



INDEX

A

aaa accounting dot1x command [2-1](#)
aaa authentication dot1x command [2-3](#)
AAA methods [2-3](#)
access control entries
 See ACEs
access control lists
 See ACLs
access groups
 IP [2-104](#)
 MAC, displaying [2-397](#)
 matching for QoS classification [2-203](#)
access mode [2-542](#)
access ports [2-542](#)
ACEs [2-64, 2-238](#)
ACLs
 as match criteria for QoS classes [2-203](#)
 deny [2-62](#)
 displaying [2-298](#)
 for non-IP protocols [2-181](#)
 IP [2-104](#)
 on Layer 2 interfaces [2-104](#)
 permit [2-236](#)
action command [2-5](#)
address aliasing [2-224](#)
aggregate policers
 applying [2-243](#)
 creating [2-245](#)
 displaying [2-432](#)
 QoS [2-246](#)
aggregate-port learner [2-230](#)
allowed VLANs [2-558](#)

archive download-sw command [2-7](#)
archive tar command [2-10](#)
archive upload-sw command [2-13](#)
arp access-list command [2-15](#)
attaching policy maps to interfaces [2-280](#)
audience [xvii](#)
authorization state of controlled port [2-70](#)
autonegotiation of duplex mode [2-78](#)

B

backup interfaces
 configuring [2-536](#)
 displaying [2-348](#)
bandwidth, configuring for QoS [2-17](#)
bandwidth command [2-17](#)
boot (boot loader) command [A-2](#)
boot bootlpr command [2-20](#)
boot config-file command [2-21](#)
boot enable-break command [2-22](#)
boot helper command [2-23](#)
boot helper-config file command [2-24](#)
booting
 Cisco IOS image [2-27](#)
 displaying environment variables [2-303](#)
 interrupting [2-22](#)
 manually [2-25](#)
boot loader
 accessing [A-1](#)
 booting
 Cisco IOS image [A-2](#)
 helper image [2-23](#)

boot loader (continued)

- directories
 - creating [A-15](#)
 - displaying a list of [A-7](#)
 - removing [A-19](#)
- displaying
 - available commands [A-12](#)
 - memory heap utilization [A-14](#)
 - version [A-26](#)
- environment variables
 - described [A-20](#)
 - displaying settings [A-20](#)
 - location of [A-21](#)
 - setting [A-20](#)
 - unsettling [A-24](#)
- files
 - copying [A-5](#)
 - deleting [A-6](#)
 - displaying a list of [A-7](#)
 - displaying the contents of [A-4](#), [A-16](#), [A-23](#)
 - renaming [A-17](#)
- file system
 - formatting [A-10](#)
 - initializing flash [A-9](#)
 - running a consistency check [A-11](#)
- loading helper images [A-13](#)
- prompt [A-1](#)
- resetting the system [A-18](#)

boot manual command [2-25](#)
 boot private-config-file command [2-26](#)
 boot system command [2-27](#)
 BPDU filtering, for spanning tree [2-482](#), [2-520](#)
 BPDU guard, for spanning tree [2-484](#), [2-520](#)
 broadcast storm control [2-529](#)
 bundling characteristics, UNI [2-86](#)
 burst bytes, in QoS policers [2-239](#), [2-245](#)

C

cat (boot loader) command [A-4](#)
 caution, description [xviii](#)
 CBWFQ, configuring [2-17](#)
 CDP, enabling protocol tunneling for [2-165](#)
 CFM [2-229](#)
 CFM as OAM protocol [2-229](#)
 channel-group command [2-28](#)
 channel-protocol command [2-32](#)
 child policy maps [2-282](#)
 class-based traffic shaping [2-296](#)
 class-based weighted fair queuing
 See CBWFQ
 class command [2-34](#)
 class-map command [2-36](#)
 class-map configuration mode [2-37](#)
 class maps

- creating [2-36](#)
- defining the match criteria [2-204](#)
- displaying [2-307](#)
- matching in [2-36](#)

- class of service
 See CoS
 clear ip arp inspection log command [2-38](#)
 clear ip arp inspection statistics command [2-39](#)
 clear ipc command [2-42](#)
 clear l2protocol-tunnel counters command [2-43](#)
 clear lacp command [2-44](#)
 clear mac address-table command [2-45](#), [2-46](#)
 clear pagp command [2-47](#)
 clear policer cpu uni counters command [2-48](#)
 clear port-security command [2-49](#)
 clear spanning-tree counters command [2-51](#)
 clear spanning-tree detected-protocols command [2-52](#)
 clear vmps statistics command [2-54](#)
 command modes defined [1-1](#)
 committed information rate in QoS policers [2-239](#), [2-245](#)

configuration, initial
 See also getting started guide and hardware installation guide

configuration files
 password recovery disable considerations [A-1](#)
 specifying the name [2-21, 2-26](#)

configuring multiple interfaces [2-99](#)

conform-action command [2-55](#)

control-plane policer [2-48](#)

control-plane policer information, displaying [2-433](#)

control-plane security [2-248](#)

control plane statistics, clearing [2-48](#)

conventions
 command [xviii](#)
 for examples [xviii](#)
 publication [xviii](#)
 text [xviii](#)

copy (boot loader) command [A-5](#)

CoS
 as match criteria for QoS groups [2-204](#)
 for QoS classification [2-285](#)
 setting value in policy maps [2-285](#)

CoS value, assigning to Layer 2 protocol packets [2-168](#)

CPU ASIC statistics, displaying [2-308](#)

CPU protection policers, displaying [C-21](#)

