A-4
  - supported A-1
- notifications 32-5
- overview 32-1, 32-4
- security levels 32-3
- status, displaying 32-17
- system contact and location 32-15
- trap manager, configuring 32-13

## SNMP (continued)

## traps

- described [32-3, 32-5](#)
- differences from informs [32-5](#)
- disabling [32-15](#)
- enabling [32-11](#)
- enabling MAC address notification [6-22](#)
- overview [32-1, 32-4](#)
- types of [32-11](#)

users [32-6, 32-9](#)

versions supported [32-2](#)

SNMP and Syslog Over IPv6 [38-7](#)

SNMPv1 [32-2](#)

SNMPv2C [32-2](#)

SNMPv3 [32-2](#)

snooping, IGMP [23-2](#)

software compatibility

See stacks, switch

software images

- location in flash [B-25](#)
- recovery procedures [46-2](#)
- scheduling reloads [3-22](#)
- tar file format, described [B-25](#)
- See also downloading and uploading

source addresses

- in IPv4 ACLs [33-12](#)
- in IPv6 ACLs [34-6](#)

source-and-destination-IP address based forwarding, EtherChannel [36-8](#)

source-and-destination MAC address forwarding, EtherChannel [36-8](#)

source-IP address based forwarding, EtherChannel [36-8](#)

source-MAC address forwarding, EtherChannel [36-8](#)

Source-specific multicast

See SSM

## SPAN

- and stack changes [29-10](#)
- configuration guidelines [29-12](#)
- default configuration [29-11](#)
- destination ports [29-8](#)
- displaying status [29-28](#)
- interaction with other features [29-9](#)
- monitored ports [29-6](#)
- monitoring ports [29-8](#)
- overview [1-13, 29-1](#)
- ports, restrictions [25-12](#)
- received traffic [29-5](#)
- session limits [29-12](#)
- sessions
  - configuring ingress forwarding [29-16, 29-23](#)
  - creating [29-13, 29-25](#)
  - defined [29-4](#)
  - limiting source traffic to specific VLANs [29-16](#)
  - removing destination (monitoring) ports [29-14](#)
  - specifying monitored ports [29-13, 29-25](#)
  - with ingress traffic enabled [29-15](#)
- source ports [29-6](#)
- transmitted traffic [29-6](#)
- VLAN-based [29-7](#)

spanning tree and native VLANs [12-19](#)

Spanning Tree Protocol

See STP

SPAN traffic [29-5](#)

split horizon, RIP [37-24](#)

## SRR

- configuring
  - shaped weights on egress queues [35-75](#)
  - shared weights on egress queues [35-76](#)
  - shared weights on ingress queues [35-68](#)
- described [35-14](#)
- shaped mode [35-14](#)
- shared mode [35-14](#)
- support for [1-11, 1-12](#)

- SSH
  - configuring [7-39](#)
  - cryptographic software image [7-37](#)
  - described [1-7, 7-37](#)
  - encryption methods [7-38](#)
  - switch stack considerations [5-18, 7-38](#)
  - user authentication methods, supported [7-38](#)
- SSL
  - configuration guidelines [7-44](#)
  - configuring a secure HTTP client [7-47](#)
  - configuring a secure HTTP server [7-45](#)
  - cryptographic software image [7-41](#)
  - described [7-41](#)
  - monitoring [7-48](#)
- SSM
  - address management restrictions [43-16](#)
  - CGMP limitations [43-16](#)
  - components [43-14](#)
  - configuration guidelines [43-16](#)
  - configuring [43-14, 43-17](#)
  - differs from Internet standard multicast [43-15](#)
  - IGMP snooping [43-16](#)
  - IGMPv3 [43-14](#)
  - IGMPv3 Host Signalling [43-16](#)
  - IP address range [43-15](#)
  - monitoring [43-17](#)
  - operations [43-15](#)
  - PIM [43-14](#)
  - state maintenance limitations [43-17](#)
- SSM mapping [43-17](#)
  - configuration guidelines [43-18](#)
  - configuring [43-17, 43-20](#)
  - DNS-based [43-19, 43-21](#)
  - monitoring [43-22](#)
  - overview [43-18](#)
  - restrictions [43-18](#)
  - static [43-19, 43-20](#)
  - static traffic forwarding [43-21](#)
- stack changes
  - effects on
    - IPv6 routing [38-10](#)
- stack changes, effects on
  - ACL configuration [33-7](#)
  - CDP [26-2](#)
  - cross-stack EtherChannel [36-12](#)
  - EtherChannel [36-9](#)
  - fallback bridging [45-3](#)
  - HSRP [39-5](#)
  - IEEE 802.1x port-based authentication [9-8](#)
  - IGMP snooping [23-7](#)
  - IP routing [37-4](#)
  - IPv6 ACLs [34-3](#)
  - MAC address tables [6-21](#)
  - MSTP [18-8](#)
  - multicast routing [43-10](#)
  - MVR [23-18](#)
  - port security [25-18](#)
  - SDM template selection [8-3](#)
  - SNMP [32-1](#)
  - SPAN and RSPAN [29-10](#)
  - STP [17-12](#)
  - system message log [31-2](#)
  - VLANs [12-6](#)
  - VTP [13-6](#)
- stack master
  - bridge ID (MAC address) [5-8](#)
  - defined [5-1](#)
  - election [5-6](#)
  - IPv6 [38-10](#)
  - re-election [5-6](#)
  - See also stacks, switch
- stack member
  - accessing CLI of specific member [5-25](#)
  - configuring
    - member number [5-23](#)
    - priority value [5-24](#)
  - defined [5-1](#)

