



Numerics

- 10/100 autonegotiation feature, forced [5-8](#)
- 10-Gigabit Ethernet port
 - deploy with Gigabit Ethernet SFP ports [5-6](#)
- 802.10 SAID (default) [12-4](#)
- 802.1Q
 - trunks [15-6](#)
 - tunneling
 - compatibility with other features [19-5](#)
 - defaults [19-4](#)
 - described [19-2](#)
 - tunnel ports with other features [19-6](#)
- 802.1Q VLANs
 - encapsulation [13-3](#)
 - trunk restrictions [13-5](#)
- 802.1s
 - See MST
- 802.1w
 - See MST
- 802.1X
 - See port-based authentication
- 802.1X authentication
 - for Critical Authentication [30-10](#)
 - for guest VLANs [30-8](#)
 - for MAC Authentication Bypass [30-9](#)
 - for Wake-on-LAN [30-11](#)
 - RADIUS accounting [30-15](#)
 - with port security [30-13](#)
 - with VLAN assignment [30-6](#)
 - with voice VLAN ports [30-18](#)
- 802.3ad
 - See LACP

A

- AAA [32-1](#)
 - 'aaa accounting dot1x default start-stop group radius' command, enable .1X accounting [30-27](#)
 - 'aaa accounting system default start-stop group radius' command, enable .1X accounting [30-27](#)
 - 'aaa authentication dot1x' command, create a .1X AAA authen method list [30-22](#)
 - 'aaa authorization network group radius' command, configure for RADIUS authorization [30-22](#)
 - 'aaa new-model' command, enable AAA [30-22](#)
- allowing VLAN assignment [30-22](#)
- default setting [30-20](#)
- enabling .1X authentication [30-21](#)
- enabling system accounting with .1X accounting [30-17](#)
- logging update/watchdog packets [30-17](#)
- abbreviating commands [2-5](#)
- access control entries
 - See ACEs
- access control entries and lists [32-1](#)
- access list filtering, SPAN enhancement [39-13](#)
- access lists
 - using with WCCP [46-7](#)
- access ports
 - and Layer 2 protocol tunneling [19-9](#)
 - configure port security [31-6, 31-21](#)
 - configuring [13-8](#)
- access VLANs [13-6](#)
- accounting
 - configuring for 802.1X [30-27](#)
 - with TACACS+ [3-16, 3-21](#)
- ACEs
 - ACLs [35-2](#)

- Ethernet [35-2](#)
- IP [35-2](#)
- Layer 4 operation restrictions [35-9](#)
- ACEs and ACLs [32-1](#)
- ACLs
 - ACEs [35-2](#)
 - and SPAN [39-5](#)
 - and TCAM programming [35-6](#)
 - applying on routed packets [35-22](#)
 - applying on switched packets [35-21](#)
 - compatibility on the same switch [35-3](#)
 - configuring with VLAN maps [35-21](#)
 - CPU impact [35-11](#)
 - hardware and software support [35-5](#)
 - IP, matching criteria for port ACLs [35-4](#)
 - MAC extended [35-12](#)
 - matching criteria for router ACLs [35-3](#)
 - port
 - and voice VLAN [35-4](#)
 - defined [35-2](#)
 - limitations [35-4](#)
 - processing [35-11](#)
 - troubleshooting [48-1](#)
 - types supported [35-2](#)
- acronyms, list of [A-1](#)
- active queue management [28-14](#)
- adding members to a community [11-11](#)
- addresses
 - displaying the MAC address table [4-30](#)
 - dynamic
 - changing the aging time [4-21](#)
 - defined [4-19](#)
 - learning [4-20](#)
 - removing [4-22](#)
 - MAC, discovering [4-30](#)
 - See MAC addresses
 - static
 - adding and removing [4-27](#)
 - defined [4-19](#)
- address resolution [4-30](#)
- adjacency tables
 - description [24-2](#)
 - displaying statistics [24-9](#)
- advertisements, VTP
 - See VTP advertisements
- aging time
 - MAC address table [4-21](#)
- alarms
 - major [9-2](#)
 - minor [9-2](#)
- ARP
 - defined [4-30](#)
 - table
 - address resolution [4-30](#)
 - managing [4-30](#)
- asymmetrical links, and 802.1Q tunneling [19-4](#)
- audience [xxix](#)
- authentication
 - NTP associations [4-4](#)
 - See also port-based authentication
 - TACACS+
 - defined [3-16](#)
 - key [3-18](#)
 - login [3-19](#)
- Authentication, Authorization, and Accounting (AAA) [32-1](#)
- Authentication Failed VLAN assignment
 - configure with 802.1X [30-35](#)
- authentication server
 - defined [30-3](#)
 - RADIUS server [30-3](#)
- authoritative time source, described [4-2](#)
- authorization
 - with TACACS+ [3-16, 3-21](#)
- authorized and unauthorized ports [30-4](#)
- authorized ports with 802.1X [30-4](#)
- autoconfiguration [3-2](#)
- automatic discovery

- considerations [11-10](#)
- automatic QoS
 - See QoS
- autonegotiation feature
 - forced 10/100Mbps [5-8](#)
- Auto-QoS
 - configuring [28-17](#)
- auto-sync command [7-7](#)

B

- b [44-3](#)
- BackboneFast
 - adding a switch (figure) [16-3](#)
 - and MST [15-23](#)
 - configuring [16-15](#)
 - link failure (figure) [16-13, 16-14](#)
 - not supported MST [15-23](#)
 - understanding [16-12](#)
 - See also STP
- banners
 - configuring
 - login [4-19](#)
 - message-of-the-day login [4-18](#)
 - default configuration [4-18](#)
 - when displayed [4-17](#)
- b flash command [44-3](#)
- BGP [1-7](#)
 - routing session with multi-VRF CE [27-7](#)
- blocking packets [37-1](#)
- blocking state (STP)
 - RSTP comparisons (table) [15-24](#)
- boot bootldr command [3-31](#)
- boot command [3-27](#)
- boot commands [44-3](#)
- boot fields
 - See configuration register boot fields
- bootstrap program
 - See ROM monitor

- boot system command [3-26, 3-31](#)
- boot system flash command [3-28](#)
- Border Gateway Protocol
 - See BGP
- boundary ports
 - description [15-27](#)
- BPDU Guard
 - and MST [15-23](#)
 - configuring [16-15](#)
 - overview [16-7](#)
- BPDU
 - and media speed [15-2](#)
 - pseudobridges and [15-25](#)
 - what they contain [15-3](#)
- bridge ID
 - See STP bridge ID
- bridge priority (STP) [15-16](#)
- bridge protocol data units
 - See BPDUs
- broadcast storm control
 - disabling [38-4](#)
- BSR
 - configuration example [25-21](#)
- burst rate [28-51](#)
- burst size [28-28](#)

C

- cache engine clusters [xxxi, 46-1](#)
- cache engines [xxxi, 46-1](#)
- cache farms
 - See cache engine clusters
- candidates
 - automatic discovery [11-10](#)
- candidate switch, cluster
 - defined [11-15](#)
 - requirements [11-15](#)
- cautions for passwords
 - encrypting [3-22](#)

CDP

- and trusted boundary [28-26](#)
- automatic discovery in communities [11-10](#)
- configuration [20-2](#)
- displaying configuration [20-3](#)
- enabling on interfaces [20-3](#)
- Layer 2 protocol tunneling [19-7](#)
- maintaining [20-3](#)
- monitoring [20-3](#)
- overview [1-2, 20-1](#)

cdp enable command [20-3](#)

CEF

- adjacency tables [24-2](#)
- and NSF with SSO [8-5](#)
- configuring load balancing [24-7](#)
- displaying statistics [24-8](#)
- enabling [24-6](#)
- hardware switching [24-4](#)
- load balancing [24-6](#)
- overview [24-1](#)
- software switching [24-4](#)

CGMP

- overview [18-1](#)
- channel-group group command [17-7, 17-10](#)

Cisco 7600 series Internet router

- enabling SNMP [47-16](#)

Cisco Discovery Protocol

- See CDP

Cisco Express Forwarding

- See CEF

Cisco Group Management Protocol

- See CGMP

Cisco IOS NSF-aware

- support [8-2](#)

Cisco IOS NSF-capable support [8-2](#)

Cisco IP Phones

- configuring [29-2](#)
- sound quality [29-1](#)

CiscoWorks 2000 [41-4](#)

CIST

- description [15-22](#)

class-map command [28-30](#)

class of service

- See CoS

clear cdp counters command [20-4](#)

clear cdp table command [20-3](#)

clear counters command [5-17](#)

clearing

- IP multicast table entries [25-20](#)

clear ip eigrp neighbors command [23-11](#)

clear ip flow stats command [42-9](#)