D

debug backup command [B-2](#)

debug dot1x command [B-3](#)

debug etherchannel command [B-4](#)

debug interface command [B-9](#)

debug ip dhcp snooping command [B-7](#)

debug ip igmp filter command [B-10](#)

debug ip igmp max-groups command [B-11](#)

debug ip igmp snooping command [B-12](#)

debug ip verify source packet command [B-8](#)

debug lacp command [B-13](#)

debug mac-notification command [B-14](#)

debug matm command [B-15](#)

debug matm move update command [B-16](#)

debug monitor command [B-17](#)

debug mvrdbg command [B-18](#)

debug nvram command [B-19](#)

debug pagp command [B-20](#)

debug platform acl command [B-21](#)

debug platform backup interface command [B-23](#)

debug platform cfm command [B-22](#)

debug platform cpu-queues command [B-24](#)

debug platform dot1x command [B-26](#)

debug platform etherchannel command [B-27](#)

debug platform forw-tcam command [B-28](#)

debug platform ip arp inspection command [B-29](#)

debug platform ipc command [B-37](#)

debug platform ip dhcp command [B-30](#)

debug platform ip igmp snooping command [B-31](#)

debug platform ip multicast command [B-33](#)

debug platform led command [B-38](#)

debug platform matm command [B-39](#)

debug platform messaging application command [B-40](#)

debug platform phy command [B-41](#)

debug platform pm command [B-43](#)

debug platform policer cpu uni command [B-45](#)

debug platform port-asic command [B-46](#)

debug platform port-security command [B-47](#)

debug platform qos-acl-tcam command [B-48](#)

debug platform remote-commands command [B-49](#)

debug platform resource-manager command [B-50](#)

debug platform snmp command [B-51](#)

debug platform span command [B-52](#)

debug platform supervisor-asic command [B-53](#)

debug platform sw-bridge command [B-54](#)

debug platform tcam command [B-55](#)

debug platform udd command [B-57](#)

debug platform vlan command [B-58](#)

debug pm command [B-59](#)

debug port-security command [B-61](#)

debug qos-manager command [B-62](#)

- debug spanning-tree bpdu command [B-65](#)
- debug spanning-tree bpdu-opt command [B-66](#)
- debug spanning-tree command [B-63](#)
- debug spanning-tree mstp command [B-67](#)
- debug spanning-tree switch command [B-69](#)
- debug sw-vlan command [B-71](#)
- debug sw-vlan ifs command [B-73](#)
- debug sw-vlan notification command [B-74](#)
- debug udd command [B-76](#)
- debug vqpc command [B-78](#)
- default
 - policer configuration
 - NNIs [C-23](#)
 - UNIs [C-22](#)
- define interface-range command [2-57](#)
- delete (boot loader) command [A-6](#)
- delete command [2-59](#)
- deny (ARP access-list configuration) command [2-60](#)
- deny command [2-62](#)
- detect mechanism, causes [2-79](#)
- DHCP snooping
 - accepting untrusted packets from edge switch [2-129](#)
 - enabling
 - on a VLAN [2-135](#)
 - option 82 [2-127, 2-129](#)
 - trust on an interface [2-133](#)
 - error recovery timer [2-81](#)
 - rate limiting [2-132](#)
- DHCP snooping binding database
 - binding file, configuring [2-125](#)
 - bindings
 - adding [2-123](#)
 - deleting [2-123](#)
 - displaying [2-365](#)
 - clearing database agent statistics [2-40](#)
 - database agent, configuring [2-125](#)
- DHCP snooping (continued)**
 - displaying
 - binding entries [2-365](#)
 - database agent status [2-367, 2-369](#)
 - renewing [2-271](#)
 - differentiated service code point
 - See DSCP
 - dir (boot loader) command [A-7](#)
 - directories, deleting [2-59](#)
 - documentation, related [xviii](#)
 - document conventions [xviii](#)
 - domains, CFM [2-229](#)
 - dot1x default command [2-65](#)
 - dot1x host-mode command [2-66](#)
 - dot1x initialize command [2-67](#)
 - dot1x max-req command [2-68, 2-69](#)
 - dot1x port-control command [2-70](#)
 - dot1x re-authenticate command [2-72](#)
 - dot1x reauthentication command [2-73](#)
 - dot1x system-auth-control command [2-74](#)
 - dot1x timeout command [2-75](#)
 - dropping packets, with ACL matches [2-5](#)
 - drop threshold, Layer 2 protocol tunneling [2-165](#)
 - DSCP
 - as match criteria for QoS groups [2-205, 2-211](#)
 - for QoS traffic marking [2-287](#)
 - setting in policy maps [2-287](#)
 - dual-purpose uplink ports, selecting the type [2-216](#)
 - duplex command [2-77](#)
 - dynamic-access ports
 - configuring [2-534](#)
 - restrictions [2-535](#)
 - dynamic ARP inspection
 - ARP ACLs
 - apply to a VLAN [2-109](#)
 - define [2-15](#)
 - deny packets [2-60](#)
 - display [2-302](#)
 - permit packets [2-234](#)

dynamic ARP inspection (continued)

- clear
 - log buffer [2-38](#)
 - statistics [2-39](#)
- display
 - ARP ACLs [2-302](#)
 - configuration and operating state [2-361](#)
 - log buffer [2-361](#)
 - statistics [2-361](#)
 - trust state and rate limit [2-361](#)
- enable per VLAN [2-119](#)
- error detection for [2-79](#)
- error recovery timer [2-81](#)
- log buffer
 - clear [2-38](#)
 - configure [2-113](#)
 - display [2-361](#)
- rate-limit incoming ARP packets [2-111](#)
- statistics
 - clear [2-39](#)
 - display [2-361](#)
- trusted interface state [2-115](#)
- type of packet logged [2-120](#)
- validation checks [2-117](#)

Dynamic Host Configuration Protocol (DHCP)

See DHCP snooping

E**EAP-request/identity frame**

- maximum number to send [2-69](#)
- response time before retransmitting [2-75](#)

E-LMI

- enabling [2-84](#)

E-LMI mapping [2-86](#)**environment variables, displaying** [2-303](#)**errdisable detect cause command** [2-79](#)**errdisable recovery command** [2-81](#)**error conditions, displaying** [2-331](#)**error disable detection** [2-79](#)**error-disabled interfaces, displaying** [2-348](#)**EtherChannel**