## stack member (continued)

- displaying information of [5-26](#)
- IPv6 [38-10](#)
- number [5-8](#)
- priority value [5-9](#)
- provisioning a new member [5-24](#)
- replacing [5-17](#)

See also [stacks, switch](#)

stack member number [10-8](#)

stack protocol version [5-12](#)

## stacks, switch

- accessing CLI of specific member [5-25](#)
- assigning information
  - member number [5-23](#)
  - priority value [5-24](#)
  - provisioning a new member [5-24](#)
- auto-advise [5-13](#)
- auto-copy [5-13](#)
- auto-extract [5-13](#)
- auto-upgrade [5-13](#)
- bridge ID [5-8](#)
- CDP considerations [26-2](#)
- compatibility, software [5-12](#)
- configuration file [5-16](#)
- configuration scenarios [5-19](#)
- copying an image file from one member to another [B-39](#)
- default configuration [5-21](#)
- description of [5-1](#)
- displaying information of [5-26](#)
- enabling persistent MAC address timer [5-21](#)
- hardware compatibility and SDM mismatch mode [5-11](#)
- HSRP considerations [39-5](#)
- incompatible software and image upgrades [5-16, B-39](#)
- IPv6 on [38-9](#)
- MAC address considerations [6-21](#)
- MAC address of [5-21](#)
- management connectivity [5-17](#)

## stacks, switch (continued)

- managing [5-1](#)
- membership [5-3](#)
- merged [5-3](#)
- MSTP instances supported [17-10](#)
- multicast routing, stack master and member roles [43-10](#)
- offline configuration
  - described [5-9](#)
  - effects of adding a provisioned switch [5-10](#)
  - effects of removing a provisioned switch [5-11](#)
  - effects of replacing a provisioned switch [5-11](#)
  - provisioned configuration, defined [5-9](#)
  - provisioned switch, defined [5-9](#)
  - provisioning a new member [5-24](#)
- partitioned [5-3, 46-9](#)
- provisioned switch
  - adding [5-10](#)
  - removing [5-11](#)
  - replacing [5-11](#)
- replacing a failed member [5-17](#)
- software compatibility [5-12](#)
- software image version [5-12](#)
- stack protocol version [5-12](#)
- STP
  - bridge ID [17-3](#)
  - instances supported [17-10](#)
  - root port selection [17-3](#)
  - stack root switch election [17-3](#)
- system messages
  - hostnames in the display [31-1](#)
  - remotely monitoring [31-2](#)
- system prompt consideration [6-14](#)
- system-wide configuration considerations [5-17](#)
- upgrading [B-39](#)

