



INDEX

A

- AAA down policy, NAC Layer 2 IP validation [1-10](#)
- abbreviating commands [2-4](#)
- ABRs [37-24](#)
- AC (command switch) [6-10](#)
- access-class command [34-19](#)
- access control entries
 - See ACEs
- access control entry (ACE) [40-3](#)
- access-denied response, VMPS [16-25](#)
- access groups
 - applying IPv4 ACLs to interfaces [34-20](#)
 - Layer 2 [34-20](#)
 - Layer 3 [34-20](#)
- accessing
 - clusters, switch [6-13](#)
 - command switches [6-11](#)
 - member switches [6-13](#)
 - switch clusters [6-13](#)
- access lists
 - See ACLs
- access ports
 - and Layer 2 protocol tunneling [16-10](#)
 - defined [14-3](#)
 - in switch clusters [6-9](#)
- accounting
 - with 802.1x [12-46](#)
 - with IEEE 802.1x [12-14](#)
 - with RADIUS [11-33](#)
 - with TACACS+ [11-11, 11-17](#)
- ACEs
 - and QoS [35-7](#)
 - defined [34-2](#)
 - Ethernet [34-2](#)
 - IP [34-2](#)
- ACLs
 - ACEs [34-2](#)
 - any keyword [34-12](#)
 - applying
 - on bridged packets [34-38](#)
 - on multicast packets [34-40](#)
 - on routed packets [34-39](#)
 - on switched packets [34-38](#)
 - time ranges to [34-16](#)
 - to an interface [34-19, 40-7](#)
 - to IPv6 interfaces [40-7](#)
 - to QoS [35-7](#)
 - classifying traffic for QoS [35-43](#)
 - comments in [34-18](#)
 - compiling [34-22](#)
 - defined [34-1, 34-7](#)
 - examples of [34-22, 35-43](#)
 - extended IP, configuring for QoS classification [35-44](#)
 - extended IPv4
 - creating [34-10](#)
 - matching criteria [34-7](#)
 - hardware and software handling [34-21](#)
 - host keyword [34-12](#)

ACLs (continued)

IP

- creating [34-7](#)
- fragments and QoS guidelines [35-33](#)
- implicit deny [34-9, 34-13, 34-15](#)
- implicit masks [34-9](#)
- matching criteria [34-7](#)
- undefined [34-20](#)

IPv4

- applying to interfaces [34-19](#)
- creating [34-7](#)
- matching criteria [34-7](#)
- named [34-14](#)
- numbers [34-8](#)
- terminal lines, setting on [34-18](#)
- unsupported features [34-7](#)

IPv6

- applying to interfaces [40-7](#)
- configuring [40-3, 40-4](#)
- displaying [40-8](#)
- interactions with other features [40-4](#)
- limitations [40-2, 40-3](#)
- matching criteria [40-3](#)
- named [40-2](#)
- precedence of [40-2](#)
- supported [40-2](#)
- unsupported features [40-3](#)

Layer 4 information in [34-37](#)

logging messages [34-8](#)

MAC extended [34-27, 35-45](#)

matching [34-7, 34-20, 40-3](#)

monitoring [34-40, 40-8](#)

named, IPv4 [34-14](#)

named, IPv6 [40-2](#)

names [40-4](#)

number per QoS class map [35-33](#)

port [34-2, 40-1](#)

precedence of [34-2](#)

QoS [35-7, 35-43](#)

ACLs (continued)

resequencing entries [34-14](#)

router [34-2, 40-1](#)

router ACLs and VLAN map configuration guidelines [34-37](#)

standard IP, configuring for QoS classification [35-43](#)

standard IPv4

- creating [34-9](#)

- matching criteria [34-7](#)

support for [1-9](#)

support in hardware [34-21](#)

time ranges [34-16](#)

types supported [34-2](#)

unsupported features, IPv4 [34-7](#)

unsupported features, IPv6 [40-3](#)

using router ACLs with VLAN maps [34-36](#)

VLAN maps

- configuration guidelines [34-30](#)

- configuring [34-29](#)

active link [21-4, 21-5, 21-6](#)

active links [21-2](#)

active router [41-1](#)

active traffic monitoring, IP SLAs [42-1](#)

address aliasing [24-2](#)

addresses

- displaying the MAC address table [7-30](#)

dynamic

- accelerated aging [17-8](#)

- changing the aging time [7-21](#)

- default aging [17-8](#)

- defined [7-19](#)

- learning [7-20](#)

- removing [7-22](#)

IPv6 [38-2](#)

MAC, discovering [7-30](#)

multicast

- group address range [45-3](#)

- STP address management [17-8](#)

addresses (continued)

- static
 - adding and removing [7-26](#)
 - defined [7-19](#)
- address resolution [7-30, 37-8](#)
- Address Resolution Protocol
 - See ARP
- adjacency tables, with CEF [37-86](#)
- administrative distances
 - defined [37-98](#)
 - OSPF [37-30](#)
 - routing protocol defaults [37-88](#)
- administrative VLAN
 - REP, configuring [20-8](#)
- administrative VLAN, REP [20-8](#)
- advertisements
 - CDP [27-1](#)
 - LLDP [26-1, 26-2](#)
 - RIP [37-18](#)
 - VTP [16-16, 17-3, 17-4](#)
- age timer, REP [20-8](#)
- aggregatable global unicast addresses [38-3](#)
- aggregate addresses, BGP [37-57](#)
- aggregated ports
 - See EtherChannel
- aggregate policers [35-58](#)
- aggregate policing [1-12](#)
- aging, accelerating [17-8](#)
- aging time
 - accelerated
 - for MSTP [18-23](#)
 - for STP [17-8, 17-21](#)
 - MAC address table [7-21](#)
 - maximum
 - for MSTP [18-23, 18-24](#)
 - for STP [17-21, 17-22](#)
- alarm profiles
 - configuring [3-11](#)
 - creating or modifying [3-10](#)

- alarms
 - default configuration [3-4](#)
 - displaying [3-12](#)
 - power supply [3-2](#)
 - temperature [3-2](#)
- alarms, RMON [30-3](#)
- allowed-VLAN list [16-18](#)
- application engines, redirecting traffic to [44-1](#)
- area border routers
 - See ABRs
- area routing
 - IS-IS [37-61](#)
 - ISO IGRP [37-61](#)
- ARP
 - configuring [37-9](#)
 - defined [1-5, 7-30, 37-8](#)
 - encapsulation [37-10](#)
 - static cache configuration [37-9](#)
 - table
 - address resolution [7-30](#)
 - managing [7-30](#)
- ASBRs [37-24](#)
- AS-path filters, BGP [37-51](#)
- associating the temperature alarms to a relay [3-7](#)
- asymmetrical links, and IEEE 802.1Q tunneling [16-4](#)
- attaching an alarm profile to a port [3-11](#)
- attributes, RADIUS
 - vendor-proprietary [11-36](#)
 - vendor-specific [11-34](#)
- attribute-value pairs [12-12, 12-14, 12-18](#)
- authentication
 - EIGRP [37-38](#)
 - HSRP [41-10](#)
 - local mode with AAA [11-43](#)
 - NTP associations [7-4](#)
 - open1x [12-27](#)
 - RADIUS
 - key [11-26](#)
 - login [11-28](#)

ACLs (continued)

TACACS+

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

See also port-based authentication

authentication compatibility with Catalyst 6000 switches [12-8](#)

authentication failed VLAN

See restricted VLAN

authentication keys, and routing protocols [37-98](#)

authentication manager

CLI commands [12-9](#)compatibility with older 802.1x CLI commands [12-9 to ??](#)overview [12-7](#)authoritative time source, described [7-2](#)

authorization

with RADIUS [11-32](#)with TACACS+ [11-11, 11-16](#)authorized ports with IEEE 802.1x [12-10](#)autoconfiguration [4-3](#)auto enablement [12-28](#)

automatic discovery

considerations

beyond a noncandidate device [6-7](#)brand new switches [6-9](#)connectivity [6-4](#)different VLANs [6-6](#)management VLANs [6-7](#)non-CDP-capable devices [6-6](#)noncluster-capable devices [6-6](#)routed ports [6-8](#)in switch clusters [6-4](#)

See also CDP

automatic QoS

See QoS

automatic recovery, clusters [6-10](#)

See also HSRP

auto-MDIX

configuring [14-19](#)described [14-19](#)

autonegotiation

duplex mode [1-3](#)interface configuration guidelines [14-16](#)mismatches [48-7](#)

autonomous system boundary routers

See ASBRs

autonomous systems, in BGP [37-45](#)Auto-RP, described [45-6](#)autosensing, port speed [1-3](#)

Auto Smartports macros

displaying [15-5](#)autostate exclude [14-5](#)

auxiliary VLAN

See voice VLAN

availability, features [1-7](#)

B

BackboneFast

described [19-5](#)disabling [19-14](#)enabling [19-13](#)support for [1-7](#)

backup interfaces

See Flex Links

backup links [21-2](#)backup static routing, configuring [43-12](#)

banners

configuring

login [7-19](#)message-of-the-day login [7-18](#)default configuration [7-17](#)when displayed [7-17](#)Berkeley r-tools replacement [11-55](#)

- BGP
 - aggregate addresses [37-57](#)
 - aggregate routes, configuring [37-57](#)
 - CIDR [37-57](#)
 - clear commands [37-60](#)
 - community filtering [37-54](#)
 - configuring neighbors [37-55](#)
 - default configuration [37-42](#)
 - described [37-41](#)
 - enabling [37-45](#)
 - monitoring [37-60](#)
 - multipath support [37-49](#)
 - neighbors, types of [37-25](#)
 - path selection [37-49](#)
 - peers, configuring [37-55](#)
 - prefix filtering [37-53](#)
 - resetting sessions [37-48](#)
 - route dampening [37-59](#)
 - route maps [37-51](#)
 - route reflectors [37-58](#)
 - routing domain confederation [37-58](#)
 - routing session with multi-VRF CE [37-80](#)
 - show commands [37-60](#)
 - supernets [37-57](#)
 - support for [1-12](#)
 - Version 4 [37-42](#)
- binding cluster group and HSRP group [41-12](#)
- binding database
 - address, DHCP server
 - See DHCP, Cisco IOS server database
 - DHCP snooping
 - See DHCP snooping binding database
- bindings
 - address, Cisco IOS DHCP server [22-6](#)
 - DHCP snooping database [22-6](#)
 - IP source guard [22-15](#)
- binding table, DHCP snooping
 - See DHCP snooping binding database
- blocking packets [25-7](#)
- Boolean expressions in tracked lists [43-4](#)
- booting
 - boot loader, function of [4-2](#)
 - boot process [4-2](#)
 - manually [4-18](#)
 - specific image [4-19](#)
- boot loader
 - accessing [4-19](#)
 - described [4-2](#)
 - environment variables [4-19](#)
 - prompt [4-19](#)
 - trap-door mechanism [4-2](#)
- bootstrap router (BSR), described [45-7](#)
- Border Gateway Protocol
 - See BGP
- BPDU
 - error-disabled state [19-2](#)
 - filtering [19-3](#)
 - RSTP format [18-12](#)
- BPDU filtering
 - described [19-3](#)
 - disabling [19-12](#)
 - enabling [19-12](#)
 - support for [1-7](#)
- BPDU guard
 - described [19-2](#)
 - disabling [19-12](#)
 - enabling [19-11](#)
 - support for [1-7](#)
- bridged packets, ACLs on [34-38](#)
- bridge groups
 - See fallback bridging
- bridge protocol data unit
 - See BPDU
- broadcast flooding [37-16](#)
- broadcast packets
 - directed [37-13](#)
 - flooded [37-13](#)

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

broadcast storms [25-1, 37-13](#)

C

cables, monitoring for unidirectional links [28-1](#)

candidate switch

automatic discovery [6-4](#)

defined [6-3](#)

requirements [6-3](#)

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

Catalyst 6000 switches

authentication compatibility [12-8](#)

CA trustpoint

configuring [11-51](#)

defined [11-49](#)

CDP

and trusted boundary [35-39](#)

automatic discovery in switch clusters [6-4](#)

configuring [27-2](#)

default configuration [27-2](#)

defined with LLDP [26-1](#)

described [27-1](#)

disabling for routing device [27-3 to 27-4](#)

enabling and disabling

on an interface [27-4](#)

on a switch [27-3](#)

Layer 2 protocol tunneling [16-7](#)

monitoring [27-4](#)

overview [27-1](#)

support for [1-5](#)

transmission timer and holdtime, setting [27-2](#)

updates [27-2](#)

CEF

defined [37-85](#)

enabling [37-86](#)

IPv6 [38-18](#)

CGMP

as IGMP snooping learning method [24-8](#)

clearing cached group entries [45-60](#)

enabling server support [45-43](#)

joining multicast group [24-3](#)

overview [45-9](#)

server support only [45-9](#)

switch support of [1-3](#)

CIDR [37-57](#)

CipherSuites [11-50](#)

Cisco 7960 IP Phone [18-1](#)

Cisco Discovery Protocol

See CDP

Cisco Express Forwarding

See CEF

Cisco Group Management Protocol

See CGMP

Cisco IOS DHCP server

See DHCP, Cisco IOS DHCP server

Cisco IOS File System

See IFS

Cisco IOS IP SLAs [42-1](#)

Cisco Secure ACS

attribute-value pairs for downloadable ACLs [12-18](#)

attribute-value pairs for redirect URL [12-18](#)

Cisco Secure ACS configuration guide [12-57](#)

CiscoWorks 2000 [1-4, 32-4](#)

CISP [12-28](#)

CIST regional root

See MSTP

CIST root

See MSTP

civic location [26-2](#)

classless interdomain routing

See CIDR

classless routing [37-6](#)

- class maps for QoS
 - configuring [35-46](#)
 - described [35-7](#)
 - displaying [35-78](#)
- class of service
 - See CoS
- clearing interfaces [14-25](#)
- 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 [2-9](#)
 - getting help [2-3](#)
 - history
 - changing the buffer size [2-6](#)
 - described [2-5](#)
 - disabling [2-6](#)
 - recalling commands [2-6](#)
 - managing clusters [6-14](#)
 - no and default forms of commands [2-4](#)
- Client Information Signalling Protocol
 - See CISP
- client mode, VTP [17-3](#)
- client processes, tracking [43-1](#)
- CLNS
 - See ISO CLNS
- clock
 - See system clock
- clusters, switch
 - accessing [6-13](#)
 - automatic discovery [6-4](#)
 - automatic recovery [6-10](#)
 - benefits [1-2](#)
 - clusters, switch (continued)**
 - compatibility [6-4](#)
 - described [6-1](#)
 - LRE profile considerations [6-14](#)
 - managing
 - through CLI [6-14](#)
 - through SNMP [6-15](#)
 - planning [6-4](#)
 - planning considerations
 - automatic discovery [6-4](#)
 - automatic recovery [6-10](#)
 - CLI [6-14](#)
 - host names [6-13](#)
 - IP addresses [6-13](#)
 - LRE profiles [6-14](#)
 - passwords [6-13](#)
 - RADIUS [6-14](#)
 - SNMP [6-14, 6-15](#)
 - TACACS+ [6-14](#)
 - See also candidate switch, command switch, cluster standby group, member switch, and standby command switch
- cluster standby group
 - and HSRP group [41-12](#)
 - automatic recovery [6-12](#)
 - considerations [6-11](#)
 - defined [6-2](#)
 - requirements [6-3](#)
 - virtual IP address [6-11](#)
 - See also HSRP
- CNS
 - Configuration Engine
 - configID, deviceID, hostname [5-3](#)
 - configuration service [5-2](#)
 - described [5-1](#)
 - event service [5-3](#)

CNS (continued)

- embedded agents
 - described [5-5](#)
 - enabling automated configuration [5-6](#)
 - enabling configuration agent [5-9](#)
 - enabling event agent [5-7](#)
 - management functions [1-5](#)
- CoA Request Commands [11-23](#)
- command-line interface
 - See CLI
- command modes [2-1](#)
- commands
 - abbreviating [2-4](#)
 - no and default [2-4](#)
- commands, setting privilege levels [11-8](#)
- command switch
 - accessing [6-11](#)
 - active (AC) [6-10](#)
 - configuration conflicts [48-7](#)
 - defined [6-2](#)
 - passive (PC) [6-10](#)
 - password privilege levels [6-15](#)
 - priority [6-10](#)
 - recovery
 - from command-switch failure [6-10, 48-4](#)
 - from lost member connectivity [48-7](#)
 - redundant [6-10](#)
 - replacing
 - with another switch [48-6](#)
 - with cluster member [48-4](#)
 - requirements [6-3](#)
 - standby (SC) [6-10](#)
 - See also candidate switch, cluster standby group, member switch, and standby command switch
- community list, BGP [37-54](#)
- community ports [14-2](#)
- community strings
 - configuring [6-14, 32-8](#)
 - for cluster switches [32-4](#)
 - in clusters [6-14](#)
 - overview [32-4](#)
 - SNMP [6-14](#)
- community VLANs [14-2, 14-3](#)
- compatibility, feature [25-12](#)
- config.text [4-17](#)
- configurable leave timer, IGMP [24-6](#)
- configuration, initial
 - defaults [1-14](#)
 - Express Setup [1-2](#)
- configuration changes, logging [31-10](#)
- configuration conflicts, recovering from lost member connectivity [48-7](#)
- configuration examples, network [1-17](#)
- configuration files
 - archiving [B-19](#)
 - clearing the startup configuration [B-19](#)
 - creating using a text editor [B-10](#)
 - default name [4-17](#)
 - deleting a stored configuration [B-19](#)
 - described [B-8](#)
 - downloading
 - automatically [4-17](#)
 - preparing [B-10, B-13, B-16](#)
 - reasons for [B-8](#)
 - using FTP [B-13](#)
 - using RCP [B-17](#)
 - 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 [32-16](#)
 - obtaining with DHCP [4-9](#)
 - password recovery disable considerations [11-5](#)
 - replacing a running configuration [B-19, B-20](#)
 - rolling back a running configuration [B-19, B-20](#)

configuration files (continued)