- assigning Ethernet interface to channel group [2-28](#)
- creating port-channel logical interface [2-97](#)
- debug EtherChannel/PAgP, display [B-4](#)
- debug platform-specific events, display [B-27](#)
- displaying [2-335](#)
- enabling Layer 2 protocol tunneling for
 - LACP [2-166](#)
 - PAgP [2-166](#)
 - UDLD [2-166](#)

interface information, displaying [2-348](#)**LACP**

- clearing channel-group information [2-44](#)
- debug messages, display [B-13](#)
- displaying [2-391](#)
- modes [2-28](#)
- port priority for hot-standby ports [2-169](#)
- restricting a protocol [2-32](#)
- system priority [2-171](#)

load-distribution methods [2-252](#)**PAgP**

- aggregate-port learner [2-230](#)
- clearing channel-group information [2-47](#)
- debug messages, display [B-20](#)
- displaying [2-428](#)
- error detection for [2-79](#)
- error recovery timer [2-81](#)
- learn method [2-230](#)
- modes [2-28](#)
- physical-port learner [2-230](#)
- priority of interface for transmitted traffic [2-232](#)

ethernet lmi ce command [2-84](#)**Ethernet controller, internal register display** [2-310](#)**ethernet evc command** [2-83](#)**ethernet lim global command** [2-84](#)**ethernet lmi ce-vlan map command** [2-86, 2-88](#)**ethernet lmi command** [2-84](#)

Ethernet Local Management Interface

See E-LMI

Ethernet service

debugging [B-5](#)

displaying [2-338](#)

Ethernet service instance [2-276](#)

Ethernet service interfaces [2-342](#)

Ethernet statistics, collecting [2-273](#)

Ethernet UNI configuration [2-90](#)

ethernet uni id command [2-92](#)

Ethernet virtual connections

See EVCs

EVC configuration mode [2-83](#)

EVCs [2-83](#)

and VLANs [2-90](#)

service instances [2-276](#)

UNI counts [2-579](#)

EVC service

point-to-multipoint [2-579](#)

point-to-point [2-579](#)

examples, conventions for [xviii](#)

exceed-action command [2-93](#)

extended-range VLANs

and allowed VLAN list [2-558](#)

configuring [2-583](#)

extended system ID for STP [2-490](#)

F

fan information, displaying [2-326](#)

files, deleting [2-59](#)

flash_init (boot loader) command [A-9](#)

Flex Links

configuring [2-536](#)

displaying [2-348](#)

flowcontrol command [2-95](#)

format (boot loader) command [A-10](#)

forwarding packets, with ACL matches [2-5](#)

forwarding results, display [C-6](#)

frame forwarding information, displaying [C-6](#)

fsck (boot loader) command [A-11](#)

G

global configuration mode [1-2, 1-3](#)

H

hardware ACL statistics [2-298](#)

help (boot loader) command [A-12](#)

host connection, port configuration [2-541](#)

host ports, private VLANs [2-545](#)

I

IEEE 802.1ag Connectivity Fault Management

See CFM

IEEE 802.1Q trunk ports and native VLANs [2-588](#)

IEEE 802.1Q tunnel ports

configuring [2-542](#)

displaying [2-321](#)

limitations [2-543](#)

IEEE 802.1x

and switchport modes [2-543](#)

violation error recovery [2-81](#)

See also port-based authentication

IGMP filters

applying [2-138](#)

debug messages, display [B-10](#)

IGMP groups, setting maximum [2-140](#)

IGMP maximum groups, debugging [B-11](#)

IGMP profiles

creating [2-142](#)

displaying [2-372](#)

- IGMP snooping
 - adding ports as a static member of a group [2-157](#)
 - displaying [2-373, 2-377, 2-379](#)
 - enabling [2-144](#)
 - enabling the configurable-leave timer [2-146](#)
 - enabling the Immediate-Leave feature [2-154](#)
 - flooding query count [2-152](#)
 - interface topology change notification behavior [2-153](#)
 - multicast table [2-375](#)
 - querier [2-148](#)
 - query solicitation [2-152](#)
 - report suppression [2-150](#)
 - switch topology change notification behavior [2-152](#)
- images
 - See software images
- Immediate-Leave feature, MVR [2-226](#)
- immediate-leave processing [2-154](#)
- initial configuration
 - See also getting started guide and hardware installation guide
- input policy maps
 - and ACL classification [2-203](#)
 - and aggregate policers [2-246](#)
 - commands not supported in [2-250](#)
 - configuration guidelines [2-250](#)
- interface command [2-102](#)
- interface configuration mode [1-2, 1-4](#)
- interface port-channel command [2-97](#)
- interface range command [2-99](#)
- interface-range macros [2-57](#)
- interfaces
 - assigning Ethernet interface to channel group [2-28](#)
 - configuring [2-77](#)
 - configuring multiple [2-99](#)
 - creating port-channel logical [2-97](#)
 - debug messages, display [B-9](#)
 - disabling [2-471](#)
 - displaying the MAC address table [2-409](#)
 - restarting [2-471](#)
- interface speed, configuring [2-527](#)
- internal registers, displaying [2-310, 2-317](#)
- Internet Group Management Protocol
 - See IGMP
- invalid GBIC
 - error detection for [2-79](#)
 - error recovery timer [2-81](#)
- ip address command [2-107](#)
- IP addresses, setting [2-107](#)
- IP address matching [2-201](#)
- ip arp inspection filter vlan command [2-109](#)
- ip arp inspection limit command [2-111](#)
- ip arp inspection log-buffer command [2-113](#)
- ip arp inspection trust command [2-115](#)
- ip arp inspection validate command [2-117](#)
- ip arp inspection vlan command [2-119](#)
- ip arp inspection vlan logging command [2-120](#)
- IP DHCP snooping
 - See DHCP snooping
- ip dhcp snooping binding command [2-123](#)
- ip dhcp snooping command [2-122](#)
- ip dhcp snooping database command [2-125](#)
- ip dhcp snooping information option allow-untrusted command [2-129](#)
- ip dhcp snooping information option command [2-127](#)
- ip dhcp snooping information option format remote-id command [2-131](#)
- ip dhcp snooping limit rate command [2-132](#)
- ip dhcp snooping trust command [2-133](#)
- ip dhcp snooping verify command [2-134](#)
- ip dhcp snooping vlan command [2-135](#)
- ip dhcp snooping vlan information option format-type circuit-id string command [2-136](#)
- ip igmp filter command [2-138](#)
- ip igmp max-groups command [2-140](#)
- ip igmp profile command [2-142](#)
- ip igmp snooping command [2-144](#)
- ip igmp snooping last-member-query-interval command [2-146](#)
- ip igmp snooping querier command [2-148](#)