- stacks, switch (continued)
  - version-mismatch (VM) mode
    - automatic upgrades with auto-upgrade [5-13](#)
    - described [5-12](#)
    - examples [5-14](#)
    - manual upgrades with auto-advise [5-13](#)
    - upgrades with auto-extract [5-13](#)
  - See also stack master and stack member
- StackWise Plus technology, Cisco [1-3](#)
  - See also stacks, switch
- standby ip command [39-7](#)
- standby links [20-2](#)
- standby router [39-1](#)
- standby timers, HSRP [39-11](#)
- startup configuration
  - booting
    - manually [3-18](#)
    - specific image [3-19](#)
  - clearing [B-20](#)
  - configuration file
    - automatically downloading [3-17](#)
    - specifying the filename [3-17](#)
  - default boot configuration [3-17](#)
- static access ports
  - assigning to VLAN [12-11](#)
  - defined [10-3, 12-3](#)
- static addresses
  - See addresses
- static IP routing [1-13](#)
- static MAC addressing [1-9](#)
- static routes
  - configuring [37-83](#)
  - configuring for IPv6 [38-20](#)
  - understanding [38-6](#)
- static routing [37-3](#)
- static SSM mapping [43-19, 43-20](#)
- static traffic forwarding [43-21](#)
- static VLAN membership [12-2](#)
- statistics
  - CDP [26-5](#)
  - IEEE 802.1x [9-52](#)
  - interface [10-27](#)
  - IP multicast routing [43-62](#)
  - LLDP [27-8](#)
  - LLDP-MED [27-8](#)
  - OSPF [37-35](#)
  - QoS ingress and egress [35-78](#)
  - RMON group Ethernet [30-5](#)
  - RMON group history [30-5](#)
  - SNMP input and output [32-17](#)
  - VTP [13-16](#)
- sticky learning [25-9](#)
- storm control
  - configuring [25-3](#)
  - described [25-1](#)
  - disabling [25-5](#)
  - displaying [25-19](#)
  - support for [1-4](#)
  - thresholds [25-1](#)
- STP
  - accelerating root port selection [19-4](#)
  - BackboneFast
    - described [19-7](#)
    - disabling [19-17](#)
    - enabling [19-16](#)
  - BPDU filtering
    - described [19-3](#)
    - disabling [19-15](#)
    - enabling [19-14](#)
  - BPDU guard
    - described [19-2](#)
    - disabling [19-14](#)
    - enabling [19-13](#)
  - BPDU message exchange [17-3](#)
  - configuration guidelines [17-13, 19-12](#)

## STP (continued)

- configuring
  - forward-delay time [17-23](#)
  - hello time [17-22](#)
  - maximum aging time [17-23](#)
  - path cost [17-20](#)
  - port priority [17-18](#)
  - root switch [17-16](#)
  - secondary root switch [17-18](#)
  - spanning-tree mode [17-15](#)
  - switch priority [17-21](#)
  - transmit hold-count [17-24](#)
- counters, clearing [17-24](#)
- cross-stack UplinkFast
  - described [19-5](#)
  - enabling [19-16](#)
- default configuration [17-13](#)
- default optional feature configuration [19-12](#)
- designated port, defined [17-4](#)
- designated switch, defined [17-4](#)
- detecting indirect link failures [19-8](#)
- disabling [17-16](#)
- displaying status [17-24](#)
- EtherChannel guard
  - described [19-10](#)
  - disabling [19-17](#)
  - enabling [19-17](#)
- extended system ID
  - effects on root switch [17-16](#)
  - effects on the secondary root switch [17-18](#)
  - overview [17-4](#)
  - unexpected behavior [17-16](#)
- features supported [1-7](#)
- IEEE 802.1D and bridge ID [17-4](#)
- IEEE 802.1D and multicast addresses [17-9](#)
- IEEE 802.1t and VLAN identifier [17-5](#)
- inferior BPDU [17-3](#)
- instances supported [17-10](#)
- interface state, blocking to forwarding [19-2](#)

