



INDEX

A

- abbreviating commands [2-4](#)
- AC (command switch) [5-9](#)
- access-class command [29-34](#)
- access control entries
 - See ACEs
- access-denied response, VMPS [12-24](#)
- access groups, applying IPv4 ACLs to interfaces [29-35](#)
- accessing
 - clusters, switch [5-12](#)
 - command switches [5-10](#)
 - member switches [5-12](#)
 - switch clusters [5-12](#)
- access lists
 - See ACLs
- access ports
 - in switch clusters [5-8](#)
- access ports, defined [10-2](#)
- accounting
 - with 802.1x [9-32](#)
 - with IEEE 802.1x [9-9](#)
 - with RADIUS [8-28](#)
 - with TACACS+ [8-11, 8-17](#)
- ACEs
 - and QoS [31-6](#)
 - defined [29-20](#)
 - Ethernet [29-20](#)
 - IP [29-20](#)

ACLs

- ACEs [29-20](#)
- any keyword [29-27](#)
- applying
 - time ranges to [29-32](#)
 - to an interface [29-34](#)
 - to QoS [31-6](#)
- classifying traffic for QoS [31-40](#)
- comments in [29-33](#)
- compiling [29-35](#)
- defined [29-19, 29-23](#)
- examples of [29-35, 31-40](#)
- extended IP, configuring for QoS classification [31-41](#)
- extended IPv4
 - creating [29-26](#)
 - matching criteria [29-23](#)
- hardware and software handling [29-35](#)
- host keyword [29-28](#)
- IP
 - creating [29-23](#)
 - fragments and QoS guidelines [31-31](#)
 - implicit deny [29-25, 29-29, 29-31](#)
 - implicit masks [29-25](#)
 - matching criteria [29-23](#)
 - undefined [29-35](#)
- IPv4
 - applying to interfaces [29-34](#)
 - creating [29-23](#)
 - matching criteria [29-23](#)
 - named [29-30](#)
 - numbers [29-24](#)
 - terminal lines, setting on [29-34](#)
 - unsupported features [29-22](#)

ACLs (continued)

- MAC extended [29-37, 31-42](#)
 - matching [29-23, 29-35](#)
 - monitoring [29-40](#)
 - named, IPv4 [29-30](#)
 - number per QoS class map [31-31](#)
 - QoS [31-6, 31-40](#)
 - resequencing entries [29-30](#)
 - standard IP, configuring for QoS classification [31-40](#)
 - standard IPv4
 - creating [29-25](#)
 - matching criteria [29-23](#)
 - support for [1-8](#)
 - support in hardware [29-35](#)
 - time ranges [29-32](#)
 - unsupported features, IPv4 [29-22](#)
- active link [18-4, 18-5, 18-6](#)
- active links [18-2](#)
- active traffic monitoring, IP SLAs [30-1](#)
- address aliasing [20-2](#)
- addresses
 - displaying the MAC address table [6-26](#)
 - dynamic
 - accelerated aging [15-8](#)
 - changing the aging time [6-21](#)
 - default aging [15-8](#)
 - defined [6-19](#)
 - learning [6-20](#)
 - removing [6-22](#)
 - MAC, discovering [6-26](#)
 - multicast, STP address management [15-8](#)
 - static
 - adding and removing [6-24](#)
 - defined [6-19](#)
- address resolution [6-26](#)
- Address Resolution Protocol
- See ARP

- advertisements
 - CDP [22-1](#)
 - LLDP [23-2](#)
 - VTP [12-16, 13-3](#)
- aggregatable global unicast addresses [32-3](#)
- aggregated ports
 - See EtherChannel
- aggregate policers [31-48](#)
- aggregate policing [1-10](#)
- aging, accelerating [15-8](#)
- aging time
 - accelerated
 - for MSTP [16-23](#)
 - for STP [15-8, 15-21](#)
 - MAC address table [6-21](#)
 - maximum
 - for MSTP [16-23, 16-24](#)
 - for STP [15-21, 15-22](#)
- alarms, RMON [26-3](#)
- allowed-VLAN list [12-18](#)
- ARP
 - defined [1-5, 6-26](#)
 - table
 - address resolution [6-26](#)
 - managing [6-26](#)
- attributes, RADIUS
 - vendor-proprietary [8-31](#)
 - vendor-specific [8-29](#)
- audience [xxxi](#)
- authentication
 - local mode with AAA [8-32](#)
 - NTP associations [6-4](#)
 - RADIUS
 - key [8-21](#)
 - login [8-23](#)

authentication (continued)

TACACS+

defined [8-11](#)key [8-13](#)login [8-14](#)

See also port-based authentication

authentication failed VLAN

See restricted VLAN

authoritative time source, described [6-2](#)

authorization

with RADIUS [8-27](#)with TACACS+ [8-11, 8-16](#)authorized ports with IEEE 802.1x [9-8](#)autoconfiguration [3-3](#)

automatic discovery

considerations

beyond a noncandidate device [5-7](#)brand new switches [5-8](#)connectivity [5-4](#)different VLANs [5-6](#)management VLANs [5-7](#)non-CDP-capable devices [5-6](#)noncluster-capable devices [5-6](#)in switch clusters [5-4](#)

See also CDP

automatic QoS

See QoS

automatic recovery, clusters [5-9](#)

See also HSRP

auto-MDIX

configuring [10-15](#)described [10-15](#)

autonegotiation

duplex mode [1-3](#)interface configuration guidelines [10-12](#)mismatches [35-11](#)autosensing, port speed [1-3](#)

auxiliary VLAN

See voice VLAN

availability, features [1-6](#)**B**

BackboneFast

described [17-5](#)disabling [17-14](#)enabling [17-13](#)support for [1-6](#)

backup interfaces

See Flex Links

backup links [18-2](#)

banners

configuring

login [6-19](#)message-of-the-day login [6-18](#)default configuration [6-17](#)when displayed [6-17](#)Berkeley r-tools replacement [8-44](#)

binding database

DHCP snooping

See DHCP snooping binding database

bindings

DHCP snooping database [19-5](#)

binding table, DHCP snooping

See DHCP snooping binding database

blocking packets [21-7](#)

booting

boot loader, function of [3-2](#)boot process [3-1](#)manually [3-17](#)specific image [3-18](#)

boot loader

accessing [3-18](#)described [3-2](#)environment variables [3-18](#)

boot loader (continued)

- prompt [3-18](#)
- trap-door mechanism [3-2](#)

BPDU

- error-disabled state [17-2](#)
- filtering [17-3](#)
- RSTP format [16-12](#)

BPDU filtering

- described [17-3](#)
- disabling [17-12](#)
- enabling [17-12](#)
- support for [1-7](#)

BPDU guard

- described [17-2](#)
- disabling [17-12](#)
- enabling [17-11](#)
- support for [1-7](#)

bridge protocol data unit

See BPDU

broadcast storm-control command [21-4](#)**broadcast storms [21-1](#)**

C**cables, monitoring for unidirectional links [24-1](#)****candidate switch**

- automatic discovery [5-4](#)
- defined [5-3](#)
- requirements [5-3](#)

See also command switch, cluster standby group, and member switch

CA trustpoint

- configuring [8-40](#)
- defined [8-38](#)

caution, described [xxxii](#)**CDP**

- and trusted boundary [31-36](#)
- automatic discovery in switch clusters [5-4](#)
- configuring [22-2](#)
- default configuration [22-2](#)
- defined with LLDP [23-1](#)
- described [22-1](#)
- disabling for routing device [22-3 to 22-4](#)
- enabling and disabling
 - on an interface [22-4](#)
 - on a switch [22-3](#)
- monitoring [22-4](#)
- overview [22-1](#)
- support for [1-5](#)
- transmission timer and holdtime, setting [22-2](#)
- updates [22-2](#)

CGMP

- as IGMP snooping learning method [20-8](#)
- joining multicast group [20-3](#)

CipherSuites [8-39](#)**Cisco 7960 IP Phone [14-1](#)****Cisco Discovery Protocol**

See CDP

Cisco IOS File System

See IFS

Cisco IOS IP Service Level Agreements (SLAs) responder [1-4](#)**Cisco IOS IP SLAs [30-1](#)****Cisco Network Assistant**

See Network Assistant

CiscoWorks 2000 [1-4, 28-4](#)**CIST regional root**

See MSTP

CIST root

See MSTP

civic location [23-3](#)

- class maps for QoS
 - configuring [31-43](#)
 - described [31-7](#)
 - displaying [31-68](#)
- class of service
 - See CoS
- clearing interfaces [10-19](#)
- CLI
 - abbreviating commands [2-4](#)
 - command modes [2-1](#)
 - configuration logging [2-5](#)
 - described [1-4](#)
 - editing features
 - enabling and disabling [2-7](#)
 - keystroke editing [2-7](#)
 - wrapped lines [2-9](#)
 - error messages [2-5](#)
 - filtering command output [2-10](#)
 - getting help [2-3](#)
 - history
 - changing the buffer size [2-6](#)
 - described [2-6](#)
 - disabling [2-7](#)
 - recalling commands [2-6](#)
 - managing clusters [5-13](#)
 - no and default forms of commands [2-4](#)
- client mode, VTP [13-3](#)
- clock
 - See system clock
- cluster requirements [xxxiii](#)
- clusters, switch
 - accessing [5-12](#)
 - automatic discovery [5-4](#)
 - automatic recovery [5-9](#)
 - benefits [1-2](#)
 - compatibility [5-4](#)
 - described [5-1](#)
 - LRE profile considerations [5-13](#)
 - clusters, switch (continued)**
 - managing
 - through CLI [5-13](#)
 - through SNMP [5-14](#)
 - planning [5-4](#)
 - planning considerations
 - automatic discovery [5-4](#)
 - automatic recovery [5-9](#)
 - CLI [5-13](#)
 - host names [5-12](#)
 - IP addresses [5-12](#)
 - LRE profiles [5-13](#)
 - passwords [5-12](#)
 - RADIUS [5-13](#)
 - SNMP [5-13, 5-14](#)
 - TACACS+ [5-13](#)
 - See also candidate switch, command switch, cluster standby group, member switch, and standby command switch
 - cluster standby group
 - automatic recovery [5-11](#)
 - considerations [5-10](#)
 - defined [5-2](#)
 - requirements [5-3](#)
 - virtual IP address [5-10](#)
 - See also HSRP
- CNS [1-5](#)
- Configuration Engine
 - configID, deviceID, hostname [4-3](#)
 - configuration service [4-2](#)
 - described [4-1](#)
 - event service [4-3](#)
- embedded agents
 - described [4-5](#)
 - enabling automated configuration [4-6](#)
 - enabling configuration agent [4-9](#)
 - enabling event agent [4-8](#)
- management functions [1-4](#)

Coarse Wave Division Multiplexer

See CWDM SFPs

command-line interface

See CLI

command modes [2-1](#)

commands

abbreviating [2-4](#)

no and default [2-4](#)

commands, setting privilege levels [8-8](#)

command switch

accessing [5-10](#)

active (AC) [5-9](#)

configuration conflicts [35-11](#)

defined [5-2](#)

passive (PC) [5-9](#)

password privilege levels [5-14](#)

priority [5-9](#)

recovery

from command-switch failure [5-9, 35-7](#)

from lost member connectivity [35-11](#)

redundant [5-9](#)

replacing

with another switch [35-9](#)

with cluster member [35-8](#)

requirements [5-3](#)

standby (SC) [5-9](#)