ip igmp snooping report-suppression command [2-150](#)
 ip igmp snooping tcn command [2-152](#)
 ip igmp snooping tcn flood command [2-153](#)
 ip igmp snooping vlan immediate-leave command [2-154](#)
 ip igmp snooping vlan mrouter command [2-155](#)
 ip igmp snooping vlan static command [2-157](#)
 IP multicast addresses [2-223](#)
 IP precedence, as match criteria for QoS groups [2-207](#)
 ip source binding command [2-159](#)
 IP source guard
 disabling [2-163](#)
 displaying
 binding entries [2-381](#)
 configuration [2-383](#)
 enabling [2-163](#)
 static IP source bindings [2-159](#)
 IP source guard, displaying dynamic binding entries [2-365](#)
 ip ssh command [2-161](#)
 ip verify source command [2-163](#)

J

jumbo frames
 See MTU

L

l2protocol-tunnel command [2-165](#)
 l2protocol-tunnel cos command [2-168](#)
 LACP
 See EtherChannel
 lacp port-priority command [2-169](#)
 lacp system-priority command [2-171](#)
 Layer 2 mode, enabling [2-532](#)
 Layer 2 protocol ports, displaying [2-389](#)

Layer 2 protocol-tunnel
 error detection for [2-79](#)
 error recovery timer [2-81](#)
 Layer 2 protocol tunnel counters [2-43](#)
 Layer 2 protocol tunneling error recovery [2-166](#)
 Layer 2 traceroute
 IP addresses [2-572](#)
 MAC addresses [2-569](#)
 Layer 3 mode, enabling [2-532](#)
 line configuration mode [1-2, 1-4](#)
 Link Aggregation Control Protocol
 See EtherChannel
 link flap
 error detection for [2-79](#)
 error recovery timer [2-81](#)
 link state group command [2-173](#)
 link state track command [2-175](#)
 load_helper (boot loader) command [A-13](#)
 load-distribution methods for EtherChannel [2-252](#)
 logging event command [2-176](#)
 logging file command [2-177](#)
 logical interface [2-97](#)
 loopback error
 detection for [2-79](#)
 recovery timer [2-81](#)
 loop guard, for spanning tree [2-492, 2-496](#)

M

mac access-group command [2-179](#)
 MAC access-groups, displaying [2-397](#)
 MAC access list configuration mode [2-181](#)
 mac access-list extended command [2-181](#)
 MAC access lists [2-62](#)

MAC addresses

- disabling MAC address learning per VLAN [2-184](#)

- displaying

- aging time [2-403](#)

- all [2-401](#)

- dynamic [2-407](#)

- MAC address-table move updates [2-412](#)

- notification settings [2-411, 2-414](#)

- number of addresses in a VLAN [2-405](#)

- per interface [2-409](#)

- per VLAN [2-418](#)

- static [2-416](#)

- static and dynamic entries [2-399](#)

- dynamic

- aging time [2-183](#)

- deleting [2-45](#)

- displaying [2-407](#)

- enabling MAC address notification [2-188](#)

- enabling MAC address-table move update [2-186](#)

- matching [2-201](#)

- static

- adding and removing [2-190](#)

- displaying [2-416](#)

- dropping on an interface [2-191](#)

- tables [2-401](#)

- MAC address notification, debugging [B-14](#)

- mac address-table aging-time [2-179, 2-201](#)

- mac address-table aging-time command [2-183](#)

- mac address-table learning command [2-184](#)

- mac address-table move update command [2-186](#)

- mac address-table notification command [2-188](#)

- mac address-table static command [2-190](#)

- mac address-table static drop command [2-191](#)

- macro description command [2-195](#)

- macro global command [2-196](#)

- macro global description command [2-198](#)

- macro name command [2-199](#)

macros

- adding a description [2-195](#)

- adding a global description [2-198](#)

- applying [2-196](#)

- creating [2-199](#)

- displaying [2-430](#)

- interface range [2-57, 2-99](#)

- specifying parameter values [2-196](#)

- tracing [2-196](#)

- maintenance end points [2-579](#)

- manual

- audience [xvii](#)

- purpose of [xvii](#)

- mapping tables, QoS [2-565](#)

- maps

- class

- creating [2-36](#)

- VLAN

- creating [2-586](#)

- defining [2-201](#)

- displaying [2-466](#)

- match access-group command [2-203](#)

- match cos command [2-204](#)

- match ip dscp command [2-205](#)

- match ip precedence command [2-207](#)

- match qos-group command [2-209](#)

- match vlan command [2-211](#)

- maximum transmission unit

- See MTU

- mdix auto command [2-214](#)

- media-type command [2-216](#)

- memory (boot loader) command [A-14](#)

- mkdir (boot loader) command [A-15](#)

- mode, MVR [2-223](#)

- modes, commands [1-1](#)

- monitor session command [2-218](#)

- more (boot loader) command [A-16](#)