- specifying the filename [4-17](#)
- system contact and location information [32-16](#)
- types and location [B-9](#)
- uploading
 - preparing [B-10, B-13, B-16](#)
 - reasons for [B-8](#)
 - using FTP [B-14](#)
 - using RCP [B-18](#)
 - using TFTP [B-11](#)
- configuration guidelines
 - REP [20-7](#)
- configuration guidelines, multi-VRF CE [37-74](#)
- configuration logger [31-10](#)
- configuration logging [2-5](#)
- configuration replacement [B-19](#)
- configuration rollback [B-19](#)
- configuration settings, saving [4-15](#)
- configure terminal command [14-9](#)
- configuring 802.1x user distribution [12-53](#)
- configuring port-based authentication violation modes [12-36 to 12-37](#)
- configuring small-frame arrival rate [25-5](#)
- config-vlan mode [2-2](#)
- conflicts, configuration [48-7](#)
- connections, secure remote [11-44](#)
- connectivity problems [48-8, 48-10, 48-11](#)
- consistency checks in VTP Version 2 [17-4](#)
- console port, connecting to [2-10](#)
- content-routing technology
 - See WCCP
- control protocol, IP SLAs [42-4](#)
- convergence
 - REP [20-4](#)
- corrupted software, recovery steps with Xmodem [48-2](#)
- CoS
 - in Layer 2 frames [35-2](#)
 - override priority [18-6](#)
 - trust priority [18-6](#)

- CoS input queue threshold map for QoS [35-16](#)
- CoS output queue threshold map for QoS [35-18](#)
- CoS-to-DSCP map for QoS [35-60](#)
- counters, clearing interface [14-25](#)
- CPU utilization, troubleshooting [48-19](#)
- crashinfo file [48-18](#)
- critical authentication, IEEE 802.1x [12-50](#)
- critical VLAN [12-21](#)
- cryptographic software image
 - Kerberos [11-38](#)
 - SSH [11-44](#)
 - SSL [11-48](#)
- customer edge devices [37-72](#)
- customizable web pages, web-based authentication [13-6](#)

D

- DAACL
 - See downloadable ACL
- daylight saving time [7-13](#)
- debugging
 - enabling all system diagnostics [48-15](#)
 - enabling for a specific feature [48-15](#)
 - redirecting error message output [48-15](#)
 - using commands [48-14](#)
- default alarm configuration [3-4](#)
- default commands [2-4](#)
- default configuration
 - 802.1x [12-31](#)
 - auto-QoS [35-20](#)
 - banners [7-17](#)
 - BGP [37-42](#)
 - booting [4-17](#)
 - CDP [27-2](#)
 - DHCP [22-8](#)
 - DHCP option 82 [22-8](#)
 - DHCP snooping [22-8](#)
 - DHCP snooping binding database [22-8](#)
 - DNS [7-16](#)

default configuration (continued)

- dynamic ARP inspection [23-5](#)
- EIGRP [37-34](#)
- EtherChannel [36-10](#)
- Ethernet interfaces [14-13](#)
- fallback bridging [47-3](#)
- Flex Links [21-8](#)
- HSRP [41-5](#)
- IEEE 802.1Q tunneling [16-4](#)
- IGMP [45-38](#)
- IGMP filtering [24-24](#)
- IGMP snooping [24-7, 39-5, 39-6](#)
- IGMP throttling [24-24](#)
- initial switch information [4-3](#)
- IP addressing, IP routing [37-4](#)
- IP multicast routing [45-10](#)
- IP SLAs [42-6](#)
- IP source guard [22-17](#)
- IPv6 [38-10](#)
- IS-IS [37-63](#)
- Layer 2 interfaces [14-13](#)
- Layer 2 protocol tunneling [16-11](#)
- LLDP [26-4](#)
- MAC address table [7-21](#)
- MAC address-table move update [21-8](#)
- MSDP [46-4](#)
- MSTP [18-14](#)
- multi-VRF CE [37-73](#)
- MVR [24-19](#)
- NTP [7-4](#)
- optional spanning-tree configuration [19-9](#)
- OSPF [37-25](#)
- password and privilege level [11-2](#)
- PIM [45-10](#)
- private VLANs [14-6](#)
- PROFINET [9-4](#)
- PTP [8-2](#)
- RADIUS [11-26](#)
- REP [20-7](#)

default configuration (continued)

- RIP [37-19](#)
- RMON [30-3](#)
- RSPAN [29-9](#)
- SDM template [10-3](#)
- SNMP [32-6](#)
- SPAN [29-9](#)
- SSL [11-51](#)
- standard QoS [35-30](#)
- STP [17-11](#)
- system message logging [31-3](#)
- system name and prompt [7-15](#)
- TACACS+ [11-13](#)
- UDLD [28-3](#)
- VLAN, Layer 2 Ethernet interfaces [16-16](#)
- VLANs [16-7](#)
- VMPS [16-26](#)
- voice VLAN [18-3](#)
- VTP [17-7](#)
- WCCP [44-5](#)
- default gateway [4-15, 37-11](#)
- default networks [37-88](#)
- default router preference
 - See [DRP](#)
- default routes [37-88](#)
- default routing [37-2](#)
- default web-based authentication configuration
 - 802.1X [13-9](#)
- deleting VLANs [16-9](#)
- denial-of-service attack [25-1](#)
- description command [14-20](#)
- designing your network, examples [1-17](#)
- destination addresses
 - in IPv4 ACLs [34-11](#)
 - in IPv6 ACLs [40-5](#)
- destination-IP address-based forwarding, EtherChannel [36-8](#)
- destination-MAC address forwarding, EtherChannel [36-8](#)
- detecting indirect link failures, STP [19-5](#)

- device [B-23](#)
- device discovery protocol [26-1, 27-1](#)
- device manager
 - benefits [1-2](#)
 - described [1-2, 1-4](#)
 - in-band management [1-6](#)
 - upgrading a switch [B-23](#)
- DHCP
 - Cisco IOS server database
 - configuring [22-13](#)
 - default configuration [22-8](#)
 - described [22-6](#)
 - DHCP for IPv6
 - See DHCPv6
 - enabling
 - relay agent [22-10](#)
 - DHCP-based autoconfiguration
 - client request message exchange [4-4](#)
 - configuring
 - client side [4-4](#)
 - DNS [4-8](#)
 - relay device [4-8](#)
 - server side [4-6](#)
 - TFTP server [4-7](#)
 - example [4-9](#)
 - lease options
 - for IP address information [4-6](#)
 - for receiving the configuration file [4-7](#)
 - overview [4-3](#)
 - relationship to BOOTP [4-4](#)
 - relay support [1-5, 1-13](#)
 - support for [1-5](#)
 - DHCP-based autoconfiguration and image update
 - configuring [4-11 to 4-14](#)
 - understanding [4-5 to 4-6](#)
 - DHCP binding database
 - See DHCP snooping binding database
 - DHCP binding table
 - See DHCP snooping binding database
 - DHCP object tracking, configuring primary interface [43-11](#)
 - DHCP option 82
 - circuit ID suboption [22-5](#)
 - configuration guidelines [22-8](#)
 - default configuration [22-8](#)
 - displaying [22-15](#)
 - forwarding address, specifying [22-10](#)
 - helper address [22-10](#)
 - overview [22-3](#)
 - packet format, suboption
 - circuit ID [22-5](#)
 - remote ID [22-5](#)
 - remote ID suboption [22-5](#)
 - DHCP server port-based address allocation
 - configuration guidelines [22-26](#)
 - default configuration [22-25](#)
 - described [22-25](#)
 - displaying [22-28](#)
 - enabling [22-26](#)
 - reserved addresses [22-26](#)
 - DHCP server port-based address assignment
 - support for [1-5](#)
 - DHCP snooping
 - accepting untrusted packets form edge switch [22-3, 22-12](#)
 - and private VLANs [22-13](#)
 - binding database
 - See DHCP snooping binding database
 - configuration guidelines [22-8](#)
 - default configuration [22-8](#)
 - displaying binding tables [22-15](#)
 - message exchange process [22-4](#)
 - option 82 data insertion [22-3](#)
 - trusted interface [22-2](#)
 - untrusted interface [22-2](#)
 - untrusted messages [22-2](#)

- DHCP snooping binding database
 - adding bindings [22-14](#)
 - binding file
 - format [22-7](#)
 - location [22-6](#)
 - bindings [22-6](#)
 - clearing agent statistics [22-14](#)
 - configuration guidelines [22-9](#)
 - configuring [22-14](#)
 - default configuration [22-8](#)
 - deleting
 - binding file [22-14](#)
 - bindings [22-14](#)
 - database agent [22-14](#)
 - described [22-6](#)
 - displaying [22-15](#)
 - binding entries [22-15](#)
 - status and statistics [22-15](#)
 - enabling [22-14](#)
 - entry [22-6](#)
 - renewing database [22-14](#)
 - resetting
 - delay value [22-14](#)
 - timeout value [22-14](#)
- DHCP snooping binding table
 - See DHCP snooping binding database
- DHCPv6
 - configuration guidelines [38-14](#)
 - default configuration [38-14](#)
 - described [38-6](#)
 - enabling client function [38-17](#)
 - enabling DHCPv6 server function [38-15](#)
 - support for [1-13](#)
- Differentiated Services architecture, QoS [35-2](#)
- Differentiated Services Code Point [35-2](#)
- Diffusing Update Algorithm (DUAL) [37-33](#)
- directed unicast requests [1-5](#)
- directories
 - changing [B-4](#)
 - creating and removing [B-4](#)
 - displaying the working [B-4](#)
- discovery, clusters
 - See automatic discovery
- displaying switch alarms [3-12](#)
- Distance Vector Multicast Routing Protocol
 - See DVMRP
- distance-vector protocols [37-3](#)
- distribute-list command [37-97](#)
- DNS
 - and DHCP-based autoconfiguration [4-8](#)
 - default configuration [7-16](#)
 - displaying the configuration [7-17](#)
 - in IPv6 [38-4](#)
 - overview [7-15](#)
 - setting up [7-16](#)
 - support for [1-5](#)
- DNS-based SSM mapping [45-18, 45-20](#)
- domain names
 - DNS [7-15](#)
 - VTP [17-8](#)
- Domain Name System
 - See DNS
- domains, ISO IGRP routing [37-61](#)
- dot1q-tunnel switchport mode [16-15](#)
- double-tagged packets
 - IEEE 802.1Q tunneling [16-2](#)
 - Layer 2 protocol tunneling [16-10](#)
- downloadable ACL [12-18, 12-57](#)
- downloading
 - configuration files
 - preparing [B-10, B-13, B-16](#)
 - reasons for [B-8](#)
 - using FTP [B-13](#)
 - using RCP [B-17](#)
 - using TFTP [B-11](#)

downloading (continued)

image files

deleting old image [B-27](#)preparing [B-25, B-28, B-32](#)reasons for [B-23](#)using CMS [1-2](#)using FTP [B-29](#)using HTTP [1-2, B-23](#)using RCP [B-33](#)using TFTP [B-25](#)using the device manager or Network Assistant [B-23](#)drop threshold for Layer 2 protocol packets [16-11](#)**DRP**configuring [38-12](#)described [38-4](#)IPv6 [38-4](#)support for [1-13](#)**DSCP** [1-11, 35-2](#)DSCP input queue threshold map for QoS [35-16](#)DSCP output queue threshold map for QoS [35-18](#)DSCP-to-CoS map for QoS [35-63](#)DSCP-to-DSCP-mutation map for QoS [35-64](#)DSCP transparency [35-40](#)**DTP** [1-8, 16-15](#)dual-action detection [36-5](#)DUAL finite state machine, EIGRP [37-34](#)dual IPv4 and IPv6 templates [10-2, 38-5, 38-6](#)

dual protocol stacks

IPv4 and IPv6 [38-5](#)SDM templates supporting [38-6](#)

dual-purpose uplinks

defined [14-6](#)LEDs [14-6](#)link selection [14-6, 14-14](#)setting the type [14-14](#)**DVMRP**

autosummarization

configuring a summary address [45-57](#)disabling [45-59](#)connecting PIM domain to DVMRP router [45-50](#)enabling unicast routing [45-53](#)

interoperability

with Cisco devices [45-48](#)with Cisco IOS software [45-8](#)mrinfo requests, responding to [45-52](#)

neighbors

advertising the default route to [45-51](#)discovery with Probe messages [45-48](#)displaying information [45-52](#)prevent peering with nonpruning [45-55](#)rejecting nonpruning [45-54](#)overview [45-8](#)

routes

adding a metric offset [45-59](#)advertising all [45-59](#)advertising the default route to neighbors [45-51](#)caching DVMRP routes learned in report messages [45-53](#)changing the threshold for syslog messages [45-56](#)deleting [45-60](#)displaying [45-61](#)favoring one over another [45-59](#)limiting the number injected into MBONE [45-56](#)limiting unicast route advertisements [45-48](#)routing table [45-9](#)source distribution tree, building [45-9](#)support for [1-13](#)

tunnels

configuring [45-50](#)displaying neighbor information [45-52](#)

dynamic access ports

characteristics [16-3](#)configuring [16-27](#)defined [14-3](#)

dynamic addresses

See addresses

dynamic ARP inspection

ARP cache poisoning [23-1](#)

ARP requests, described [23-1](#)

ARP spoofing attack [23-1](#)

clearing

log buffer [23-15](#)

statistics [23-14](#)

configuration guidelines [23-6](#)

configuring

ACLs for non-DHCP environments [23-8](#)

in DHCP environments [23-7](#)

log buffer [23-13](#)

rate limit for incoming ARP packets [23-4, 23-10](#)

default configuration [23-5](#)

denial-of-service attacks, preventing [23-10](#)

described [23-1](#)

DHCP snooping binding database [23-2](#)

displaying

ARP ACLs [23-14](#)

configuration and operating state [23-14](#)

log buffer [23-15](#)

statistics [23-14](#)

trust state and rate limit [23-14](#)

error-disabled state for exceeding rate limit [23-4](#)

function of [23-2](#)

interface trust states [23-3](#)

log buffer

clearing [23-15](#)

configuring [23-13](#)

displaying [23-15](#)

logging of dropped packets, described [23-4](#)

man-in-the-middle attack, described [23-2](#)

network security issues and interface trust states [23-3](#)

priority of ARP ACLs and DHCP snooping entries [23-4](#)

dynamic ARP inspection (continued)

rate limiting of ARP packets

configuring [23-10](#)

described [23-4](#)

error-disabled state [23-4](#)

statistics

clearing [23-14](#)

displaying [23-14](#)

validation checks, performing [23-12](#)

dynamic auto trunking mode [16-15](#)

dynamic desirable trunking mode [16-15](#)

Dynamic Host Configuration Protocol

See DHCP-based autoconfiguration

dynamic port VLAN membership

described [16-25](#)

reconfirming [16-28](#)

troubleshooting [16-30](#)

types of connections [16-27](#)

dynamic routing [37-3](#)

ISO CLNS [37-61](#)

Dynamic Trunking Protocol

See DTP

E

EBGP [37-40](#)

editing features

enabling and disabling [2-7](#)

keystrokes used [2-7](#)

wrapped lines [2-9](#)

EIGRP

authentication [37-38](#)

components [37-33](#)

configuring [37-36](#)

default configuration [37-34](#)

definition [37-33](#)

interface parameters, configuring [37-37](#)

monitoring [37-40](#)

stub routing [37-39](#)