See also candidate switch, cluster standby group, member switch, and standby command switch

community strings

configuring [5-13, 28-8](#)

for cluster switches [28-4](#)

in clusters [5-13](#)

overview [28-4](#)

SNMP [5-13](#)

compatibility, feature [21-12](#)

config.text [3-16](#)

configurable leave timer, IGMP [20-5](#)

configuration, initial

defaults [1-12](#)

Express Setup [1-2](#)

See also getting started guide and hardware installation guide

configuration changes, logging [27-10](#)

configuration conflicts, recovering from lost member connectivity [35-11](#)

configuration examples, network [1-14](#)

configuration files

archiving [B-19](#)

clearing the startup configuration [B-18](#)

creating using a text editor [B-9](#)

default name [3-16](#)

deleting a stored configuration [B-18](#)

described [B-8](#)

downloading

automatically [3-16](#)

preparing [B-10, B-12, B-15](#)

reasons for [B-8](#)

using FTP [B-13](#)

using RCP [B-16](#)

using TFTP [B-11](#)

guidelines for creating and using [B-9](#)

guidelines for replacing and rolling back [B-20](#)

invalid combinations when copying [B-5](#)

limiting TFTP server access [28-15](#)

obtaining with DHCP [3-8](#)

password recovery disable considerations [8-5](#)

replacing a running configuration [B-18, B-19](#)

rolling back a running configuration [B-18, B-20](#)

specifying the filename [3-16](#)

system contact and location information [28-14](#)

configuration files (continued)

- types and location [B-9](#)
- uploading
 - preparing [B-10, B-12, B-15](#)
 - reasons for [B-8](#)
 - using FTP [B-14](#)
 - using RCP [B-17](#)
 - using TFTP [B-11](#)
- configuration logger [27-10](#)
- configuration logging [2-5](#)
- configuration replacement [B-18](#)
- configuration rollback [B-18, B-19](#)
- configuration settings, saving [3-15](#)
- configure terminal command [10-5](#)
- configuring small-frame arrival rate [21-5](#)
- config-vlan mode [2-2, 12-6](#)
- conflicts, configuration [35-11](#)
- connections, secure remote [8-33](#)
- connectivity problems [35-12, 35-13, 35-15](#)
- consistency checks in VTP Version 2 [13-4](#)
- console port, connecting to [2-10](#)
- control protocol, IP SLAs [30-4](#)
- conventions
 - command [xxxii](#)
 - for examples [xxxii](#)
 - publication [xxxii](#)
 - text [xxxii](#)
- corrupted software, recovery steps with Xmodem [35-2](#)
- CoS
 - in Layer 2 frames [31-2](#)
 - override priority [14-6](#)
 - trust priority [14-6](#)
- CoS input queue threshold map for QoS [31-14](#)
- CoS output queue threshold map for QoS [31-17](#)
- CoS-to-DSCP map for QoS [31-51](#)
- counters, clearing interface [10-19](#)
- crashinfo file [35-21](#)
- critical authentication, IEEE 802.1x [9-36](#)

cryptographic software image

- SSH [8-33](#)
 - SSL [8-37](#)
- CWDM SFPs [1-19](#)

D

- daylight saving time [6-13](#)
- debugging
 - enabling all system diagnostics [35-19](#)
 - enabling for a specific feature [35-18](#)
 - redirecting error message output [35-19](#)
 - using commands [35-18](#)
- default commands [2-4](#)
- default configuration
 - 802.1x [9-21](#)
 - auto-QoS [31-19](#)
 - banners [6-17](#)
 - booting [3-16](#)
 - CDP [22-2](#)
 - DHCP [19-7](#)
 - DHCP option 82 [19-7](#)
 - DHCP snooping [19-7](#)
 - DHCP snooping binding database [19-7](#)
 - DNS [6-16](#)
 - EtherChannel [34-9](#)
 - Ethernet interfaces [10-9](#)
 - Flex Links [18-8](#)
 - IGMP filtering [20-24](#)
 - IGMP snooping [20-6, 33-5, 33-6](#)
 - IGMP throttling [20-24](#)
 - initial switch information [3-3](#)
 - IP SLAs [30-5](#)
 - IPv6 [32-13](#)
 - Layer 2 interfaces [10-9](#)
 - LLDP [23-3](#)
 - MAC address table [6-21](#)
 - MAC address-table move update [18-8](#)
 - MSTP [16-14](#)

default configuration (continued)

- MVR [20-19](#)
- NTP [6-4](#)
- optional spanning-tree configuration [17-9](#)
- password and privilege level [8-2](#)
- RADIUS [8-20](#)
- RMON [26-3](#)
- RSPAN [25-9](#)
- SDM template [7-2](#)
- SNMP [28-6](#)
- SPAN [25-9](#)
- SSL [8-40](#)
- standard QoS [31-29](#)
- STP [15-11](#)
- system message logging [27-3](#)
- system name and prompt [6-15](#)
- TACACS+ [8-13](#)
- UDLD [24-4](#)
- VLAN, Layer 2 Ethernet interfaces [12-16](#)
- VLANs [12-7](#)
- VMPS [12-25](#)
- voice VLAN [14-3](#)
- VTP [13-6](#)
- default gateway [3-14](#)
- deleting VLANs [12-10](#)
- denial-of-service attack [21-1](#)
- description command [10-16](#)
- designing your network, examples [1-14](#)
- destination addresses
 - in IPv4 ACLs [29-27](#)
- destination-IP address-based forwarding, EtherChannel [34-7](#)
- destination-MAC address forwarding, EtherChannel [34-7](#)
- detecting indirect link failures, STP [17-5](#)
- device [B-22](#)
- device discovery protocol [22-1, 23-1](#)
- device manager
 - benefits [1-2](#)
 - described [1-2, 1-4](#)
 - in-band management [1-5](#)
 - requirements [xxxii](#)
 - upgrading a switch [B-22](#)
- DHCP
 - Cisco IOS server database
 - configuring [19-10](#)
 - enabling
 - relay agent [19-8](#)
- DHCP-based autoconfiguration
 - client request message exchange [3-4](#)
 - configuring
 - client side [3-3](#)
 - DNS [3-7](#)
 - relay device [3-7](#)
 - server side [3-6](#)
 - TFTP server [3-7](#)
 - example [3-9](#)
 - lease options
 - for IP address information [3-6](#)
 - for receiving the configuration file [3-6](#)
 - overview [3-3](#)
 - relationship to BOOTP [3-3](#)
 - relay support [1-5](#)
 - support for [1-5](#)
- DHCP-based autoconfiguration and image update
 - configuring [3-11 to 3-14](#)
 - understanding [3-4 to 3-5](#)
- DHCP binding database
 - See DHCP snooping binding database
- DHCP binding table
 - See DHCP snooping binding database
- DHCP option 82
 - circuit ID suboption [19-5](#)
 - configuration guidelines [19-7](#)
 - default configuration [19-7](#)
 - displaying [19-12](#)

DHCP option 82 (continued)

- overview [19-3](#)
- packet format, suboption
 - circuit ID [19-5](#)
 - remote ID [19-5](#)
- remote ID suboption [19-5](#)

DHCP snooping

- accepting untrusted packets form edge switch [19-3, 19-9](#)
- binding database
 - See DHCP snooping binding database
- configuration guidelines [19-7](#)
- default configuration [19-7](#)
- displaying binding tables [19-12](#)
- message exchange process [19-4](#)
- option 82 data insertion [19-3](#)
- trusted interface [19-2](#)
- untrusted interface [19-2](#)
- untrusted messages [19-2](#)

DHCP snooping binding database

- adding bindings [19-11](#)
- binding entries, displaying [19-12](#)
- binding file
 - format [19-6](#)
 - location [19-5](#)
- bindings [19-5](#)
- clearing agent statistics [19-11](#)
- configuration guidelines [19-8](#)
- configuring [19-11](#)
- default configuration [19-7](#)
- deleting
 - binding file [19-11](#)
 - bindings [19-11](#)
 - database agent [19-11](#)
- described [19-5](#)
- displaying [19-12](#)
- displaying status and statistics [19-12](#)
- enabling [19-11](#)
- entry [19-5](#)

DHCP snooping binding database (continued)

- renewing database [19-11](#)
- resetting
 - delay value [19-11](#)
 - timeout value [19-11](#)
- DHCP snooping binding table
 - See DHCP snooping binding database
- Differentiated Services architecture, QoS [31-2](#)
- Differentiated Services Code Point [31-2](#)
- directed unicast requests [1-5](#)
- directories
 - changing [B-3](#)
 - creating and removing [B-4](#)
 - displaying the working [B-3](#)
- discovery, clusters
 - See automatic discovery

DNS

- and DHCP-based autoconfiguration [3-7](#)
- default configuration [6-16](#)
- displaying the configuration [6-17](#)
- in IPv6 [32-4](#)
- overview [6-15](#)
- setting up [6-16](#)
- support for [1-5](#)
- documentation, related [xxxii](#)
- document conventions [xxxii](#)
- domain names
 - DNS [6-15](#)
 - VTP [13-8](#)

Domain Name System

See DNS

downloading

- configuration files
 - preparing [B-10, B-12, B-15](#)
 - reasons for [B-8](#)
 - using FTP [B-13](#)
 - using RCP [B-16](#)
 - using TFTP [B-11](#)

downloading (continued)

image files

deleting old image [B-26](#)preparing [B-25, B-28, B-32](#)reasons for [B-22](#)using CMS [1-2](#)using FTP [B-29](#)using HTTP [1-2, B-22](#)using RCP [B-33](#)using TFTP [B-25](#)using the device manager or Network Assistant [B-22](#)DSCP [1-10, 31-2](#)DSCP input queue threshold map for QoS [31-14](#)DSCP output queue threshold map for QoS [31-17](#)DSCP-to-CoS map for QoS [31-54](#)DSCP-to-DSCP-mutation map for QoS [31-55](#)DSCP transparency [31-37](#)DTP [1-7, 12-15](#)Dual IPv4-and-IPv6 SDM Templates [32-12](#)dual IPv4 and IPv6 templates [32-1, 32-12](#)

dual protocol stacks

IPv4 and IPv6 [32-12](#)SDM templates supporting [32-12](#)

dual-purpose uplinks

defined [10-4](#)LEDs [10-4](#)link selection [10-4](#)setting the type [10-10](#)

dynamic access ports

characteristics [12-3](#)configuring [12-27](#)defined [10-3](#)

dynamic addresses

See addresses

dynamic auto trunking mode [12-15](#)dynamic desirable trunking mode [12-15](#)

Dynamic Host Configuration Protocol

See DHCP-based autoconfiguration

dynamic port VLAN membership

described [12-25](#)reconfirming [12-27](#)troubleshooting [12-29](#)types of connections [12-27](#)

Dynamic Trunking Protocol

See DTP

E

editing features

enabling and disabling [2-7](#)keystrokes used [2-7](#)wrapped lines [2-9](#)ELIN location [23-3](#)enable password [8-3](#)enable secret password [8-3](#)encryption, CipherSuite [8-39](#)encryption for passwords [8-3](#)environment variables, function of [3-19](#)error-disabled state, BPDU [17-2](#)error messages during command entry [2-5](#)