MSTP

- displaying [2-447](#)
- interoperability [2-52](#)
- link type [2-494](#)
- MST region
 - aborting changes [2-500](#)
 - applying changes [2-500](#)
 - configuration name [2-500](#)
 - configuration revision number [2-500](#)
 - current or pending display [2-500](#)
 - displaying [2-447](#)
 - MST configuration mode [2-500](#)
 - VLANs-to-instance mapping [2-500](#)
- path cost [2-502](#)
- protocol mode [2-498](#)
- restart protocol migration process [2-52](#)
- root port
 - loop guard [2-492](#)
 - preventing from becoming designated [2-492](#)
 - restricting which can be root [2-492](#)
 - root guard [2-492](#)
- root switch
 - affects of extended system ID [2-490](#)
 - hello-time [2-505, 2-516](#)
 - interval between BPDU messages [2-507](#)
 - interval between hello BPDU messages [2-505, 2-516](#)
 - max-age [2-507](#)
 - maximum hop count before discarding BPDU [2-509](#)
 - port priority for selection of [2-511](#)
 - primary or secondary [2-516](#)
 - switch priority [2-514](#)

MSTP (continued)

- state changes
 - blocking to forwarding state [2-522](#)
 - enabling BPDU filtering [2-482, 2-520](#)
 - enabling BPDU guard [2-484, 2-520](#)
 - enabling Port Fast [2-520, 2-522](#)
 - forward-delay time [2-504](#)
 - length of listening and learning states [2-504](#)
 - rapid transition to forwarding [2-494](#)
 - shutting down Port Fast-enabled ports [2-520](#)
 - state information display [2-446](#)
- MTU
- configuring size [2-562](#)
 - displaying global setting [2-454](#)
- multicast group address, MVR [2-226](#)
- multicast groups, MVR [2-224](#)
- multicast router learning method [2-155](#)
- multicast router ports, configuring [2-155](#)
- multicast storm control [2-529](#)
- multicast VLAN, MVR [2-223](#)
- multicast VLAN registration
- See MVR
- multiple hosts on authorized port [2-66](#)
- Multiple Spanning Tree Protocol
- See MSTP
- multiplexing, UNI [2-90](#)
- MVR
- and address aliasing [2-224](#)
 - configuring [2-223](#)
 - configuring interfaces [2-226](#)
 - debug messages, display [B-18](#)
 - displaying [2-422](#)
 - displaying interface information [2-424](#)
 - members, displaying [2-426](#)
- mvr (global configuration) command [2-223](#)
- mvr (interface configuration) command [2-226](#)
- mvr vlan group command [2-227](#)

N

native VLANs [2-558](#)
 native VLAN tagging [2-588](#)
 network node interface [2-254](#)
 nonegotiate, speed [2-527, 2-528](#)
 non-IP protocols
 denying [2-62](#)
 forwarding [2-236](#)
 non-IP traffic access lists [2-181](#)
 non-IP traffic forwarding
 denying [2-62](#)
 permitting [2-236](#)
 normal-range VLANs [2-583](#)
 note, description [xviii](#)
 no vlan command [2-583](#)

O

OAM PDUs [2-88](#)
 OAM protocol [2-229](#)
 oam protocol cfm svlan command [2-229](#)
 operation, administration, and maintenance protocol
 See OAM
 output policy maps
 and QoS group classification [2-209](#)
 and traffic shaping [2-296](#)
 commands not supported in [2-250](#)
 configuration guidelines [2-250](#)
 priority in [2-259](#)
 queue limit in [2-266](#)

P

PAgP
 See EtherChannel
 pagp learn-method command [2-230](#)
 pagp port-priority command [2-232](#)
 parent policy maps [2-283](#)

password-recovery mechanism, enabling and disabling [2-278](#)
 permit (ARP access-list configuration) command [2-234](#)
 permit command [2-236](#)
 per-VLAN spanning-tree plus
 See STP
 physical-port learner [2-230](#)
 PID, displaying [2-359](#)
 PIM-DVMRP, as multicast router learning method [2-155](#)
 police
 multiple conform actions for a class [2-55](#)
 multiple exceed actions for a class [2-93](#)
 with priority [2-239](#)
 police aggregate command [2-243](#)
 police command [2-239](#)
 policer aggregate command [2-245](#)
 policer configuration
 default for NNIs [C-23](#)
 default for UNIs [C-22](#)
 policer cpu uni command [2-248](#)
 policers
 aggregate [2-243, 2-245](#)
 for CPU protection [2-248](#)
 individual [2-239](#)
 policy-map class, configuring multiple actions [2-55, 2-93](#)
 policy-map class configuration mode [2-34](#)
 policy-map class police configuration mode [2-55, 2-241](#)
 policy-map command [2-249](#)
 policy-map configuration mode [2-249](#)
 policy maps
 and CoS classification [2-204](#)
 and DSCP classification [2-205](#)
 and IP precedence classification [2-207](#)
 and policing [2-241](#)
 applying [2-280](#)
 applying to an interface [2-250, 2-280, 2-293](#)
 child [2-282](#)
 creating [2-249](#)
 displaying [2-435](#)

policy maps (continued)

- hierarchical [2-282](#)
- parent [2-283](#)
- policers
 - for a single class [2-239](#)
 - for multiple classes [2-243, 2-245, 2-248, 2-282](#)
- setting priority [2-258](#)
- setting QoS group identifier [2-291](#)
- traffic classification, defining [2-34](#)
- traffic marking
 - setting CoS values [2-285](#)
 - setting DSCP values [2-287](#)
 - setting IP precedence values [2-289](#)