CLI

- accessing [2-1](#)
- backing out one level [2-5](#)
- getting commands [2-5](#)
- history substitution [2-3](#)
- managing clusters [11-15](#)
- modes [2-5](#)
- monitoring environments [39-1](#)
- ROM monitor [2-7](#)
- software basics [2-4](#)

clients

- in 802.1X authentication [30-2](#)

clock

- See system clock

clustering switches

- command switch characteristics [11-14, 11-15](#)
- and VTY [11-14](#)
- convert to a community [11-12](#)
- managing
- through CLI [11-15](#)
- overview [11-13](#)
- planning considerations
- CLI [11-15](#)
- passwords [11-11](#)

command-line processing [2-3](#)

command modes [2-5](#)

commands

- b flash [44-3](#)
- boot [44-3](#)
- confreg [44-3](#)
- dev [44-3](#)
- dir device [44-3](#)
- frame [44-5](#)
- i [44-3](#)
- listing [2-5](#)
- meminfo [44-5](#)
- reset [44-3](#)
- ROM monitor [44-2 to 44-3](#)
- ROM monitor debugging [44-5](#)
- SNMP [47-16](#)
- sysret [44-5](#)
- command switch, cluster
 - requirements [11-14](#)
- common and internal spanning tree
 - See CIST
- common spanning tree
 - See CST
- community of switches
 - access modes in Network Assistant [11-11](#)
 - adding devices [11-11](#)
 - candidate characteristics [11-9](#)
 - communication protocols [11-11](#)
 - community name [11-10](#)
 - configuration information [11-11](#)
 - converting from a cluster [11-12](#)
 - host name [11-10](#)
 - passwords [11-11](#)
- community ports [36-4](#)
- community strings
 - configuring [41-7](#)
 - overview [41-4](#)
- community VLANs [36-3, 36-4](#)
 - and SPAN features [36-11](#)
 - configure as a PVLAN [36-12](#)
- compiling MIBs [47-16](#)
- config-register command [3-28](#)
- config terminal command [3-9](#)
- configurable leave timer, IGMP [18-3](#)
- configuration examples
 - SNMP [41-15](#)
- configuration files
 - limiting TFTP server access [41-15](#)
 - obtaining with DHCP [3-6](#)
 - saving [3-10](#)
 - system contact and location information [41-14](#)
- configuration guidelines
 - SNMP [41-6](#)
- configuration register
 - boot fields
 - listing value [3-29](#)
 - modifying [3-28](#)
 - changing from ROM monitor [44-3](#)
 - changing settings [3-28 to 3-29](#)
 - configuring [3-26](#)
 - settings at startup [3-27](#)
- configure terminal command [3-28, 5-2](#)
- confreg command [44-3](#)
- console configuration mode [2-5](#)
- console download [44-4 to 44-5](#)
- console port
 - disconnecting user sessions [6-6](#)
 - monitoring user sessions [6-6](#)
- control plane policing
 - See CoPP
- CoPP
 - applying QoS service policy to control plane [32-3](#)
 - configuring
 - ACLs to match traffic [32-3](#)
 - enabling MLS QoS [32-3](#)
 - packet classification criteria [32-3](#)
 - service-policy map [32-3](#)
 - control plane configuration mode
 - entering [32-3](#)
 - displaying
 - dynamic information [32-7](#)

- number of conforming bytes and packets [32-7](#)
 - rate information [32-7](#)
- entering control plane configuration mode [32-3](#)
- monitoring statistics [32-7](#)
- overview [32-1](#)
- copy running-config startup-config command [3-10](#)
- copy system:running-config nvram:startup-config command [3-31](#)
- CoS
 - configuring port value [28-47](#)
 - definition [28-3](#)
 - figure [28-2](#)
 - overriding on Cisco IP Phones [29-4](#)
 - priority [29-4](#)
- CoS-to-DSCP maps [28-52](#)
- counters
 - clearing MFIB [25-20](#)
 - clearing on interfaces [5-17](#)
- CPU port sniffing [39-10](#)
- Critical Authentication
 - configure with 802.1X [30-32](#)
- CST
 - description [15-25](#)
 - IST and [15-22](#)
 - MST and [15-22](#)
- customer edge devices [27-2](#)

D

- daylight saving time [4-13](#)
- debug commands, ROM monitor [44-5](#)
- default configuration
 - 802.1X [30-20](#)
 - auto-QoS [28-17](#)
 - banners [4-18](#)
 - DNS [4-16](#)
 - IGMP filtering [18-18](#)
 - Layer 2 protocol tunneling [19-9](#)
 - MAC address table [4-21](#)
 - multi-VRF CE [27-4](#)
 - NTP [4-4](#)
 - private VLANs [36-10](#)
 - RMON [43-3](#)
 - SNMP [41-6](#)
 - SPAN and RSPAN [39-6](#)
 - system message logging [40-3](#)
 - system name and prompt [4-15](#)
 - TACACS+ [3-18](#)
- default gateway
 - configuring [3-11](#)
 - verifying configuration [3-11](#)
- default settings, erase command [3-31](#)
- deploying 10-Gigabit Ethernet and a Gigabit Ethernet SFP ports [5-6](#)
- description command [5-10](#)
- detecting unidirectional links [21-1](#)
- dev command [44-3](#)
- DHCP-based autoconfiguration
 - client request message exchange [3-3](#)
 - configuring
 - client side [3-3](#)
 - DNS [3-5](#)
 - relay device [3-5](#)
 - server-side [3-4](#)
 - TFTP server [3-4](#)
- example [3-7](#)
- lease options
 - for IP address information [3-4](#)
 - for receiving the configuration file [3-4](#)
- overview [3-2](#)
- relationship to BOOTP [3-3](#)
- DHCP snooping
 - configuring [33-3](#)
 - default configuration [33-3](#)
 - displaying binding tables [33-10](#)
 - displaying configuration [33-11](#)
 - enabling [33-4](#)
 - enabling on private VLAN [33-6](#)

- enabling the database agent [33-6](#)
- monitoring [33-10, 33-13, 33-14](#)
- overview [33-1](#)
- Snooping database agent [33-2](#)
- DHCP Snooping Database Agent
 - adding to the database (example) [33-9](#)
 - enabling (example) [33-7](#)
 - overview [33-2](#)
 - reading from a TFTP file (example) [33-8](#)
- Diagnostics
 - online [45-1](#)
 - troubleshooting [45-2](#)
 - Power-On-Self-Test
 - causes of failure [45-13](#)
 - how it works [45-3](#)
 - overview [45-3](#)
 - Power-On-Self-Test for Supervisor Engine V-10GE [45-7](#)
- Differentiated Services Code Point values
 - See DSCP values
- DiffServ architecture, QoS [28-2](#)
- Digital optical monitoring transceiver support [5-7](#)
- dir device command [44-3](#)
- disabled state
 - RSTP comparisons (table) [15-24](#)
- disabling
 - broadcast storm control [38-4](#)
- disconnect command [6-6](#)
- discovery, clusters
 - See automatic discovery
- DNS
 - and DHCP-based autoconfiguration [3-5](#)
 - default configuration [4-16](#)
 - displaying the configuration [4-17](#)
 - overview [4-15](#)
 - setting up [4-16](#)
- documentation
 - organization [xxix](#)
 - related [xxxii](#)
- domain names
 - DNS [4-15](#)
- Domain Name System
 - See DNS
- double-tagged packets
 - 802.1Q tunneling [19-2](#)
 - Layer 2 protocol tunneling [19-9](#)
- downloading MIBs [47-14, 47-15](#)
- drop threshold for Layer 2 protocol packets [19-9](#)
- DSCP maps [28-52](#)
- DSCP-to-CoS maps
 - configuring [28-54](#)
- DSCP values
 - configuring maps [28-52](#)
 - configuring port value [28-48](#)
 - definition [28-4](#)
 - IP precedence [28-2](#)
 - mapping markdown [28-24](#)
 - mapping to transmit queues [28-49](#)
- DTP
 - VLAN trunks and [13-3](#)
- duplex command [5-9](#)
- duplex mode
 - configuring interface [5-8](#)
- dynamic ARP inspection
 - ARP cache poisoning [34-2](#)
 - configuring
 - ACLs for non-DHCP environments [34-10](#)
 - in DHCP environments [34-5](#)
 - log buffer [34-14](#)
 - rate limit for incoming ARP packets [34-16](#)
 - denial-of-service attacks, preventing [34-16](#)
 - interface trust state, security coverage [34-3](#)
 - log buffer
 - configuring [34-14](#)
 - logging of dropped packets [34-4](#)
 - overview [34-1](#)
 - port channels, their behavior [34-4](#)
 - priority of static bindings [34-4](#)

purpose of [34-2](#)
 rate limiting of ARP packets [34-4](#)
 configuring [34-16](#)
 validation checks, performing [34-18](#)
 Dynamic Host Configuration Protocol snooping
 See DHCP snooping
 dynamic port VLAN membership
 example [12-26](#)
 limit on hosts [12-25](#)
 reconfirming [12-23](#)
 troubleshooting [12-25](#)
 Dynamic Trunking Protocol
 See DTP