EtherChannel

automatic creation of [34-4, 34-5](#)

channel groups

binding physical and logical interfaces [34-3](#)numbering of [34-3](#)configuration guidelines [34-9](#)configuring Layer 2 interfaces [34-10](#)default configuration [34-9](#)described [34-2](#)displaying status [34-16](#)forwarding methods [34-6, 34-12](#)IEEE 802.3ad, described [34-5](#)

interaction

with STP [34-9](#)with VLANs [34-10](#)

EtherChannel (continued)

LACP

- described [34-5](#)
- displaying status [34-16](#)
- hot-standby ports [34-14](#)
- interaction with other features [34-6](#)
- modes [34-5](#)
- port priority [34-15](#)
- system priority [34-15](#)

- load balancing [34-6, 34-12](#)

PAgP

- aggregate-port learners [34-13](#)
- compatibility with Catalyst 1900 [34-13](#)
- described [34-4](#)
- displaying status [34-16](#)
- interaction with other features [34-5](#)
- learn method and priority configuration [34-13](#)
- modes [34-4](#)
- support for [1-3](#)

port-channel interfaces

- described [34-3](#)
- numbering of [34-3](#)

port groups [10-3](#)support for [1-3](#)

EtherChannel guard

- described [17-7](#)
- disabling [17-14](#)
- enabling [17-14](#)

Ethernet VLANs

- adding [12-8](#)
- defaults and ranges [12-7](#)
- modifying [12-8](#)

EUI [32-3](#)events, RMON [26-3](#)

examples

- conventions for [xxxii](#)
- network configuration [1-14](#)

expedite queue for QoS [31-67](#)Express Setup [1-2](#)

See also getting started guide

extended crashinfo file [35-21](#)

extended-range VLANs

- configuration guidelines [12-12](#)
- configuring [12-11](#)
- creating [12-12](#)
- defined [12-1](#)

extended system ID

- MSTP [16-17](#)
- STP [15-4, 15-14](#)

extended universal identifier

See EUI

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

Ffa0 interface [1-6](#)Fast Convergence [18-3](#)features, incompatible [21-12](#)fiber-optic, detecting unidirectional links [24-1](#)

files

basic crashinfo

- description [35-21](#)
- location [35-21](#)

copying [B-4](#)crashinfo, description [35-21](#)deleting [B-5](#)displaying the contents of [B-7](#)

extended crashinfo

- description [35-21](#)
- location [35-22](#)

tar

- creating [B-6](#)
- displaying the contents of [B-6](#)
- extracting [B-7](#)
- image file format [B-23](#)

file system

- displaying available file systems [B-2](#)
- displaying file information [B-3](#)
- local file system names [B-1](#)
- network file system names [B-4](#)
- setting the default [B-2](#)

filtering

- non-IP traffic [29-37](#)
- show and more command output [2-10](#)

filtering show and more command output [2-10](#)

filters, IP

- See ACLs, IP

flash device, number of [B-1](#)Flex Link Multicast Fast Convergence [18-3](#)

Flex Links

- configuration guidelines [18-8](#)
- configuring [18-9](#)
- configuring preferred VLAN [18-12](#)
- configuring VLAN load balancing [18-11](#)
- default configuration [18-8](#)
- description [18-2](#)
- link load balancing [18-2](#)
- monitoring [18-14](#)
- VLANs [18-2](#)

flooded traffic, blocking [21-8](#)flow-based packet classification [1-10](#)

flowcharts

- QoS classification [31-6](#)
- QoS egress queueing and scheduling [31-15](#)
- QoS ingress queueing and scheduling [31-13](#)
- QoS policing and marking [31-9](#)

flowcontrol

- configuring [10-14](#)
- described [10-14](#)

forward-delay time

- MSTP [16-23](#)
- STP [15-21](#)

FTP

- accessing MIB files [A-3](#)
- configuration files
 - downloading [B-13](#)
 - overview [B-12](#)
 - preparing the server [B-12](#)
 - uploading [B-14](#)
- image files
 - deleting old image [B-30](#)
 - downloading [B-29](#)
 - preparing the server [B-28](#)
 - uploading [B-30](#)

Ggeneral query [18-5](#)Generating IGMP Reports [18-4](#)get-bulk-request operation [28-3](#)get-next-request operation [28-3, 28-4](#)get-request operation [28-3, 28-4](#)get-response operation [28-3](#)global configuration mode [2-2](#)global leave, IGMP [20-12](#)guest VLAN and 802.1x [9-12](#)

guide

- audience [xxxi](#)
- purpose of [xxxi](#)

guide mode [1-2](#)

GUIs

- See device manager and Network Assistant

H

hello time

- MSTP [16-22](#)
- STP [15-20](#)

help, for the command line [2-3](#)

- history
 - changing the buffer size [2-6](#)
 - described [2-6](#)
 - disabling [2-7](#)
 - recalling commands [2-6](#)
 - history table, level and number of syslog messages [27-10](#)
 - host names, in clusters [5-12](#)
 - hosts, limit on dynamic ports [12-29](#)
 - HP OpenView [1-4](#)
 - HSRP
 - automatic cluster recovery [5-11](#)
 - cluster standby group considerations [5-10](#)
 - See also clusters, cluster standby group, and standby command switch
 - HTTP over SSL
 - see HTTPS
 - HTTPS [8-38](#)
 - configuring [8-41](#)
 - self-signed certificate [8-38](#)
 - HTTP secure server [8-38](#)
-
- ICMP
 - IPv6 [32-4](#)
 - time-exceeded messages [35-15](#)
 - traceroute and [35-15](#)
 - ICMP ping
 - executing [35-13](#)
 - overview [35-12](#)
 - ICMPv6 [32-4](#)
 - IDS appliances
 - and ingress RSPAN [25-20](#)
 - and ingress SPAN [25-13](#)
 - IEEE 802.1D
 - See STP
 - IEEE 802.1p [14-1](#)
 - IEEE 802.1Q
 - and trunk ports [10-3](#)
 - configuration limitations [12-15](#)
 - encapsulation [12-14](#)
 - native VLAN for untagged traffic [12-20](#)
 - IEEE 802.1s
 - See MSTP
 - IEEE 802.1w
 - See RSTP
 - IEEE 802.1x
 - See port-based authentication
 - IEEE 802.3ad
 - See EtherChannel
 - IEEE 802.3x flow control [10-14](#)
 - ifIndex values, SNMP [28-5](#)
 - IFS [1-5](#)
 - IGMP
 - configurable leave timer
 - described [20-5](#)
 - enabling [20-10](#)
 - flooded multicast traffic
 - controlling the length of time [20-11](#)
 - disabling on an interface [20-12](#)
 - global leave [20-12](#)
 - query solicitation [20-12](#)
 - recovering from flood mode [20-12](#)
 - joining multicast group [20-3](#)
 - join messages [20-3](#)
 - leave processing, enabling [20-10, 33-9](#)
 - leaving multicast group [20-5](#)
 - queries [20-4](#)
 - report suppression
 - described [20-6](#)
 - disabling [20-15, 33-11](#)
 - supported versions [20-2](#)
 - support for [1-3](#)

- IGMP filtering
 - configuring [20-24](#)
 - default configuration [20-24](#)
 - described [20-23](#)
 - monitoring [20-28](#)
 - support for [1-4](#)
- IGMP groups
 - configuring filtering [20-26](#)
 - setting the maximum number [20-26](#)
- IGMP Immediate Leave
 - configuration guidelines [20-10](#)
 - described [20-5](#)
 - enabling [20-10](#)
- IGMP profile
 - applying [20-25](#)
 - configuration mode [20-24](#)
 - configuring [20-24](#)
- IGMP snooping
 - and address aliasing [20-2](#)
 - configuring [20-6](#)
 - default configuration [20-6, 33-5, 33-6](#)
 - definition [20-1](#)
 - enabling and disabling [20-7, 33-6](#)
 - global configuration [20-7](#)
 - Immediate Leave [20-5](#)
 - method [20-8](#)
 - monitoring [20-15, 33-11](#)
 - querier
 - configuration guidelines [20-13](#)
 - configuring [20-13](#)
 - supported versions [20-2](#)
 - support for [1-3](#)
 - VLAN configuration [20-7](#)
- IGMP throttling
 - configuring [20-26](#)
 - default configuration [20-24](#)
 - described [20-23](#)
 - displaying action [20-28](#)
- Immediate Leave, IGMP [20-5](#)
 - enabling [33-9](#)
- inaccessible authentication bypass [9-14](#)
- initial configuration
 - defaults [1-12](#)
 - Express Setup [1-2](#)
 - See also getting started guide and hardware installation guide
- interface
 - number [10-5](#)
 - range macros [10-7](#)
- interface command [10-5](#)
- interface configuration mode [2-3](#)
- interfaces
 - auto-MDIX, configuring [10-15](#)
 - configuration guidelines
 - duplex and speed [10-12](#)
 - configuring
 - procedure [10-5](#)
 - counters, clearing [10-19](#)
 - default configuration [10-9](#)
 - described [10-16](#)
 - descriptive name, adding [10-16](#)
 - displaying information about [10-18](#)
 - flow control [10-14](#)
 - management [1-4](#)
 - monitoring [10-18](#)
 - naming [10-16](#)
 - physical, identifying [10-5](#)
 - range of [10-6](#)
 - restarting [10-19](#)
 - shutting down [10-19](#)
 - speed and duplex, configuring [10-13](#)
 - status [10-18](#)
 - supported [10-5](#)
 - types of [10-1](#)
- interfaces range macro command [10-7](#)
- interface types [10-5](#)

- Internet Protocol version 6
 - See IPv6
- Intrusion Detection System
 - See IDS appliances
- inventory management TLV [23-3, 23-6](#)
- IP ACLs
 - for QoS classification [31-6](#)
 - implicit deny [29-25, 29-29](#)
 - implicit masks [29-25](#)
 - named [29-30](#)
 - undefined [29-35](#)
- IP addresses
 - 128-bit [32-2](#)
 - candidate or member [5-3, 5-12](#)
 - cluster access [5-2](#)
 - command switch [5-3, 5-10, 5-12](#)
 - discovering [6-26](#)
 - IPv6 [32-2](#)
 - redundant clusters [5-10](#)
 - standby command switch [5-10, 5-12](#)
 - See also IP information
- ip igmp profile command [20-24](#)
- IP information
 - assigned
 - manually [3-14](#)
 - through DHCP-based autoconfiguration [3-3](#)
 - default configuration [3-3](#)
- IP phones
 - and QoS [14-1](#)
 - automatic classification and queuing [31-18](#)
 - configuring [14-4](#)
 - ensuring port security with QoS [31-35](#)
 - trusted boundary for QoS [31-35](#)
- IP precedence [31-2](#)
- IP-precedence-to-DSCP map for QoS [31-52](#)
- IP protocols in ACLs [29-27](#)
- IP Service Level Agreements
 - See IP SLAs
- IP service levels, analyzing [30-1](#)
- IP SLAs
 - benefits [30-2](#)
 - configuration guidelines [30-5](#)
 - Control Protocol [30-4](#)
 - default configuration [30-5](#)
 - definition [30-1](#)
 - measuring network performance [30-3](#)
 - monitoring [30-7](#)
 - operation [30-3](#)
 - responder
 - described [30-4](#)
 - enabling [30-6](#)
 - response time [30-4](#)
 - SNMP support [30-2](#)
 - supported metrics [30-2](#)
- IP traceroute
 - executing [35-16](#)
 - overview [35-15](#)
- IPv4 ACLs
 - applying to interfaces [29-34](#)
 - extended, creating [29-26](#)
 - named [29-30](#)
 - standard, creating [29-25](#)
- IPv4 and IPv6
 - differences [32-2](#)
 - dual protocol stacks [32-10](#)
- IPv6
 - addresses [32-2](#)
 - address formats [32-2](#)
 - advantages [32-2](#)
 - applications [32-9](#)
 - autoconfiguration [32-4](#)
 - autogenerated address [32-6](#)
 - configuring static routes [32-15](#)
 - default configuration [32-13](#)
 - defined [32-1](#)
 - duplicate-address detection [32-5](#)
 - global prefixes [32-5](#)
 - ICMP [32-4](#)