- ELIN location [26-3](#)
- embedded event manager
 - actions [33-4](#)
 - configuring [33-1, 33-5](#)
 - displaying information [33-6](#)
 - environmental variables [33-4](#)
 - event detectors [33-2](#)
 - policies [33-4](#)
 - registering and defining an applet [33-5](#)
 - registering and defining a TCL script [33-6](#)
 - understanding [33-1](#)
- enable password [11-3](#)
- enable secret password [11-3](#)
- enabling SNMP traps [3-11](#)
- encryption, CipherSuite [11-50](#)
- encryption for passwords [11-3](#)
- Enhanced IGRP
 - See EIGRP
- enhanced object tracking
 - backup static routing [43-12](#)
 - commands [43-1](#)
 - defined [43-1](#)
 - DHCP primary interface [43-11](#)
 - HSRP [43-7](#)
 - IP routing state [43-2](#)
 - IP SLAs [43-9](#)
 - line-protocol state [43-2](#)
 - network monitoring with IP SLAs [43-11](#)
 - routing policy, configuring [43-12](#)
 - static route primary interface [43-10](#)
 - tracked lists [43-3](#)
- enhanced object tracking static routing [43-10](#)
- environmental variables, embedded event manager [33-4](#)
- environment variables, function of [4-20](#)
- equal-cost routing [1-13, 37-87](#)
- error-disabled state, BPDU [19-2](#)
- error messages during command entry [2-5](#)
- EtherChannel
 - automatic creation of [36-4, 36-6](#)
 - channel groups
 - binding physical and logical interfaces [36-3](#)
 - numbering of [36-3](#)
 - configuration guidelines [36-10](#)
 - configuring
 - Layer 2 interfaces [36-11](#)
 - Layer 3 physical interfaces [36-14](#)
 - Layer 3 port-channel logical interfaces [36-13](#)
 - default configuration [36-10](#)
 - described [36-2](#)
 - displaying status [36-20](#)
 - forwarding methods [36-7, 36-16](#)
 - IEEE 802.3ad, described [36-6](#)
 - interaction
 - with STP [36-10](#)
 - with VLANs [36-11](#)
- LACP
 - described [36-6](#)
 - displaying status [36-20](#)
 - hot-standby ports [36-18](#)
 - interaction with other features [36-7](#)
 - modes [36-6](#)
 - port priority [36-19](#)
 - system priority [36-19](#)
- Layer 3 interface [37-3](#)
- load balancing [36-7, 36-16](#)
- logical interfaces, described [36-3](#)
- PAgP
 - aggregate-port learners [36-16](#)
 - compatibility with Catalyst 1900 [36-17](#)
 - described [36-4](#)
 - displaying status [36-20](#)
 - interaction with other features [36-6](#)
 - interaction with virtual switches [36-5](#)
 - learn method and priority configuration [36-16](#)
 - modes [36-5](#)

EtherChannel (continued) PAgP

- support for [1-3](#)

- with dual-action detection [36-5](#)

- port-channel interfaces

- described [36-3](#)

- numbering of [36-3](#)

- port groups [14-6](#)

- support for [1-3](#)

EtherChannel guard

- described [19-7](#)

- disabling [19-14](#)

- enabling [19-14](#)

Ethernet VLANs

- adding [16-8](#)

- defaults and ranges [16-7](#)

- modifying [16-8](#)

EUI [38-3](#)

- event detectors, embedded event manager [33-2](#)

- events, RMON [30-3](#)

examples

- network configuration [1-17](#)

- expedite queue for QoS [35-77](#)

Express Setup [1-2](#)

- See also getting started guide

- extended crashinfo file [48-18](#)

extended-range VLANs

- configuration guidelines [16-11](#)

- configuring [16-10](#)

- creating [16-12](#)

- creating with an internal VLAN ID [16-13](#)

- defined [16-1](#)

extended system ID

- MSTP [18-17](#)

- STP [17-4, 17-14](#)

extended universal identifier

- See EUI

Extensible Authentication Protocol over LAN [12-1](#)

external BGP

- See EBGp

- external neighbors, BGP [37-45](#)

F

- fa0 interface [1-6](#)

fallback bridging

- and protected ports [47-3](#)

- bridge groups

- creating [47-3](#)

- described [47-1](#)

- displaying [47-10](#)

- function of [47-2](#)

- number supported [47-4](#)

- removing [47-4](#)

- bridge table

- clearing [47-10](#)

- displaying [47-10](#)

- configuration guidelines [47-3](#)

- connecting interfaces with [14-7](#)

- default configuration [47-3](#)

- described [47-1](#)

- frame forwarding

- flooding packets [47-2](#)

- forwarding packets [47-2](#)

- overview [47-1](#)

- protocol, unsupported [47-3](#)

- STP

- disabling on an interface [47-9](#)

- forward-delay interval [47-8](#)

- hello BPDU interval [47-7](#)

- interface priority [47-6](#)

- maximum-idle interval [47-8](#)

- path cost [47-6](#)

- VLAN-bridge spanning-tree priority [47-5](#)

- VLAN-bridge STP [47-2](#)

- support for [1-13](#)

- SVIs and routed ports [47-1](#)

fallback bridging (continued)

- unsupported protocols [47-3](#)

- VLAN-bridge STP [17-10](#)

Fast Convergence [21-3](#)

FCS bit error rate alarm

- configuring [3-8, 3-9](#)

- defined [3-3](#)

FCS error hysteresis threshold [3-2](#)

features, incompatible [25-12](#)

FIB [37-86](#)

fiber-optic, detecting unidirectional links [28-1](#)

files

- basic crashinfo

- description [48-18](#)

- location [48-18](#)

- copying [B-5](#)

- crashinfo, description [48-18](#)

- deleting [B-5](#)

- displaying the contents of [B-8](#)

- extended crashinfo

- description [48-19](#)

- location [48-19](#)

- tar

- creating [B-6](#)

- displaying the contents of [B-6](#)

- extracting [B-7](#)

- image file format [B-24](#)

file system

- displaying available file systems [B-2](#)

- displaying file information [B-3](#)

- local file system names [B-1](#)

- network file system names [B-5](#)

- setting the default [B-3](#)

filtering

- in a VLAN [34-29](#)

- IPv6 traffic [40-3, 40-7](#)

- non-IP traffic [34-27](#)

- show and more command output [2-9](#)

filtering show and more command output [2-9](#)

filters, IP

- See ACLs, IP

flash device, number of [B-1](#)

flexible authentication ordering

- configuring [12-60](#)

- overview [12-27](#)

Flex Link Multicast Fast Convergence [21-3](#)

Flex Links

- configuration guidelines [21-8](#)

- configuring [21-9](#)

- configuring preferred VLAN [21-12](#)

- configuring VLAN load balancing [21-11](#)

- default configuration [21-8](#)

- description [21-1](#)

- link load balancing [21-2](#)

- monitoring [21-14](#)

- VLANs [21-2](#)

flooded traffic, blocking [25-8](#)

flow-based packet classification [1-11](#)

flowcharts

- QoS classification [35-6](#)

- QoS egress queueing and scheduling [35-17](#)

- QoS ingress queueing and scheduling [35-15](#)

- QoS policing and marking [35-10](#)

flowcontrol

- configuring [14-18](#)

- described [14-18](#)

forward-delay time

- MSTP [18-23](#)

- STP [17-21](#)

Forwarding Information Base

- See FIB

forwarding nonroutable protocols [47-1](#)

- FTP
- accessing MIB files [A-3](#)
 - configuration files
 - downloading [B-13](#)
 - overview [B-12](#)
 - preparing the server [B-13](#)
 - uploading [B-14](#)
 - image files
 - deleting old image [B-31](#)
 - downloading [B-29](#)
 - preparing the server [B-28](#)
 - uploading [B-31](#)
-
- G**
- general query [21-5](#)
 - Generating IGMP Reports [21-3](#)
 - get-bulk-request operation [32-3](#)
 - get-next-request operation [32-3, 32-4](#)
 - get-request operation [32-3, 32-4](#)
 - get-response operation [32-3](#)
 - global configuration mode [2-2](#)
 - global leave, IGMP [24-13](#)
 - global status monitoring alarms [3-2](#)
 - guest VLAN and 802.1x [12-19](#)
 - guide mode [1-2](#)
 - GUIs
 - See device manager and Network Assistant
-
- H**
- hardware limitations and Layer 3 interfaces [14-21](#)
 - hello time
 - MSTP [18-22](#)
 - STP [17-20](#)
 - help, for the command line [2-3](#)
 - hierarchical policy maps [35-8](#)
 - configuration guidelines [35-33](#)
 - configuring [35-52](#)
 - described [35-11](#)
 - history
 - changing the buffer size [2-6](#)
 - described [2-5](#)
 - disabling [2-6](#)
 - recalling commands [2-6](#)
 - history table, level and number of syslog messages [31-10](#)
 - host names, in clusters [6-13](#)
 - host ports
 - configuring [14-11](#)
 - kinds of [14-2](#)
 - hosts, limit on dynamic ports [16-30](#)
 - Hot Standby Router Protocol
 - See HSRP
 - HP OpenView [1-4](#)
 - HSRP
 - authentication string [41-10](#)
 - automatic cluster recovery [6-12](#)
 - binding to cluster group [41-12](#)
 - cluster standby group considerations [6-11](#)
 - command-switch redundancy [1-7](#)
 - configuring [41-4](#)
 - default configuration [41-5](#)
 - definition [41-1](#)
 - guidelines [41-5](#)
 - monitoring [41-13](#)
 - object tracking [43-7](#)
 - overview [41-1](#)
 - priority [41-7](#)
 - routing redundancy [1-12](#)
 - support for ICMP redirect messages [41-12](#)
 - timers [41-10](#)
 - tracking [41-8](#)
 - See also clusters, cluster standby group, and standby command switch

- HSRP for IPv6
 - configuring [38-24](#)
 - guidelines [38-23](#)
 - HTTP over SSL
 - see HTTPS
 - HTTPS [11-49](#)
 - configuring [11-52](#)
 - self-signed certificate [11-49](#)
 - HTTP secure server [11-49](#)
-
- I**
- IBPG [37-40](#)
 - ICMP
 - IPv6 [38-4](#)
 - redirect messages [37-11](#)
 - support for [1-13](#)
 - time-exceeded messages [48-12](#)
 - traceroute and [48-12](#)
 - unreachable messages [34-19](#)
 - unreachable messages and IPv6 [40-4](#)
 - unreachables and ACLs [34-21](#)
 - ICMP Echo operation
 - configuring [42-12](#)
 - IP SLAs [42-11](#)
 - ICMP ping
 - executing [48-9](#)
 - overview [48-9](#)
 - ICMP Router Discovery Protocol
 - See IRDP
 - ICMPv6 [38-4](#)
 - IDS appliances
 - and ingress RSPAN [29-19](#)
 - and ingress SPAN [29-13](#)
 - IEEE 1588 standard [8-1](#)
 - IEEE 802.1D
 - See STP
 - IEEE 802.1p [18-1](#)
 - IEEE 802.1Q
 - and trunk ports [14-3](#)
 - configuration limitations [16-16](#)
 - encapsulation [16-14](#)
 - native VLAN for untagged traffic [16-20](#)
 - tunneling
 - compatibility with other features [16-5](#)
 - defaults [16-4](#)
 - described [16-1](#)
 - tunnel ports with other features [16-6](#)
 - IEEE 802.1s
 - See MSTP
 - IEEE 802.1w
 - See RSTP
 - IEEE 802.1x
 - See port-based authentication
 - IEEE 802.3ad
 - See EtherChannel
 - IEEE 802.3x flow control [14-18](#)
 - ifIndex values, SNMP [32-5](#)
 - IFS [1-5](#)
 - IGMP
 - configurable leave timer
 - described [24-6](#)
 - enabling [24-11](#)
 - configuring the switch
 - as a member of a group [45-38](#)
 - statically connected member [45-42](#)
 - controlling access to groups [45-39](#)
 - default configuration [45-38](#)
 - deleting cache entries [45-61](#)
 - displaying groups [45-61](#)
 - fast switching [45-42](#)
 - flooded multicast traffic
 - controlling the length of time [24-12](#)
 - disabling on an interface [24-13](#)
 - global leave [24-13](#)
 - query solicitation [24-13](#)
 - recovering from flood mode [24-13](#)

IGMP (continued)

- host-query interval, modifying [45-40](#)
 - joining multicast group [24-3](#)
 - join messages [24-3](#)
 - leave processing, enabling [24-10, 39-8](#)
 - leaving multicast group [24-5](#)
 - multicast reachability [45-38](#)
 - overview [45-3](#)
 - queries [24-4](#)
 - report suppression
 - described [24-6](#)
 - disabling [24-15, 39-11](#)
 - supported versions [24-3](#)
 - support for [1-3](#)
 - Version 1
 - changing to Version 2 [45-40](#)
 - described [45-3](#)
 - Version 2
 - changing to Version 1 [45-40](#)
 - described [45-3](#)
 - maximum query response time value [45-42](#)
 - pruning groups [45-22](#)
 - query timeout value [45-41](#)
- IGMP filtering
- configuring [24-24](#)
 - default configuration [24-24](#)
 - described [24-23](#)
 - monitoring [24-28](#)
 - support for [1-4](#)
- IGMP groups
- configuring filtering [24-27](#)
 - setting the maximum number [24-26](#)
- IGMP helper [1-4, 45-6](#)
- IGMP Immediate Leave
- configuration guidelines [24-11](#)
 - described [24-5](#)
 - enabling [24-10](#)

IGMP profile

- applying [24-26](#)
 - configuration mode [24-24](#)
 - configuring [24-25](#)
- IGMP snooping
- and address aliasing [24-2](#)
 - configuring [24-6](#)
 - default configuration [24-7, 39-5, 39-6](#)
 - definition [24-2](#)
 - enabling and disabling [24-7, 39-6](#)
 - global configuration [24-7](#)
 - Immediate Leave [24-5](#)
 - method [24-8](#)
 - monitoring [24-15, 39-11](#)
 - querier
 - configuration guidelines [24-14](#)
 - configuring [24-14](#)
 - supported versions [24-3](#)
 - support for [1-3](#)
 - VLAN configuration [24-8](#)
- IGMP throttling
- configuring [24-27](#)
 - default configuration [24-24](#)
 - described [24-24](#)
 - displaying action [24-28](#)
- IGP [37-24](#)
- Immediate Leave, IGMP [24-5](#)
- enabling [39-8](#)
- inaccessible authentication bypass [12-21](#)
- support for multiauth ports [12-21](#)
- initial configuration
- defaults [1-14](#)
 - Express Setup [1-2](#)
- interface
- range macros [14-11](#)
- interface command [14-8 to 14-9](#)
- interface configuration
- REP [20-9](#)
- interface configuration mode [2-3](#)

- interfaces
 - auto-MDIX, configuring [14-19](#)
 - configuration guidelines
 - duplex and speed [14-16](#)
 - configuring
 - procedure [14-9](#)
 - counters, clearing [14-25](#)
 - default configuration [14-13](#)
 - described [14-20](#)
 - descriptive name, adding [14-20](#)
 - displaying information about [14-24](#)
 - flow control [14-18](#)
 - management [1-4](#)
 - monitoring [14-24](#)
 - naming [14-20](#)
 - physical, identifying [14-7, 14-8](#)
 - range of [14-9](#)
 - restarting [14-26](#)
 - shutting down [14-26](#)
 - speed and duplex, configuring [14-17](#)
 - status [14-24](#)
 - supported [14-7](#)
 - types of [14-1](#)
- interfaces range macro command [14-11](#)
- interface types [14-8](#)
- Interior Gateway Protocol
 - See IGP
- internal BGP
 - See IBGP
- internal neighbors, BGP [37-45](#)
- Internet Control Message Protocol
 - See ICMP
- Internet Group Management Protocol
 - See IGMP
- Internet Protocol version 6
 - See IPv6
- inter-VLAN routing [1-13, 37-2](#)
- Intrusion Detection System
 - See IDS appliances
- inventory management TLV [26-2, 26-6](#)
- IP ACLs
 - for QoS classification [35-7](#)
 - implicit deny [34-9, 34-13](#)
 - implicit masks [34-9](#)
 - named [34-14](#)
 - undefined [34-20](#)
- IP addresses
 - 128-bit [38-2](#)
 - candidate or member [6-3, 6-13](#)
 - classes of [37-5](#)
 - cluster access [6-2](#)
 - command switch [6-3, 6-11, 6-13](#)
 - default configuration [37-4](#)
 - discovering [7-30](#)
 - for IP routing [37-4](#)
 - IPv6 [38-2](#)
 - MAC address association [37-8](#)
 - monitoring [37-17](#)
 - redundant clusters [6-11](#)
 - standby command switch [6-11, 6-13](#)
 - See also IP information
- IP broadcast address [37-15](#)
- ip cef distributed command [37-86](#)
- IP directed broadcasts [37-13](#)
- ip igmp profile command [24-24](#)
- IP information
 - assigned
 - manually [4-14](#)
 - through DHCP-based autoconfiguration [4-3](#)
 - default configuration [4-3](#)
- IP multicast routing
 - addresses
 - all-hosts [45-3](#)
 - all-multicast-routers [45-3](#)
 - host group address range [45-3](#)
 - administratively-scoped boundaries, described [45-46](#)
 - and IGMP snooping [24-2](#)

IP multicast routing (continued)

Auto-RP

- adding to an existing sparse-mode cloud [45-25](#)
- benefits of [45-25](#)
- clearing the cache [45-61](#)
- configuration guidelines [45-11](#)
- filtering incoming RP announcement messages [45-28](#)
- overview [45-6](#)
- preventing candidate RP spoofing [45-28](#)
- preventing join messages to false RPs [45-27](#)
- setting up in a new internetwork [45-25](#)
- using with BSR [45-33](#)

bootstrap router

- configuration guidelines [45-11](#)
- configuring candidate BSRs [45-31](#)
- configuring candidate RPs [45-32](#)
- defining the IP multicast boundary [45-30](#)
- defining the PIM domain border [45-29](#)
- overview [45-7](#)
- using with Auto-RP [45-33](#)