Port Aggregation Protocol

See EtherChannel

port-based authentication

- AAA method list [2-3](#)
- debug messages, display [B-3](#)
- enabling 802.1x
 - globally [2-74](#)
 - per interface [2-70](#)
- host modes [2-66](#)
- IEEE 802.1x AAA accounting methods [2-1](#)
- initialize an interface [2-67](#)
- manual control of authorization state [2-70](#)
- multiple hosts on authorized port [2-66](#)
- periodic re-authentication
 - enabling [2-73](#)
 - time between attempts [2-75](#)
- quiet period between failed authentication exchanges [2-75](#)
- re-authenticating 802.1x-enabled ports [2-72](#)
- resetting configurable 802.1x parameters [2-65](#)
- switch-to-authentication server retransmission time [2-75](#)
- switch-to-client frame-retransmission number [2-68 to 2-69](#)
- switch-to-client retransmission time [2-75](#)

port-channel load-balance command [2-252](#)

Port Fast, for spanning tree [2-522](#)

port ranges, defining [2-57](#)

ports, debugging [B-59](#)

ports, protected [2-556](#)

port security

- aging [2-552](#)
- debug messages, display [B-61](#)
- enabling [2-548](#)
- violation error recovery [2-81](#)

port shaping [2-297](#)

port-type command [2-254](#)

port types, MVR [2-226](#)

power information, displaying [2-326](#)

power-supply dual command [2-256](#)

precedence

- for QoS traffic marking [2-289](#)
- setting in policy maps [2-289](#)

priority command [2-258](#)

priority queuing, QoS [2-258](#)

priority with police, QoS [2-258](#)

private-vlan command [2-261](#)

private-vlan mapping command [2-264](#)

private VLANs

- association [2-554](#)
- configuring [2-261](#)
- configuring ports [2-545](#)
- displaying [2-461](#)
- host ports [2-545](#)
- mapping
 - configuring [2-554](#)
 - displaying [2-348](#)
- promiscuous ports [2-545](#)

privileged EXEC mode [1-2, 1-3](#)

product identification information, displaying [2-359](#)

promiscuous ports, private VLANs [2-545](#)

PVST+

See STP

Q

QoS

aggregate policers

- applying [2-243](#)
- creating [2-245](#)
- displaying [2-432](#)

class maps

- creating [2-36](#)
- defining the match criteria [2-204](#)
- displaying [2-307](#)

displaying statistics for [2-435, C-29](#)

policy maps

- applying an aggregate policer [2-243, 2-245, 2-248, 2-282](#)
- applying to an interface [2-280, 2-293](#)
- creating [2-249](#)
- defining policers [2-239](#)
- displaying policy maps [2-435](#)
- setting CoS values [2-285](#)
- setting DSCP values [2-287](#)
- setting IP precedence values [2-289](#)
- setting QoS group identifier [2-291](#)
- traffic classifications [2-34](#)

table maps

- configuring [2-565](#)
- displaying [2-455](#)

QoS groups

- as match criteria [2-209](#)
- for QoS traffic classification [2-291](#)
- setting in policy maps [2-291](#)

QoS match criteria

- ACLs [2-203](#)
- CoS value [2-204](#)
- DSCP value [2-205, 2-211](#)
- precedence value [2-207](#)
- QoS group number [2-209](#)

quality of service

See QoS

querytime, MVR [2-223](#)

queue-limit command [2-266](#)

R

rapid per-VLAN spanning-tree plus

See STP

rapid PVST+

See STP

re-authenticating 802.1x-enabled ports [2-72](#)

re-authentication

- periodic [2-73](#)
- time between attempts [2-75](#)

receiver ports, MVR [2-226](#)

receiving flow-control packets [2-95](#)

recovery mechanism

- causes [2-81](#)
- display [2-305, 2-329, 2-333](#)
- timer interval [2-81](#)

remote-span command [2-269](#)

Remote Switched Port Analyzer

See RSPAN

rename (boot loader) command [A-17](#)

renew ip dhcp snooping database command [2-271](#)

reset (boot loader) command [A-18](#)

resource templates, displaying [2-444](#)

rmdir (boot loader) command [A-19](#)

rmon collection stats command [2-273](#)

root guard, for spanning tree [2-492](#)

routed ports

- IP addresses on [2-108](#)
- number supported [2-108](#)

RSPAN

- configuring [2-218](#)
- displaying [2-420](#)
- filter RSPAN traffic [2-218](#)
- remote-span command [2-269](#)

RSPAN (continued)

sessions

add interfaces to [2-218](#)displaying [2-420](#)start new [2-218](#)**S**sdm prefer command [2-274](#)

SDM templates

allowed resources [2-275](#)displaying [2-444](#)secure ports, limitations [2-550](#)sending flow-control packets [2-95](#)service instance command [2-276](#)service instances, displaying [2-340](#)service password-recovery command [2-278](#)service policy (policy-map class configuration) command [2-282](#)service-policy interface configuration command [2-280](#)service-policy policy-map class configuration command [2-282](#)set (boot loader) command [A-20](#)set cos command [2-285](#)set dscp command [2-287](#)set precedence command [2-289](#)set qos-group command [2-291](#)setup command [2-293](#)SFPs, displaying information about [2-359](#)shape average command [2-296](#)show access-lists command [2-298](#)show aggregate-policer command [2-455](#)show archive status command [2-301](#)show arp access-list command [2-302](#)show boot command [2-303](#)show class-map command [2-307](#)show controllers cpu-interface command [2-308](#)show controllers ethernet-controller command [2-310](#)show controllers tcam command [2-317](#)show controllers utilization command [2-319](#)show controller utilization command [2-319](#)show dot1q-tunnel command [2-321](#)show dot1x command [2-323](#)show env command [2-326](#)show errdisable detect command [2-329](#)show errdisable flap-values command [2-331](#)show errdisable recovery command [2-333](#)show etherchannel command [2-335](#)show ethernet service evc command [2-338](#)show ethernet service instance command [2-340](#)show ethernet service interface command [2-342](#)show flowcontrol command [2-344](#)show idprom command [2-346](#)show interfaces command [2-348](#)show interfaces counters command [2-357](#)show inventory command [2-359](#)show ip arp inspection command [2-361](#)show ipc command [2-365](#)show ip dhcp snooping binding command [2-365](#)show ip dhcp snooping command [2-364](#)show ip dhcp snooping database command [2-367, 2-369](#)show ip igmp profile command [2-372](#)show ip igmp snooping command [2-373](#)show ip igmp snooping command querier detail [2-379](#)show ip igmp snooping groups command [2-375](#)show ip igmp snooping mrouter command [2-377](#)show ip igmp snooping querier command [2-379](#)show ip igmp snooping querier detail command [2-379](#)show ip source binding command [2-381](#)show ip verify source command [2-383](#)show l2protocol-tunnel command [2-389](#)show lacp command [2-391](#)show link state group command [2-395](#)show mac access-group command [2-397](#)show mac address-table address command [2-401](#)show mac address-table aging time command [2-403](#)show mac address-table command [2-399](#)show mac address-table count command [2-405](#)