IPv6 (continued)

- ICMP rate limiting [32-14](#)
- link-local address [32-5](#)
- monitoring [32-17](#)
- neighbor discovery [32-4](#)
- reasons for [32-1](#)
- router advertisement messages [32-5](#)
- router advertisements [32-5](#)
- SDM templates [32-12, 33-1](#)
- Stateless Autoconfiguration [32-4](#)
- supported features [32-3](#)

J

- join messages, IGMP [20-3](#)

L**LACP**

See EtherChannel

- Layer 2 frames, classification with CoS [31-2](#)
- Layer 2 interfaces, default configuration [10-9](#)
- Layer 2 traceroute
 - and ARP [35-14](#)
 - and CDP [35-14](#)
 - broadcast traffic [35-14](#)
 - described [35-14](#)
 - IP addresses and subnets [35-14](#)
 - MAC addresses and VLANs [35-14](#)
 - multicast traffic [35-14](#)
 - multiple devices on a port [35-15](#)
 - unicast traffic [35-14](#)
 - usage guidelines [35-14](#)
- Layer 3 packets, classification methods [31-2](#)
- LDAP [4-2](#)
- Leaking IGMP Reports [18-4](#)
- LEDs, switch
 - See hardware installation guide

- lightweight directory access protocol
 - See LDAP
- line configuration mode [2-3](#)
- Link Aggregation Control Protocol
 - See EtherChannel
- link failure, detecting unidirectional [16-8](#)
- Link Layer Discovery Protocol
 - See CDP
- link local unicast addresses [32-3](#)
- link redundancy
 - See Flex Links
- links, unidirectional [24-1](#)
- link-state tracking
 - configuring [34-19](#)
 - described [34-17](#)
- LLDP
 - configuring [23-3](#)
 - characteristics [23-4](#)
 - default configuration [23-3](#)
 - disabling and enabling
 - globally [23-5](#)
 - on an interface [23-5](#)
 - monitoring and maintaining [23-7](#)
 - overview [23-1](#)
 - supported TLVs [23-2](#)
 - switch stack considerations [23-2](#)
 - transmission timer and holdtime, setting [23-4](#)
- LLDP-MED
 - configuring
 - procedures [23-3](#)
 - TLVs [23-6](#)
 - monitoring and maintaining [23-7](#)
 - overview [23-1, 23-2](#)
 - supported TLVs [23-2](#)
- LLDP Media Endpoint Discovery
 - See LLDP-MED
- local SPAN [25-2](#)
- location TLV [23-3, 23-6](#)

- login authentication
 - with RADIUS [8-23](#)
 - with TACACS+ [8-14](#)
- login banners [6-17](#)
- log messages
 - See system message logging
- Long-Reach Ethernet (LRE) technology [1-15](#)
- loop guard
 - described [17-9](#)
 - enabling [17-15](#)
 - support for [1-7](#)
- LRE profiles, considerations in switch clusters [5-13](#)

M

- MAC/PHY configuration status TLV [23-2](#)
- MAC addresses
 - aging time [6-21](#)
 - and VLAN association [6-20](#)
 - building the address table [6-20](#)
 - default configuration [6-21](#)
 - discovering [6-26](#)
 - displaying [6-26](#)
 - dynamic
 - learning [6-20](#)
 - removing [6-22](#)
 - in ACLs [29-37](#)
 - static
 - adding [6-24](#)
 - allowing [6-25](#)
 - characteristics of [6-24](#)
 - dropping [6-25](#)
 - removing [6-24](#)
- MAC address notification, support for [1-11](#)
- MAC address-table move update
 - configuration guidelines [18-8](#)
 - configuring [18-12](#)
 - default configuration [18-8](#)
- MAC address-table move update (continued)**
 - description [18-6](#)
 - monitoring [18-14](#)
- MAC address-to-VLAN mapping [12-24](#)
- MAC authentication bypass [9-10](#)
- MAC extended access lists
 - applying to Layer 2 interfaces [29-39](#)
 - configuring for QoS [31-42](#)
 - creating [29-37](#)
 - defined [29-37](#)
 - for QoS classification [31-5](#)
- macros
 - See Smartports macros
- magic packet [9-17](#)
- manageability features [1-5](#)
- management access
 - in-band
 - browser session [1-5](#)
 - CLI session [1-6](#)
 - device manager [1-5](#)
 - SNMP [1-6](#)
 - out-of-band console port connection [1-6](#)
- management address TLV [23-2](#)
- management options
 - CLI [2-1](#)
 - clustering [1-3](#)
 - CNS [4-1](#)
 - Network Assistant [1-2](#)
 - overview [1-4](#)
- management VLAN
 - considerations in switch clusters [5-7](#)
 - discovery through different management VLANs [5-7](#)

mapping tables for QoS

configuring

CoS-to-DSCP [31-51](#)DSCP [31-50](#)DSCP-to-CoS [31-54](#)DSCP-to-DSCP-mutation [31-55](#)IP-precedence-to-DSCP [31-52](#)policed-DSCP [31-53](#)described [31-10](#)

marking

action with aggregate policers [31-48](#)described [31-4](#), [31-8](#)matching, IPv4 ACLs [29-23](#)

maximum aging time

MSTP [16-23](#)STP [15-21](#)maximum hop count, MSTP [16-24](#)membership mode, VLAN port [12-3](#)

member switch

automatic discovery [5-4](#)defined [5-2](#)managing [5-13](#)passwords [5-12](#)recovering from lost connectivity [35-11](#)requirements [5-3](#)

See also candidate switch, cluster standby group, and standby command switch

messages, to users through banners [6-17](#)

MIBs

accessing files with FTP [A-3](#)location of files [A-3](#)overview [28-1](#)SNMP interaction with [28-4](#)supported [A-1](#)mirroring traffic for analysis [25-1](#)mismatches, autonegotiation [35-11](#)module number [10-5](#)

monitoring

access groups [29-40](#)cables for unidirectional links [24-1](#)CDP [22-4](#)features [1-11](#)Flex Links [18-14](#)

IGMP

filters [20-28](#)snooping [20-15](#), [33-11](#)interfaces [10-18](#)IP SLAs operations [30-7](#)IPv4 ACL configuration [29-40](#)IPv6 [32-17](#)MAC address-table move update [18-14](#)multicast router interfaces [20-16](#), [33-12](#)MVR [20-22](#)network traffic for analysis with probe [25-2](#)

port

blocking [21-19](#)protection [21-19](#)SFP status [10-18](#), [35-12](#)speed and duplex mode [10-13](#)traffic flowing among switches [26-1](#)traffic suppression [21-18](#)VLANs [12-14](#)VMPS [12-28](#)VTP [13-16](#)mrouter Port [18-3](#)mrouter port [18-5](#)

MSTP

boundary ports

configuration guidelines [16-15](#)described [16-6](#)

BPDU filtering

described [17-3](#)enabling [17-12](#)

MSTP (continued)

- BPDU guard
 - described [17-2](#)
 - enabling [17-11](#)
- CIST, described [16-3](#)
- CIST regional root [16-3](#)
- CIST root [16-5](#)
- configuration guidelines [16-15, 17-10](#)
- configuring
 - forward-delay time [16-23](#)
 - hello time [16-22](#)
 - link type for rapid convergence [16-24](#)
 - maximum aging time [16-23](#)
 - maximum hop count [16-24](#)
 - MST region [16-16](#)
 - neighbor type [16-25](#)
 - path cost [16-20](#)
 - port priority [16-19](#)
 - root switch [16-17](#)
 - secondary root switch [16-18](#)
 - switch priority [16-21](#)
- CST
 - defined [16-3](#)
 - operations between regions [16-4](#)
- default configuration [16-14](#)
- default optional feature configuration [17-9](#)
- displaying status [16-26](#)
- enabling the mode [16-16](#)
- EtherChannel guard
 - described [17-7](#)
 - enabling [17-14](#)
- extended system ID
 - effects on root switch [16-17](#)
 - effects on secondary root switch [16-18](#)
 - unexpected behavior [16-17](#)

MSTP (continued)

- IEEE 802.1s
 - implementation [16-6](#)
 - port role naming change [16-7](#)
 - terminology [16-5](#)
- instances supported [15-9](#)
- interface state, blocking to forwarding [17-2](#)
- interoperability and compatibility among modes [15-10](#)
- interoperability with IEEE 802.1D
 - described [16-8](#)
 - restarting migration process [16-25](#)
- IST
 - defined [16-3](#)
 - master [16-3](#)
 - operations within a region [16-3](#)
- loop guard
 - described [17-9](#)
 - enabling [17-15](#)
- mapping VLANs to MST instance [16-16](#)
- MST region
 - CIST [16-3](#)
 - configuring [16-16](#)
 - described [16-2](#)
 - hop-count mechanism [16-5](#)
 - IST [16-3](#)
 - supported spanning-tree instances [16-2](#)
- optional features supported [1-7](#)
- overview [16-2](#)
- Port Fast
 - described [17-2](#)
 - enabling [17-10](#)
- preventing root switch selection [17-8](#)
- root guard
 - described [17-8](#)
 - enabling [17-15](#)

MSTP (continued)

- root switch

- configuring [16-17](#)

- effects of extended system ID [16-17](#)

- unexpected behavior [16-17](#)

- shutdown Port Fast-enabled port [17-2](#)

- status, displaying [16-26](#)

- multicast groups

- Immediate Leave [20-5](#)

- joining [20-3](#)

- leaving [20-5](#)

- static joins [20-9, 33-8](#)

- multicast router interfaces, monitoring [20-16, 33-12](#)

- multicast router ports, adding [20-9, 33-8](#)

- multicast storm [21-1](#)

- multicast storm-control command [21-4](#)

- multicast television application [20-17](#)

- multicast VLAN [20-16](#)

- Multicast VLAN Registration

- See MVR

- MVR

- and address aliasing [20-20](#)

- and IGMPv3 [20-20](#)

- configuration guidelines [20-19](#)

- configuring interfaces [20-21](#)

- default configuration [20-19](#)

- described [20-16](#)

- example application [20-17](#)

- modes [20-20](#)

- monitoring [20-22](#)

- multicast television application [20-17](#)

- setting global parameters [20-20](#)

- support for [1-3](#)

N

- NAC

- critical authentication [9-14, 9-36](#)

- IEEE 802.1x authentication using a RADIUS server [9-40](#)

- IEEE 802.1x validation using RADIUS server [9-40](#)

- inaccessible authentication bypass [9-36](#)

- Layer 2 IEEE 802.1x validation [1-9, 9-19, 9-40](#)

- named IPv4 ACLs [29-30](#)

- NameSpace Mapper

- See NSM

- native VLAN

- configuring [12-20](#)