## STP (continued)

- interface states
  - blocking [17-6](#)
  - disabled [17-7](#)
  - forwarding [17-6, 17-7](#)
  - learning [17-7](#)
  - listening [17-7](#)
  - overview [17-5](#)
- interoperability and compatibility among modes [17-11](#)
- keepalive messages [17-2](#)
- Layer 2 protocol tunneling [16-8](#)
- limitations with IEEE 802.1Q trunks [17-11](#)
- load sharing
  - overview [12-24](#)
  - using path costs [12-27](#)
  - using port priorities [12-25](#)
- loop guard
  - described [19-11](#)
  - enabling [19-18](#)
- modes supported [17-10](#)
- multicast addresses, effect of [17-9](#)
- optional features supported [1-8](#)
- overview [17-2](#)
- path costs [12-27](#)
- Port Fast
  - described [19-2](#)
  - enabling [19-12](#)
- port priorities [12-26](#)
- preventing root switch selection [19-10](#)
- protocols supported [17-10](#)
- redundant connectivity [17-8](#)
- root guard
  - described [19-10](#)
  - enabling [19-18](#)
- root port, defined [17-3](#)
- root port selection on a switch stack [17-3](#)

- STP (continued)
  - root switch
    - configuring 17-16
    - effects of extended system ID 17-4, 17-16
    - election 17-3
    - unexpected behavior 17-16
  - shutdown Port Fast-enabled port 19-2
  - stack changes, effects of 17-12
  - status, displaying 17-24
  - superior BPDU 17-3
  - timers, described 17-22
  - UplinkFast
    - described 19-3
    - enabling 19-15
  - VLAN-bridge 17-11
- stratum, NTP 6-2
- stub areas, OSPF 37-31
- stub routing, EIGRP 37-43
- subdomains, private VLAN 15-1
- subnet mask 37-7
- subnet zero 37-8
- success response, VMPS 12-29
- summer time 6-13
- SunNet Manager 1-5
- supernet 37-8
- SVI autostate exclude
  - configuring 10-24
  - defined 10-6
- SVI link state 10-6
- SVIs
  - and IP unicast routing 37-5
  - and router ACLs 33-4
  - connecting VLANs 10-7
  - defined 10-5
  - routing between VLANs 12-2
- switch 38-2
- switch console port 1-7
- Switch Database Management
  - See SDM
- switched packets, ACLs on 33-36
- Switched Port Analyzer
  - See SPAN
- switched ports 10-2
- switchport backup interface 20-4, 20-5
- switchport block multicast command 25-8
- switchport block unicast command 25-8
- switchport command 10-17
- switchport mode dot1q-tunnel command 16-6
- switchport protected command 25-7
- switch priority
  - MSTP 18-21
  - STP 17-21
- switch software features 1-1
- switch virtual interface
  - See SVI
- synchronization, BGP 37-49
- syslog
  - See system message logging
- system clock
  - configuring
    - daylight saving time 6-13
    - manually 6-11
    - summer time 6-13
    - time zones 6-12
  - displaying the time and date 6-12
  - overview 6-1
  - See also NTP
- system message logging
  - default configuration 31-4
  - defining error message severity levels 31-9
  - disabling 31-4
  - displaying the configuration 31-14
  - enabling 31-5
  - facility keywords, described 31-14
  - level keywords, described 31-10
  - limiting messages 31-10
  - message format 31-2
  - overview 31-1

system message logging (continued)

- sequence numbers, enabling and disabling [31-8](#)
- setting the display destination device [31-5](#)
- stack changes, effects of [31-2](#)
- synchronizing log messages [31-6](#)
- syslog facility [1-13](#)
- time stamps, enabling and disabling [31-8](#)
- UNIX syslog servers
  - configuring the daemon [31-12](#)
  - configuring the logging facility [31-13](#)
  - facilities supported [31-14](#)

system MTU and IEEE 802.1Q tunneling [16-5](#)

system name

- default configuration [6-15](#)
- default setting [6-15](#)
- manual configuration [6-15](#)
- See also DNS

system prompt, default setting [6-14, 6-15](#)

system resources, optimizing [8-1](#)

---

## T

### TACACS+

- accounting, defined [7-11](#)
- authentication, defined [7-11](#)
- authorization, defined [7-11](#)
- configuring
  - accounting [7-17](#)
  - authentication key [7-13](#)
  - authorization [7-16](#)
  - login authentication [7-14](#)
- default configuration [7-13](#)
- displaying the configuration [7-17](#)
- identifying the server [7-13](#)
- limiting the services to the user [7-16](#)
- operation of [7-12](#)
- overview [7-10](#)
- support for [1-10](#)
- tracking services accessed by user [7-17](#)