Cisco implementation [45-2](#)

configuring

- basic multicast routing [45-11](#)
- IP multicast boundary [45-46](#)

default configuration [45-10](#)

enabling

- multicast forwarding [45-12](#)
- PIM mode [45-12](#)

group-to-RP mappings

- Auto-RP [45-6](#)
- BSR [45-7](#)

MBONE

- deleting sdr cache entries [45-61](#)
- described [45-44](#)
- displaying sdr cache [45-62](#)
- enabling sdr listener support [45-45](#)
- limiting DVMRP routes advertised [45-56](#)
- limiting sdr cache entry lifetime [45-45](#)

IP multicast routing (continued)

SAP packets for conference session announcement [45-44](#)

Session Directory (sdr) tool, described [45-44](#)

monitoring

- packet rate loss [45-62](#)
- peering devices [45-62](#)
- tracing a path [45-62](#)

multicast forwarding, described [45-7](#)

PIMv1 and PIMv2 interoperability [45-10](#)

protocol interaction [45-2](#)

reverse path check (RPF) [45-7](#)

routing table

- deleting [45-61](#)
- displaying [45-61](#)

RP

- assigning manually [45-23](#)
- configuring Auto-RP [45-25](#)
- configuring PIMv2 BSR [45-29](#)
- monitoring mapping information [45-33](#)
- using Auto-RP and BSR [45-33](#)

statistics, displaying system and network [45-61](#)

See also CGMP

See also DVMRP

See also IGMP

See also PIM

IP phones

- and QoS [18-1](#)
- automatic classification and queuing [35-20](#)
- configuring [18-4](#)
- ensuring port security with QoS [35-38](#)
- trusted boundary for QoS [35-38](#)

IP Port Security for Static Hosts

- on a Layer 2 access port [22-19](#)
- on a PVLAN host port [22-23](#)

IP precedence [35-2](#)

IP-precedence-to-DSCP map for QoS [35-61](#)

- IP protocols
 - in ACLs [34-11](#)
 - routing [1-12](#)
- IP routes, monitoring [37-99](#)
- IP routing
 - connecting interfaces with [14-7](#)
 - disabling [37-18](#)
 - enabling [37-18](#)
- IP Service Level Agreements
 - See IP SLAs
- IP service levels, analyzing [42-1](#)
- IP SLAs
 - benefits [42-2](#)
 - configuration guidelines [42-6](#)
 - configuring object tracking [43-9](#)
 - Control Protocol [42-4](#)
 - default configuration [42-6](#)
 - definition [42-1](#)
 - ICMP echo operation [42-11](#)
 - measuring network performance [42-3](#)
 - monitoring [42-14](#)
 - multioperations scheduling [42-5](#)
 - object tracking [43-9](#)
 - operation [42-3](#)
 - reachability tracking [43-9](#)
 - responder
 - described [42-4](#)
 - enabling [42-8](#)
 - response time [42-4](#)
 - scheduling [42-5](#)
 - SNMP support [42-2](#)
 - supported metrics [42-2](#)
 - threshold monitoring [42-6](#)
 - track object monitoring agent, configuring [43-11](#)
 - track state [43-9](#)
 - UDP jitter operation [42-9](#)
- IP source guard
 - and 802.1x [22-18](#)
 - and DHCP snooping [22-15](#)
 - and EtherChannels [22-18](#)
 - and port security [22-18](#)
 - and private VLANs [22-18](#)
 - and routed ports [22-17](#)
 - and TCAM entries [22-18](#)
 - and trunk interfaces [22-17](#)
 - and VRF [22-18](#)
 - binding configuration
 - automatic [22-15](#)
 - manual [22-15](#)
 - binding table [22-15](#)
 - configuration guidelines [22-17](#)
 - default configuration [22-17](#)
 - described [22-15](#)
 - disabling [22-19](#)
 - displaying
 - active IP or MAC bindings [22-25](#)
 - bindings [22-25](#)
 - configuration [22-25](#)
 - enabling [22-18, 22-19](#)
 - filtering
 - source IP address [22-16](#)
 - source IP and MAC address [22-16](#)
 - source IP address filtering [22-16](#)
 - source IP and MAC address filtering [22-16](#)
 - static bindings
 - adding [22-18, 22-19](#)
 - deleting [22-19](#)
 - static hosts [22-19](#)
- IP traceroute
 - executing [48-12](#)
 - overview [48-12](#)

IP unicast routing

- address resolution [37-8](#)
- administrative distances [37-88, 37-98](#)
- ARP [37-8](#)
- assigning IP addresses to Layer 3 interfaces [37-5](#)
- authentication keys [37-98](#)
- broadcast
 - address [37-15](#)
 - flooding [37-16](#)
 - packets [37-13](#)
 - storms [37-13](#)
- classless routing [37-6](#)
- configuring static routes [37-87](#)
- default
 - addressing configuration [37-4](#)
 - gateways [37-11](#)
 - networks [37-88](#)
 - routes [37-88](#)
 - routing [37-2](#)
- directed broadcasts [37-13](#)
- disabling [37-18](#)
- dynamic routing [37-3](#)
- enabling [37-18](#)
- EtherChannel Layer 3 interface [37-3](#)
- IGP [37-24](#)
- inter-VLAN [37-2](#)
- IP addressing
 - classes [37-5](#)
 - configuring [37-4](#)
- IPv6 [38-3](#)
- IRDP [37-11](#)
- Layer 3 interfaces [37-3](#)
- MAC address and IP address [37-8](#)
- passive interfaces [37-96](#)
- protocols
 - distance-vector [37-3](#)
 - dynamic [37-3](#)
 - link-state [37-3](#)
- proxy ARP [37-8](#)

IP unicast routing (continued)

- redistribution [37-89](#)
- reverse address resolution [37-8](#)
- routed ports [37-3](#)
- static routing [37-3](#)
- steps to configure [37-4](#)
- subnet mask [37-5](#)
- subnet zero [37-6](#)
- supernet [37-6](#)
- UDP [37-14](#)
- with SVIs [37-3](#)
- See also BGP
- See also EIGRP
- See also OSPF
- See also RIP
- IPv4 ACLs
 - applying to interfaces [34-19](#)
 - extended, creating [34-10](#)
 - named [34-14](#)
 - standard, creating [34-9](#)
- IPv4 and IPv6
 - dual protocol stacks [38-5](#)
- IPv6
 - ACLs
 - displaying [40-8](#)
 - limitations [40-2](#)
 - matching criteria [40-3](#)
 - port [40-1](#)
 - precedence [40-2](#)
 - router [40-1](#)
 - supported [40-2](#)
 - addresses [38-2](#)
 - address formats [38-2](#)
 - applications [38-5](#)
 - assigning address [38-10](#)
 - autoconfiguration [38-5](#)
 - CEFv6 [38-18](#)
 - configuring static routes [38-19](#)
 - default configuration [38-10](#)

IPv6 (continued)

- default router preference (DRP) [38-4](#)
 - defined [38-1](#)
 - Enhanced Interior Gateway Routing Protocol (EIGRP) IPv6 [38-7](#)
 - EIGRP IPv6 Commands [38-7](#)
 - Router ID [38-7](#)
 - feature limitations [38-8](#)
 - features not supported [38-8](#)
 - forwarding [38-10](#)
 - ICMP [38-4](#)
 - monitoring [38-26](#)
 - neighbor discovery [38-4](#)
 - OSPF [38-6](#)
 - path MTU discovery [38-4](#)
 - SDM templates [10-2, 39-1, 40-1](#)
 - Stateless Autoconfiguration [38-5](#)
 - supported features [38-2](#)
 - switch limitations [38-8](#)
 - understanding static routes [38-6](#)
- IPv6 traffic, filtering [40-3](#)
- IRDP
- configuring [37-12](#)
 - definition [37-11](#)
 - support for [1-13](#)
- IS-IS
- addresses [37-61](#)
 - area routing [37-61](#)
 - default configuration [37-63](#)
 - monitoring [37-70](#)
 - show commands [37-70](#)
 - system routing [37-61](#)
- ISL
- and IPv6 [38-3](#)

ISO CLNS

- clear commands [37-70](#)
 - dynamic routing protocols [37-61](#)
 - monitoring [37-70](#)
 - NETs [37-61](#)
 - NSAPs [37-61](#)
 - OSI standard [37-61](#)
- ISO IGRP
- area routing [37-61](#)
 - system routing [37-61](#)
- isolated port [14-2](#)
- isolated VLANs [14-2, 14-3](#)

J

- join messages, IGMP [24-3](#)

K**KDC**

- described [11-39](#)
 - See also Kerberos
- Kerberos
- authenticating to
 - boundary switch [11-41](#)
 - KDC [11-41](#)
 - network services [11-42](#)
 - configuration examples [11-38](#)
 - configuring [11-42](#)
 - credentials [11-39](#)
 - cryptographic software image [11-38](#)
 - described [11-39](#)
 - KDC [11-39](#)
 - operation [11-41](#)
 - realm [11-40](#)
 - server [11-40](#)
 - support for [1-10](#)
 - switch as trusted third party [11-39](#)

Kerberos (continued)terms [11-39](#)TGT [11-40](#)tickets [11-39](#)

key distribution center

See KDC

Ll2protocol-tunnel command [16-12](#)**LACP**Layer 2 protocol tunneling [16-9](#)

See EtherChannel

Layer 2 frames, classification with CoS [35-2](#)Layer 2 interfaces, default configuration [14-13](#)

Layer 2 protocol tunneling

configuring [16-10](#)configuring for EtherChannels [16-14](#)default configuration [16-11](#)defined [16-8](#)guidelines [16-11](#)

Layer 2 traceroute

and ARP [48-11](#)and CDP [48-10](#)broadcast traffic [48-10](#)described [48-10](#)IP addresses and subnets [48-11](#)MAC addresses and VLANs [48-11](#)multicast traffic [48-11](#)multiple devices on a port [48-11](#)unicast traffic [48-10](#)usage guidelines [48-10](#)Layer 3 features [1-12](#)

Layer 3 interfaces

assigning IP addresses to [37-5](#)assigning IPv4 and IPv6 addresses to [38-13](#)assigning IPv6 addresses to [38-11](#)changing from Layer 2 mode [37-5, 37-78](#)types of [37-3](#)Layer 3 packets, classification methods [35-2](#)LDAP [5-2](#)Leaking IGMP Reports [21-4](#)

LEDs, switch

See hardware installation guide

lightweight directory access protocol

See LDAP

line configuration mode [2-3](#)

Link Aggregation Control Protocol

See EtherChannel

link failure, detecting unidirectional [18-7](#)link fault alarm [3-3](#)link integrity, verifying with REP [20-3](#)

Link Layer Discovery Protocol

See CDP

link local unicast addresses [38-3](#)

link redundancy

See Flex Links

links, unidirectional [28-1](#)link state advertisements (LSAs) [37-28](#)link-state protocols [37-3](#)

link-state tracking

configuring [36-23](#)described [36-21](#)

LLDP

configuring [26-4](#)characteristics [26-5](#)default configuration [26-4](#)enabling [26-5](#)monitoring and maintaining [26-10](#)overview [26-1](#)supported TLVs [26-1](#)switch stack considerations [26-2](#)transmission timer and holdtime, setting [26-5](#)

LLDP-MED

configuring

procedures [26-4](#)TLVs [26-6](#)monitoring and maintaining [26-10](#)overview [26-1](#), [26-2](#)supported TLVs [26-2](#)

LLDP Media Endpoint Discovery

See LLDP-MED

load balancing [41-4](#)local SPAN [29-2](#)location TLV [26-2](#), [26-6](#)logging messages, ACL [34-8](#)

login authentication

with RADIUS [11-28](#)with TACACS+ [11-14](#)login banners [7-17](#)

log messages

See system message logging

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

loop guard

described [19-9](#)enabling [19-15](#)support for [1-7](#)LRE profiles, considerations in switch clusters [6-14](#)**M**

MAB

See MAC authentication bypass

MAB aging timer [1-8](#)

MAB inactivity timer

default setting [12-31](#)range [12-34](#)MAC/PHY configuration status TLV [26-2](#)

MAC addresses

aging time [7-21](#)and VLAN association [7-20](#)building the address table [7-20](#)default configuration [7-21](#)disabling learning on a VLAN [7-29](#)discovering [7-30](#)displaying [7-30](#)displaying in the IP source binding table [22-24](#)

dynamic

learning [7-20](#)removing [7-22](#)in ACLs [34-27](#)IP address association [37-8](#)

static

adding [7-27](#)allowing [7-28](#), [7-29](#)characteristics of [7-26](#)dropping [7-28](#)removing [7-27](#)MAC address learning [1-5](#)MAC address learning, disabling on a VLAN [7-29](#)MAC address notification, support for [1-13](#)

MAC address-table move update

configuration guidelines [21-8](#)configuring [21-12](#)default configuration [21-8](#)description [21-6](#)monitoring [21-14](#)MAC address-to-VLAN mapping [16-24](#)MAC authentication bypass [12-34](#)configuring [12-53](#)overview [12-15](#)

See MAB

- MAC extended access lists
 - applying to Layer 2 interfaces [34-28](#)
 - configuring for QoS [35-45](#)
 - creating [34-27](#)
 - defined [34-27](#)
 - for QoS classification [35-5](#)
- magic packet [12-24](#)
- manageability features [1-5](#)
- management access
 - in-band
 - browser session [1-6](#)
 - CLI session [1-6](#)
 - device manager [1-6](#)
 - SNMP [1-6](#)
 - out-of-band console port connection [1-6](#)
- management address TLV [26-2](#)
- management options
 - CLI [2-1](#)
 - clustering [1-3](#)
 - CNS [5-1](#)
 - Network Assistant [1-2](#)
 - overview [1-4](#)
- management VLAN
 - considerations in switch clusters [6-7](#)
 - discovery through different management VLANs [6-7](#)
- manual preemption, REP, configuring [20-13](#)
- mapping tables for QoS
 - configuring
 - CoS-to-DSCP [35-60](#)
 - DSCP [35-60](#)
 - DSCP-to-CoS [35-63](#)
 - DSCP-to-DSCP-mutation [35-64](#)
 - IP-precedence-to-DSCP [35-61](#)
 - policed-DSCP [35-62](#)
 - described [35-12](#)
- marking
 - action with aggregate policers [35-58](#)
 - described [35-4, 35-8](#)
- matching
 - IPv6 ACLs [40-3](#)
 - IPv4 ACLs [34-7](#)
- maximum aging time
 - MSTP [18-23](#)
 - STP [17-21](#)
- maximum hop count, MSTP [18-24](#)
- maximum number of allowed devices, port-based authentication [12-34](#)
- maximum-paths command [37-49, 37-87](#)
- MDA
 - configuration guidelines [12-12](#)
 - described [1-9, 12-11](#)
 - exceptions with authentication process [12-5](#)
- membership mode, VLAN port [16-3](#)
- member switch
 - automatic discovery [6-4](#)
 - defined [6-2](#)
 - managing [6-14](#)
 - passwords [6-13](#)
 - recovering from lost connectivity [48-7](#)
 - requirements [6-3](#)
 - See also candidate switch, cluster standby group, and standby command switch
- messages, to users through banners [7-17](#)
- metrics, in BGP [37-49](#)
- metric translations, between routing protocols [37-92](#)
- metro tags [16-2](#)
- MHSRP [41-4](#)
- MIBs
 - accessing files with FTP [A-3](#)
 - location of files [A-3](#)
 - overview [32-1](#)
 - SNMP interaction with [32-4](#)
 - supported [A-1](#)
- mirroring traffic for analysis [29-1](#)
- mismatches, autonegotiation [48-7](#)
- module number [14-8](#)

monitoring

- access groups [34-40](#)
- alarms [3-12](#)
- BGP [37-60](#)
- cables for unidirectional links [28-1](#)
- CDP [27-4](#)
- CEF [37-86](#)
- EIGRP [37-40](#)
- fallback bridging [47-10](#)
- features [1-13](#)
- Flex Links [21-14](#)
- HSRP [41-13](#)
- IEEE 802.1Q tunneling [16-17](#)
- IGMP
 - filters [24-28](#)
 - snooping [24-15, 39-11](#)
- interfaces [14-24](#)
- IP
 - address tables [37-17](#)
 - multicast routing [45-60](#)
 - routes [37-99](#)
- IP SLAs operations [42-14](#)
- IPv4 ACL configuration [34-40](#)
- IPv6 [38-26](#)
- IPv6 ACL configuration [40-8](#)
- IS-IS [37-70](#)
- ISO CLNS [37-70](#)
- Layer 2 protocol tunneling [16-17](#)
- MAC address-table move update [21-14](#)
- MSDP peers [46-18](#)
- multicast router interfaces [24-16, 39-11](#)
- multi-VRF CE [37-85](#)
- MVR [24-23](#)
- network traffic for analysis with probe [29-2](#)
- object tracking [43-12](#)
- OSPF [37-32](#)
- port
 - blocking [25-19](#)
 - protection [25-19](#)

monitoring (continued)