- default [12-20](#)

- neighbor discovery, IPv6 [32-4](#)

- Network Admission Control

- See NAC

- Network Admission Control Software Configuration Guide [9-42, 9-43](#)

- Network Assistant

- benefits [1-2](#)

- described [1-4](#)

- downloading image files [1-2](#)

- guide mode [1-2](#)

- management options [1-2](#)

- requirements [xxxii](#)

- upgrading a switch [B-22](#)

- wizards [1-2](#)

- network configuration examples

- increasing network performance [1-14](#)

- long-distance, high-bandwidth transport [1-19](#)

- providing network services [1-15](#)

- server aggregation and Linux server cluster [1-17](#)

- small to medium-sized network [1-18](#)

- network design

- performance [1-15](#)

- services [1-15](#)

- network management
 - CDP [22-1](#)
 - RMON [26-1](#)
 - SNMP [28-1](#)
- network performance, measuring with IP SLAs [30-3](#)
- network policy TLV [23-2, 23-6](#)
- Network Time Protocol
 - See NTP
- no commands [2-4](#)
- nonhierarchical policy maps
 - described [31-8](#)
- non-IP traffic filtering [29-37](#)
- nontrunking mode [12-15](#)
- normal-range VLANs [12-4](#)
 - configuration guidelines [12-5](#)
 - configuration modes [12-6](#)
 - configuring [12-4](#)
 - defined [12-1](#)
- note, described [xxxii](#)
- NSM [4-3](#)
- NTP
 - associations
 - authenticating [6-4](#)
 - defined [6-2](#)
 - enabling broadcast messages [6-6](#)
 - peer [6-5](#)
 - server [6-5](#)
 - default configuration [6-4](#)
 - displaying the configuration [6-11](#)
 - overview [6-2](#)
 - restricting access
 - creating an access group [6-8](#)
 - disabling NTP services per interface [6-10](#)
 - source IP address, configuring [6-10](#)
 - stratum [6-2](#)
 - support for [1-5](#)

NTP (continued)

- synchronizing devices [6-5](#)
- time
 - services [6-2](#)
 - synchronizing [6-2](#)

O

- optimizing system resources [7-1](#)
- options, management [1-4](#)
- out-of-profile markdown [1-11](#)

P

- packet modification, with QoS [31-17](#)
- PAgP
 - See EtherChannel
- passwords
 - default configuration [8-2](#)
 - disabling recovery of [8-5](#)
 - encrypting [8-3](#)
 - for security [1-8](#)
 - in clusters [5-12](#)
 - overview [8-1](#)
 - recovery of [35-3](#)
 - setting
 - enable [8-3](#)
 - enable secret [8-3](#)
 - Telnet [8-6](#)
 - with usernames [8-6](#)
 - VTP domain [13-8](#)
- path cost
 - MSTP [16-20](#)
 - STP [15-18](#)
- PC (passive command switch) [5-9](#)
- performance, network design [1-14](#)
- performance features [1-3](#)
- persistent self-signed certificate [8-38](#)

per-VLAN spanning-tree plus

See PVST+

physical ports [10-2](#)

PIM-DVMRP, as snooping method [20-8](#)

ping

character output description [35-13](#)

executing [35-13](#)

overview [35-12](#)

policed-DSCP map for QoS [31-53](#)

policers

configuring

for each matched traffic class [31-45](#)

for more than one traffic class [31-48](#)

described [31-4](#)

displaying [31-68](#)

number of [31-31](#)

types of [31-8](#)

policing

described [31-4](#)

token-bucket algorithm [31-8](#)

policy maps for QoS

characteristics of [31-45](#)

described [31-7](#)

displaying [31-68](#)

nonhierarchical on physical ports

described [31-8](#)

port ACLs, described [29-20](#)

Port Aggregation Protocol

See EtherChannel

port-based authentication

accounting [9-9](#)

authentication server

defined [9-3](#)

RADIUS server [9-3](#)

client, defined [9-3](#)

configuration guidelines [9-22](#)

port-based authentication (continued)

configuring

802.1x authentication [9-25](#)

guest VLAN [9-33](#)

host mode [9-28](#)

inaccessible authentication bypass [9-36](#)

manual re-authentication of a client [9-29](#)

periodic re-authentication [9-28](#)

quiet period [9-29](#)

RADIUS server [9-27](#)

RADIUS server parameters on the switch [9-26](#)

restricted VLAN [9-34](#)

switch-to-client frame-retransmission
number [9-31](#)

switch-to-client retransmission time [9-30](#)

default configuration [9-21](#)

described [9-1](#)

device roles [9-3](#)

displaying statistics [9-44](#)

EAPOL-start frame [9-6](#)

EAP-request/identity frame [9-6](#)

EAP-response/identity frame [9-6](#)

encapsulation [9-3](#)

guest VLAN

configuration guidelines [9-13, 9-14](#)

described [9-12](#)

host mode [9-8](#)

inaccessible authentication bypass

configuring [9-36](#)

described [9-14](#)

guidelines [9-23](#)

initiation and message exchange [9-6](#)

magic packet [9-17](#)

method lists [9-25](#)

multiple-hosts mode, described [9-9](#)

port-based authentication (continued)

- ports
 - authorization state and dot1x port-control command [9-8](#)
 - authorized and unauthorized [9-8](#)
 - critical [9-14](#)
 - voice VLAN [9-15](#)
- port security
 - and voice VLAN [9-17](#)
 - described [9-16](#)
 - interactions [9-16](#)
 - multiple-hosts mode [9-9](#)
- readiness check
 - configuring [9-24](#)
 - described [9-10, 9-24](#)
- resetting to default values [9-44](#)
- statistics, displaying [9-44](#)
- switch
 - as proxy [9-3](#)
 - RADIUS client [9-3](#)
- upgrading from a previous release [9-24](#)
- VLAN assignment
 - AAA authorization [9-25](#)
 - characteristics [9-11](#)
 - configuration tasks [9-12](#)
 - described [9-11](#)
- voice VLAN
 - described [9-15](#)
 - PVID [9-15](#)
 - VVID [9-15](#)
- wake-on-LAN, described [9-17](#)
- port blocking [1-3, 21-7](#)
- port-channel
 - See EtherChannel
- port description TLV [23-2](#)
- Port Fast
 - described [17-2](#)
 - enabling [17-10](#)
 - mode, spanning tree [12-25](#)
 - support for [1-7](#)
- port membership modes, VLAN [12-3](#)
- port priority
 - MSTP [16-19](#)
 - STP [15-16](#)
- ports
 - access [10-2](#)
 - blocking [21-7](#)
 - dual-purpose uplink [10-4](#)
 - dynamic access [12-3](#)
 - protected [21-6](#)
 - secure [21-8](#)
 - static-access [12-3, 12-10](#)
 - switch [10-2](#)
 - trunks [12-3, 12-14](#)
 - VLAN assignments [12-10](#)
- port security
 - aging [21-17](#)
 - and QoS trusted boundary [31-35](#)
 - configuring [21-12](#)
 - default configuration [21-11](#)
 - described [21-8](#)
 - displaying [21-19](#)
 - on trunk ports [21-14](#)
 - sticky learning [21-9](#)
 - violations [21-10](#)
 - with other features [21-11](#)
- port-shutdown response, VMPS [12-24](#)
- port VLAN ID TLV [23-2](#)
- power management TLV [23-2, 23-6](#)
- preemption, default configuration [18-8](#)
- preemption delay, default configuration [18-8](#)
- preferential treatment of traffic
 - See QoS
- preventing unauthorized access [8-1](#)

primary links [18-2](#)

priority

- overriding CoS [14-6](#)
- trusting CoS [14-6](#)

private VLAN edge ports

- See protected ports

privileged EXEC mode [2-2](#)

privilege levels

- changing the default for lines [8-9](#)
- command switch [5-14](#)
- exiting [8-9](#)
- logging into [8-9](#)
- mapping on member switches [5-14](#)
- overview [8-2, 8-7](#)
- setting a command with [8-8](#)

protected ports [1-8, 21-6](#)

proxy reports [18-4](#)

pruning, VTP

- disabling
 - in VTP domain [13-14](#)
 - on a port [12-20](#)
- enabling
 - in VTP domain [13-14](#)
 - on a port [12-19](#)
- examples [13-5](#)
- overview [13-4](#)

pruning-eligible list

- changing [12-19](#)
- for VTP pruning [13-4](#)
- VLANs [13-14](#)

PVST+

- described [15-9](#)
- IEEE 802.1Q trunking interoperability [15-10](#)
- instances supported [15-9](#)

Q

QoS

- and MQC commands [31-1](#)
- auto-QoS
 - categorizing traffic [31-19](#)
 - configuration and defaults display [31-28](#)
 - configuration guidelines [31-23](#)
 - described [31-18](#)
 - disabling [31-25](#)
 - displaying generated commands [31-25](#)
 - displaying the initial configuration [31-28](#)
 - effects on running configuration [31-23](#)
 - egress queue defaults [31-19](#)
 - enabling for VoIP [31-24](#)
 - example configuration [31-26](#)
 - ingress queue defaults [31-19](#)
 - list of generated commands [31-20](#)
- basic model [31-4](#)
- classification
 - class maps, described [31-7](#)
 - defined [31-4](#)
 - DSCP transparency, described [31-37](#)
 - flowchart [31-6](#)
 - forwarding treatment [31-3](#)
 - in frames and packets [31-3](#)
 - IP ACLs, described [31-5, 31-6](#)
 - MAC ACLs, described [31-5, 31-6](#)
 - options for IP traffic [31-5](#)
 - options for non-IP traffic [31-5](#)
 - policy maps, described [31-7](#)
 - trust DSCP, described [31-5](#)
 - trusted CoS, described [31-5](#)
 - trust IP precedence, described [31-5](#)
- class maps
 - configuring [31-43](#)
 - displaying [31-68](#)

QoS (continued)

- configuration guidelines
 - auto-QoS [31-23](#)
 - standard QoS [31-31](#)
- configuring
 - aggregate policers [31-48](#)
 - auto-QoS [31-18](#)
 - default port CoS value [31-35](#)
 - DSCP maps [31-50](#)
 - DSCP transparency [31-37](#)
 - DSCP trust states bordering another domain [31-37](#)
 - egress queue characteristics [31-61](#)
 - ingress queue characteristics [31-56](#)
 - IP extended ACLs [31-41](#)
 - IP standard ACLs [31-40](#)
 - MAC ACLs [31-42](#)
 - port trust states within the domain [31-33](#)
 - trusted boundary [31-35](#)
- default auto configuration [31-19](#)
- default standard configuration [31-29](#)
- displaying statistics [31-68](#)
- DSCP transparency [31-37](#)
- egress queues
 - allocating buffer space [31-61](#)
 - buffer allocation scheme, described [31-16](#)
 - configuring shaped weights for SRR [31-65](#)
 - configuring shared weights for SRR [31-66](#)
 - described [31-4](#)
 - displaying the threshold map [31-64](#)
 - flowchart [31-15](#)
 - mapping DSCP or CoS values [31-64](#)
 - scheduling, described [31-4](#)
 - setting WTD thresholds [31-61](#)
 - WTD, described [31-17](#)
- enabling globally [31-32](#)

QoS (continued)