### tagged packets

- IEEE 802.1Q [16-3](#)
- Layer 2 protocol [16-7](#)

### tar files

- creating [B-7](#)
- displaying the contents of [B-7](#)
- extracting [B-8](#)
- image file format [B-25](#)

### TDR [1-14](#)

### Telnet

- accessing management interfaces [2-11](#)
- number of connections [1-6](#)
- setting a password [7-6](#)

### templates, SDM [8-2](#)

### temporary self-signed certificate [7-43](#)

### Terminal Access Controller Access Control System Plus

See TACACS+

### terminal lines, setting a password [7-6](#)

### TFTP

#### configuration files

- downloading [B-12](#)
- preparing the server [B-11](#)
- uploading [B-12](#)

#### configuration files in base directory [3-7](#)

#### configuring for autoconfiguration [3-7](#)

#### image files

- deleting [B-29](#)
- downloading [B-27](#)
- preparing the server [B-27](#)
- uploading [B-29](#)

#### limiting access by servers [32-15](#)

### TFTP server [1-6](#)

### threshold, traffic level [25-2](#)

### threshold monitoring, IP SLAs [40-5](#)

### time

See NTP and system clock

### Time Domain Reflector

See TDR

### time-range command [33-17](#)



- time ranges in ACLs [33-17](#)
- time stamps in log messages [31-8](#)
- time zones [6-12](#)
- TLVs
  - defined [27-2](#)
  - LLDP [27-2](#)
  - LLDP-MED [27-2](#)
- Token Ring VLANs
  - support for [12-6](#)
  - VTP support [13-4](#)
- ToS [1-11](#)
- traceroute, Layer 2
  - and ARP [46-13](#)
  - and CDP [46-13](#)
  - broadcast traffic [46-12](#)
  - described [46-12](#)
  - IP addresses and subnets [46-13](#)
  - MAC addresses and VLANs [46-13](#)
  - multicast traffic [46-13](#)
  - multiple devices on a port [46-13](#)
  - unicast traffic [46-12](#)
  - usage guidelines [46-13](#)
- traceroute command [46-15](#)
  - See also IP traceroute
- tracked lists
  - configuring [41-3](#)
  - types [41-3](#)
- tracked objects
  - by Boolean expression [41-4](#)
  - by threshold percentage [41-6](#)
  - by threshold weight [41-5](#)
- tracking interface line-protocol state [41-2](#)
- tracking IP routing state [41-2](#)
- tracking objects [41-1](#)
- tracking process [41-1](#)
- track state, tracking IP SLAs [41-9](#)
- traffic
  - blocking flooded [25-8](#)
  - fragmented [33-5](#)
  - fragmented IPv6 [34-2](#)
  - unfragmented [33-5](#)
- traffic policing [1-11](#)
- traffic suppression [25-1](#)
- transmit hold-count
  - see STP
- transparent mode, VTP [13-3, 13-12](#)
- trap-door mechanism [3-2](#)
- traps
  - configuring MAC address notification [6-22](#)
  - configuring managers [32-11](#)
  - defined [32-3](#)
  - enabling [6-22, 32-11](#)
  - notification types [32-11](#)
  - overview [32-1, 32-4](#)
- troubleshooting
  - connectivity problems [46-11, 46-12, 46-14](#)
  - detecting unidirectional links [28-1](#)
  - displaying crash information [46-21](#)
  - PIMv1 and PIMv2 interoperability problems [43-35](#)
  - setting packet forwarding [46-18](#)
  - SFP security and identification [46-10](#)
  - show forward command [46-18](#)
  - with CiscoWorks [32-4](#)
  - with debug commands [46-17](#)
  - with ping [46-11](#)
  - with system message logging [31-1](#)
  - with traceroute [46-14](#)
- trunk failover
  - See link-state tracking
- trunking encapsulation [1-8](#)
- trunk ports
  - configuring [12-21](#)
  - defined [10-3, 12-3](#)
  - encapsulation [12-21, 12-26, 12-27](#)