E

EAP frames
 changing retransmission time [30-40](#)
 exchanging (figure) [30-4](#), [30-6](#), [30-10](#)
 request/identity [30-3](#)
 response/identity [30-3](#)
 setting retransmission number [30-41](#)
 EAPOL frames
 802.1X authentication and [30-3](#)
 OTP authentication, example (figure) [30-4](#), [30-6](#), [30-10](#)
 start [30-3](#)
 edge ports
 description [15-27](#)
 EGP
 overview [1-7](#)
 EIGRP (Enhanced IGRP)
 stub routing
 benefits [23-10](#)
 configuration tasks [23-10](#)
 configuring [23-6](#)
 overview [23-6](#)
 restrictions [23-10](#)
 verifying [23-11](#)
 EIGRP (enhanced IGRP)

 overview [1-7](#)
 eigrp stub command [23-11](#)
 Embedded CiscoView
 displaying information [11-26](#)
 installing and configuring [11-24](#)
 overview [11-23](#)
 enable command [3-9](#), [3-28](#)
 enable mode [2-5](#)
 enabling SNMP [47-16](#)
 encapsulation types [13-3](#)
 Enhanced Interior Gateway Routing Protocol
 See EIGRP
 environmental monitoring
 LED indications [9-2](#)
 SNMP traps [9-2](#)
 supervisor engine [9-2](#)
 switching modules [9-2](#)
 using CLI commands [9-1](#)
 EtherChannel
 channel-group group command [17-7](#), [17-10](#)
 configuration guidelines [17-5](#)
 configuring [17-6 to 17-14](#)
 configuring Layer 2 [17-9](#)
 configuring Layer 3 [17-6](#)
 interface port-channel command [17-7](#)
 lacp system-priority
 command example [17-12](#)
 modes [17-3](#)
 overview [17-1](#)
 PAgP
 Understanding [17-3](#)
 physical interface configuration [17-7](#)
 port-channel interfaces [17-2](#)
 port-channel load-balance command [17-12](#)
 removing [17-14](#)
 removing interfaces [17-13](#)
 explicit host tracking
 enabling [18-10](#)
 extended range VLANs

See VLANs

Extensible Authentication Protocol over LAN [30-1](#)

Exterior Gateway Protocol

See EGP

F

FastDrop

clearing entries [25-20](#)

displaying entries [25-19](#)

overview [25-10](#)

FIB

description [24-2](#)

See also MFIB

filtering

in a VLAN [35-14](#)

non-IP traffic [35-12](#)

flags [25-11](#)

Flash memory

configuring router to boot from [3-30](#)

loading system images from [3-30](#)

security precautions [3-30](#)

flooded traffic, blocking [37-2](#)

flow control, configuring [5-11](#)

forward-delay time (STP)

configuring [15-18](#)

forwarding information base

See FIB

frame command [44-5](#)

G

gateway

See default gateway

get-bulk-request operation [41-3](#)

get-next-request operation [41-3, 41-4](#)

get-request operation [41-3, 41-4](#)

get-response operation [41-3](#)

Gigabit Ethernet SFP ports

deploy with 10-Gigabit Ethernet [5-6](#)

global configuration mode [2-5](#)

Guest-VLANs

configure with 802.1X [30-28, 30-36](#)

H

hardware and software ACL support [35-5](#)

hardware switching [24-5](#)

hello time (STP)

configuring [15-17](#)

high CPU, troubleshooting [48-3](#)

history

CLI [2-3](#)

history table, level and number of syslog messages [40-9](#)

hop counts

configuring MST bridges [15-28](#)

host

configuring host statically [18-10](#)

limit on dynamic port [12-25](#)

host ports

kinds of [36-4](#)

Hot Standby Routing Protocol

See HSRP

HSRP

description [1-6](#)

hw-module module num power command [9-17](#)

I

ICMP

enabling [6-11](#)

ping [6-7](#)

running IP traceroute [6-8](#)

time exceeded messages [6-8](#)

i command [44-3](#)

IDS

- using with SPAN and RSPAN [39-2](#)
- IEEE 802.1s
 - See MST
- IEEE 802.1w
 - See MST
- IEEE 802.3ad
 - See LACP
- IGMP
 - configurable leave timer
 - enabling [18-8](#)
 - configurable-leave timer [18-3](#)
 - description [25-3](#)
 - enabling [25-13](#)
 - explicit host tracking [18-4, 18-10](#)
 - immediate-leave processing [18-3](#)
 - overview [18-1](#)
- IGMP filtering
 - configuring [18-18](#)
 - default configuration [18-18](#)
 - described [18-18](#)
 - monitoring [18-21](#)
- IGMP groups
 - setting the maximum number [18-20](#)
- IGMP Immediate Leave
 - configuration guidelines [18-8](#)
- IGMP profile
 - applying [18-19](#)
 - configuration mode [18-18](#)
 - configuring [18-19](#)
- IGMP snooping
 - configuration guidelines [18-4](#)
 - enabling [18-5, 18-6](#)
 - IP multicast and [25-4](#)
 - monitoring [18-13](#)
 - overview [18-1](#)
- IGRP
 - description [1-7](#)
- immediate-leave processing
 - enabling [18-8](#)
- IGMP
 - See fast-leave processing
- ingress packets, SPAN enhancement [39-12](#)
- inline power
 - configuring on Cisco IP phones [29-5](#)
- insufficient inline power handling for Supervisor Engine II-TS [9-15](#)
- Intelligent Power Management [10-4](#)
- interface command [3-9, 5-1](#)
- interface port-channel command [17-7](#)
- interface range command [5-4](#)
- interface range macro command [5-5](#)
- interfaces
 - adding descriptive name [5-10](#)
 - clearing counters [5-17](#)
 - configuring [5-2](#)
 - configuring ranges [5-4](#)
 - displaying information about [5-16](#)
 - Layer 2 modes [13-4](#)
 - maintaining [5-16](#)
 - monitoring [5-16](#)
 - naming [5-10](#)
 - numbers [5-2](#)
 - overview [5-1](#)
 - restarting [5-17](#)
 - See also Layer 2 interfaces
- Interior Gateway Routing Protocol
 - See IGRP
- Internet Control Message Protocol
 - See ICMP
- Internet Group Management Protocol
 - See IGMP
- Inter-Switch Link encapsulation
 - See ISL encapsulation
- Intrusion Detection System
 - See IDS
- IP
 - configuring default gateway [3-11](#)
 - configuring static routes [3-11](#)

- displaying statistics [24-8](#)
- flow switching cache [42-9](#)
- IP addresses
 - cluster candidate or member [11-15](#)
 - cluster command switch [11-14](#)
 - discovering [4-30](#)
- ip cef command [24-6](#)
- IP Enhanced IGRP
 - interfaces, displaying [23-11](#)
- ip flow-aggregation cache destination-prefix command [42-11](#)
- ip flow-aggregation cache prefix command [42-11](#)
- ip flow-aggregation cache source-prefix command [42-12](#)
- ip flow-export command [42-9](#)
- ip icmp rate-limit unreachable command [6-12](#)
- ip igmp profile command [18-18](#)
- ip igmp snooping tcn flood command [18-12](#)
- ip igmp snooping tcn flood query count command [18-12](#)
- ip igmp snooping tcn query solicit command [18-13](#)
- IP information
 - assigned
 - through DHCP-based autoconfiguration [3-2](#)
- ip load-sharing per-destination command [24-7](#)
- ip local policy route-map command [26-5](#)
- ip mask-reply command [6-13](#)
- IP multicast
 - clearing table entries [25-20](#)
 - configuring [25-12](#)
 - default configuration [25-13](#)
 - displaying PIM information [25-15](#)
 - displaying the routing table information [25-16](#)
 - enabling [25-13](#)
 - enabling dense-mode PIM [25-14](#)
 - enabling sparse-mode [25-14](#)
 - features not supported [25-12](#)
 - hardware forwarding [25-8](#)
 - IGMP snooping and [18-4, 25-4](#)
 - monitoring [25-15](#)
 - overview [25-1](#)
 - routing protocols [25-2](#)
 - software forwarding [25-8](#)
 - troubleshooting [48-4](#)
 - See also Auto-RP; IGMP; PIM; RP; RPF
- ip multicast-routing command [25-13](#)
- IP phones
 - automatic classification and queueing [28-17](#)
 - configuring voice ports [29-3](#)
 - See Cisco IP Phones [29-1](#)
 - trusted boundary for QoS [28-26](#)
- ip pim command [25-14](#)
- ip pim dense-mode command [25-14](#)
- ip pim sparse-dense-mode command [25-15](#)
- ip policy route-map command [26-4](#)
- ip redirects command [6-12](#)
- ip route-cache flow command [42-7](#)
- IP routing tables
 - deleting entries [25-20](#)
- IP Source Guard
 - configuring [33-12](#)
 - configuring on private VLANs [33-13](#)
 - displaying [33-13, 33-14](#)
 - overview [33-11](#)
- IP statistics
 - displaying [24-8](#)
- IP traceroute
 - executing [6-8](#)
 - overview [6-8](#)
- IP unicast
 - displaying statistics [24-8](#)
 - troubleshooting [48-10](#)
- ip unreachable command [6-11](#)
- IPX
 - redistribution of route information with EIGRP [1-7](#)
- ISL
 - encapsulation [13-3](#)
 - trunking with 802.1Q tunneling [19-4](#)
- isolated port [36-4](#)
- isolated VLANs [36-3, 36-4](#)

IST

- and MST regions [15-22](#)
- description [15-22](#)
- master [15-27](#)

J

jumbo frames

- and ethernet ports [5-14](#)
- configuring MTU sizes for [5-15](#)
- ports and linecards that support [5-13](#)
- VLAN interfaces [5-14](#)

K

- keyboard shortcuts [2-3](#)

L

- l2protocol-tunnel command [19-11](#)

- labels, definition [28-3](#)

LACP

- system ID [17-4](#)

- Layer 2 access ports [13-8](#)

Layer 2 frames

- classification with CoS [28-2](#)

Layer 2 interfaces

- assigning VLANs [12-8](#)
- configuring [13-5](#)
- configuring as PVLAN host ports [36-16](#)
- configuring as PVLAN promiscuous ports [36-14](#)
- configuring as PVLAN trunk ports [36-17](#)
- defaults [13-5](#)
- disabling configuration [13-9](#)
- modes [13-4](#)
- show interfaces command [13-7](#)