- flowcharts
 - classification [31-6](#)
 - egress queueing and scheduling [31-15](#)
 - ingress queueing and scheduling [31-13](#)
 - policing and marking [31-9](#)
- implicit deny [31-7](#)
- ingress queues
 - allocating bandwidth [31-59](#)
 - allocating buffer space [31-58](#)
 - buffer and bandwidth allocation, described [31-14](#)
 - configuring shared weights for SRR [31-59](#)
 - configuring the priority queue [31-60](#)
 - described [31-4](#)
 - displaying the threshold map [31-58](#)
 - flowchart [31-13](#)
 - mapping DSCP or CoS values [31-57](#)
 - priority queue, described [31-14](#)
 - scheduling, described [31-4](#)
 - setting WTD thresholds [31-57](#)
 - WTD, described [31-14](#)
- IP phones
 - automatic classification and queueing [31-18](#)
 - detection and trusted settings [31-18, 31-35](#)
- limiting bandwidth on egress interface [31-67](#)
- mapping tables
 - CoS-to-DSCP [31-51](#)
 - displaying [31-68](#)
 - DSCP-to-CoS [31-54](#)
 - DSCP-to-DSCP-mutation [31-55](#)
 - IP-precedence-to-DSCP [31-52](#)
 - policed-DSCP [31-53](#)
 - types of [31-10](#)
- marked-down actions [31-47](#)
- marking, described [31-4, 31-8](#)
- overview [31-2](#)
- packet modification [31-17](#)

QoS (continued)

policers

- configuring [31-47, 31-49](#)
- described [31-8](#)
- displaying [31-68](#)
- number of [31-31](#)
- types of [31-8](#)

policies, attaching to an interface [31-8](#)

policing

- described [31-4, 31-8](#)
- token bucket algorithm [31-8](#)

policy maps

- characteristics of [31-45](#)
- displaying [31-68](#)
- nonhierarchical on physical ports [31-45](#)

QoS label, defined [31-4](#)

queues

- configuring egress characteristics [31-61](#)
- configuring ingress characteristics [31-56](#)
- high priority (expedite) [31-17, 31-67](#)
- location of [31-11](#)
- SRR, described [31-12](#)
- WTD, described [31-11](#)

rewrites [31-17](#)

support for [1-10](#)

trust states

- bordering another domain [31-37](#)
- described [31-5](#)
- trusted device [31-35](#)
- within the domain [31-33](#)

quality of service

See QoS

queries, IGMP [20-4](#)

query solicitation, IGMP [20-12](#)

R**RADIUS**

attributes

- vendor-proprietary [8-31](#)
- vendor-specific [8-29](#)

configuring

- accounting [8-28](#)
- authentication [8-23](#)
- authorization [8-27](#)
- communication, global [8-21, 8-29](#)
- communication, per-server [8-20, 8-21](#)
- multiple UDP ports [8-20](#)

default configuration [8-20](#)

defining AAA server groups [8-25](#)

displaying the configuration [8-31](#)

identifying the server [8-20](#)

in clusters [5-13](#)

limiting the services to the user [8-27](#)

method list, defined [8-19](#)

operation of [8-19](#)

overview [8-18](#)

suggested network environments [8-18](#)

support for [1-9](#)

tracking services accessed by user [8-28](#)

range

- macro [10-7](#)
- of interfaces [10-6](#)

rapid convergence [16-10](#)

rapid per-VLAN spanning-tree plus

See rapid PVST+

rapid PVST+

described [15-9](#)

IEEE 802.1Q trunking interoperability [15-10](#)

instances supported [15-9](#)

Rapid Spanning Tree Protocol

See RSTP

rcommand command [5-13](#)

- RCP
 - configuration files
 - downloading [B-16](#)
 - overview [B-15](#)
 - preparing the server [B-15](#)
 - uploading [B-17](#)
 - image files
 - deleting old image [B-35](#)
 - downloading [B-33](#)
 - preparing the server [B-32](#)
 - uploading [B-35](#)
- readiness check
 - port-based authentication
 - configuring [9-24](#)
 - described [9-10, 9-24](#)
- reconfirmation interval, VMPS, changing [12-27](#)
- reconfirming dynamic VLAN membership [12-27](#)
- recovery procedures [35-1](#)
- redundancy
 - EtherChannel [34-3](#)
 - STP
 - backbone [15-8](#)
 - path cost [12-22](#)
 - port priority [12-21](#)
- redundant links and UplinkFast [17-13](#)
- reloading software [3-20](#)
- Remote Authentication Dial-In User Service
 - See RADIUS
- Remote Copy Protocol
 - See RCP
- Remote Network Monitoring
 - See RMON
- Remote SPAN
 - See RSPAN
- remote SPAN [25-2](#)
- report suppression, IGMP
 - described [20-6](#)
 - disabling [20-15, 33-11](#)
- requirements
 - cluster [xxxiii](#)
 - device manager [xxxii](#)
 - Network Assistant [xxxii](#)
- resequencing ACL entries [29-30](#)
- resetting a UDLD-shutdown interface [24-6](#)
- responder, IP SLAs
 - described [30-4](#)
 - enabling [30-6](#)
- response time, measuring with IP SLAs [30-4](#)
- restricted VLAN
 - configuring [9-34](#)
 - described [9-13](#)
 - using with IEEE 802.1x [9-13](#)
- restricting access
 - NTP services [6-8](#)
 - overview [8-1](#)
 - passwords and privilege levels [8-2](#)
 - RADIUS [8-17](#)
 - TACACS+ [8-10](#)
- retry count, VMPS, changing [12-28](#)
- RFC
 - 1112, IP multicast and IGMP [20-2](#)
 - 1157, SNMPv1 [28-2](#)
 - 1305, NTP [6-2](#)
 - 1757, RMON [26-2](#)
 - 1901, SNMPv2C [28-2](#)
 - 1902 to 1907, SNMPv2 [28-2](#)
 - 2236, IP multicast and IGMP [20-2](#)
 - 2273-2275, SNMPv3 [28-2](#)
- RMON
 - default configuration [26-3](#)
 - displaying status [26-6](#)
 - enabling alarms and events [26-3](#)
 - groups supported [26-2](#)
 - overview [26-1](#)

RMON (continued)

- statistics
 - collecting group Ethernet [26-5](#)
 - collecting group history [26-5](#)
- support for [1-11](#)

root guard

- described [17-8](#)
- enabling [17-15](#)
- support for [1-7](#)

root switch

- MSTP [16-17](#)
- STP [15-14](#)

RSPAN

- characteristics [25-7](#)
- configuration guidelines [25-16](#)
- default configuration [25-9](#)
- defined [25-2](#)
- destination ports [25-6](#)
- displaying status [25-22](#)
- interaction with other features [25-8](#)
- monitored ports [25-5](#)
- monitoring ports [25-6](#)
- overview [1-11, 25-1](#)
- received traffic [25-4](#)
- sessions
 - creating [25-16](#)
 - defined [25-3](#)
 - limiting source traffic to specific VLANs [25-21](#)
 - specifying monitored ports [25-16](#)
 - with ingress traffic enabled [25-20](#)
- source ports [25-5](#)
- transmitted traffic [25-5](#)
- VLAN-based [25-6](#)

RSTP

- active topology [16-9](#)
- BPDU
 - format [16-12](#)
 - processing [16-13](#)
- designated port, defined [16-9](#)

RSTP (continued)

- designated switch, defined [16-9](#)
- interoperability with IEEE 802.1D
 - described [16-8](#)
 - restarting migration process [16-25](#)
 - topology changes [16-13](#)
- overview [16-8](#)
- port roles
 - described [16-9](#)
 - synchronized [16-11](#)
- proposal-agreement handshake process [16-10](#)
- rapid convergence
 - described [16-10](#)
 - edge ports and Port Fast [16-10](#)
 - point-to-point links [16-10, 16-24](#)
 - root ports [16-10](#)
- root port, defined [16-9](#)
- See also MSTP
- running configuration
 - replacing [B-18, B-19](#)
 - rolling back [B-18, B-20](#)
- running configuration, saving [3-15](#)

S

- SC (standby command switch) [5-9](#)
- scheduled reloads [3-20](#)
- SCP
 - and SSH [8-44](#)
 - configuring [8-44](#)
- SDM
 - described [7-1](#)
 - templates
 - configuring [7-3](#)
 - number of [7-1](#)
- SDM template
 - configuration guidelines [7-2](#)
 - configuring [7-2](#)
 - types of [7-1](#)

- Secure Copy Protocol
- secure HTTP client
 - configuring [8-43](#)
 - displaying [8-44](#)
- secure HTTP server
 - configuring [8-42](#)
 - displaying [8-44](#)
- secure MAC addresses
 - deleting [21-16](#)
 - maximum number of [21-9](#)
 - types of [21-9](#)
- secure ports, configuring [21-8](#)
- secure remote connections [8-33](#)
- Secure Shell
 - See SSH
- Secure Socket Layer
 - See SSL
- security, port [21-8](#)
- security features [1-8](#)
- See SCP
- sequence numbers in log messages [27-8](#)
- server mode, VTP [13-3](#)
- service-provider network, MSTP and RSTP [16-1](#)
- set-request operation [28-4](#)
- setup program
 - failed command switch replacement [35-9](#)
 - replacing failed command switch [35-8](#)
- severity levels, defining in system messages [27-8](#)
- SFPs
 - monitoring status of [10-18, 35-12](#)
 - security and identification [35-11](#)
 - status, displaying [35-12](#)
- shaped round robin
 - See SRR
- show access-lists hw-summary command [29-35](#)
- show and more command output, filtering [2-10](#)
- show cdp traffic command [22-5](#)
- show cluster members command [5-13](#)
- show configuration command [10-16](#)
- show forward command [35-19](#)
- show interfaces command [10-13, 10-16](#)
- show interfaces switchport [18-4](#)
- show lldp traffic command [23-8](#)
- show platform forward command [35-19](#)
- show running-config command
 - displaying ACLs [29-34, 29-35](#)
 - interface description in [10-16](#)
- shutdown command on interfaces [10-19](#)
- Simple Network Management Protocol
 - See SNMP
- small-frame arrival rate, configuring [21-5](#)
- Smartports macros
 - applying Cisco-default macros [11-6](#)
 - applying global parameter values [11-5, 11-6](#)
 - applying macros [11-5](#)
 - applying parameter values [11-5, 11-7](#)
 - configuration guidelines [11-2](#)
 - creating [11-4](#)
 - default configuration [11-2](#)
 - defined [11-1](#)
 - displaying [11-8](#)
 - tracing [11-3](#)
 - website [11-2](#)
- SNAP [22-1](#)
- SNMP
 - accessing MIB variables with [28-4](#)
 - agent
 - described [28-4](#)
 - disabling [28-7](#)
 - and IP SLAs [30-2](#)
 - authentication level [28-10](#)
 - community strings
 - configuring [28-8](#)
 - for cluster switches [28-4](#)
 - overview [28-4](#)
 - configuration examples [28-16](#)
 - default configuration [28-6](#)
 - engine ID [28-7](#)

SNMP (continued)