## trunks

- allowed-VLAN list [12-22](#)
- configuring [12-21, 12-26, 12-27](#)
- ISL [12-16](#)
- load sharing
  - setting STP path costs [12-27](#)
  - using STP port priorities [12-25, 12-26](#)
- native VLAN for untagged traffic [12-24](#)
- parallel [12-27](#)
- pruning-eligible list [12-23](#)
- to non-DTP device [12-18](#)

trusted boundary for QoS [35-38](#)

## trusted port states

- between QoS domains [35-40](#)
- classification options [35-5](#)
- ensuring port security for IP phones [35-38](#)
- support for [1-11](#)
- within a QoS domain [35-35](#)

trustpoints, CA [7-42](#)

## tunneling

- defined [16-1](#)
- IEEE 802.1Q [16-1](#)
- Layer 2 protocol [16-8](#)

## tunnel ports

- described [10-4, 16-1](#)
- IEEE 802.1Q, configuring [16-6](#)
- incompatibilities with other features [16-6](#)

twisted-pair Ethernet, detecting unidirectional links [28-1](#)

## type of service

See ToS

## U

## UDLD

- configuration guidelines [28-4](#)
- default configuration [28-4](#)

## UDLD (continued)

- disabling
    - globally [28-5](#)
    - on fiber-optic interfaces [28-5](#)
    - per interface [28-6](#)
  - echoing detection mechanism [28-2](#)
  - enabling
    - globally [28-5](#)
    - per interface [28-6](#)
  - Layer 2 protocol tunneling [16-10](#)
  - link-detection mechanism [28-1](#)
  - neighbor database [28-2](#)
  - overview [28-1](#)
  - resetting an interface [28-6](#)
  - status, displaying [28-7](#)
  - support for [1-7](#)
- UDP, configuring [37-16](#)
- UDP jitter, configuring [40-8](#)
- UDP jitter operation, IP SLAs [40-8](#)
- unauthorized ports with IEEE 802.1x [9-7](#)
- unicast MAC address filtering [1-6](#)
- and adding static addresses [6-25](#)
  - and broadcast MAC addresses [6-25](#)
  - and CPU packets [6-25](#)
  - and multicast addresses [6-25](#)
  - and router MAC addresses [6-25](#)
  - configuration guidelines [6-25](#)
  - described [6-25](#)
- unicast storm [25-1](#)
- unicast storm control command [25-4](#)
- unicast traffic, blocking [25-8](#)
- UniDirectional Link Detection protocol
- See UDLD

- universal software image
    - cryptographic [1-1](#)
    - feature set
      - advanced IP services [1-2](#)
      - IP base [1-2](#)
      - IP services [1-2](#)
    - noncryptographic [1-1](#)
  - UNIX syslog servers
    - daemon configuration [31-12](#)
    - facilities supported [31-14](#)
    - message logging configuration [31-13](#)
  - unrecognized Type-Length-Value (TLV) support [13-4](#)
  - upgrading software images
    - See downloading
  - UplinkFast
    - described [19-3](#)
    - disabling [19-16](#)
    - enabling [19-15](#)
    - support for [1-7](#)
  - uploading
    - configuration files
      - preparing [B-11](#), [B-14](#), [B-17](#)
      - reasons for [B-9](#)
      - using FTP [B-15](#)
      - using RCP [B-19](#)
      - using TFTP [B-12](#)
    - image files
      - preparing [B-27](#), [B-30](#), [B-35](#)
      - reasons for [B-24](#)
      - using FTP [B-33](#)
      - using RCP [B-38](#)
      - using TFTP [B-29](#)
  - User Datagram Protocol
    - See UDP
  - user EXEC mode [2-2](#)
  - username-based authentication [7-6](#)
- 
- V
    - version-dependent transparent mode [13-4](#)
    - version-mismatch (VM) mode
      - automatic upgrades with auto-upgrade [5-13](#)
      - described [5-12](#)
      - displaying [5-12](#)
      - manual upgrades with auto-advise [5-13](#)
      - upgrades with auto-extract [5-13](#)
    - Virtual Private Network
      - See VPN
    - virtual router [39-1](#), [39-2](#)
    - virtual switches and PAgP [36-6](#)
    - vlan.dat file [12-5](#)
    - VLAN 1
      - disabling on a trunk port [12-22](#)
      - minimization [12-22](#)
    - VLAN ACLs
      - See VLAN maps
    - vlan-assignment response, VMPS [12-29](#)
    - VLAN configuration
      - at bootup [12-8](#)
      - saving [12-8](#)
    - VLAN configuration mode [2-2](#), [12-7](#)
    - VLAN database
      - and startup configuration file [12-8](#)
      - and VTP [13-1](#)
      - VLAN configuration saved in [12-7](#)
      - VLANs saved in [12-4](#)
    - vlan database command [12-7](#)
    - vlan dot1q tag native command [16-5](#)
    - VLAN filtering and SPAN [29-7](#)
    - vlan global configuration command [12-7](#)
    - VLAN ID, discovering [6-27](#)
    - VLAN link state [10-5](#)
    - VLAN load balancing on flex links
      - configuration guidelines [20-8](#)
      - described [20-2](#)
    - VLAN management domain [13-2](#)