Layer 2 interface type

- resetting [36-21](#)

- setting [36-21](#)

Layer 2 protocol tunneling

- configuring [19-9](#)
- default configuration [19-9](#)
- defined [19-7](#)
- guidelines [19-10](#)

Layer 2 switching

- overview [13-1](#)

Layer 2 Traceroute

- and ARP [6-10](#)
- and CDP [6-9](#)
- host-to-host paths [6-9](#)
- IP addresses and subnets [6-10](#)
- MAC addresses and VLANs [6-10](#)
- multicast traffic [6-10](#)
- multiple devices on a port [6-10](#)
- unicast traffic [1-18, 6-9](#)
- usage guidelines [6-9](#)

Layer 2 trunks

- configuring [13-6](#)
- overview [13-3](#)

Layer 3 packets

- classification methods [28-2](#)

Layer 4 port operations

- configuration guidelines [35-10](#)
- restrictions [35-9](#)

LEDs

- description (table) [9-2](#)

listening state (STP)

- RSTP comparisons (table) [15-24](#)

load balancing

- configuring for CEF [24-7](#)
- configuring for EtherChannel [17-12](#)
- overview [17-5, 24-6](#)
- per-destination [24-7](#)

login authentication

- with TACACS+ [3-19](#)

login banners [4-17](#)

login timer

- changing [6-5](#)
- log messages
 - See system message logging
- logoutwarning command [6-6](#)
- loop guard
 - and MST [15-23](#)
 - configuring [16-4](#)
 - overview [16-3](#)

M

MAC addresses

- aging time [4-21](#)
- allocating [15-5](#)
- and VLAN association [4-20](#)
- building tables [4-20, 13-2](#)
- convert dynamic to sticky secure [31-5](#)
- default configuration [4-21](#)
- discovering [4-30](#)
- displaying [4-30, 6-3](#)
- displaying in DHCP snooping binding table [33-11](#)
- dynamic
 - learning [4-20](#)
 - removing [4-22](#)
- in ACLs [35-12](#)
- static
 - adding [4-28](#)
 - allowing [4-29](#)
 - characteristics of [4-27](#)
 - dropping [4-29](#)
 - removing [4-28](#)
- sticky [31-4](#)
- sticky secure, adding [31-5](#)

MAC Authentication Bypass

- configure with 802.1X [30-31](#)

MAC extended access lists [35-12](#)

macros

- See Smartports macros

main-cpu command [7-7](#)

management options

- SNMP [41-1](#)

mapping

- DSCP markdown values [28-24](#)
- DSCP values to transmit queues [28-49](#)

mapping tables

- configuring DSCP [28-52](#)
- described [28-14](#)

mask destination command [42-11](#)

mask source command [42-11, 42-12](#)

match ip address command [26-3](#)

maximum aging time (STP)

- configuring [15-18](#)

members

- automatic discovery [11-10](#)

member switch

- managing [11-15](#)

member switch, cluster

- defined [11-14](#)
- requirements [11-15](#)

meminfo command [44-5](#)

messages, to users through banners [4-17](#)

metro tags [19-2](#)

MFIB

- CEF [25-5](#)
- displaying [25-18](#)
- overview [25-11](#)

MIBs

- compiling [47-16](#)
- downloading [47-14, 47-15](#)
- overview [41-1](#)
- related information [47-15](#)
- SNMP interaction with [41-4](#)

modules

- checking status [6-1](#)
- powering down [9-17](#)

monitoring

- 802.1Q tunneling [19-12](#)
- ACL information [35-29](#)

IGMP filters [18-21](#)
 IGMP snooping [18-13](#)
 Layer 2 protocol tunneling [19-12](#)
 multi-VRF CE [27-12](#)
 private VLANs [36-21](#)
 traffic flowing among switches [43-1](#)
 tunneling [19-12](#)
 VLAN filters [35-20](#)
 VLAN maps [35-20](#)
 M-record [15-23](#)
 MST
 and multiple spanning trees [1-3, 15-22](#)
 boundary ports [15-27](#)
 BPDUs [15-23](#)
 configuration parameters [15-26](#)
 configuring [15-29](#)
 displaying configurations [15-34](#)
 edge ports [15-27](#)
 enabling [15-29](#)
 hop count [15-28](#)
 instances
 configuring parameters [15-33](#)
 description [15-22](#)
 number supported [15-26](#)
 interoperability with PVST+ [15-23](#)
 link type [15-28](#)
 master [15-27](#)
 message age [15-28](#)
 regions [15-26](#)
 restrictions [15-29](#)
 to-SST interoperability [15-24](#)
 MSTP
 M-record [15-23](#)
 M-tree [15-23](#)
 M-tree [15-23](#)
 MTU size
 configuring [5-15, 5-18, 5-19](#)
 default [12-4](#)
 multicast

 See IP multicast
 multicast packets
 blocking [37-2](#)
 multicast routers
 displaying routing tables [25-16](#)
 flood suppression [18-10](#)
 Multicast Storm Control
 overview [38-6](#)
 suppression on WS-X4014 [38-7](#)
 suppression on WS-X4016 [38-6](#)
 multiple forwarding paths [1-3, 15-22](#)
 Multiple Spanning Tree
 See MST
 multiple VPN routing/forwarding
 See multi-VRF CE
 multi-VRF CE
 components [27-4](#)
 configuration example [27-8](#)
 default configuration [27-4](#)
 defined [27-1](#)
 displaying [27-12](#)
 monitoring [27-12](#)
 network components [27-4](#)
 packet-forwarding process [27-4](#)

N

native VLAN
 and 802.1Q tunneling [19-4](#)
 specifying [13-6](#)
 NetFlow
 aggregation
 minimum mask,default value [42-11](#)
 destination-prefix aggregation
 configuration (example) [42-16](#)
 minimum mask, configuring [42-11](#)
 IP
 flow switching cache [42-9](#)
 prefix aggregation

- configuration (example) [42-14](#)
 - minimum mask, configuring [42-11](#)
- source-prefix aggregation
 - minimum mask, configuring [42-11](#)
- switching
 - checking for required hardware [42-6](#)
 - configuration (example) [42-13](#)
 - configuring switched IP flows [42-8](#)
 - enabling Collection [42-7](#)
 - exporting cache entries [42-9](#)
 - statistics [42-9](#)
- NetFlow statistics
 - caveats on supervisor [42-6](#)
 - checking for required hardware [42-6](#)
 - configuring collection [42-6](#)
 - enabling Collection [42-7](#)
 - exporting cache entries [42-9](#)
 - overview of collection [42-1](#)
 - switched/bridged IP flows [42-8](#)
- Network Assistant
 - and VTY [11-14](#)
 - configure
 - enable communication with switch [11-16, 11-20](#)
 - connect to a device [11-7](#)
 - default configuration [11-4](#)
 - installation requirements [11-2](#)
 - installing [11-5](#)
 - launch [11-7](#)
 - overview of CLI commands [11-4](#)
 - software and hardware requirements [11-2](#)
- network fault tolerance [1-3, 15-22](#)
- network management
 - configuring [20-1](#)
 - RMON [43-1](#)
 - SNMP [41-1](#)
- Network Time Protocol
 - See NTP
- New Software Features in Release 7.7
 - TDR [6-3](#)
- Next Hop Resolution Protocol
 - See NHRP
- NFFC/NFFC II
 - IGMP snooping and [18-4](#)
- NHRP
 - support [1-7](#)
- non-IP traffic filtering [35-12](#)
- non-RPF traffic
 - description [25-9](#)
 - in redundant configurations (figure) [25-10](#)
- Nonstop Forwarding
 - See NSF
- nonvolatile random-access memory
 - See NVRAM
- normal-range VLANs
 - See VLANs
- NSF
 - defined [8-1](#)
 - guidelines and restrictions [8-9](#)
 - operation [8-4](#)
- NSF-aware
 - supervisor engines [8-3](#)
 - support [8-2](#)
- NSF-capable
 - supervisor engines [8-3](#)
 - support [8-2](#)
- NSF with SSO supervisor engine redundancy
 - and CEF [8-5](#)
 - overview [8-4](#)
 - SSO operation [8-4](#)
- NTP
 - associations
 - authenticating [4-4](#)
 - defined [4-2](#)
 - enabling broadcast messages [4-7](#)
 - peer [4-6](#)
 - server [4-6](#)
 - default configuration [4-4](#)
 - displaying the configuration [4-11](#)

- overview [4-2](#)
- restricting access
 - creating an access group [4-9](#)
 - disabling NTP services per interface [4-10](#)
- source IP address, configuring [4-10](#)
- stratum [4-2](#)
- synchronizing devices [4-6](#)
- time
 - services [4-2](#)
 - synchronizing [4-2](#)

NVRAM

- saving settings [3-10](#)

O

OIR

- overview [5-16](#)

Online Diagnostics [45-1](#)

online insertion and removal

- See OIR

Open Shortest Path First

- See OSPF

operating system images

- See system images

OSPF

- area concept [1-8](#)
- description [1-8](#)

P

packets

- modifying [28-16](#)
- software processed
 - and QoS [28-16](#)

packet type filtering

- overview [39-15](#)
- SPAN enhancement [39-15](#)