- groups [28-7, 28-9](#)
 - host [28-7](#)
 - ifIndex values [28-5](#)
 - in-band management [1-6](#)
 - in clusters [5-13](#)
 - informs
 - and trap keyword [28-11](#)
 - described [28-5](#)
 - differences from traps [28-5](#)
 - disabling [28-14](#)
 - enabling [28-14](#)
 - limiting access by TFTP servers [28-15](#)
 - limiting system log messages to NMS [27-10](#)
 - manager functions [1-4, 28-3](#)
 - managing clusters with [5-14](#)
 - MIBs
 - location of [A-3](#)
 - supported [A-1](#)
 - notifications [28-5](#)
 - overview [28-1, 28-4](#)
 - security levels [28-3](#)
 - status, displaying [28-17](#)
 - system contact and location [28-14](#)
 - trap manager, configuring [28-13](#)
 - traps
 - described [28-3, 28-5](#)
 - differences from informs [28-5](#)
 - disabling [28-14](#)
 - enabling [28-11](#)
 - enabling MAC address notification [6-22](#)
 - overview [28-1, 28-4](#)
 - types of [28-11](#)
 - users [28-7, 28-9](#)
 - versions supported [28-2](#)
- SNMP and Syslog Over IPv6 [32-10](#)
- SNMPv1 [28-2](#)
- SNMPv2C [28-2](#)
- SNMPv3 [28-2](#)
- snooping, IGMP [20-1](#)
- software images
 - location in flash [B-23](#)
 - recovery procedures [35-2](#)
 - scheduling reloads [3-20](#)
 - tar file format, described [B-23](#)
 - See also downloading and uploading
- source addresses
 - in IPv4 ACLs [29-27](#)
- source-and-destination-IP address based forwarding, EtherChannel [34-7](#)
- source-and-destination MAC address forwarding, EtherChannel [34-7](#)
- source-IP address based forwarding, EtherChannel [34-7](#)
- source-MAC address forwarding, EtherChannel [34-6](#)
- SPAN
 - configuration guidelines [25-10](#)
 - default configuration [25-9](#)
 - destination ports [25-6](#)
 - displaying status [25-22](#)
 - interaction with other features [25-8](#)
 - monitored ports [25-5](#)
 - monitoring ports [25-6](#)
 - overview [1-11, 25-1](#)
 - ports, restrictions [21-12](#)
 - received traffic [25-4](#)
 - sessions
 - configuring ingress forwarding [25-14, 25-21](#)
 - creating [25-10](#)
 - defined [25-3](#)
 - limiting source traffic to specific VLANs [25-14](#)
 - removing destination (monitoring) ports [25-12](#)
 - specifying monitored ports [25-10](#)
 - with ingress traffic enabled [25-13](#)
 - source ports [25-5](#)
 - transmitted traffic [25-5](#)
 - VLAN-based [25-6](#)
- spanning tree and native VLANs [12-16](#)

- Spanning Tree Protocol
 - See STP
- SPAN traffic [25-4](#)
- SRR
 - configuring
 - shaped weights on egress queues [31-65](#)
 - shared weights on egress queues [31-66](#)
 - shared weights on ingress queues [31-59](#)
 - described [31-12](#)
 - shaped mode [31-12](#)
 - shared mode [31-12](#)
 - support for [1-11](#)
- SSH
 - configuring [8-34](#)
 - cryptographic software image [8-33](#)
 - described [1-6, 8-33](#)
 - encryption methods [8-34](#)
 - user authentication methods, supported [8-34](#)
- SSL
 - configuration guidelines [8-40](#)
 - configuring a secure HTTP client [8-43](#)
 - configuring a secure HTTP server [8-41](#)
 - cryptographic software image [8-37](#)
 - described [8-37](#)
 - monitoring [8-44](#)
- standby command switch
 - configuring
 - considerations [5-10](#)
 - defined [5-2](#)
 - priority [5-9](#)
 - requirements [5-3](#)
 - virtual IP address [5-10](#)
 - See also cluster standby group and HSRP
- standby group, cluster
 - See cluster standby group and HSRP
- standby links [18-2](#)
- startup configuration
 - booting
 - manually [3-17](#)
 - specific image [3-18](#)
 - clearing [B-18](#)
 - configuration file
 - automatically downloading [3-16](#)
 - specifying the filename [3-16](#)
 - default boot configuration [3-16](#)
- static access ports
 - assigning to VLAN [12-10](#)
 - defined [10-3, 12-3](#)
- static addresses
 - See addresses
- static MAC addressing [1-8](#)
- static routes
 - configuring for IPv6 [32-15](#)
- static VLAN membership [12-2](#)
- statistics
 - 802.1x [9-44](#)
 - CDP [22-4](#)
 - interface [10-18](#)
 - LLDP [23-7](#)
 - LLDP-MED [23-7](#)
 - QoS ingress and egress [31-68](#)
 - RMON group Ethernet [26-5](#)
 - RMON group history [26-5](#)
 - SNMP input and output [28-17](#)
 - VTP [13-16](#)
- sticky learning [21-9](#)
- storm control
 - configuring [21-3](#)
 - described [21-1](#)
 - disabling [21-5](#)
 - displaying [21-19](#)
 - support for [1-3](#)
 - thresholds [21-1](#)

STP

- accelerating root port selection [17-4](#)
- BackboneFast
 - described [17-5](#)
 - disabling [17-14](#)
 - enabling [17-13](#)
- BPDU filtering
 - described [17-3](#)
 - disabling [17-12](#)
 - enabling [17-12](#)
- BPDU guard
 - described [17-2](#)
 - disabling [17-12](#)
 - enabling [17-11](#)
- BPDU message exchange [15-3](#)
- configuration guidelines [15-12, 17-10](#)
- configuring
 - forward-delay time [15-21](#)
 - hello time [15-20](#)
 - maximum aging time [15-21](#)
 - path cost [15-18](#)
 - port priority [15-16](#)
 - root switch [15-14](#)
 - secondary root switch [15-16](#)
 - spanning-tree mode [15-13](#)
 - switch priority [15-19](#)
 - transmit hold-count [15-22](#)
- counters, clearing [15-22](#)
- default configuration [15-11](#)
- default optional feature configuration [17-9](#)
- designated port, defined [15-3](#)
- designated switch, defined [15-3](#)
- detecting indirect link failures [17-5](#)
- disabling [15-14](#)
- displaying status [15-22](#)
- EtherChannel guard
 - described [17-7](#)
 - disabling [17-14](#)
 - enabling [17-14](#)

STP (continued)

- extended system ID
 - effects on root switch [15-14](#)
 - effects on the secondary root switch [15-16](#)
 - overview [15-4](#)
 - unexpected behavior [15-14](#)
- features supported [1-6](#)
- IEEE 802.1D and bridge ID [15-4](#)
- IEEE 802.1D and multicast addresses [15-8](#)
- IEEE 802.1t and VLAN identifier [15-4](#)
- inferior BPDU [15-3](#)
- instances supported [15-9](#)
- interface state, blocking to forwarding [17-2](#)
- interface states
 - blocking [15-6](#)
 - disabled [15-7](#)
 - forwarding [15-5, 15-6](#)
 - learning [15-6](#)
 - listening [15-6](#)
 - overview [15-4](#)
- interoperability and compatibility among modes [15-10](#)
- limitations with IEEE 802.1Q trunks [15-10](#)
- load sharing
 - overview [12-20](#)
 - using path costs [12-22](#)
 - using port priorities [12-21](#)
- loop guard
 - described [17-9](#)
 - enabling [17-15](#)
- modes supported [15-9](#)
- multicast addresses, effect of [15-8](#)
- optional features supported [1-7](#)
- overview [15-2](#)
- path costs [12-22, 12-23](#)
- Port Fast
 - described [17-2](#)
 - enabling [17-10](#)
- port priorities [12-21](#)

STP (continued)

- preventing root switch selection [17-8](#)
- protocols supported [15-9](#)
- redundant connectivity [15-8](#)
- root guard
 - described [17-8](#)
 - enabling [17-15](#)
- root port, defined [15-3](#)
- root switch
 - configuring [15-14](#)
 - effects of extended system ID [15-4, 15-14](#)
 - election [15-3](#)
 - unexpected behavior [15-14](#)
- shutdown Port Fast-enabled port [17-2](#)
- status, displaying [15-22](#)
- superior BPDU [15-3](#)
- timers, described [15-20](#)
- UplinkFast
 - described [17-3](#)
 - enabling [17-13](#)
- stratum, NTP [6-2](#)
- success response, VMPS [12-24](#)
- summer time [6-13](#)
- SunNet Manager [1-4](#)
- switch clustering technology [5-1](#)
 - See also clusters, switch
- switch console port [1-6](#)
- Switch Database Management
 - See SDM
- Switched Port Analyzer
 - See SPAN
- switched ports [10-2](#)
- switchport backup interface [18-4, 18-5](#)
- switchport block multicast command [21-8](#)
- switchport block unicast command [21-8](#)
- switchport protected command [21-7](#)
- switch priority
 - MSTP [16-21](#)
 - STP [15-19](#)

- switch software features [1-1](#)
- syslog
 - See system message logging
- Syslog Over IPv6 [32-11](#)
- system capabilities TLV [23-2](#)
- system clock
 - configuring
 - daylight saving time [6-13](#)
 - manually [6-11](#)
 - summer time [6-13](#)
 - time zones [6-12](#)
 - displaying the time and date [6-12](#)
 - overview [6-1](#)
 - See also NTP
- system description TLV [23-2](#)
- system message logging
 - default configuration [27-3](#)
 - defining error message severity levels [27-8](#)
 - disabling [27-4](#)
 - displaying the configuration [27-13](#)
 - enabling [27-4](#)
 - facility keywords, described [27-13](#)
 - level keywords, described [27-9](#)
 - limiting messages [27-10](#)
 - message format [27-2](#)
 - overview [27-1](#)
 - sequence numbers, enabling and disabling [27-8](#)
 - setting the display destination device [27-5](#)
 - synchronizing log messages [27-6](#)
 - syslog facility [1-11](#)
 - time stamps, enabling and disabling [27-7](#)
 - UNIX syslog servers
 - configuring the daemon [27-12](#)
 - configuring the logging facility [27-12](#)
 - facilities supported [27-13](#)

system name

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

See also DNS

system name TLV [23-2](#)system prompt, default setting [6-14, 6-15](#)system resources, optimizing [7-1](#)**T**

TACACS+

accounting, defined [8-11](#)authentication, defined [8-11](#)authorization, defined [8-11](#)

configuring

accounting [8-17](#)authentication key [8-13](#)authorization [8-16](#)login authentication [8-14](#)default configuration [8-13](#)displaying the configuration [8-17](#)identifying the server [8-13](#)in clusters [5-13](#)limiting the services to the user [8-16](#)operation of [8-12](#)overview [8-10](#)support for [1-9](#)tracking services accessed by user [8-17](#)

tar files

creating [B-6](#)displaying the contents of [B-6](#)extracting [B-7](#)image file format [B-23](#)TDR [1-12](#)

Telnet

accessing management interfaces [2-10](#)number of connections [1-6](#)setting a password [8-6](#)templates, SDM [7-2](#)temporary self-signed certificate [8-38](#)

Terminal Access Controller Access Control System Plus

See TACACS+

terminal lines, setting a password [8-6](#)

TFTP

configuration files

downloading [B-11](#)preparing the server [B-10](#)uploading [B-11](#)configuration files in base directory [3-7](#)configuring for autoconfiguration [3-7](#)

image files

deleting [B-26](#)downloading [B-25](#)preparing the server [B-25](#)uploading [B-27](#)limiting access by servers [28-15](#)TFTP server [1-5](#)threshold, traffic level [21-2](#)

time

See NTP and system clock

Time Domain Reflector

See TDR

time-range command [29-32](#)time ranges in ACLs [29-32](#)time stamps in log messages [27-7](#)time zones [6-12](#)