- private VLANs [14-14](#)
- PROFINET [9-5](#)
- PTP [8-4](#)
- REP [20-13](#)
- RP mapping information [45-33](#)
- SFP status [14-25, 48-8](#)
- source-active messages [46-18](#)
- speed and duplex mode [14-17](#)
- SSM mapping [45-21](#)
- traffic flowing among switches [30-1](#)
- traffic suppression [25-19](#)
- tunneling [16-17](#)
- VLAN
 - filters [34-41](#)
 - maps [34-41](#)
- VLANs [16-14](#)
- VMPS [16-29](#)
- VTP [17-16](#)
- mrouter Port [21-3](#)
- mrouter port [21-5](#)
- MSDP
 - benefits of [46-3](#)
 - clearing MSDP connections and statistics [46-18](#)
 - controlling source information
 - forwarded by switch [46-11](#)
 - originated by switch [46-8](#)
 - received by switch [46-13](#)
 - default configuration [46-4](#)
 - dense-mode regions
 - sending SA messages to [46-16](#)
 - specifying the originating address [46-17](#)
 - filtering
 - incoming SA messages [46-14](#)
 - SA messages to a peer [46-12](#)
 - SA requests from a peer [46-10](#)
 - join latency, defined [46-6](#)

MSDP (continued)

- meshed groups
 - configuring [46-15](#)
 - defined [46-15](#)
- originating address, changing [46-17](#)
- overview [46-1](#)
- peer-RPF flooding [46-2](#)
- peers
 - configuring a default [46-4](#)
 - monitoring [46-18](#)
 - peering relationship, overview [46-1](#)
 - requesting source information from [46-8](#)
 - shutting down [46-15](#)
- source-active messages
 - caching [46-6](#)
 - clearing cache entries [46-18](#)
 - defined [46-2](#)
 - filtering from a peer [46-10](#)
 - filtering incoming [46-14](#)
 - filtering to a peer [46-12](#)
 - limiting data with TTL [46-13](#)
 - monitoring [46-18](#)
 - restricting advertised sources [46-9](#)
- support for [1-13](#)

MSTP

- boundary ports
 - configuration guidelines [18-15](#)
 - described [18-6](#)
- BPDU filtering
 - described [19-3](#)
 - enabling [19-12](#)
- BPDU guard
 - described [19-2](#)
 - enabling [19-11](#)
- CIST, described [18-3](#)
- CIST regional root [18-3](#)
- CIST root [18-5](#)
- configuration guidelines [18-14, 19-10](#)

MSTP (continued)

- configuring
 - forward-delay time [18-23](#)
 - hello time [18-22](#)
 - link type for rapid convergence [18-24](#)
 - maximum aging time [18-23](#)
 - maximum hop count [18-24](#)
 - MST region [18-15](#)
 - neighbor type [18-25](#)
 - path cost [18-20](#)
 - port priority [18-19](#)
 - root switch [18-17](#)
 - secondary root switch [18-18](#)
 - switch priority [18-21](#)
- CST
 - defined [18-3](#)
 - operations between regions [18-4](#)
- default configuration [18-14](#)
- default optional feature configuration [19-9](#)
- displaying status [18-26](#)
- enabling the mode [18-15](#)
- EtherChannel guard
 - described [19-7](#)
 - enabling [19-14](#)
- extended system ID
 - effects on root switch [18-17](#)
 - effects on secondary root switch [18-18](#)
 - unexpected behavior [18-17](#)
- IEEE 802.1s
 - implementation [18-6](#)
 - port role naming change [18-6](#)
 - terminology [18-5](#)
- instances supported [17-9](#)
- interface state, blocking to forwarding [19-2](#)
- interoperability and compatibility among modes [17-10](#)
- interoperability with IEEE 802.1D
 - described [18-8](#)
 - restarting migration process [18-25](#)

MSTP (continued)

- IST
 - defined [18-2](#)
 - master [18-3](#)
 - operations within a region [18-3](#)
- loop guard
 - described [19-9](#)
 - enabling [19-15](#)
- mapping VLANs to MST instance [18-16](#)
- MST region
 - CIST [18-3](#)
 - configuring [18-15](#)
 - described [18-2](#)
 - hop-count mechanism [18-5](#)
 - IST [18-2](#)
 - supported spanning-tree instances [18-2](#)
- optional features supported [1-7](#)
- overview [18-2](#)
- Port Fast
 - described [19-2](#)
 - enabling [19-10](#)
- preventing root switch selection [19-8](#)
- root guard
 - described [19-8](#)
 - enabling [19-15](#)
- root switch
 - configuring [18-17](#)
 - effects of extended system ID [18-17](#)
 - unexpected behavior [18-17](#)
- shutdown Port Fast-enabled port [19-2](#)
- status, displaying [18-26](#)
- multiauth
 - support for inaccessible authentication bypass [12-21](#)
- multiauth mode
 - See multiple-authentication mode

- multicast groups
 - Immediate Leave [24-5](#)
 - joining [24-3](#)
 - leaving [24-5](#)
 - static joins [24-10, 39-7](#)
- multicast packets
 - ACLs on [34-40](#)
 - blocking [25-8](#)
- multicast router interfaces, monitoring [24-16, 39-11](#)
- multicast router ports, adding [24-9, 39-8](#)
- Multicast Source Discovery Protocol
 - See MSDP
- multicast storm [25-1](#)
- multicast storm-control command [25-4](#)
- multicast television application [24-17](#)
- multicast VLAN [24-17](#)
- Multicast VLAN Registration
 - See MVR
- multidomain authentication
 - See MDA
- multioperations scheduling, IP SLAs [42-5](#)
- multiple authentication [12-12](#)
- multiple authentication mode
 - configuring [12-40](#)
- Multiple HSRP
 - See MHSRP
- multiple VPN routing/forwarding in customer edge devices
 - See multi-VRF CE
- multi-VRF CE
 - configuration example [37-81](#)
 - configuration guidelines [37-74](#)
 - configuring [37-73](#)
 - default configuration [37-73](#)
 - defined [37-71](#)
 - displaying [37-85](#)
 - monitoring [37-85](#)
 - network components [37-73](#)

multi-VRF CE (continued)

- packet-forwarding process [37-73](#)
- support for [1-13](#)

MVR

- and address aliasing [24-20](#)
- and IGMPv3 [24-20](#)
- configuration guidelines [24-19](#)
- configuring interfaces [24-21](#)
- default configuration [24-19](#)
- described [24-17](#)
- example application [24-17](#)
- modes [24-20](#)
- monitoring [24-23](#)
- multicast television application [24-17](#)
- setting global parameters [24-20](#)
- support for [1-4](#)

N**NAC**

- AAA down policy [1-10](#)
- critical authentication [12-21, 12-50](#)
- IEEE 802.1x authentication using a RADIUS server [12-55](#)
- IEEE 802.1x validation using RADIUS server [12-55](#)
- inaccessible authentication bypass [1-10, 12-50](#)
- Layer 2 IEEE 802.1x validation [1-10, 12-26, 12-55](#)
- Layer 2 IP validation [1-10](#)

named IPv4 ACLs [34-14](#)**NameSpace Mapper**

See NSM

native VLAN

- and IEEE 802.1Q tunneling [16-4](#)
- configuring [16-20](#)
- default [16-20](#)

NEAT

- configuring [12-56](#)
- overview [12-28](#)

neighbor discovery, IPv6 [38-4](#)**neighbor discovery/recovery, EIGRP [37-33](#)****neighbor offset numbers, REP [20-4](#)****neighbors, BGP [37-55](#)****Network Admission Control****NAC****Network Assistant**

- benefits [1-2](#)
- described [1-4](#)
- downloading image files [1-2](#)
- guide mode [1-2](#)
- management options [1-2](#)
- upgrading a switch [B-23](#)
- wizards [1-2](#)

network configuration examples

- increasing network performance [1-17](#)
- providing network services [1-17](#)

network design

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

Network Edge Access Topology

See NEAT

network management

- CDP [27-1](#)
- RMON [30-1](#)
- SNMP [32-1](#)

network performance, measuring with IP SLAs [42-3](#)**network policy TLV [26-2, 26-7](#)****Network Time Protocol**

See NTP

no commands [2-4](#)**nonhierarchical policy maps**

- configuration guidelines [35-33](#)
- described [35-9](#)

non-IP traffic filtering [34-27](#)**nontrunking mode [16-15](#)****normal-range VLANs [16-4](#)**

- configuration guidelines [16-6](#)
- configuring [16-4](#)
- defined [16-1](#)

no switchport command [14-4](#)

not-so-stubby areas

- See NSSA

NSAPs, as ISO IGRP addresses [37-61](#)

NSF Awareness

- IS-IS [37-63](#)

NSM [5-3](#)

NSSA, OSPF [37-28](#)

NTP

- associations
 - authenticating [7-4](#)
 - defined [7-2](#)
 - enabling broadcast messages [7-6](#)
 - peer [7-5](#)
 - server [7-5](#)
- default configuration [7-4](#)
- displaying the configuration [7-11](#)
- overview [7-2](#)
- restricting access
 - creating an access group [7-8](#)
 - disabling NTP services per interface [7-10](#)
- source IP address, configuring [7-10](#)
- stratum [7-2](#)
- support for [1-5](#)
- synchronizing devices [7-5](#)
- time
 - services [7-2](#)
 - synchronizing [7-2](#)

O

object tracking

- HSRP [43-7](#)
- IP SLAs [43-9](#)
- IP SLAs, configuring [43-9](#)
- monitoring [43-12](#)

off mode, VTP [17-3](#)

openlx

- configuring [12-61](#)

openlx authentication

- overview [12-27](#)

Open Shortest Path First

- See OSPF

optimizing system resources [10-1](#)

options, management [1-4](#)

OSPF

- area parameters, configuring [37-28](#)
- configuring [37-26](#)
- default configuration
 - metrics [37-30](#)
 - route [37-30](#)
 - settings [37-25](#)
- described [37-23](#)
- for IPv6 [38-6](#)
- interface parameters, configuring [37-27](#)
- LSA group pacing [37-31](#)
- monitoring [37-32](#)
- router IDs [37-32](#)
- route summarization [37-29](#)
- support for [1-12](#)
- virtual links [37-30](#)

out-of-profile markdown [1-12](#)

P

packet modification, with QoS [35-19](#)

PAgP

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

parallel paths, in routing tables [37-87](#)

passive interfaces

- configuring [37-96](#)
- OSPF [37-30](#)

passwords

- default configuration [11-2](#)
- disabling recovery of [11-5](#)
- encrypting [11-3](#)
- for security [1-9](#)

passwords (continued)

- in clusters [6-13](#)
- overview [11-1](#)
- recovery of [48-3](#)
- setting
 - enable [11-3](#)
 - enable secret [11-3](#)
 - Telnet [11-6](#)
 - with usernames [11-6](#)
- VTP domain [17-8](#)

path cost

- MSTP [18-20](#)
- STP [17-18](#)

path MTU discovery [38-4](#)**PBR**

- defined [37-93](#)
- enabling [37-94](#)
- fast-switched policy-based routing [37-95](#)
- local policy-based routing [37-96](#)

PC (passive command switch) [6-10](#)**peers, BGP [37-55](#)****percentage thresholds in tracked lists [43-6](#)****performance, network design [1-17](#)****performance features [1-3](#)****persistent self-signed certificate [11-49](#)****per-user ACLs and Filter-Ids [12-8](#)****per-VLAN spanning-tree plus**

See PVST+

PE to CE routing, configuring [37-80](#)**physical ports [14-2](#)****PIM**

- default configuration [45-10](#)
- dense mode
 - overview [45-4](#)
 - rendezvous point (RP), described [45-5](#)
 - RPF lookups [45-8](#)
- displaying neighbors [45-61](#)
- enabling a mode [45-12](#)
- overview [45-4](#)

PIM (continued)

- router-query message interval, modifying [45-36](#)
- shared tree and source tree, overview [45-34](#)
- shortest path tree, delaying the use of [45-35](#)
- sparse mode
 - join messages and shared tree [45-5](#)
 - overview [45-5](#)
 - prune messages [45-5](#)
 - RPF lookups [45-8](#)
- stub routing
 - configuration guidelines [45-21](#)
 - displaying [45-61](#)
 - enabling [45-22](#)
 - overview [45-5](#)
- support for [1-13](#)
- versions
 - interoperability [45-10](#)
 - troubleshooting interoperability problems [45-34](#)
 - v2 improvements [45-4](#)

PIM-DVMRP, as snooping method [24-8](#)**ping**

- character output description [48-10](#)
- executing [48-9](#)
- overview [48-9](#)

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

- configuring
 - for each matched traffic class [35-48](#)
 - for more than one traffic class [35-58](#)
- described [35-4](#)
- displaying [35-78](#)
- number of [35-34](#)
- types of [35-9](#)

policing

- described [35-4](#)
- hierarchical
 - See hierarchical policy maps
- token-bucket algorithm [35-9](#)

- policy-based routing
 - See PBR
- policy maps for QoS
 - characteristics of [35-48](#)
 - described [35-7](#)
 - displaying [35-79](#)
 - hierarchical [35-8](#)
 - hierarchical on SVIs
 - configuration guidelines [35-33](#)
 - configuring [35-52](#)
 - described [35-11](#)
 - nonhierarchical on physical ports
 - configuration guidelines [35-33](#)
 - described [35-9](#)
- port ACLs
 - defined [34-2](#)
 - types of [34-3](#)
- Port Aggregation Protocol
 - See EtherChannel
- port-based authentication
 - accounting [12-14](#)
 - authentication server
 - defined [12-3, 13-2](#)
 - RADIUS server [12-3](#)
 - client, defined [12-3, 13-2](#)
 - configuration guidelines [12-32, 13-9](#)
 - configuring
 - 802.1x authentication [12-37](#)
 - guest VLAN [12-47](#)
 - host mode [12-40](#)
 - inaccessible authentication bypass [12-50](#)
 - manual re-authentication of a client [12-42](#)
 - periodic re-authentication [12-41](#)
 - quiet period [12-43](#)
 - RADIUS server [12-40, 13-13](#)
 - RADIUS server parameters on the switch [12-39, 13-11](#)
 - restricted VLAN [12-48](#)
 - port-based authentication (continued)**
 - switch-to-client frame-retransmission number [12-44, 12-45](#)
 - switch-to-client retransmission time [12-43](#)
 - violation modes [12-36 to 12-37](#)
 - default configuration [12-31, 13-9](#)
 - described [12-1](#)
 - device roles [12-2, 13-2](#)
 - displaying statistics [12-62, 13-17](#)
 - downloadable ACLs and redirect URLs
 - configuring [12-57 to 12-59, ?? to 12-60](#)
 - overview [12-18 to 12-19](#)
 - EAPOL-start frame [12-5](#)
 - EAP-request/identity frame [12-5](#)
 - EAP-response/identity frame [12-5](#)
 - enabling
 - 802.1X authentication [13-11](#)
 - encapsulation [12-3](#)
 - flexible authentication ordering
 - configuring [12-60](#)
 - overview [12-27](#)
 - guest VLAN
 - configuration guidelines [12-20, 12-21](#)
 - described [12-19](#)
 - host mode [12-11](#)
 - inaccessible authentication bypass
 - configuring [12-50](#)
 - described [12-21](#)
 - guidelines [12-33](#)
 - initiation and message exchange [12-5](#)
 - magic packet [12-24](#)
 - maximum number of allowed devices per port [12-34](#)
 - method lists [12-37](#)
 - multiple authentication [12-12](#)
 - per-user ACLs
 - AAA authorization [12-37](#)
 - configuration tasks [12-17](#)
 - described [12-17](#)
 - RADIUS server attributes [12-17](#)

port-based authentication (continued)

ports

authorization state and dot1x port-control command [12-10](#)

authorized and unauthorized [12-10](#)

voice VLAN [12-23](#)

port security

and voice VLAN [12-24](#)

described [12-23](#)

interactions [12-23](#)

multiple-hosts mode [12-11](#)

readiness check

configuring [12-34](#)

described [12-15, 12-34](#)

resetting to default values [12-62](#)

statistics, displaying [12-62](#)

switch

as proxy [12-3, 13-2](#)

RADIUS client [12-3](#)

switch supplicant

configuring [12-56](#)

overview [12-28](#)

user distribution

guidelines [12-26](#)

overview [12-26](#)

VLAN assignment

AAA authorization [12-37](#)

characteristics [12-15](#)

configuration tasks [12-16](#)

described [12-15](#)

voice aware 802.1x security

configuring [12-35](#)

described [12-28, 12-35](#)

voice VLAN

described [12-23](#)

PVID [12-23](#)

VVID [12-23](#)

wake-on-LAN, described [12-24](#)

with ACLs and RADIUS Filter-Id attribute [12-29](#)

port-based authentication methods, supported [12-7](#)

port blocking [1-3, 25-7](#)

port-channel

See EtherChannel

port description TLV [26-1](#)

Port Fast

described [19-2](#)

enabling [19-10](#)

mode, spanning tree [16-26](#)

support for [1-7](#)

port membership modes, VLAN [16-3](#)

port not forwarding alarm [3-3](#)

port not operating alarm [3-3](#)

port priority

MSTP [18-19](#)