PAgP

- understanding [17-3](#)

passwords

- configuring enable password [3-14](#)
- configuring enable secret password [3-14](#)
- encrypting [3-22](#)
- in clusters [11-11](#)
- recovering lost enable password [3-24](#)
- setting line password [3-14](#)

PBR (policy-based routing)

- configuration (example) [26-5](#)
- enabling [26-3](#)
- features [26-2](#)
- overview [26-1](#)
- route maps [26-2](#)
- when to use [26-2](#)

PeerResetReason environmental variable

- tracking supervisor engine resets [48-14](#)

per-port and VLAN Access Control List [33-11](#)

per-port per-VLAN QoS

- enabling [28-42](#)
- overview [28-16](#)

Per-VLAN Rapid Spanning Tree [15-6](#)

- enabling [15-20](#)
- overview [15-6](#)

PE to CE routing, configuring [27-7](#)

PIM

- configuring dense mode [25-14](#)
- configuring sparse mode [25-14](#)
- displaying information [25-15](#)
- displaying statistics [25-20](#)
- enabling sparse-dense mode [25-14, 25-15](#)
- overview [25-3](#)

PIM-DM [25-3](#)

PIM-SM [25-3](#)

ping

- executing [6-7](#)
- overview [6-7](#)

ping command [6-7, 25-15](#)

PoE [10-8](#)

- configuring power consumption for single device [10-5](#)
- configuring power consumption for switch [10-5](#)
- power consumption for powered devices
 - Intelligent Power Management [10-4](#)
 - overview [10-4](#)
 - supported cabling topology [10-6](#)
- powering down a module [9-17](#)
- power management modes [10-2](#)
- show interface status [10-7](#)
- point-to-point
 - in 802.1X authentication (figure) [30-2](#), [30-16](#)
- police command [28-34](#)
- policed-DSCP map [28-53](#)
- policers
 - description [28-5](#)
 - types of [28-10](#)
- policies
 - See QoS policies
- policing
 - See QoS policing
- policy-map command [28-30](#), [28-32](#)
- policy maps
 - attaching to interfaces [28-35](#)
 - configuring [28-32](#)
- port ACLs
 - and voice VLAN [35-4](#)
 - defined [35-2](#)
 - limitations [35-4](#)
- Port Aggregation Protocol
 - see PAgP
- port-based authentication
 - 802.1X with voice VLAN [30-18](#)
 - changing the quiet period [30-39](#)
 - client, defined [30-2](#)
 - configuration guidelines [30-21](#)
 - configure 802.1X accounting [30-27](#)
 - configure switch-to-RADIUS server communication [30-24](#)
 - configure with Authentication Failed VLAN assignment [30-35](#)
 - configure with Critical Authentication [30-32](#)
 - configure with Guest-VLANs [30-28](#), [30-36](#)
 - configure with MAC Authentication Bypass [30-31](#)
 - configure with Wake-on-LAN [30-34](#)
 - configuring Guest-VLAN [30-24](#)
 - configuring manual re-authentication of a client [30-42](#)
 - controlling authorization state [30-4](#)
 - default configuration [30-20](#)
 - described [30-1](#)
 - device roles [30-2](#)
 - displaying statistics [30-43](#)
 - enabling [30-21](#)
 - enabling multiple hosts [30-38](#)
 - enabling periodic re-authentication [30-37](#)
 - encapsulation [30-3](#)
 - initiation and message exchange [30-3](#)
 - method lists [30-21](#)
 - ports not supported [30-4](#)
 - resetting to default values [30-43](#)
 - setting retransmission number [30-41](#)
 - setting retransmission time [30-40](#)
 - topologies, supported [30-19](#)
 - using with port security [30-13](#)
 - with Critical Authentication [30-10](#)
 - with Guest VLANs [30-8](#)
 - with MAC Authentication Bypass [30-9](#)
 - with VLAN assignment [30-6](#)
- port-based QoS features
 - See QoS
- port-channel interfaces
 - See also EtherChannel
 - creating [17-6](#)
 - overview [17-2](#)
- port-channel load-balance
 - command [17-12](#)
 - command example [17-12](#)
- port-channel load-balance command [17-12](#)

- port cost (STP)
 - configuring [15-15](#)
- PortFast
 - and MST [15-23](#)
 - BPDU filter, configuring [16-8](#)
 - configuring or enabling [16-15](#)
 - overview [16-5](#)
- PortFast BPDU filtering
 - and MST [15-23](#)
 - enabling [16-8](#)
 - overview [16-8](#)
- port priority
 - configuring MST instances [15-33](#)
 - configuring STP [15-13](#)
- ports
 - blocking [37-1](#)
 - checking status [6-2](#)
 - dynamic VLAN membership
 - example [12-26](#)
 - reconfirming [12-23](#)
 - forwarding, resuming [37-3](#)
 - See also interfaces
- port security
 - aging [31-5](#)
 - and QoS trusted boundary [28-26](#)
 - configuring [31-7](#)
 - displaying [31-26](#)
 - guidelines and restrictions [31-31](#)
 - on access ports [31-6, 31-21](#)
 - on private VLAN [31-13](#)
 - host [31-13](#)
 - promiscuous [31-15](#)
 - topology [31-13, 31-17, 31-31](#)
 - on trunk port [31-16](#)
 - guidelines and restrictions [31-13, 31-17, 31-20, 31-31](#)
 - port mode changes [31-21](#)
 - on voice ports [31-21](#)
 - RADIUS accounting [30-15](#)
 - sticky learning [31-5](#)
 - troubleshooting
 - common system error messages [31-33](#)
 - verifying that an address is secure [31-32](#)
 - using with 802.1X [30-13](#)
 - violations [31-5](#)
 - with 802.1X Authentication [31-30](#)
 - with DHCP and IP Source Guard [31-30](#)
 - with other features [31-31](#)
- port states
 - description [15-5](#)
- port trust state
 - See trust states
- power
 - inline [29-5](#)
- power dc input command [9-14](#)
- power handling for Supervisor Engine II-TS [10-12](#)
- power inline command [10-3](#)
- power inline consumption command [10-5](#)
- power management
 - Catalyst 4500 series [9-3](#)
 - Catalyst 4500 Series power supplies [9-9](#)
 - Catalyst 4948 series [9-17](#)
 - combined mode [9-5](#)
 - configuring combined mode [9-8](#)
 - configuring redundant mode [9-7](#)
 - overview [9-1](#)
 - redundancy [9-3](#)
 - redundant mode [9-5](#)
- Power-On-Self-Test diagnostics [45-3, 45-13](#)
- Power-On-Self-Test for Supervisor Engine V-10GE [45-7](#)
- power redundancy-mode command [9-8](#)
- power supplies
 - fixed [9-4](#)
 - variable [9-4, 9-17](#)
- primary VLANs [36-2, 36-4](#)
 - associating with secondary VLANs [36-13](#)
 - configuring as a PVLAN [36-12](#)
- priority
 - overriding CoS of incoming frames [29-4](#)

- private VLAN
 - configure port security [31-13](#)
 - private VLANs
 - across multiple switches [36-5](#)
 - and SVIs [36-9](#)
 - benefits of [36-2](#)
 - community ports [36-4](#)
 - community VLANs [36-3, 36-4](#)
 - default configuration [36-10](#)
 - end station access to [36-3](#)
 - isolated port [36-4](#)
 - isolated VLANs [36-3, 36-4](#)
 - monitoring [36-21](#)
 - ports
 - community [36-4](#)
 - isolated [36-4](#)
 - promiscuous [36-5](#)
 - primary VLANs [36-2, 36-4](#)
 - promiscuous ports [36-5](#)
 - secondary VLANs [36-3](#)
 - subdomains [36-2](#)
 - traffic in [36-8](#)
 - troubleshooting
 - common system error messages [36-23](#)
 - verifying that an address is secure [36-23](#)
 - privileged EXEC mode [2-5](#)
 - privileges
 - changing default [3-23](#)
 - configuring levels [3-23](#)
 - exiting [3-24](#)
 - logging in [3-23](#)
 - promiscuous ports
 - configuring PVLAN [36-14](#)
 - defined [36-5](#)
 - setting mode [36-21](#)
 - protocol timers [15-4](#)
 - provider edge devices [27-2](#)
 - pruning, VTP
 - See VTP pruning
 - pseudobridges
 - description [15-25](#)
 - PVACL [33-11](#)
 - PVID (port VLAN ID)
 - and 802.1X with voice VLAN ports [30-18](#)
 - PVLAN promiscuous trunk port
 - configuring [36-2, 36-15, 36-18](#)
 - PVLANS
 - 802.1q support [36-12](#)
 - across multiple switches [36-5](#)
 - configuration guidelines [36-10](#)
 - configure port security [31-13, 31-15, 31-17, 31-31](#)
 - configuring [36-9](#)
 - configuring a VLAN [36-12](#)
 - configuring promiscuous ports [36-14](#)
 - host ports
 - configuring a Layer 2 interface [36-16](#)
 - setting [36-21](#)
 - overview [36-1](#)
 - permitting routing, example [36-20](#)
 - promiscuous mode
 - setting [36-21](#)
 - setting
 - interface mode [36-21](#)
-
- ## Q
- QoS
 - allocating bandwidth [28-50](#)
 - and software processed packets [28-16](#)
 - auto-QoS
 - configuration and defaults display [28-20](#)
 - configuration guidelines [28-18](#)
 - described [28-17](#)
 - displaying [28-20](#)
 - effects on NVRAM configuration [28-18](#)
 - enabling for VoIP [28-19](#)
 - basic model [28-5](#)
 - burst size [28-28](#)