## VLAN Management Policy Server

See VMPS

VLAN map entries, order of [33-30](#)

## VLAN maps

applying [33-34](#)

common uses for [33-34](#)

configuration guidelines [33-30](#)

configuring [33-29](#)

creating [33-31](#)

defined [33-2](#)

denying access to a server example [33-34](#)

denying and permitting packets [33-31](#)

displaying [33-40](#)

examples of ACLs and VLAN maps [33-32](#)

removing [33-34](#)

support for [1-9](#)

## VLAN membership

confirming [12-32](#)

modes [12-3](#)

## VLAN Query Protocol

See VQP

## VLANs

adding [12-9](#)

adding to VLAN database [12-9](#)

aging dynamic addresses [17-9](#)

allowed on trunk [12-22](#)

and spanning-tree instances [12-3, 12-6, 12-13](#)

configuration guidelines, extended-range

VLANs [12-13](#)

configuration guidelines, normal-range VLANs [12-6](#)

configuration options [12-7](#)

configuring [12-1](#)

configuring IDs 1006 to 4094 [12-13](#)

connecting through SVIs [10-7](#)

creating in config-vlan mode [12-9](#)

creating in VLAN configuration mode [12-10](#)

customer numbering in service-provider  
networks [16-3](#)

default configuration [12-8](#)

## VLAN (continued)

deleting [12-10](#)

described [10-2, 12-1](#)

displaying [12-16](#)

extended-range [12-1, 12-12](#)

features [1-8](#)

illustrated [12-2](#)

internal [12-13](#)

in the switch stack [12-6](#)

limiting source traffic with RSPAN [29-20](#)

limiting source traffic with SPAN [29-16](#)

modifying [12-9](#)

multicast [23-18](#)

native, configuring [12-24](#)

normal-range [12-1, 12-4](#)

number supported [1-8](#)

parameters [12-5](#)

port membership modes [12-3](#)

static-access ports [12-11](#)

STP and IEEE 802.1Q trunks [17-11](#)

supported [12-2](#)

Token Ring [12-6](#)

traffic between [12-2](#)

VLAN-bridge STP [17-11, 45-2](#)

VTP modes [13-3](#)

## VLAN Trunking Protocol

See VTP

VLAN trunks [12-16](#)

## VMPS

administering [12-33](#)

configuration example [12-34](#)

configuration guidelines [12-30](#)

default configuration [12-30](#)

description [12-28](#)

dynamic port membership

described [12-29](#)

reconfirming [12-32](#)

troubleshooting [12-33](#)

mapping MAC addresses to VLANs [12-28](#)