- show mac address-table dynamic command [2-407](#)
- show mac address-table interface command [2-409](#)
- show mac address-table learning command [2-411](#)
- show mac address-table move update command [2-412](#)
- show mac address-table notification command [2-46, 2-414, B-16](#)
- show mac address-table static command [2-416](#)
- show mac address-table vlan command [2-418](#)
- show monitor command [2-420](#)
- show mvr command [2-422](#)
- show mvr interface command [2-424](#)
- show mvr members command [2-426](#)
- show pagp command [2-428](#)
- show parser macro command [2-430](#)
- show platform acl command [C-2](#)
- show platform cfm command [C-3](#)
- show platform configuration command [C-4](#)
- show platform etherchannel command [C-5](#)
- show platform forward command [C-6](#)
- show platform igmp snooping command [C-8](#)
- show platform ipc trace command [C-13](#)
- show platform ip multicast command [C-10](#)
- show platform ip unicast command [C-11](#)
- show platform layer4op command [C-14](#)
- show platform mac-address-table command [C-15](#)
- show platform messaging command [C-16](#)
- show platform monitor command [C-17](#)
- show platform mvr table command [C-18](#)
- show platform pm command [C-19](#)
- show platform policer cpu command [C-21](#)
- show platform port-asic command [C-24](#)
- show platform port-security command [C-28](#)
- show platform qos command [C-29](#)
- show platform resource-manager command [C-32](#)
- show platform snmp counters command [C-34](#)
- show platform spanning-tree synchronization command [C-35](#)
- show platform stp-instance command [C-36](#)
- show platform team command [C-37](#)
- show platform vlan command [C-40](#)
- show policer aggregate command [2-432](#)
- show policer cpu uni command [2-433](#)
- show policy-map command [2-435](#)
- show policy-map interface output fields [2-438](#)
- show port security command [2-439](#)
- show port-type command [2-442](#)
- show sdm prefer command [2-444](#)
- show spanning-tree command [2-446](#)
- show storm-control command [2-452](#)
- show system mtu command [2-454](#)
- show udd command [2-457](#)
- show version command [2-459](#)
- show vlan access-map command [2-466](#)
- show vlan command [2-461](#)
- show vlan command, fields [2-463](#)
- show vlan filter command [2-467](#)
- show vmps command [2-468](#)
- shutdown command [2-471](#)
- shutdown threshold, Layer 2 protocol tunneling [2-165](#)
- shutdown vlan command [2-472](#)
- SNMP host, specifying [2-476](#)
- SNMP informs, enabling the sending of [2-473](#)
- snmp-server enable traps command [2-473](#)
- snmp-server host command [2-476](#)
- snmp trap mac-notification command [2-480](#)
- SNMP traps
 - enabling MAC address notification trap [2-480](#)
 - enabling the MAC address notification feature [2-188](#)
 - enabling the sending of [2-473](#)
- software images
 - deleting [2-59](#)
 - downloading [2-7](#)
 - upgrading [2-7](#)
 - uploading [2-13](#)
- software version, displaying [2-459](#)
- source ports, MVR [2-226](#)

SPAN

- configuring [2-218](#)
- debug messages, display [B-17](#)
- displaying [2-420](#)
- filter SPAN traffic [2-218](#)
- sessions
 - add interfaces to [2-218](#)
 - displaying [2-420](#)
 - start new [2-218](#)

spanning-tree bpdupfilter command [2-482](#)

spanning-tree bpduguard command [2-484](#)

spanning-tree cost command [2-486](#)

spanning-tree etherchannel command [2-488](#)

spanning-tree extend system-id command [2-490](#)

spanning-tree guard command [2-492](#)

spanning-tree link-type command [2-494](#)

spanning-tree loopguard default command [2-496](#)

spanning-tree mode command [2-498](#)

spanning-tree mst configuration command [2-500](#)

spanning-tree mst cost command [2-502](#)

spanning-tree mst forward-time command [2-504](#)

spanning-tree mst hello-time command [2-505](#)

spanning-tree mst max-age command [2-507](#)

spanning-tree mst max-hops command [2-509](#)

spanning-tree mst port-priority command [2-511](#)

spanning-tree mst pre-standard command [2-513](#)

spanning-tree mst priority command [2-514](#)

spanning-tree mst root command [2-516](#)

spanning-tree portfast (global configuration) command [2-520](#)

spanning-tree portfast (interface configuration) command [2-522](#)

spanning-tree port-priority command [2-518](#)

Spanning Tree Protocol

See STP

spanning-tree vlan command [2-524](#)

speed command [2-527](#)

SSH, configuring version [2-161](#)

static-access ports, configuring [2-534](#)

statistics, Ethernet group [2-273](#)

sticky learning, enabling [2-548](#)

storm-control command [2-529](#)

STP

counters, clearing [2-51](#)

debug messages, display

MSTP [B-67](#)

optimized BPDUs handling [B-66](#)

spanning-tree activity [B-63](#)

switch shim [B-69](#)

transmitted and received BPDUs [B-65](#)

enabling protocol tunneling for [2-165](#)