- classification [28-6 to 28-10](#)
 - configuration guidelines [28-25](#)
 - auto-QoS [28-18](#)
 - configuring
 - auto-QoS [28-17](#)
 - DSCP maps [28-52](#)
 - traffic shaping [28-51](#)
 - trusted boundary [28-26](#)
 - VLAN-based [28-46](#)
 - configuring UBRL [28-36](#)
 - creating policing rules [28-29](#)
 - default auto configuration [28-17](#)
 - default configuration [28-23](#)
 - definitions [28-3](#)
 - disabling on interfaces [28-35](#)
 - enabling and disabling [28-45](#)
 - enabling on interfaces [28-35](#)
 - enabling per-port per-VLAN [28-42](#)
 - flowcharts [28-8, 28-12](#)
 - IP phones
 - automatic classification and queueing [28-17](#)
 - detection and trusted settings [28-17, 28-26](#)
 - overview [28-1](#)
 - overview of per-port per-VLAN [28-16](#)
 - packet modification [28-16](#)
 - port-based [28-46](#)
 - priority [28-15](#)
 - traffic shaping [28-15](#)
 - transmit rate [28-51](#)
 - trust states
 - trusted device [28-26](#)
 - VLAN-based [28-46](#)
 - See also COS; DSCP values; transmit queues
 - QoS active queue management
 - tracking queue length [28-14](#)
 - QoS labels
 - definition [28-3](#)
 - QoS mapping tables
 - CoS-to-DSCP [28-52](#)
 - DSCP-to-CoS [28-54](#)
 - policed-DSCP [28-53](#)
 - types [28-14](#)
 - QoS marking
 - description [28-5](#)
 - QoS policers
 - burst size [28-28](#)
 - types of [28-10](#)
 - QoS policing
 - definition [28-5](#)
 - described [28-5, 28-10](#)
 - QoS policy
 - attaching to interfaces [28-11](#)
 - overview of configuration [28-29](#)
 - QoS transmit queues
 - allocating bandwidth [28-50](#)
 - burst [28-15](#)
 - configuring [28-49](#)
 - configuring traffic shaping [28-51](#)
 - mapping DHCP values to [28-49](#)
 - maximum rate [28-15](#)
 - overview [28-14](#)
 - sharing link bandwidth [28-15](#)
 - Quality of service
 - See QoS
 - queueing [28-5, 28-14](#)
-
- ## R
- RADIUS server
 - configure to-Switch communication [30-24](#)
 - configuring settings [30-26](#)
 - parameters on the switch [30-24](#)
 - range command [5-4](#)
 - range macros
 - defining [5-5](#)
 - ranges of interfaces
 - configuring [5-4](#)
 - Rapid Spanning Tree

- See RSTP
- rcommand command [11-15](#)
- re-authentication of a client
 - configuring manual [30-42](#)
 - enabling periodic [30-37](#)
- reduced MAC address [15-2](#)
- redundancy
 - configuring [7-7](#)
 - guidelines and restrictions [7-5](#)
 - changes made through SNMP [7-11](#)
 - NSF-aware support [8-2](#)
 - NSF-capable support [8-2](#)
 - overview [7-2](#)
 - redundancy command [7-7](#)
 - understanding synchronization [7-4](#)
- redundancy (NSF) [8-1](#)
 - configuring
 - BGP [8-11](#)
 - CEF [8-11](#)
 - EIGRP [8-16](#)
 - IS-IS [8-14](#)
 - OSPF [8-13](#)
 - routing protocols [8-5](#)
- redundancy (RPR)
 - route processor redundancy [7-3](#)
 - synchronization [7-5](#)
- redundancy (SSO)
 - redundancy command [8-10](#)
 - route processor redundancy [7-3](#)
 - synchronization [7-5](#)
- related documentation [xxxii](#)
- reload command [3-28, 3-29](#)
- Remote Network Monitoring
 - See RMON
- replication
 - description [25-8](#)
- reserved-range VLANs
 - See VLANs
- reset command [44-3](#)
- resetting a switch to defaults [3-31](#)
- restricting access
 - NTP services [4-8](#)
 - TACACS+ [3-15](#)
- retransmission number
 - setting in 802.1X authentication [30-41](#)
- retransmission time
 - changing in 802.1X authentication [30-40](#)
- RFC
 - 1157, SNMPv1 [41-2](#)
 - 1305, NTP [4-2](#)
 - 1757, RMON [43-2](#)
 - 1901, SNMPv2C [41-2](#)
 - 1902 to 1907, SNMPv2 [41-2](#)
 - 2273-2275, SNMPv3 [41-2](#)
- RIP
 - description [1-8](#)
- RMON
 - default configuration [43-3](#)
 - displaying status [43-6](#)
 - enabling alarms and events [43-3](#)
 - groups supported [43-2](#)
 - overview [43-1](#)
- ROM monitor
 - boot process and [3-25](#)
 - CLI [2-7](#)
 - commands [44-2 to 44-3](#)
 - debug commands [44-5](#)
 - entering [44-2](#)
 - exiting [44-6](#)
 - overview [44-1](#)
- root bridge
 - configuring [15-9](#)
 - selecting in MST [15-22](#)
- root guard
 - and MST [15-23](#)
 - enabling [16-2](#)
 - overview [16-2](#)
- routed packets

- ACLs [35-22](#)
- route-map (IP) command [26-3](#)
- route maps
 - defining [26-3](#)
 - PBR [26-2](#)
- router ACLs
 - description [35-2](#)
 - using with VLAN maps [35-21](#)
- route targets
 - VPN [27-4](#)
- Routing Information Protocol
 - See RIP
- RSPAN
 - configuration guidelines [39-16](#)
 - destination ports [39-5](#)
 - IDS [39-2](#)
 - monitored ports [39-4](#)
 - monitoring ports [39-5](#)
 - received traffic [39-3](#)
 - sessions
 - creating [39-17](#)
 - defined [39-3](#)
 - limiting source traffic to specific VLANs [39-23](#)
 - monitoring VLANs [39-22](#)
 - removing source (monitored) ports [39-21](#)
 - specifying monitored ports [39-17](#)
 - source ports [39-4](#)
 - transmitted traffic [39-4](#)
 - VLAN-based [39-5](#)
- RSTP
 - compatibility [15-23](#)
 - description [15-22](#)
 - port roles [15-23](#)
 - port states [15-24](#)
- scheduling [28-14](#)
 - defined [28-5](#)
 - overview [28-6](#)
- secondary root switch [15-12](#)
- secondary VLANs [36-3](#)
 - associating with primary [36-13](#)
 - permitting routing [36-20](#)
- security
 - configuring [32-1](#)
- Security Association Identifier
 - See 802.10 SAID
- sequence numbers in log messages [40-7](#)
- servers, VTP
 - See VTP servers
- service-policy command [28-30](#)
- service-policy input command [22-2, 28-35](#)
- service-provider networks
 - and customer VLANs [19-2](#)
 - Layer 2 protocols across [19-7](#)
- set default interface command [26-4](#)
- set interface command [26-4](#)
- set ip default next-hop command [26-4](#)
- set ip next-hop command [26-4](#)
- set-request operation [41-4](#)
- severity levels, defining in system messages [40-8](#)
- show adjacency command [24-9](#)
- show boot command [3-31](#)
- show catalyst4000 chassis-mac-address command [15-3](#)
- show cdp command [20-2, 20-3](#)
- show cdp entry command [20-4](#)
- show cdp interface command [20-3](#)
- show cdp neighbors command [20-4](#)
- show cdp traffic command [20-4](#)
- show ciscoview package command [11-26](#)
- show ciscoview version command [11-26](#)
- show cluster members command [11-15](#)
- show configuration command [5-10](#)
- show debugging command [20-4](#)
- show environment command [9-2](#)

S

- SAID
 - See 802.10 SAID

- show history command [2-4](#)
- show interfaces command [5-15, 5-16, 5-18, 5-19](#)
- show interfaces status command [6-2](#)
- show ip cache flow aggregation destination-prefix command [42-12](#)
- show ip cache flow aggregation prefix command [42-12](#)
- show ip cache flow aggregation source-prefix command [42-12](#)
- show ip cache flow command [42-9](#)
- show ip cef command [24-8](#)
- show ip eigrp interfaces command [23-11](#)
- show ip eigrp neighbors command [23-11](#)
- show ip eigrp topology command [23-11](#)
- show ip eigrp traffic command [23-11](#)
- show ip interface command [25-15](#)
- show ip local policy command [26-5](#)
- show ip mroute command [25-15](#)
- show ip pim interface command [25-15](#)
- show l2protocol command [19-11](#)
- show mac-address-table address command [6-3](#)
- show mac-address-table interface command [6-3](#)
- show mls entry command [24-8](#)
- show module command [6-1, 15-5](#)
- show PoE consumed [10-8](#)
- show power inline command [10-7](#)
- show power inline consumption command [10-5](#)
- show power supplies command [9-8](#)
- show protocols command [5-17](#)
- show running-config command
 - adding description for an interface [5-10](#)
 - checking your settings [3-9](#)
 - displaying ACLs [35-15, 35-17, 35-24, 35-25](#)
- show startup-config command [3-10](#)
- show users command [6-6](#)
- show version command [3-28, 3-29](#)
- shutdown, command [5-18](#)
- shutdown threshold for Layer 2 protocol packets [19-9](#)
- shutting down
 - interfaces [5-17](#)