STP [17-17](#)

ports

access [14-3](#)

blocking [25-7](#)

dual-purpose uplink [14-6](#)

dynamic access [16-3](#)

IEEE 802.1Q tunnel [16-4](#)

protected [25-6](#)

REP [20-6](#)

routed [14-4](#)

secure [25-8](#)

static-access [16-3, 16-9](#)

switch [14-2](#)

trunks [16-3, 16-14](#)

VLAN assignments [16-9](#)

port security

aging [25-17](#)

and private VLANs [25-18](#)

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

configuring [25-13](#)

default configuration [25-11](#)

described [25-8](#)

displaying [25-19](#)

enabling [25-18](#)

port security (continued)

- on trunk ports [25-14](#)
- sticky learning [25-9](#)
- violations [25-10](#)
- with other features [25-11](#)
- port-shutdown response, VMPS [16-25](#)
- port status monitoring alarms
 - FCS bit error rate alarm [3-3](#)
 - link fault alarm [3-3](#)
 - port not forwarding alarm [3-3](#)
 - port not operating alarm [3-3](#)
- port VLAN ID TLV [26-2](#)
- power management TLV [26-2, 26-7](#)
- power supply alarm, configuring [3-5](#)
- Precision Time Protocol
 - See PTP
- preempt delay time, REP [20-5](#)
- preemption, default configuration [21-8](#)
- preemption delay, default configuration [21-8](#)
- preferential treatment of traffic
 - See QoS
- prefix lists, BGP [37-53](#)
- preventing unauthorized access [11-1](#)
- primary edge port, REP [20-4](#)
- primary interface for object tracking, DHCP, configuring [43-11](#)
- primary interface for static routing, configuring [43-10](#)
- primary links [21-2](#)
- primary VLANs [14-1, 14-3](#)
- priority
 - HSRP [41-7](#)
 - overriding CoS [18-6](#)
 - trusting CoS [18-6](#)
- private VLAN edge ports
 - See protected ports
- private VLANs
 - across multiple switches [14-4](#)
 - and SDM template [14-4](#)
 - and SVIs [14-5](#)

private VLANs (continued)

- benefits of [14-1](#)
- community ports [14-2](#)
- community VLANs [14-2, 14-3](#)
- configuration guidelines [14-6, 14-7, 14-8](#)
- configuration tasks [14-6](#)
- configuring [14-9](#)
- default configuration [14-6](#)
- end station access to [14-3](#)
- IP addressing [14-3](#)
- isolated port [14-2](#)
- isolated VLANs [14-2, 14-3](#)
- mapping [14-13](#)
- monitoring [14-14](#)
- ports
 - community [14-2](#)
 - configuration guidelines [14-8](#)
 - configuring host ports [14-11](#)
 - configuring promiscuous ports [14-12](#)
 - described [16-4](#)
 - isolated [14-2](#)
 - promiscuous [14-2](#)
- primary VLANs [14-1, 14-3](#)
- promiscuous ports [14-2](#)
- secondary VLANs [14-2](#)
- subdomains [14-1](#)
- traffic in [14-5](#)
- privileged EXEC mode [2-2](#)
- privilege levels
 - changing the default for lines [11-9](#)
 - command switch [6-15](#)
 - exiting [11-9](#)
 - logging into [11-9](#)
 - mapping on member switches [6-15](#)
 - overview [11-2, 11-7](#)
 - setting a command with [11-8](#)

PROFINET 9-1

- configuring 9-4
- default configuration 9-4
- displaying configuration 9-5

promiscuous ports

- configuring 14-12
- defined 14-2

protected ports 1-9, 25-6

protocol-dependent modules, EIGRP 37-34

Protocol-Independent Multicast Protocol

See PIM

provider edge devices 37-72

proxy ARP

- configuring 37-10
- definition 37-8
- with IP routing disabled 37-11

proxy reports 21-3

pruning, VTP

- disabling
 - in VTP domain 17-14
 - on a port 16-20
- enabling
 - in VTP domain 17-14
 - on a port 16-19
- examples 17-6
- overview 17-5

pruning-eligible list

- changing 16-19
- for VTP pruning 17-5
- VLANs 17-14

PTP 8-1

- configuring 8-3
- default configuration 8-2
- displaying configuration 8-4

PVST+

- described 17-9
- IEEE 802.1Q trunking interoperability 17-10
- instances supported 17-9

Q**QoS**

and MQC commands 35-1

auto-QoS

- categorizing traffic 35-20
- configuration and defaults display 35-29
- configuration guidelines 35-25
- described 35-20
- disabling 35-27
- displaying generated commands 35-27
- displaying the initial configuration 35-29
- effects on running configuration 35-25
- egress queue defaults 35-21
- enabling for VoIP 35-26
- example configuration 35-28
- ingress queue defaults 35-21
- list of generated commands 35-22

basic model 35-4

classification

- class maps, described 35-7
- defined 35-4
- DSCP transparency, described 35-40
- flowchart 35-6
- forwarding treatment 35-3
- in frames and packets 35-3
- IP ACLs, described 35-5, 35-7
- MAC ACLs, described 35-5, 35-7
- options for IP traffic 35-5
- options for non-IP traffic 35-5
- policy maps, described 35-7
- trust DSCP, described 35-5
- trusted CoS, described 35-5
- trust IP precedence, described 35-5

class maps

- configuring 35-46
- displaying 35-78

QoS (continued)

- configuration guidelines
 - auto-QoS [35-25](#)
 - standard QoS [35-33](#)
- configuring
 - aggregate policers [35-58](#)
 - auto-QoS [35-20](#)
 - default port CoS value [35-38](#)
 - DSCP maps [35-60](#)
 - DSCP transparency [35-40](#)
 - DSCP trust states bordering another domain [35-40](#)
 - egress queue characteristics [35-70](#)
 - ingress queue characteristics [35-66](#)
 - IP extended ACLs [35-44](#)
 - IP standard ACLs [35-43](#)
 - MAC ACLs [35-45](#)
 - policy maps, hierarchical [35-52](#)
 - port trust states within the domain [35-36](#)
 - trusted boundary [35-38](#)
- default auto configuration [35-20](#)
- default standard configuration [35-30](#)
- displaying statistics [35-78](#)
- DSCP transparency [35-40](#)
- egress queues
 - allocating buffer space [35-71](#)
 - buffer allocation scheme, described [35-17](#)
 - configuring shaped weights for SRR [35-75](#)
 - configuring shared weights for SRR [35-76](#)
 - described [35-4](#)
 - displaying the threshold map [35-74](#)
 - flowchart [35-17](#)
 - mapping DSCP or CoS values [35-73](#)
 - scheduling, described [35-4](#)
 - setting WTD thresholds [35-71](#)
 - WTD, described [35-18](#)
- enabling globally [35-35](#)

QoS (continued)

- flowcharts
 - classification [35-6](#)
 - egress queueing and scheduling [35-17](#)
 - ingress queueing and scheduling [35-15](#)
 - policing and marking [35-10](#)
- implicit deny [35-7](#)
- ingress queues
 - allocating bandwidth [35-68](#)
 - allocating buffer space [35-68](#)
 - buffer and bandwidth allocation, described [35-16](#)
 - configuring shared weights for SRR [35-68](#)
 - configuring the priority queue [35-69](#)
 - described [35-4](#)
 - displaying the threshold map [35-67](#)
 - flowchart [35-15](#)
 - mapping DSCP or CoS values [35-66](#)
 - priority queue, described [35-16](#)
 - scheduling, described [35-4](#)
 - setting WTD thresholds [35-66](#)
 - WTD, described [35-16](#)
- IP phones
 - automatic classification and queueing [35-20](#)
 - detection and trusted settings [35-20, 35-38](#)
- limiting bandwidth on egress interface [35-77](#)
- mapping tables
 - CoS-to-DSCP [35-60](#)
 - displaying [35-78](#)
 - DSCP-to-CoS [35-63](#)
 - DSCP-to-DSCP-mutation [35-64](#)
 - IP-precedence-to-DSCP [35-61](#)
 - policed-DSCP [35-62](#)
 - types of [35-12](#)
- marked-down actions [35-50, 35-55](#)
- marking, described [35-4, 35-8](#)
- overview [35-2](#)
- packet modification [35-19](#)

QoS (continued)

policers

- configuring [35-50, 35-55, 35-58](#)
- described [35-8](#)
- displaying [35-78](#)
- number of [35-34](#)
- types of [35-9](#)

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

policing

- described [35-4, 35-8](#)
- token bucket algorithm [35-9](#)

policy maps

- characteristics of [35-48](#)
- displaying [35-79](#)
- hierarchical [35-8](#)
- hierarchical on SVIs [35-52](#)
- nonhierarchical on physical ports [35-48](#)

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

queues

- configuring egress characteristics [35-70](#)
- configuring ingress characteristics [35-66](#)
- high priority (expedite) [35-19, 35-77](#)
- location of [35-13](#)
- SRR, described [35-14](#)
- WTD, described [35-13](#)

rewrites [35-19](#)

support for [1-11](#)

trust states

- bordering another domain [35-40](#)
- described [35-5](#)
- trusted device [35-38](#)
- within the domain [35-36](#)

quality of service

See QoS

queries, IGMP [24-4](#)

query solicitation, IGMP [24-13](#)

R**RADIUS**

attributes

- vendor-proprietary [11-36](#)
- vendor-specific [11-34](#)

configuring

- accounting [11-33](#)
- authentication [11-28](#)
- authorization [11-32](#)
- communication, global [11-26, 11-34](#)
- communication, per-server [11-26](#)
- multiple UDP ports [11-26](#)

default configuration [11-26](#)

defining AAA server groups [11-30](#)

displaying the configuration [11-38](#)

identifying the server [11-26](#)

in clusters [6-14](#)

limiting the services to the user [11-32](#)

method list, defined [11-25](#)

operation of [11-19](#)

overview [11-18](#)

server load balancing [11-38](#)

suggested network environments [11-18](#)

support for [1-10](#)

tracking services accessed by user [11-33](#)

RADIUS Change of Authorization [11-19](#)

range

- macro [14-11](#)
- of interfaces [14-10](#)

rapid convergence [18-9](#)

rapid per-VLAN spanning-tree plus

See rapid PVST+

rapid PVST+

described [17-9](#)

IEEE 802.1Q trunking interoperability [17-10](#)

instances supported [17-9](#)

Rapid Spanning Tree Protocol

See RSTP

- RARP [37-8](#)
- rcommand command [6-14](#)
- RCP
 - configuration files
 - downloading [B-17](#)
 - overview [B-15](#)
 - preparing the server [B-16](#)
 - uploading [B-18](#)
 - image files
 - deleting old image [B-35](#)
 - downloading [B-33](#)
 - preparing the server [B-32](#)
 - uploading [B-35](#)
- reachability, tracking IP SLAs IP host [43-9](#)
- readiness check
 - port-based authentication
 - configuring [12-34](#)
 - described [12-15, 12-34](#)
- real-time clock synchronization [8-1](#)
- reconfirmation interval, VMPS, changing [16-28](#)
- reconfirming dynamic VLAN membership [16-28](#)
- recovery procedures [48-1](#)
- redirect URL [12-18, 12-57](#)
- redundancy
 - EtherChannel [36-3](#)
 - HSRP [41-1](#)
 - STP
 - backbone [17-8](#)
 - path cost [16-23](#)
 - port priority [16-21](#)
- redundant links and UplinkFast [19-13](#)
- reliable transport protocol, EIGRP [37-33](#)
- reloading software [4-21](#)
- Remote Authentication Dial-In User Service
 - See RADIUS
- Remote Copy Protocol
 - See RCP
- Remote Network Monitoring
 - See RMON
- Remote SPAN
 - See RSPAN
- remote SPAN [29-2](#)
- REP
 - administrative VLAN [20-8](#)
 - administrative VLAN, configuring [20-8](#)
 - age timer [20-8](#)
 - and STP [20-6](#)
 - configuration guidelines [20-7](#)
 - configuring interfaces [20-9](#)
 - convergence [20-4](#)
 - default configuration [20-7](#)
 - manual preemption, configuring [20-13](#)
 - monitoring [20-13](#)
 - neighbor offset numbers [20-4](#)
 - open segment [20-2](#)
 - ports [20-6](#)
 - preempt delay time [20-5](#)
 - primary edge port [20-4](#)
 - ring segment [20-2](#)
 - secondary edge port [20-4](#)
 - segments [20-1](#)
 - characteristics [20-2](#)
 - SNMP traps, configuring [20-13](#)
 - supported interfaces [20-1](#)
 - triggering VLAN load balancing [20-5](#)
 - verifying link integrity [20-3](#)
 - VLAN blocking [20-12](#)
 - VLAN load balancing [20-4](#)
- report suppression, IGMP
 - described [24-6](#)
 - disabling [24-15, 39-11](#)
- resequencing ACL entries [34-14](#)
- reserved addresses in DHCP pools [22-26](#)
- resets, in BGP [37-48](#)
- resetting a UDLD-shutdown interface [28-5](#)
- Resilient Ethernet Protocol
 - See REP

- responder, IP SLAs
 - described [42-4](#)
 - enabling [42-8](#)
- response time, measuring with IP SLAs [42-4](#)
- restricted VLAN
 - configuring [12-48](#)
 - described [12-20](#)
 - using with IEEE 802.1x [12-20](#)
- restricting access
 - NTP services [7-8](#)
 - overview [11-1](#)
 - passwords and privilege levels [11-2](#)
 - RADIUS [11-17](#)
 - TACACS+ [11-10](#)
- retry count, VMPS, changing [16-29](#)
- reverse address resolution [37-8](#)
- Reverse Address Resolution Protocol
 - See RARP
- RFC
 - 1058, RIP [37-18](#)
 - 1112, IP multicast and IGMP [24-2](#)
 - 1157, SNMPv1 [32-2](#)
 - 1163, BGP [37-40](#)
 - 1166, IP addresses [37-5](#)
 - 1253, OSPF [37-24](#)
 - 1267, BGP [37-40](#)
 - 1305, NTP [7-2](#)
 - 1587, NSSAs [37-24](#)
 - 1757, RMON [30-2](#)
 - 1771, BGP [37-40](#)
 - 1901, SNMPv2C [32-2](#)
 - 1902 to 1907, SNMPv2 [32-2](#)
 - 2236, IP multicast and IGMP [24-2](#)
 - 2273-2275, SNMPv3 [32-2](#)
- RFC 5176 Compliance [11-20](#)
- RIP
 - advertisements [37-18](#)
 - authentication [37-21](#)
 - configuring [37-20](#)
 - default configuration [37-19](#)
 - described [37-18](#)
 - for IPv6 [38-6](#)
 - hop counts [37-19](#)
 - split horizon [37-22](#)
 - summary addresses [37-22](#)
 - support for [1-12](#)
- RMON
 - default configuration [30-3](#)
 - displaying status [30-6](#)
 - enabling alarms and events [30-3](#)
 - groups supported [30-2](#)
 - overview [30-1](#)
 - statistics
 - collecting group Ethernet [30-5](#)
 - collecting group history [30-5](#)
 - support for [1-14](#)
- root guard
 - described [19-8](#)
 - enabling [19-15](#)
 - support for [1-7](#)
- root switch
 - MSTP [18-17](#)
 - STP [17-14](#)
- route calculation timers, OSPF [37-30](#)
- route dampening, BGP [37-59](#)
- routed packets, ACLs on [34-39](#)
- routed ports
 - configuring [37-3](#)
 - defined [14-4](#)
 - in switch clusters [6-8](#)
 - IP addresses on [14-21, 37-3](#)
- route-map command [37-95](#)

- route maps
 - BGP [37-51](#)
 - policy-based routing [37-93](#)
 - router ACLs
 - defined [34-2](#)
 - types of [34-4](#)
 - route reflectors, BGP [37-58](#)
 - router ID, OSPF [37-32](#)
 - route selection, BGP [37-49](#)
 - route summarization, OSPF [37-29](#)
 - route targets, VPN [37-73](#)
 - routing
 - default [37-2](#)
 - dynamic [37-3](#)
 - redistribution of information [37-89](#)
 - static [37-3](#)
 - routing domain confederation, BGP [37-58](#)
 - Routing Information Protocol
 - See RIP
 - routing protocol administrative distances [37-88](#)
 - RSPAN
 - characteristics [29-8](#)
 - configuration guidelines [29-15](#)
 - default configuration [29-9](#)
 - defined [29-2](#)
 - destination ports [29-7](#)
 - displaying status [29-22](#)
 - interaction with other features [29-8](#)
 - monitored ports [29-5](#)
 - monitoring ports [29-7](#)
 - overview [1-13, 29-1](#)
 - received traffic [29-4](#)
 - sessions
 - creating [29-16](#)
 - defined [29-3](#)
 - limiting source traffic to specific VLANs [29-21](#)
 - specifying monitored ports [29-16](#)
 - with ingress traffic enabled [29-19](#)
 - RSPAN (continued)
 - source ports [29-5](#)
 - transmitted traffic [29-5](#)
 - VLAN-based [29-6](#)
 - RSTP
 - active topology [18-9](#)
 - BPDU
 - format [18-12](#)
 - processing [18-12](#)
 - designated port, defined [18-9](#)
 - designated switch, defined [18-9](#)
 - interoperability with IEEE 802.1D
 - described [18-8](#)
 - restarting migration process [18-25](#)
 - topology changes [18-13](#)
 - overview [18-8](#)
 - port roles
 - described [18-9](#)
 - synchronized [18-11](#)
 - proposal-agreement handshake process [18-10](#)
 - rapid convergence
 - described [18-9](#)
 - edge ports and Port Fast [18-9](#)
 - point-to-point links [18-10, 18-24](#)
 - root ports [18-10](#)
 - root port, defined [18-9](#)
 - See also MSTP
 - running configuration
 - replacing [B-19, B-20](#)
 - rolling back [B-19, B-20](#)
 - running configuration, saving [4-15](#)
-
- ## S
- SC (standby command switch) [6-10](#)
 - scheduled reloads [4-21](#)
 - scheduling, IP SLAs operations [42-5](#)