EtherChannel misconfiguration [2-488](#)

extended system ID [2-490](#)

path cost [2-486](#)

protocol modes [2-498](#)

root port

loop guard [2-492](#)

preventing from becoming designated [2-492](#)

restricting which can be root [2-492](#)

root guard [2-492](#)

root switch

affects of extended system ID [2-490, 2-525](#)

hello-time [2-524](#)

interval between BDPU messages [2-524](#)

interval between hello BPDU messages [2-524](#)

max-age [2-524](#)

port priority for selection of [2-518](#)

primary or secondary [2-524](#)

switch priority [2-524](#)

state changes

blocking to forwarding state [2-522](#)

enabling BPDU filtering [2-482, 2-520](#)

enabling BPDU guard [2-484, 2-520](#)

enabling Port Fast [2-520, 2-522](#)

enabling timer to recover from error state [2-81](#)

forward-delay time [2-524](#)

length of listening and learning states [2-524](#)

shutting down Port Fast-enabled ports [2-520](#)

STP (continued)

- state information display [2-446](#)
- VLAN options [2-514, 2-524](#)
- SVIs, creating [2-102](#)
- Switched Port Analyzer
 - See SPAN
- switching characteristics
 - modifying [2-532](#)
 - returning to interfaces [2-532](#)
- switchport access command [2-534](#)
- switchport backup interface command [2-536](#)
- switchport block command [2-539](#)
- switchport command [2-532](#)
- switchport host command [2-541](#)
- switchport mode command [2-542](#)
- switchport mode private-vlan command [2-545](#)
- switchport port-security aging command [2-552](#)
- switchport port-security command [2-548](#)
- switchport private-vlan command [2-554](#)
- switchport protected command [2-556](#)
- switchports, displaying [2-348](#)
- switchport trunk command [2-558](#)
- system env temperature threshold yellow command [2-560](#)
- system message logging, save message to flash [2-177](#)
- system mtu command [2-562](#)
- system resource templates [2-274](#)

T

- table-map command [2-565](#)
- table-map configuration mode [2-565](#)
- table maps
 - configuring [2-565](#)
 - displaying [2-455](#)
 - QoS [2-565](#)
- tar files, creating, listing, and extracting [2-10](#)
- TDR, running [2-567](#)
- temperature information, displaying [2-326](#)
- templates, system resources [2-274](#)
- test cable-diagnostics tdr command [2-567](#)
- traceroute mac command [2-569](#)
- traceroute mac ip command [2-572](#)
- traffic shaping, QoS [2-296](#)
- trunking, VLAN mode [2-542](#)
- trunk mode [2-542](#)
- trunk ports [2-542](#)
- tunnel ports, Layer 2 protocol, displaying [2-389](#)
- type (boot loader) command [A-23](#)

U**UDLD**

- aggressive mode [2-574, 2-576](#)
- debug messages, display [B-76](#)
- enable globally [2-574](#)
- enable per interface [2-576](#)
- error recovery timer [2-81](#)
- message timer [2-574](#)
- normal mode [2-574, 2-576](#)
- reset a shutdown interface [2-578](#)
- status [2-457](#)

- udld command [2-574](#)
- udld port command [2-576](#)
- udld reset command [2-578](#)

UNI

- bundling and multiplexing [2-90](#)
- Ethernet [2-90](#)

- unicast storm control [2-529](#)

- uni count command [2-579](#)

UniDirectional Link Detection

- See UDLD

- UNI ID, Ethernet [2-92](#)

- uni-vlan command [2-581](#)

- unknown multicast traffic, preventing [2-539](#)

- unknown unicast traffic, preventing [2-539](#)

- unset (boot loader) command [A-24](#)

upgrading

- software images [2-7](#)
- monitoring status of [2-301](#)

upgrading information

See release notes

user EXEC mode [1-2](#)

user network interface [2-254](#)

V

version (boot loader) command [A-26](#)

vlan access-map command [2-586](#)

VLAN access map configuration mode [2-586](#)

VLAN access maps

- actions [2-5](#)
- displaying [2-466](#)

vlan command [2-583](#)

VLAN configuration mode

- commands [2-583](#)
- description [1-4](#)
- entering [2-583](#)
- summary [1-2](#)

vlan dot1q tag native command [2-588](#)

vlan filter command [2-590](#)

VLAN filters, displaying [2-467](#)

VLAN ID range [2-583](#)

VLAN maps

- applying [2-590](#)
- creating [2-586](#)
- defining [2-201](#)
- displaying [2-466](#)

VLAN Query Protocol

See VQP

VLANs

- adding [2-583](#)
- configuring [2-583](#)
- debug messages, display
 - activation of [B-74](#)
 - VLAN IOS file system error tests [B-73](#)
 - VLAN manager activity [B-71](#)
- displaying configurations [2-461](#)
- extended-range [2-583](#)
- MAC addresses
 - displaying [2-418](#)
 - number of [2-405](#)
- normal-range [2-583](#)
- private [2-545](#)
 - configuring [2-261](#)
 - displaying [2-461](#)
 - See also private VLANs
- restarting [2-472](#)
- saving the configuration [2-583](#)
- shutting down [2-472](#)
- suspending [2-472](#)

VMPS

- configuring servers [2-595](#)
- displaying [2-468](#)
- error recovery timer [2-81](#)
- reconfirming dynamic VLAN assignments [2-592](#)
- vmmps reconfirm (global configuration) command [2-593](#)
- vmmps reconfirm (privileged EXEC) command [2-592](#)
- vmmps retry command [2-594](#)
- vmmps server command [2-595](#)

VQP

- and dynamic-access ports [2-535](#)
- clearing client statistics [2-54](#)
- displaying information [2-468](#)
- per-server retry count [2-594](#)
- reconfirmation interval [2-593](#)
- reconfirming dynamic VLAN assignments [2-592](#)
- VTP, enabling tunneling for [2-165](#)

W

Weighted Tail Drop

See WTD

WTD, queue-limit command [2-266](#)