Simple Network Management Protocol

See SNMP

single spanning tree

See SST

slot numbers, description [5-2](#)

Smartports macros

applying global parameter values [14-8](#)

applying macros [14-8](#)

applying parameter values [14-9](#)

configuration guidelines [14-6](#)

configuring [14-2](#)

creating [14-8](#)

default configuration [14-4](#)

defined [14-1](#)

displaying [14-13](#)

tracing [14-7](#)

website [14-2](#)

SNMP

accessing MIB variables with [41-4](#)

agent

described [41-4](#)

disabling [41-7](#)

authentication level [41-10](#)

community strings

configuring [41-7](#)

overview [41-4](#)

configuration examples [41-15](#)

configuration guidelines [41-6](#)

default configuration [41-6](#)

enabling [47-16](#)

engine ID [41-6](#)

groups [41-6, 41-9](#)

host [41-6](#)

informs

and trap keyword [41-11](#)

described [41-5](#)

differences from traps [41-5](#)

enabling [41-14](#)

limiting access by TFTP servers [41-15](#)

- limiting system log messages to NMS [40-9](#)
- manager functions [41-3](#)
- notifications [41-5](#)
- overview [41-1](#), [41-4](#)
- status, displaying [41-16](#)
- system contact and location [41-14](#)
- trap manager, configuring [41-13](#)
- traps
 - described [41-3](#), [41-5](#)
 - differences from informs [41-5](#)
 - enabling [41-11](#)
 - enabling MAC address notification [4-22](#)
 - enabling MAC move notification [4-24](#)
 - enabling MAC threshold notification [4-26](#)
 - overview [41-1](#), [41-4](#)
 - types of [41-11](#)
- users [41-6](#), [41-9](#)
- versions supported [41-2](#)
- SNMP commands [47-16](#)
- SNMPv1 [41-2](#)
- SNMPv2C [41-2](#)
- SNMPv3 [41-2](#)
- software
 - upgrading [7-13](#)
- software configuration register [3-26](#)
- software switching
 - description [24-5](#)
 - interfaces [24-6](#)
 - key data structures used [25-7](#)
- SPAN
 - and ACLs [39-5](#)
 - configuration guidelines [39-7](#)
 - configuring [39-6 to 39-10](#)
 - destination ports [39-5](#)
 - IDS [39-2](#)
 - monitored port, defined [39-4](#)
 - monitoring port, defined [39-5](#)
 - received traffic [39-3](#)
 - sessions
 - defined [39-3](#)
 - source ports [39-4](#)
 - transmitted traffic [39-4](#)
 - VLAN-based [39-5](#)
- SPAN and RSPAN
 - concepts and terminology [39-3](#)
 - default configuration [39-6](#)
 - displaying status [39-25](#)
 - overview [39-1](#)
 - session limits [39-6](#)
- SPAN enhancements
 - access list filtering [39-13](#)
 - configuration example [39-15](#)
 - CPU port sniffing [39-10](#)
 - encapsulation configuration [39-12](#)
 - ingress packets [39-12](#)
 - packet type filtering [39-15](#)
- spanning-tree backbonefast command [16-15](#)
- spanning-tree cost command [15-15](#)
- spanning-tree guard root command [16-2](#)
- spanning-tree portfast bpduguard command [16-7](#)
- spanning-tree portfast command [16-6](#)
- spanning-tree port-priority command [15-13](#)
- spanning-tree uplinkfast command [16-11](#)
- spanning-tree vlan
 - command [15-9](#)
 - command example [15-9](#)
- spanning-tree vlan command [15-8](#)
- spanning-tree vlan cost command [15-15](#)
- spanning-tree vlan forward-time command [15-19](#)
- spanning-tree vlan hello-time command [15-17](#)
- spanning-tree vlan max-age command [15-18](#)
- spanning-tree vlan port-priority command [15-13](#)
- spanning-tree vlan priority command [15-17](#)
- spanning-tree vlan root primary command [15-10](#)
- spanning-tree vlan root secondary command [15-12](#)
- speed
 - configuring interface [5-8](#)
- speed command [5-8](#)

- SSO
 - configuring [8-10](#)
- SSO operation [8-4](#)
- SST
 - description [15-22](#)
 - interoperability [15-24](#)
- static addresses
 - See addresses
- static routes
 - configuring [3-11](#)
 - verifying [3-12](#)
- statistics
 - displaying 802.1X [30-43](#)
 - displaying PIM [25-20](#)
 - NetFlow accounting [42-9](#)
 - SNMP input and output [41-16](#)
- sticky learning
 - configuration file [31-5](#)
 - defined [31-5](#)
 - disabling [31-5](#)
 - enabling [31-5](#)
 - saving addresses [31-5](#)
- sticky MAC addresses
 - configuring [31-7](#)
 - defined [31-4](#)
- Storm Control
 - disabling [38-4](#)
 - displaying [38-5](#)
 - enabling [38-3](#)
 - hardware-based, implementing [38-2](#)
 - overview [38-1](#)
- STP
 - bridge ID [15-2](#)
 - configuring [15-7 to 15-20](#)
 - creating topology [15-4](#)
 - defaults [15-6](#)
 - disabling [15-19](#)
 - enabling [15-7](#)
 - enabling extended system ID [15-8](#)
 - enabling Per-VLAN Rapid Spanning Tree [15-20](#)
 - forward-delay time [15-18](#)
 - hello time [15-17](#)
 - Layer 2 protocol tunneling [19-7](#)
 - maximum aging time [15-18](#)
 - overview [15-1, 15-3](#)
 - per-VLAN rapid spanning tree [15-6](#)
 - port cost [15-15](#)
 - port priority [15-13](#)
 - root bridge [15-9](#)
- stratum, NTP [4-2](#)
- stub routing (EIGRP)
 - benefits [23-10](#)
 - configuration tasks [23-10](#)
 - configuring [23-6](#)
 - overview [23-6](#)
 - restrictions [23-10](#)
 - verifying [23-11](#)
- subdomains, private VLAN [36-2](#)
- summer time [4-13](#)
- supervisor engine
 - accessing the redundant [7-14](#)
 - configuring [3-8 to 3-13](#)
 - copying files to standby [7-14](#)
 - default configuration [3-1](#)
 - default gateways [3-11](#)
 - environmental monitoring [9-1](#)
 - redundancy [8-1](#)
 - ROM monitor [3-25](#)
 - startup configuration [3-25](#)
 - static routes [3-11](#)
 - synchronizing configurations [7-11](#)
- Supervisor Engine II-TS
 - insufficient inline power handling [9-15, 10-12](#)
- SVIs
 - and router ACLs [35-3](#)
- switched packets
 - and ACLs [35-21](#)
- Switched Port Analyzer

- See SPAN
- switching, NetFlow
 - checking for required hardware [42-6](#)
 - configuration (example) [42-13](#)
 - configuring switched IP flows [42-8](#)
 - enabling Collection [42-7](#)
 - exporting cache entries [42-9](#)
- switchport
 - show interfaces [5-15, 5-18, 5-19](#)
- switchport access vlan command [13-6, 13-8](#)
- switchport block multicast command [37-2](#)
- switchport block unicast command [37-2](#)
- switchport mode access command [13-8](#)
- switchport mode dot1q-tunnel command [19-6](#)
- switchport mode dynamic command [13-6](#)
- switchport mode trunk command [13-6](#)
- switch ports
 - See access ports
- switchport trunk allowed vlan command [13-6](#)
- switchport trunk encapsulation command [13-6](#)
- switchport trunk encapsulation dot1q command [13-3](#)
- switchport trunk encapsulation isl command [13-3](#)
- switchport trunk encapsulation negotiate command [13-3](#)
- switchport trunk native vlan command [13-6](#)
- switchport trunk pruning vlan command [13-6](#)
- switch-to-RADIUS server communication
 - configuring [30-24](#)
- syslog
 - See system message logging
- syslog messages [9-2](#)
- sysret command [44-5](#)
- system
 - reviewing configuration [3-10](#)
 - settings at startup [3-27](#)
- system clock
 - configuring
 - daylight saving time [4-13](#)
 - manually [4-11](#)
 - summer time [4-13](#)
 - time zones [4-12](#)
 - displaying the time and date [4-12](#)
 - overview [4-1](#)
 - See also NTP
- system images
 - loading from Flash memory [3-30](#)
 - modifying boot field [3-27](#)
 - specifying [3-29](#)
- system message logging
 - default configuration [40-3](#)
 - defining error message severity levels [40-8](#)
 - disabling [40-4](#)
 - displaying the configuration [40-12](#)
 - enabling [40-4](#)
 - facility keywords, described [40-12](#)
 - level keywords, described [40-8](#)
 - limiting messages [40-9](#)
 - message format [40-2](#)
 - overview [40-1](#)
 - sequence numbers, enabling and disabling [40-7](#)
 - setting the display destination device [40-4](#)
 - synchronizing log messages [40-5](#)
 - timestamps, enabling and disabling [40-7](#)
- UNIX syslog servers
 - configuring the daemon [40-10](#)
 - configuring the logging facility [40-11](#)
 - facilities supported [40-12](#)
- system MTU
 - 802.1Q tunneling [19-5](#)
 - maximums [19-5](#)
- system name
 - default configuration [4-15](#)
 - default setting [4-15](#)
 - manual configuration [4-15](#)
 - See also DNS
- system prompt, default setting [4-14, 4-15](#)