- SCP
 - and SSH [11-55](#)
 - configuring [11-55](#)
- SDM
 - templates
 - configuring [10-4](#)
 - number of [10-1](#)
 - SDM template [40-3](#)
 - configuration guidelines [10-3](#)
 - configuring [10-3](#)
 - dual IPv4 and IPv6 [10-2](#)
 - types of [10-1](#)
 - secondary edge port, REP [20-4](#)
 - secondary VLANs [14-2](#)
 - Secure Copy Protocol
 - secure HTTP client
 - configuring [11-54](#)
 - displaying [11-54](#)
 - secure HTTP server
 - configuring [11-52](#)
 - displaying [11-54](#)
 - secure MAC addresses
 - deleting [25-16](#)
 - maximum number of [25-10](#)
 - types of [25-9](#)
 - secure ports, configuring [25-8](#)
 - secure remote connections [11-44](#)
 - Secure Shell
 - See SSH
 - Secure Socket Layer
 - See SSL
 - security, port [25-8](#)
 - security features [1-8](#)
 - See SCP
 - sequence numbers in log messages [31-8](#)
 - server mode, VTP [17-3](#)
 - service-provider network, MSTP and RSTP [18-1](#)
 - service-provider networks
 - and customer VLANs [16-2](#)
 - and IEEE 802.1Q tunneling [16-1](#)
 - Layer 2 protocols across [16-8](#)
 - Layer 2 protocol tunneling for EtherChannels [16-9](#)
 - set-request operation [32-4](#)
 - setting a secondary temperature threshold [3-6, 3-7](#)
 - setting power supply alarm options [3-5](#)
 - setting the FCS error hysteresis threshold [3-9](#)
 - setting the FCS error threshold [3-8](#)
 - setup program
 - failed command switch replacement [48-6](#)
 - replacing failed command switch [48-4](#)
 - severity levels, defining in system messages [31-8](#)
 - SFPs
 - monitoring status of [14-25, 48-8](#)
 - security and identification [48-8](#)
 - status, displaying [48-8](#)
 - shaped round robin
 - See SRR
 - show access-lists hw-summary command [34-21](#)
 - show alarm commands [3-12](#)
 - show and more command output, filtering [2-9](#)
 - show cdp traffic command [27-5](#)
 - show cluster members command [6-14](#)
 - show configuration command [14-20](#)
 - show forward command [48-16](#)
 - show interfaces command [14-17, 14-20](#)
 - show interfaces switchport [21-4](#)
 - show l2protocol command [16-13, 16-15](#)
 - show lldp traffic command [26-11](#)
 - show platform forward command [48-16](#)
 - show running-config command
 - displaying ACLs [34-19, 34-20, 34-31, 34-34](#)
 - interface description in [14-20](#)
 - shutdown command on interfaces [14-26](#)
 - shutdown threshold for Layer 2 protocol packets [16-11](#)
 - Simple Network Management Protocol
 - See SNMP

- small-frame arrival rate, configuring [25-5](#)
- Smartports macros
 - applying Cisco-default macros [15-3](#)
 - applying global parameter values [15-3](#)
 - configuration guidelines [15-2](#)
 - default configuration [15-1](#)
 - displaying [15-5](#)
 - tracing [15-2](#)
- SNAP [27-1](#)
- SNMP
 - accessing MIB variables with [32-4](#)
 - agent
 - described [32-4](#)
 - disabling [32-7](#)
 - and IP SLAs [42-2](#)
 - authentication level [32-10](#)
 - community strings
 - configuring [32-8](#)
 - for cluster switches [32-4](#)
 - overview [32-4](#)
 - configuration examples [32-17](#)
 - default configuration [32-6](#)
 - engine ID [32-7](#)
 - groups [32-7, 32-9](#)
 - host [32-7](#)
 - ifIndex values [32-5](#)
 - in-band management [1-6](#)
 - in clusters [6-14](#)
 - informs
 - and trap keyword [32-11](#)
 - described [32-5](#)
 - differences from traps [32-5](#)
 - disabling [32-15](#)
 - enabling [32-15](#)
 - limiting access by TFTP servers [32-16](#)
 - limiting system log messages to NMS [31-10](#)
 - manager functions [1-4, 32-3](#)
 - managing clusters with [6-15](#)
- SNMP (continued)
 - MIBs
 - location of [A-3](#)
 - supported [A-1](#)
 - notifications [32-5](#)
 - overview [32-1, 32-4](#)
 - security levels [32-3](#)
 - setting CPU threshold notification [32-15](#)
 - status, displaying [32-18](#)
 - system contact and location [32-16](#)
 - trap manager, configuring [32-13](#)
 - traps
 - described [32-3, 32-5](#)
 - differences from informs [32-5](#)
 - disabling [32-15](#)
 - enabling [32-11](#)
 - enabling MAC address notification [7-22, 7-24, 7-25](#)
 - overview [32-1, 32-4](#)
 - types of [32-12](#)
 - users [32-7, 32-9](#)
 - versions supported [32-2](#)
- SNMP and Syslog Over IPv6 [38-7](#)
- SNMP traps
 - REP [20-13](#)
- SNMPv1 [32-2](#)
- SNMPv2C [32-2](#)
- SNMPv3 [32-2](#)
- snooping, IGMP [24-2](#)
- software images
 - location in flash [B-23](#)
 - recovery procedures [48-2](#)
 - scheduling reloads [4-21](#)
 - tar file format, described [B-24](#)
 - See also downloading and uploading
- source addresses
 - in IPv4 ACLs [34-11](#)
 - in IPv6 ACLs [40-5](#)

- source-and-destination-IP address based forwarding, EtherChannel [36-8](#)
- source-and-destination MAC address forwarding, EtherChannel [36-8](#)
- source-IP address based forwarding, EtherChannel [36-8](#)
- source-MAC address forwarding, EtherChannel [36-7](#)
- Source-specific multicast
 - See SSM
- SPAN
 - configuration guidelines [29-10](#)
 - default configuration [29-9](#)
 - destination ports [29-7](#)
 - displaying status [29-22](#)
 - interaction with other features [29-8](#)
 - monitored ports [29-5](#)
 - monitoring ports [29-7](#)
 - overview [1-13, 29-1](#)
 - ports, restrictions [25-12](#)
 - received traffic [29-4](#)
 - sessions
 - configuring ingress forwarding [29-14, 29-20](#)
 - creating [29-11](#)
 - defined [29-3](#)
 - limiting source traffic to specific VLANs [29-14](#)
 - removing destination (monitoring) ports [29-12](#)
 - specifying monitored ports [29-11](#)
 - with ingress traffic enabled [29-13](#)
 - source ports [29-5](#)
 - transmitted traffic [29-5](#)
 - VLAN-based [29-6](#)
- spanning tree and native VLANs [16-16](#)
- Spanning Tree Protocol
 - See STP
- SPAN traffic [29-4](#)
- split horizon, RIP [37-22](#)
- SRR
 - configuring
 - shaped weights on egress queues [35-75](#)
 - shared weights on egress queues [35-76](#)
 - shared weights on ingress queues [35-68](#)
 - described [35-14](#)
 - shaped mode [35-14](#)
 - shared mode [35-14](#)
 - support for [1-12](#)
- SSH
 - configuring [11-45](#)
 - cryptographic software image [11-44](#)
 - described [1-6, 11-44](#)
 - encryption methods [11-44](#)
 - user authentication methods, supported [11-45](#)
- SSL
 - configuration guidelines [11-51](#)
 - configuring a secure HTTP client [11-54](#)
 - configuring a secure HTTP server [11-52](#)
 - cryptographic software image [11-48](#)
 - described [11-48](#)
 - monitoring [11-54](#)
- SSM
 - address management restrictions [45-15](#)
 - CGMP limitations [45-15](#)
 - components [45-13](#)
 - configuration guidelines [45-15](#)
 - configuring [45-13, 45-16](#)
 - differs from Internet standard multicast [45-13](#)
 - IGMP snooping [45-15](#)
 - IGMPv3 [45-13](#)
 - IGMPv3 Host Signalling [45-14](#)
 - IP address range [45-14](#)
 - monitoring [45-16](#)
 - operations [45-14](#)
 - PIM [45-13](#)
 - state maintenance limitations [45-15](#)

- SSM mapping [45-16](#)
 - configuration guidelines [45-16](#)
 - configuring [45-16](#), [45-19](#)
 - DNS-based [45-18](#), [45-20](#)
 - monitoring [45-21](#)
 - overview [45-17](#)
 - restrictions [45-17](#)
 - static [45-17](#), [45-19](#)
 - static traffic forwarding [45-20](#)
- standby command switch
 - configuring
 - considerations [6-11](#)
 - defined [6-2](#)
 - priority [6-10](#)
 - requirements [6-3](#)
 - virtual IP address [6-11](#)
 - See also cluster standby group and HSRP
- standby group, cluster
 - See cluster standby group and HSRP
- standby ip command [41-6](#)
- standby links [21-2](#)
- standby router [41-1](#)
- standby timers, HSRP [41-10](#)
- startup configuration
 - booting
 - manually [4-18](#)
 - specific image [4-17](#)
 - clearing [B-19](#)
 - configuration file
 - automatically downloading [4-17](#)
 - specifying the filename [4-17](#)
 - default boot configuration [4-17](#)
- static access ports
 - assigning to VLAN [16-9](#)
 - defined [14-3](#), [16-3](#)
- static addresses
 - See addresses
- static IP routing [1-13](#)
- static MAC addressing [1-9](#)
- static route primary interface, configuring [43-10](#)
- static routes
 - configuring [37-87](#)
 - configuring for IPv6 [38-19](#)
 - understanding [38-6](#)
- static routing [37-3](#)
- static routing support, enhanced object tracking [43-10](#)
- static SSM mapping [45-17](#), [45-19](#)
- static traffic forwarding [45-20](#)
- static VLAN membership [16-2](#)
- statistics
 - 802.1X [13-17](#)
 - 802.1x [12-62](#)
 - CDP [27-4](#)
 - interface [14-25](#)
 - IP multicast routing [45-61](#)
 - LLDP [26-10](#)
 - LLDP-MED [26-10](#)
 - NMSP [26-10](#)
 - OSPF [37-32](#)
 - QoS ingress and egress [35-78](#)
 - RMON group Ethernet [30-5](#)
 - RMON group history [30-5](#)
 - SNMP input and output [32-18](#)
 - VTP [17-16](#)
- sticky learning [25-9](#)
- storm control
 - configuring [25-3](#)
 - described [25-1](#)
 - disabling [25-5](#)
 - displaying [25-19](#)
 - support for [1-3](#)
 - thresholds [25-1](#)

STP

- accelerating root port selection [19-4](#)
- and REP [20-6](#)
- BackboneFast
 - described [19-5](#)
 - disabling [19-14](#)
 - enabling [19-13](#)
- BPDU filtering
 - described [19-3](#)
 - disabling [19-12](#)
 - enabling [19-12](#)
- BPDU guard
 - described [19-2](#)
 - disabling [19-12](#)
 - enabling [19-11](#)
- BPDU message exchange [17-3](#)
- configuration guidelines [17-12, 19-10](#)
- configuring
 - forward-delay time [17-21](#)
 - hello time [17-20](#)
 - maximum aging time [17-21](#)
 - path cost [17-18](#)
 - port priority [17-17](#)
 - root switch [17-14](#)
 - secondary root switch [17-16](#)
 - spanning-tree mode [17-13](#)
 - switch priority [17-19](#)
 - transmit hold-count [17-22](#)
- counters, clearing [17-22](#)
- default configuration [17-11](#)
- default optional feature configuration [19-9](#)
- designated port, defined [17-3](#)
- designated switch, defined [17-3](#)
- detecting indirect link failures [19-5](#)
- disabling [17-14](#)
- displaying status [17-22](#)

STP (continued)

- EtherChannel guard
 - described [19-7](#)
 - disabling [19-14](#)
 - enabling [19-14](#)
- extended system ID
 - effects on root switch [17-14](#)
 - effects on the secondary root switch [17-16](#)
 - overview [17-4](#)
 - unexpected behavior [17-15](#)
- features supported [1-7](#)
- IEEE 802.1D and bridge ID [17-4](#)
- IEEE 802.1D and multicast addresses [17-8](#)
- IEEE 802.1t and VLAN identifier [17-4](#)
- inferior BPDU [17-3](#)
- instances supported [17-9](#)
- interface state, blocking to forwarding [19-2](#)
- interface states
 - blocking [17-5](#)
 - disabled [17-7](#)
 - forwarding [17-5, 17-6](#)
 - learning [17-6](#)
 - listening [17-6](#)
 - overview [17-4](#)
- interoperability and compatibility among modes [17-10](#)
- Layer 2 protocol tunneling [16-7](#)
- limitations with IEEE 802.1Q trunks [17-10](#)
- load sharing
 - overview [16-21](#)
 - using path costs [16-23](#)
 - using port priorities [16-21](#)
- loop guard
 - described [19-9](#)
 - enabling [19-15](#)
- modes supported [17-9](#)
- multicast addresses, effect of [17-8](#)
- optional features supported [1-7](#)
- overview [17-2](#)

STP (continued)

- path costs [16-23](#)
 - Port Fast
 - described [19-2](#)
 - enabling [19-10](#)
 - port priorities [16-22](#)
 - preventing root switch selection [19-8](#)
 - protocols supported [17-9](#)
 - redundant connectivity [17-8](#)
 - root guard
 - described [19-8](#)
 - enabling [19-15](#)
 - root port, defined [17-3](#)
 - root switch
 - configuring [17-15](#)
 - effects of extended system ID [17-4, 17-14](#)
 - election [17-3](#)
 - unexpected behavior [17-15](#)
 - shutdown Port Fast-enabled port [19-2](#)
 - status, displaying [17-22](#)
 - superior BPDU [17-3](#)
 - timers, described [17-20](#)
 - UplinkFast
 - described [19-3](#)
 - enabling [19-13](#)
 - VLAN-bridge [17-10](#)
- stratum, NTP [7-2](#)
- stub areas, OSPF [37-28](#)
- stub routing, EIGRP [37-39](#)
- subdomains, private VLAN [14-1](#)
- subnet mask [37-5](#)
- subnet zero [37-6](#)
- success response, VMPS [16-25](#)
- summer time [7-13](#)
- SunNet Manager [1-4](#)
- supernet [37-6](#)
- supported port-based authentication methods [12-7](#)
- SVI autostate exclude
 - configuring [14-22](#)
 - defined [14-5](#)
- SVI link state [14-5](#)
- SVIs
 - and IP unicast routing [37-3](#)
 - and router ACLs [34-4](#)
 - connecting VLANs [14-6](#)
 - defined [14-4](#)
 - routing between VLANs [16-2](#)
- switch [38-2](#)
- switch clustering technology [6-1](#)
- See also clusters, switch
- switch console port [1-6](#)
- Switch Database Management
- See SDM
- switched packets, ACLs on [34-38](#)
- Switched Port Analyzer
- See SPAN
- switched ports [14-2](#)
- switchport backup interface [21-4, 21-5](#)
- switchport block multicast command [25-8](#)
- switchport block unicast command [25-8](#)
- switchport command [14-13](#)
- switchport mode dot1q-tunnel command [16-6](#)
- switchport protected command [25-7](#)
- switch priority
 - MSTP [18-21](#)
 - STP [17-19](#)
- switch software features [1-1](#)
- switch virtual interface
- See SVI
- synchronization, BGP [37-45](#)
- synchronization, real-time clocks [8-1](#)
- syslog
- See system message logging
- system capabilities TLV [26-2](#)