- VMPS (continued)
  - monitoring [12-33](#)
  - reconfirmation interval, changing [12-32](#)
  - reconfirming membership [12-32](#)
  - retry count, changing [12-32](#)
- voice aware 802.1x security
  - port-based authentication
    - configuring [9-33](#)
    - described [9-21, 9-32](#)
- voice-over-IP [14-1](#)
- voice VLAN
  - Cisco 7960 phone, port connections [14-1](#)
  - configuration guidelines [14-3](#)
  - configuring IP phones for data traffic
    - override CoS of incoming frame [14-6](#)
    - trust CoS priority of incoming frame [14-6](#)
  - configuring ports for voice traffic in
    - IEEE 802.1p priority tagged frames [14-5](#)
    - IEEE 802.1Q frames [14-5](#)
  - connecting to an IP phone [14-4](#)
  - default configuration [14-3](#)
  - described [14-1](#)
  - displaying [14-7](#)
  - IP phone data traffic, described [14-2](#)
  - IP phone voice traffic, described [14-2](#)
- VPN
  - configuring routing in [37-74](#)
  - forwarding [37-68](#)
  - in service provider networks [37-65](#)
  - routes [37-66](#)
- VPN routing and forwarding table
  - See VRF
- VQP [1-8, 12-28](#)
- VRF
  - defining [37-67](#)
  - tables [37-65](#)
- VRF-aware services
  - ARP [37-70](#)
  - configuring [37-70](#)
  - ftp [37-73](#)
  - HSRP [37-71](#)
  - ping [37-70](#)
  - SNMP [37-71](#)
  - syslog [37-72](#)
  - tftp [37-73](#)
  - traceroute [37-72](#)
  - uRPF [37-71](#)
- VRFs, configuring multicast [37-73](#)
- VTP
  - adding a client to a domain [13-14](#)
  - advertisements [12-20, 13-3](#)
  - and extended-range VLANs [13-2](#)
  - and normal-range VLANs [13-2](#)
  - client mode, configuring [13-11](#)
  - configuration
    - global configuration mode [13-7](#)
    - guidelines [13-8](#)
    - privileged EXEC mode [13-7](#)
    - requirements [13-9](#)
    - saving [13-7](#)
    - VLAN configuration mode [13-8](#)
  - configuration mode options [13-7](#)
  - configuration requirements [13-9](#)
  - configuration revision number
    - guideline [13-14](#)
    - resetting [13-15](#)
  - configuring
    - client mode [13-11](#)
    - server mode [13-9](#)
    - transparent mode [13-12](#)
  - consistency checks [13-4](#)
  - default configuration [13-7](#)
  - described [13-1](#)
  - disabling [13-12](#)
  - domain names [13-8](#)

## VTP (continued)

- domains [13-2](#)
- Layer 2 protocol tunneling [16-8](#)
- modes
  - client [13-3, 13-11](#)
  - server [13-3, 13-9](#)
  - transitions [13-3](#)
  - transparent [13-3, 13-12](#)
- monitoring [13-16](#)
- passwords [13-8](#)
- pruning
  - disabling [13-14](#)
  - enabling [13-14](#)
  - examples [13-5](#)
  - overview [13-4](#)
  - support for [1-8](#)
- pruning-eligible list, changing [12-23](#)
- server mode, configuring [13-9](#)
- statistics [13-16](#)
- support for [1-8](#)
- Token Ring support [13-4](#)
- transparent mode, configuring [13-12](#)
- using [13-1](#)
- version, guidelines [13-9](#)
- Version 1 [13-4](#)
- Version 2
  - configuration guidelines [13-9](#)
  - disabling [13-13](#)
  - enabling [13-13](#)
  - overview [13-4](#)

## WCCP (continued)

- dynamic service groups [42-4](#)
- enabling [42-6](#)
- features unsupported [42-5](#)
- forwarding method [42-3](#)
- Layer-2 header rewrite [42-3](#)
- MD5 security [42-4](#)
- message exchange [42-3](#)
- monitoring and maintaining [42-10](#)
- negotiation [42-3](#)
- packet redirection [42-4](#)
- packet-return method [42-3](#)
- redirecting traffic received from a client [42-6](#)
- setting the password [42-7](#)
- unsupported WCCPv2 features [42-5](#)
- web authentication [9-10](#)
  - configuring [9-48 to 9-50, 9-50 to ??](#)
  - described [1-9, 9-22](#)
  - fallback for IEEE 802.1x [9-49](#)
- Web Cache Communication Protocol
  - See WCCP
- weighted tail drop
  - See WTD
- weight thresholds in tracked lists [41-5](#)
- wizards [1-3](#)
- WTD
  - described [35-13](#)
  - setting thresholds
    - egress queue-sets [35-71](#)
    - ingress queues [35-67](#)
  - support for [1-11, 1-12](#)

## W

## WCCP

- authentication [42-4](#)
- configuration guidelines [42-6](#)
- default configuration [42-6](#)
- described [42-2](#)
- displaying [42-10](#)