TLVs

defined [23-2](#)LLDP [23-2](#)LLDP-MED [23-2](#)

Token Ring VLANs

support for [12-5](#)VTP support [13-4](#)ToS [1-10](#)

- traceroute, Layer 2
 - and ARP [35-14](#)
 - and CDP [35-14](#)
 - broadcast traffic [35-14](#)
 - described [35-14](#)
 - IP addresses and subnets [35-14](#)
 - MAC addresses and VLANs [35-14](#)
 - multicast traffic [35-14](#)
 - multiple devices on a port [35-15](#)
 - unicast traffic [35-14](#)
 - usage guidelines [35-14](#)
 - traceroute command [35-16](#)
 - See also IP traceroute
 - traffic
 - blocking flooded [21-8](#)
 - fragmented [29-21](#)
 - unfragmented [29-21](#)
 - traffic policing [1-10](#)
 - traffic suppression [21-1](#)
 - transmit hold-count
 - see STP
 - transparent mode, VTP [13-3, 13-12](#)
 - trap-door mechanism [3-2](#)
 - traps
 - configuring MAC address notification [6-22](#)
 - configuring managers [28-11](#)
 - defined [28-3](#)
 - enabling [6-22, 28-11](#)
 - notification types [28-11](#)
 - overview [28-1, 28-4](#)
 - troubleshooting
 - connectivity problems [35-12, 35-13, 35-15](#)
 - detecting unidirectional links [24-1](#)
 - displaying crash information [35-21](#)
 - setting packet forwarding [35-19](#)
 - SFP security and identification [35-11](#)
 - show forward command [35-19](#)
 - with CiscoWorks [28-4](#)
 - with debug commands [35-18](#)
 - troubleshooting (continued)**
 - with ping [35-12](#)
 - with system message logging [27-1](#)
 - with traceroute [35-15](#)
 - trunk failover
 - See link-state tracking
 - trunking encapsulation [1-7](#)
 - trunk ports
 - configuring [12-17](#)
 - defined [10-3, 12-3](#)
 - trunks
 - allowed-VLAN list [12-18](#)
 - load sharing
 - setting STP path costs [12-22](#)
 - using STP port priorities [12-21](#)
 - native VLAN for untagged traffic [12-20](#)
 - parallel [12-22](#)
 - pruning-eligible list [12-19](#)
 - to non-DTP device [12-15](#)
 - trusted boundary for QoS [31-35](#)
 - trusted port states
 - between QoS domains [31-37](#)
 - classification options [31-5](#)
 - ensuring port security for IP phones [31-35](#)
 - support for [1-10](#)
 - within a QoS domain [31-33](#)
 - trustpoints, CA [8-38](#)
 - twisted-pair Ethernet, detecting unidirectional links [24-1](#)
 - type of service
 - See ToS
-
- ## U
- UDLD
 - configuration guidelines [24-4](#)
 - default configuration [24-4](#)

UDLD (continued)

- disabling
 - globally [24-5](#)
 - on fiber-optic interfaces [24-5](#)
 - per interface [24-5](#)
- echoing detection mechanism [24-2](#)
- enabling
 - globally [24-5](#)
 - per interface [24-5](#)
- link-detection mechanism [24-1](#)
- neighbor database [24-2](#)
- overview [24-1](#)
- resetting an interface [24-6](#)
- status, displaying [24-6](#)
- support for [1-6](#)
- unauthorized ports with IEEE 802.1x [9-8](#)
- unicast MAC address filtering [1-5](#)
 - and adding static addresses [6-25](#)
 - and broadcast MAC addresses [6-25](#)
 - and CPU packets [6-25](#)
 - and multicast addresses [6-25](#)
 - and router MAC addresses [6-25](#)
 - configuration guidelines [6-25](#)
 - described [6-25](#)
- unicast storm [21-1](#)
- unicast storm control command [21-4](#)
- unicast traffic, blocking [21-8](#)
- UniDirectional Link Detection protocol
 - See UDLD
- UNIX syslog servers
 - daemon configuration [27-12](#)
 - facilities supported [27-13](#)
 - message logging configuration [27-12](#)
- unrecognized Type-Length-Value (TLV) support [13-4](#)
- upgrading a Catalyst 2950 switch
 - configuration compatibility issues [C-1](#)
 - differences in configuration commands [C-1](#)
 - feature behavior incompatibilities [C-5](#)

upgrading a Catalyst 2950 switch (continued)

- incompatible command messages [C-1](#)
- recommendations [C-1](#)
- upgrading information
 - See release notes
- upgrading software images
 - See downloading
- UplinkFast
 - described [17-3](#)
 - disabling [17-13](#)
 - enabling [17-13](#)
 - support for [1-6](#)
- uploading
 - configuration files
 - preparing [B-10](#), [B-12](#), [B-15](#)
 - reasons for [B-8](#)
 - using FTP [B-14](#)
 - using RCP [B-17](#)
 - using TFTP [B-11](#)
 - image files
 - preparing [B-25](#), [B-28](#), [B-32](#)
 - reasons for [B-23](#)
 - using FTP [B-30](#)
 - using RCP [B-35](#)
 - using TFTP [B-27](#)
- user EXEC mode [2-2](#)
- username-based authentication [8-6](#)

V

- version-dependent transparent mode [13-4](#)
- virtual IP address
 - cluster standby group [5-10](#)
 - command switch [5-10](#)
- vlan.dat file [12-4](#)
- VLAN 1, disabling on a trunk port [12-18](#)
- VLAN 1 minimization [12-18](#)
- vlan-assignment response, VMPS [12-24](#)

- VLAN configuration
 - at bootup [12-7](#)
 - saving [12-7](#)
- VLAN configuration mode [2-2, 12-6](#)
- VLAN database
 - and startup configuration file [12-7](#)
 - and VTP [13-1](#)
 - VLAN configuration saved in [12-7](#)
 - VLANs saved in [12-4](#)
- vlan database command [12-6](#)
- VLAN filtering and SPAN [25-6](#)
- vlan global configuration command [12-6](#)
- VLAN ID, discovering [6-26](#)
- VLAN load balancing on flex links [18-2](#)
 - configuration guidelines [18-8](#)
- VLAN management domain [13-2](#)
- VLAN Management Policy Server
 - See VMPS
- VLAN membership
 - confirming [12-27](#)
 - modes [12-3](#)
- VLAN Query Protocol
 - See VQP
- VLANs
 - adding [12-8](#)
 - adding to VLAN database [12-8](#)
 - aging dynamic addresses [15-9](#)
 - allowed on trunk [12-18](#)
 - and spanning-tree instances [12-2, 12-6, 12-12](#)
 - configuration guidelines, extended-range VLANs [12-12](#)
 - configuration guidelines, normal-range VLANs [12-5](#)
 - configuration options [12-6](#)
 - configuring [12-1](#)
 - configuring IDs 1006 to 4094 [12-12](#)
 - creating in config-vlan mode [12-8](#)
 - creating in VLAN configuration mode [12-9](#)
 - default configuration [12-7](#)
 - deleting [12-10](#)
- VLANs (continued)**
 - described [10-2, 12-1](#)
 - displaying [12-14](#)
 - extended-range [12-1, 12-11](#)
 - features [1-7](#)
 - illustrated [12-2](#)
 - limiting source traffic with RSPAN [25-21](#)
 - limiting source traffic with SPAN [25-14](#)
 - modifying [12-8](#)
 - multicast [20-16](#)
 - native, configuring [12-20](#)
 - normal-range [12-1, 12-4](#)
 - number supported [1-7](#)
 - parameters [12-4](#)
 - port membership modes [12-3](#)
 - static-access ports [12-10](#)
 - STP and IEEE 802.1Q trunks [15-10](#)
 - supported [12-2](#)
 - Token Ring [12-5](#)
 - traffic between [12-2](#)
 - VTP modes [13-3](#)
- VLAN Trunking Protocol
 - See VTP
- VLAN trunks [12-14](#)
- VMPS
 - administering [12-28](#)
 - configuration example [12-29](#)
 - configuration guidelines [12-25](#)
 - default configuration [12-25](#)
 - description [12-24](#)
 - dynamic port membership
 - described [12-25](#)
 - reconfirming [12-27](#)
 - troubleshooting [12-29](#)
 - entering server address [12-26](#)
 - mapping MAC addresses to VLANs [12-24](#)
 - monitoring [12-28](#)
 - reconfirmation interval, changing [12-27](#)

VMPS (continued)

reconfirming membership [12-27](#)

retry count, changing [12-28](#)

voice-over-IP [14-1](#)

voice VLAN

Cisco 7960 phone, port connections [14-1](#)

configuration guidelines [14-3](#)

configuring IP phones for data traffic

override CoS of incoming frame [14-6](#)

trust CoS priority of incoming frame [14-6](#)

configuring ports for voice traffic in

802.1p priority tagged frames [14-5](#)

802.1Q frames [14-4](#)

connecting to an IP phone [14-4](#)

default configuration [14-3](#)

described [14-1](#)

displaying [14-6](#)

IP phone data traffic, described [14-2](#)

IP phone voice traffic, described [14-2](#)

VQP [1-7, 12-24](#)

VTP

adding a client to a domain [13-14](#)

advertisements [12-16, 13-3](#)

and extended-range VLANs [13-2](#)

and normal-range VLANs [13-2](#)

client mode, configuring [13-11](#)

configuration

global configuration mode [13-7](#)

guidelines [13-8](#)

privileged EXEC mode [13-7](#)

requirements [13-9](#)

saving [13-7](#)

VLAN configuration mode [13-7](#)

configuration mode options [13-7](#)

configuration requirements [13-9](#)

configuration revision number

guideline [13-14](#)

resetting [13-15](#)

VTP (continued)

configuring

client mode [13-11](#)

server mode [13-9](#)

transparent mode [13-12](#)

consistency checks [13-4](#)

default configuration [13-6](#)

described [13-1](#)

disabling [13-12](#)

domain names [13-8](#)

domains [13-2](#)

modes

client [13-3, 13-11](#)

server [13-3, 13-9](#)

transitions [13-3](#)

transparent [13-3, 13-12](#)

monitoring [13-16](#)

passwords [13-8](#)

pruning

disabling [13-14](#)

enabling [13-14](#)

examples [13-5](#)

overview [13-4](#)

support for [1-7](#)

pruning-eligible list, changing [12-19](#)

server mode, configuring [13-9](#)

statistics [13-16](#)

support for [1-7](#)

Token Ring support [13-4](#)

transparent mode, configuring [13-12](#)

using [13-1](#)

version, guidelines [13-8](#)

Version 1 [13-4](#)

Version 2

configuration guidelines [13-8](#)

disabling [13-13](#)

enabling [13-13](#)

overview [13-4](#)

W

- web authentication [9-10](#)
 - configuring [9-41 to 9-43](#)
 - described [1-8, 9-19](#)
 - fallback for IEEE 802.1x [9-42](#)
- weighted tail drop
 - See WTD
- wizards [1-2](#)
- WTD
 - described [31-11](#)
 - setting thresholds
 - egress queue-sets [31-61](#)
 - ingress queues [31-57](#)
 - support for [1-11](#)

X

- Xmodem protocol [35-2](#)