- system clock
 - configuring
 - daylight saving time [7-13](#)
 - manually [7-11](#)
 - summer time [7-13](#)
 - time zones [7-12](#)
 - displaying the time and date [7-12](#)
 - overview [7-1](#)
 - See also NTP
 - system description TLV [26-2](#)
 - system message logging
 - default configuration [31-3](#)
 - defining error message severity levels [31-8](#)
 - disabling [31-4](#)
 - displaying the configuration [31-13](#)
 - enabling [31-4](#)
 - facility keywords, described [31-13](#)
 - level keywords, described [31-9](#)
 - limiting messages [31-10](#)
 - message format [31-2](#)
 - overview [31-1](#)
 - sequence numbers, enabling and disabling [31-8](#)
 - setting the display destination device [31-5](#)
 - synchronizing log messages [31-6](#)
 - syslog facility [1-14](#)
 - time stamps, enabling and disabling [31-7](#)
 - UNIX syslog servers
 - configuring the daemon [31-12](#)
 - configuring the logging facility [31-12](#)
 - facilities supported [31-13](#)
 - system MTU
 - and IS-IS LSPs [37-66](#)
 - system MTU and IEEE 802.1Q tunneling [16-5](#)
 - system name
 - default configuration [7-15](#)
 - default setting [7-15](#)
 - manual configuration [7-15](#)
 - See also DNS
 - system name TLV [26-2](#)
 - system prompt, default setting [7-14, 7-15](#)
 - system resources, optimizing [10-1](#)
 - system routing
 - IS-IS [37-61](#)
 - ISO IGRP [37-61](#)
-
- ## T
- TACACS+
 - accounting, defined [11-11](#)
 - authentication, defined [11-11](#)
 - authorization, defined [11-11](#)
 - configuring
 - accounting [11-17](#)
 - authentication key [11-13](#)
 - authorization [11-16](#)
 - login authentication [11-14](#)
 - default configuration [11-13](#)
 - displaying the configuration [11-17](#)
 - identifying the server [11-13](#)
 - in clusters [6-14](#)
 - limiting the services to the user [11-16](#)
 - operation of [11-12](#)
 - overview [11-10](#)
 - support for [1-10](#)
 - tracking services accessed by user [11-17](#)
 - tagged packets
 - IEEE 802.1Q [16-3](#)
 - Layer 2 protocol [16-7](#)
 - tar files
 - creating [B-6](#)
 - displaying the contents of [B-6](#)
 - extracting [B-7](#)
 - image file format [B-24](#)
 - TCL script, registering and defining with embedded event manager [33-6](#)
 - TDR [1-14](#)

- Telnet
 - accessing management interfaces [2-10](#)
 - number of connections [1-6](#)
 - setting a password [11-6](#)
- temperature alarms, configuring [3-6, 3-7](#)
- temporary self-signed certificate [11-49](#)
- Terminal Access Controller Access Control System Plus
 - See TACACS+
- terminal lines, setting a password [11-6](#)
- TFTP
 - configuration files
 - downloading [B-11](#)
 - preparing the server [B-10](#)
 - uploading [B-11](#)
 - configuration files in base directory [4-7](#)
 - configuring for autoconfiguration [4-7](#)
 - image files
 - deleting [B-27](#)
 - downloading [B-25](#)
 - preparing the server [B-25](#)
 - uploading [B-27](#)
 - limiting access by servers [32-16](#)
- TFTP server [1-5](#)
- threshold, traffic level [25-2](#)
- threshold monitoring, IP SLAs [42-6](#)
- time
 - See NTP and system clock
- Time Domain Reflector
 - See TDR
- time-range command [34-16](#)
- time ranges in ACLs [34-16](#)
- time stamps in log messages [31-7](#)
- time zones [7-12](#)
- TLVs
 - defined [26-1](#)
 - LLDP [26-1](#)
 - LLDP-MED [26-2](#)
- Token Ring VLANs
 - support for [16-6](#)
 - VTP support [17-4](#)
- ToS [1-11](#)
- traceroute, Layer 2
 - and ARP [48-11](#)
 - and CDP [48-10](#)
 - broadcast traffic [48-10](#)
 - described [48-10](#)
 - IP addresses and subnets [48-11](#)
 - MAC addresses and VLANs [48-11](#)
 - multicast traffic [48-11](#)
 - multiple devices on a port [48-11](#)
 - unicast traffic [48-10](#)
 - usage guidelines [48-10](#)
- traceroute command [48-12](#)
 - See also IP traceroute
- tracked lists
 - configuring [43-3](#)
 - types [43-3](#)
- tracked objects
 - by Boolean expression [43-4](#)
 - by threshold percentage [43-6](#)
 - by threshold weight [43-5](#)
- tracking interface line-protocol state [43-2](#)
- tracking IP routing state [43-2](#)
- tracking objects [43-1](#)
- tracking process [43-1](#)
- track state, tracking IP SLAs [43-9](#)
- traffic
 - blocking flooded [25-8](#)
 - fragmented [34-5](#)
 - fragmented IPv6 [40-2](#)
 - unfragmented [34-5](#)
- traffic policing [1-12](#)
- traffic suppression [25-1](#)
- transmit hold-count
 - see STP
- transparent mode, VTP [17-3](#)

- trap-door mechanism [4-2](#)
 - traps
 - configuring MAC address notification [7-22, 7-24, 7-25](#)
 - configuring managers [32-11](#)
 - defined [32-3](#)
 - enabling [7-22, 7-24, 7-25, 32-11](#)
 - notification types [32-12](#)
 - overview [32-1, 32-4](#)
 - triggering alarm options
 - configurable relays [3-3](#)
 - methods [3-3](#)
 - SNMP traps [3-4](#)
 - syslog messages [3-4](#)
 - troubleshooting
 - connectivity problems [48-8, 48-10, 48-11](#)
 - CPU utilization [48-19](#)
 - detecting unidirectional links [28-1](#)
 - displaying crash information [48-18](#)
 - PIMv1 and PIMv2 interoperability problems [45-34](#)
 - setting packet forwarding [48-16](#)
 - SFP security and identification [48-8](#)
 - show forward command [48-16](#)
 - with CiscoWorks [32-4](#)
 - with debug commands [48-14](#)
 - with ping [48-9](#)
 - with system message logging [31-1](#)
 - with traceroute [48-12](#)
 - trunk failover
 - See link-state tracking
 - trunking encapsulation [1-8](#)
 - trunk ports
 - configuring [16-17](#)
 - defined [14-3, 16-3](#)
 - trunks
 - allowed-VLAN list [16-18](#)
 - load sharing
 - setting STP path costs [16-23](#)
 - using STP port priorities [16-21, 16-22](#)
 - native VLAN for untagged traffic [16-20](#)
 - trunks (continued)**
 - parallel [16-23](#)
 - pruning-eligible list [16-19](#)
 - to non-DTP device [16-15](#)
 - trusted boundary for QoS [35-38](#)
 - trusted port states
 - between QoS domains [35-40](#)
 - classification options [35-5](#)
 - ensuring port security for IP phones [35-38](#)
 - support for [1-12](#)
 - within a QoS domain [35-36](#)
 - trustpoints, CA [11-49](#)
 - tunneling
 - defined [16-1](#)
 - IEEE 802.1Q [16-1](#)
 - Layer 2 protocol [16-8](#)
 - tunnel ports
 - defined [16-4](#)
 - described [14-3, 16-1](#)
 - IEEE 802.1Q, configuring [16-6](#)
 - incompatibilities with other features [16-5](#)
 - twisted-pair Ethernet, detecting unidirectional links [28-1](#)
 - type of service
 - See ToS
-
- U**
 - UDLD
 - configuration guidelines [28-4](#)
 - default configuration [28-3](#)
 - disabling
 - globally [28-5](#)
 - on fiber-optic interfaces [28-5](#)
 - per interface [28-5](#)
 - echoing detection mechanism [28-2](#)
 - enabling
 - globally [28-4](#)
 - per interface [28-5](#)
 - Layer 2 protocol tunneling [16-10](#)

UDLD (continued)

- link-detection mechanism [28-1](#)
 - neighbor database [28-2](#)
 - overview [28-1](#)
 - resetting an interface [28-5](#)
 - status, displaying [28-6](#)
 - support for [1-7](#)
- UDP, configuring [37-14](#)
- UDP jitter, configuring [42-9](#)
- UDP jitter operation, IP SLAs [42-9](#)
- unauthorized ports with IEEE 802.1x [12-10](#)
- unicast MAC address filtering [1-5](#)
- and adding static addresses [7-28](#)
 - and broadcast MAC addresses [7-27](#)
 - and CPU packets [7-27](#)
 - and multicast addresses [7-27](#)
 - and router MAC addresses [7-27](#)
 - configuration guidelines [7-27](#)
 - described [7-27](#)
- unicast storm [25-1](#)
- unicast storm control command [25-4](#)
- unicast traffic, blocking [25-8](#)
- UniDirectional Link Detection protocol
- See UDLD
- UNIX syslog servers
- daemon configuration [31-12](#)
 - facilities supported [31-13](#)
 - message logging configuration [31-12](#)
- unrecognized Type-Length-Value (TLV) support [17-4](#)
- upgrading software images
- See downloading
- UplinkFast
- described [19-3](#)
 - disabling [19-13](#)
 - enabling [19-13](#)
 - support for [1-7](#)

uploading

- configuration files
 - preparing [B-10, B-13, B-16](#)
 - reasons for [B-8](#)
 - using FTP [B-14](#)
 - using RCP [B-18](#)
 - using TFTP [B-11](#)
 - image files
 - preparing [B-25, B-28, B-32](#)
 - reasons for [B-23](#)
 - using FTP [B-31](#)
 - using RCP [B-35](#)
 - using TFTP [B-27](#)
- User Datagram Protocol
- See UDP
- user EXEC mode [2-2](#)
- username-based authentication [11-6](#)

V

- version-dependent transparent mode [17-4](#)
- virtual IP address
- cluster standby group [6-11](#)
 - command switch [6-11](#)
- Virtual Private Network
- See VPN
- virtual router [41-1, 41-2](#)
- virtual switches and PAgP [36-5](#)
- vlan.dat file [16-5](#)
- VLAN 1, disabling on a trunk port [16-19](#)
- VLAN 1 minimization [16-18](#)
- VLAN ACLs
- See VLAN maps
- vlan-assignment response, VMPS [16-25](#)
- VLAN blocking, REP [20-12](#)
- VLAN configuration
- at bootup [16-7](#)
 - saving [16-7](#)
- VLAN configuration mode [2-2](#)

VLAN database

- and startup configuration file [16-7](#)

- and VTP [17-1](#)

- VLAN configuration saved in [16-7](#)

- VLANs saved in [16-4](#)

- vlan dot1q tag native command [16-4](#)

- VLAN filtering and SPAN [29-6](#)

- vlan global configuration command [16-7](#)

- VLAN ID, discovering [7-30](#)

- VLAN link state [14-5](#)

- VLAN load balancing

- REP [20-4](#)

- VLAN load balancing, triggering [20-5](#)

- VLAN load balancing on flex links [21-2](#)

- configuration guidelines [21-8](#)

- VLAN management domain [17-2](#)

- VLAN Management Policy Server

- See VMPS

- VLAN map entries, order of [34-30](#)

- VLAN maps

- applying [34-34](#)

- common uses for [34-34](#)

- configuration guidelines [34-30](#)

- configuring [34-29](#)

- creating [34-31](#)

- defined [34-2](#)

- denying access to a server example [34-35](#)

- denying and permitting packets [34-31](#)

- displaying [34-41](#)

- examples of ACLs and VLAN maps [34-32](#)

- removing [34-34](#)

- support for [1-9](#)

- wiring closet configuration example [34-35](#)

- VLAN membership

- confirming [16-28](#)

- modes [16-3](#)

- VLAN Query Protocol

- See VQP

VLANs

- adding [16-8](#)

- adding to VLAN database [16-8](#)

- aging dynamic addresses [17-9](#)

- allowed on trunk [16-18](#)

- and spanning-tree instances [16-3, 16-6, 16-11](#)

- configuration guidelines, extended-range VLANs [16-11](#)

- configuration guidelines, normal-range VLANs [16-6](#)

- configuring [16-1](#)

- configuring IDs 1006 to 4094 [16-11](#)

- connecting through SVIs [14-6](#)

- creating [16-8](#)

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

- default configuration [16-7](#)

- deleting [16-9](#)

- described [14-2, 16-1](#)

- displaying [16-14](#)

- extended-range [16-1, 16-10](#)

- features [1-8](#)

- illustrated [16-2](#)

- internal [16-11](#)

- limiting source traffic with RSPAN [29-21](#)

- limiting source traffic with SPAN [29-14](#)

- modifying [16-8](#)

- multicast [24-17](#)

- native, configuring [16-20](#)

- normal-range [16-1, 16-4](#)

- number supported [1-8](#)

- parameters [16-5](#)

- port membership modes [16-3](#)

- static-access ports [16-9](#)

- STP and IEEE 802.1Q trunks [17-10](#)

- supported [16-2](#)

- Token Ring [16-6](#)

- traffic between [16-2](#)

- VLAN-bridge STP [17-10, 47-2](#)

- VTP modes [17-3](#)

VLAN Trunking Protocol

See VTP

VLAN trunks [16-14](#)

VMPS

administering [16-29](#)

configuration example [16-30](#)

configuration guidelines [16-26](#)

default configuration [16-26](#)

description [16-24](#)

dynamic port membership

described [16-25](#)

reconfirming [16-28](#)

troubleshooting [16-30](#)

entering server address [16-27](#)

mapping MAC addresses to VLANs [16-24](#)

monitoring [16-29](#)

reconfirmation interval, changing [16-28](#)

reconfirming membership [16-28](#)

retry count, changing [16-29](#)

voice aware 802.1x security

port-based authentication

configuring [12-35](#)

described [12-28, 12-35](#)

voice-over-IP [18-1](#)

voice VLAN

Cisco 7960 phone, port connections [18-1](#)

configuration guidelines [18-3](#)

configuring IP phones for data traffic

override CoS of incoming frame [18-6](#)

trust CoS priority of incoming frame [18-6](#)

configuring ports for voice traffic in

802.1p priority tagged frames [18-5](#)

802.1Q frames [18-5](#)

connecting to an IP phone [18-4](#)

default configuration [18-3](#)

described [18-1](#)

displaying [18-7](#)

IP phone data traffic, described [18-2](#)

IP phone voice traffic, described [18-2](#)

VPN

configuring routing in [37-80](#)

forwarding [37-73](#)

in service provider networks [37-71](#)

routes [37-72](#)

VPN routing and forwarding table

See VRF

VQP [1-8, 16-24](#)

VRF

defining [37-73](#)

tables [37-71](#)

VRF-aware services

ARP [37-77](#)

configuring [37-76](#)

ftp [37-79](#)

HSRP [37-78](#)

ping [37-77](#)

SNMP [37-77](#)

syslog [37-78](#)

tftp [37-79](#)

traceroute [37-79](#)

VTP

adding a client to a domain [17-15](#)

advertisements [16-16, 17-3, 17-4](#)

and extended-range VLANs [16-3, 17-1](#)

and normal-range VLANs [16-2, 17-1](#)

client mode, configuring [17-12](#)

configuration

guidelines [17-8](#)

requirements [17-10](#)

saving [17-8](#)

configuration requirements [17-10](#)

configuration revision number

guideline [17-15](#)

resetting [17-16](#)

consistency checks [17-4](#)

default configuration [17-7](#)

described [17-1](#)

domain names [17-8](#)

VTP (continued)

- domains [17-2](#)
- Layer 2 protocol tunneling [16-7](#)
- modes
 - client [17-3](#)
 - off [17-3](#)
 - server [17-3](#)
 - transitions [17-3](#)
 - transparent [17-3](#)
- monitoring [17-16](#)
- passwords [17-8](#)
- pruning
 - disabling [17-14](#)
 - enabling [17-14](#)
 - examples [17-6](#)
 - overview [17-5](#)
 - support for [1-8](#)
- pruning-eligible list, changing [16-19](#)
- server mode, configuring [17-10, 17-13](#)
- statistics [17-16](#)
- support for [1-8](#)
- Token Ring support [17-4](#)
- transparent mode, configuring [17-10](#)
- using [17-1](#)
- Version
 - enabling [17-13](#)
- version, guidelines [17-9](#)
- Version 1 [17-4](#)
- Version 2
 - configuration guidelines [17-9](#)
 - overview [17-4](#)
- Version 3
 - overview [17-5](#)

W**WCCP**

- authentication [44-3](#)
- configuration guidelines [44-5](#)
- default configuration [44-5](#)
- described [44-1](#)
- displaying [44-9](#)
- dynamic service groups [44-3](#)
- enabling [44-6](#)
- features unsupported [44-4](#)
- forwarding method [44-3](#)
- Layer-2 header rewrite [44-3](#)
- MD5 security [44-3](#)
- message exchange [44-2](#)
- monitoring and maintaining [44-9](#)
- negotiation [44-3](#)
- packet redirection [44-3](#)
- packet-return method [44-3](#)
- redirecting traffic received from a client [44-6](#)
- setting the password [44-6](#)
- unsupported WCCPv2 features [44-4](#)
- web authentication [12-15](#)
 - configuring [13-16 to ??](#)
 - described [1-8](#)
- web-based authentication
 - customizeable web pages [13-6](#)
 - description [13-1](#)
- web-based authentication, interactions with other features [13-7](#)
- Web Cache Communication Protocol
 - See WCCP
- weighted tail drop
 - See WTD
- weight thresholds in tracked lists [43-5](#)

wired location service

- configuring [26-9](#)
- displaying [26-10](#)
- location TLV [26-2](#)
- understanding [26-3](#)

wizards [1-2](#)

WTD

described [35-13](#)

setting thresholds

 egress queue-sets [35-71](#)

 ingress queues [35-66](#)

support for [1-12](#)

X

Xmodem protocol [48-2](#)