T

TACACS+ 32-1

- accounting, defined 3-16
- authentication, defined 3-16
- authorization, defined 3-16
- configuring
 - accounting 3-21
 - authentication key 3-18
 - authorization 3-21
 - login authentication 3-19
- default configuration 3-18
- displaying the configuration 3-22
- identifying the server 3-18
- limiting the services to the user 3-21
- operation of 3-17
- overview 3-15
- tracking services accessed by user 3-21

tagged packets

- 802.1Q 19-3
- Layer 2 protocol 19-7

TCAM programming and ACLs 35-6

TDR

- checking cable connectivity 6-3
- enabling and disabling test 6-3
- guidelines 6-3

Telnet

- accessing CLI 2-2
- disconnecting user sessions 6-6
- executing 6-5
- monitoring user sessions 6-6

telnet command 6-5

Terminal Access Controller Access Control System Plus

- See TACACS+

TFTP

- configuration files in base directory 3-5
- configuring for autoconfiguration 3-4
- limiting access by servers 41-15

TFTP download

- See also console download

time

- See NTP and system clock

Time Domain Reflectometer

- See TDR

time exceeded messages 6-8

timer

- See login timer

timestamps in log messages 40-7

time zones 4-12

Token Ring

- media not supported (note) 12-4, 12-10

TOS

- description 28-4

trace command 6-9

traceroute

- See IP traceroute
- See Layer 2 Traceroute

traceroute mac command 6-10

traceroute mac ip command 6-10

traffic

- blocking flooded 37-2

traffic control

- using ACLs (figure) 35-4
- using VLAN maps (figure) 35-5

traffic shaping 28-15

translational bridge numbers (defaults) 12-4

transmit queues

- See QoS transmit queues

transmit rate 28-51

traps

- configuring MAC address notification 4-22
- configuring MAC move notification 4-24
- configuring MAC threshold notification 4-26
- configuring managers 41-11
- defined 41-3
- enabling 4-22, 4-24, 4-26, 41-11
- notification types 41-11
- overview 41-1, 41-4

troubleshooting

ACLs [48-1](#)high CPU [48-3](#)IP multicast [48-4](#)IP unicast [48-10](#)tracking supervisor engine resets through
PeerResetReason variable [48-14](#)with CiscoWorks [41-4](#)with system message logging [40-1](#)with traceroute [6-8](#)

trunk ports

configure port security [31-16](#)configuring PVLAN [36-17 to 36-18](#)

trunks

802.1Q restrictions [13-5](#)configuring [13-6](#)configuring access VLANs [13-6](#)configuring allowed VLANs [13-6](#)default interface configuration [13-6](#)different VTP domains [13-3](#)enabling to non-DTP device [13-4](#)encapsulation [13-3](#)specifying native VLAN [13-6](#)understanding [13-3](#)trusted boundary for QoS [28-26](#)

trust states

configuring [28-46](#)

tunneling

defined [19-1](#)Layer 2 protocol [19-7](#)

tunnel ports

802.1Q, configuring [19-6](#)described [19-2](#)incompatibilities with other features [19-5](#)

type of service

See TOS

U

UDLD

default configuration [21-2](#)disabling [21-3](#)enabling [21-3](#)overview [21-1](#)unauthorized ports with 802.1X [30-4](#)

unicast

See IP unicast

unicast flood blocking

configuring [37-1](#)

unicast MAC address filtering

and adding static addresses [4-29](#)and broadcast MAC addresses [4-28](#)and CPU packets [4-28](#)and multicast addresses [4-28](#)and router MAC addresses [4-28](#)configuration guidelines [4-28](#)described [4-28](#)

unicast traffic

blocking [37-2](#)

unidirectional ethernet

enabling [22-2](#)example of setting [22-2](#)overview [22-1](#)

UniDirectional Link Detection Protocol

See UDLD

UNIX syslog servers

daemon configuration [40-10](#)facilities supported [40-12](#)message logging configuration [40-11](#)

UplinkFast

and MST [15-23](#)enabling [16-15](#)MST and [15-23](#)overview [16-10](#)

User Based Rate Limiting

configuring [28-37](#)

- overview [28-36](#)
- user EXEC mode [2-5](#)
- user sessions
 - disconnecting [6-6](#)
 - monitoring [6-6](#)

V

VACLs

- Layer 4 port operations [35-9](#)

- virtual configuration register [44-3](#)

virtual LANs

- See VLANs

Virtual Private Network

- See VPN

VLAN ACLs

- See VLAN maps

- vlan command [12-6, 12-7](#)

- vlan database command [12-7](#)

- vlan dot1q tag native command [19-4](#)

- VLAN ID, discovering [4-30](#)

VLAN Management Policy Server

- See VMPS

VLAN maps

- applying [35-17, 35-25](#)
- common uses for [35-18](#)
- configuration example [35-18](#)
- configuration guidelines [35-14](#)
- configuring [35-13](#)
- creating entries [35-15](#)
- defined [35-3](#)
- denying access example [35-19](#)
- denying packets [35-15](#)
- displaying [35-20](#)
- examples [35-19](#)
- order of entries [35-14](#)
- permitting packets [35-15](#)
- router ACLs and [35-21](#)
- using (figure) [35-5](#)

VLANs

- allowed on trunk [13-6](#)
- configuration guidelines [12-3](#)
- configuring [12-4](#)
- customer numbering in service-provider networks [19-3](#)
- default configuration [12-4](#)
- description [1-5](#)
- extended range [12-3](#)
- IDs (default) [12-4](#)
- interface assignment [12-8](#)
- limiting source traffic with RSPAN [39-23](#)
- monitoring with RSPAN [39-22](#)
- name (default) [12-4](#)
- normal range [12-3](#)
- overview [12-1](#)
- reserved range [12-3](#)
- See also PVLANS

VLAN Trunking Protocol

- See VTP

VLAN trunks

- overview [13-3](#)

VMPS

- configuration file example [12-29](#)
- configuring dynamic access ports on client [12-22](#)
- configuring retry interval [12-24](#)
- database configuration file [12-29](#)
- dynamic port membership
 - example [12-26](#)
 - reconfirming [12-23](#)
- reconfirming assignments [12-23](#)
- reconfirming membership interval [12-23](#)
- server overview [12-17](#)

VMPS client

- administering and monitoring [12-24](#)
- configure switch
 - configure reconfirmation interval [12-23](#)
 - dynamic ports [12-22](#)
 - entering IP VMPS address [12-21](#)
 - reconfirmation interval [12-24](#)

- reconfirm VLAN membership [12-23](#)
- default configuration [12-21](#)
- dynamic VLAN membership overview [12-20](#)
- troubleshooting dynamic port VLAN membership [12-25](#)
- VMPS server
 - fall-back VLAN [12-19](#)
 - illegal VMPS client requests [12-20](#)
 - overview [12-17](#)
 - security modes
 - multiple [12-19](#)
 - open [12-18](#)
 - secure [12-19](#)
- voice interfaces
 - configuring [29-1](#)
- Voice over IP
 - configuring [29-1](#)
- voice ports
 - configuring VVID [29-3](#)
- voice traffic [10-1, 29-5](#)
- voice VLAN
 - IP phone data traffic, described [29-2](#)
 - IP phone voice traffic, described [29-2](#)
- voice VLAN ports
 - using 802.1X [30-18](#)
- VPN
 - configuring routing in [27-6](#)
 - forwarding [27-4](#)
 - in service provider networks [27-1](#)
 - routes [27-2](#)
 - routing and forwarding table
 - See VRF
- VRF
 - defining [27-4](#)
 - tables [27-1](#)
- VTP
 - configuration guidelines [12-12](#)
 - configuring [12-13 to 12-17](#)
 - configuring transparent mode [12-16](#)
 - default configuration [12-12](#)
 - disabling [12-16](#)
 - Layer 2 protocol tunneling [19-7](#)
 - monitoring [12-16](#)
 - overview [12-8](#)
 - See also VTP version 2
- VTP advertisements
 - description [12-9](#)
- VTP clients
 - configuring [12-15](#)
- VTP domains
 - description [12-9](#)
- VTP modes [12-9](#)
- VTP pruning
 - enabling [12-13](#)
 - overview [12-10](#)
- VTP servers
 - configuring [12-14](#)
- VTP statistics
 - displaying [12-16](#)
- VTP version 2
 - enabling [12-14](#)
 - overview [12-10](#)
 - See also VTP
- VTY and Network Assistant [11-14](#)
- VVID (voice VLAN ID)
 - and 802.1X authentication [30-18](#)
 - configuring [29-3](#)

W

- Wake-on-LAN
 - configure with 802.1X [30-34](#)
- WCCP
 - configuration examples [46-8](#)
 - configuring on a router [46-2, 46-10](#)
 - features [46-4](#)
 - restrictions [46-5](#)
 - service groups [46-6](#)

Web Cache Communication Protocol

See WCCP [xxxi, 46-1](#)

web caches

See cache engines

web cache services

description [46-4](#)

web caching

See web cache services

See also WCCP

web scaling [46-1](#)

