



INDEX

Numerics

- 10/100 autonegotiation feature, forced [8-21](#)
- 10-Gigabit Ethernet or Gigabit Ethernet ports
 - deploy on WS-X4606-10GE-E and Sup 6-E [8-13](#)
- 10-Gigabit Ethernet port
 - deploy with Gigabit Ethernet SFP ports [8-12, 8-13](#)
- 10-slot chassis, support for WS-X46490-CSFP-E [8-17](#)
- 1400 W DC Power supply
 - special considerations [13-21](#)
- 1400 W DC SP Triple Input power supply
 - special considerations [13-22](#)
- 802.10 SAID (default) [16-5](#)
- 802.1AE
 - standard [44-2](#)
- 802.1Q
 - trunks [21-6](#)
 - tunneling
 - compatibility with other features [28-5](#)
 - defaults [28-3](#)
 - described [28-2](#)
 - tunnel ports with other features [28-6](#)
- 802.1Q VLANs
 - trunk restrictions [18-4](#)
- 802.1s
 - See MST
- 802.1w
 - See MST
- 802.1X
 - See port-based authentication
- 802.1X authentication
 - Authentication Failed VLAN assignment [45-17](#)
 - for Critical Authentication [45-14](#)

- for guest VLANs [45-11](#)
- for MAC Authentication Bypass [45-12](#)
- for Unidirectional Controlled Port [45-15](#)
- VLAN User Distribution [45-16](#)
- web-based authentication [45-14](#)
- with port security [45-19](#)
- with VLAN assignment [45-10](#)
- with voice VLAN ports [45-22](#)
- 802.1X Host Mode [45-6](#)
 - multiauthentication mode [45-8](#)
 - multidomain authentication mode [45-7](#)
 - single-host [45-7](#)
- 802.1x-REV [44-2](#)
- 802.3ad
 - See LACP
- 9000W AC, displaying OBFL [13-4](#)

A

- AAA [49-1](#)
- AAA (authentication, authorization, and accounting). See also port-based authentication. [47-2](#)
- abbreviating commands [2-5](#)
- about Wireshark [57-5](#)
- access control entries
 - See ACEs
- access control entries and lists [49-1](#)
- access-group mode, configuring on Layer 2 interface [52-31](#)
- access-group mode, using PACL with [52-30](#)
- access list filtering, SPAN enhancement [56-13](#)
- access lists
 - using with WCCP [70-8](#)
- access ports

- and Layer 2 protocol tunneling [28-15](#)
- configure port security [48-7, 48-22](#)
- configuring [18-7](#)
- access VLANs [18-5](#)
- accounting
 - with RADIUS [45-111](#)
 - with TACACS+ [3-16, 3-21](#)
- ACEs
 - ACLs [52-2](#)
 - IP [1-40, 52-2](#)
 - Layer 4 operation restrictions [52-10](#)
- ACEs and ACLs [49-1](#)
- ACL assignments, port-based authentication [45-20](#)
- ACL assignments and redirect URLs, configure [45-38](#)
- ACL configuration, displaying a Layer 2 interface [52-32](#)
- ACLs
 - ACEs [52-2](#)
 - and SPAN [56-5](#)
 - and TCAM programming for Sup 6-E [52-10](#)
 - and TCAM programming for Sup II-Plus thru V-10GE [52-6](#)
 - applying IPv6 ACLs to a Layer 3 interface [52-17](#)
 - applying on routed packets [52-26](#)
 - applying on switched packets [52-25](#)
 - compatibility on the same switch [52-3](#)
 - configuring with VLAN maps [52-25](#)
 - CPU impact [52-12](#)
 - downloadable [47-7](#)
 - hardware and software support [52-6](#)
 - IP, matching criteria for port ACLs [52-4](#)
 - MAC extended [52-14](#)
 - matching criteria for router ACLs [52-3](#)
 - port
 - and voice VLAN [52-4](#)
 - defined [52-3](#)
 - processing [52-12](#)
 - selecting mode of capturing control packets [52-7](#)
 - troubleshooting high CPU [52-6](#)
 - types supported [52-3](#)
 - understanding [52-2](#)
 - VLAN maps [52-5](#)
- ACLs, applying to a Layer 2 interface [52-31](#)
- ACLs and VLAN maps, examples [52-19](#)
- acronyms, list of [A-1](#)
- action drivers, marking [41-21, 41-55](#)
- activating and deactivating a capture point, Wireshark [57-13](#)
- activating and deactivating Wiresharkcapture points, conceptual, Wireshark [57-9](#)
- active queue management [41-9](#)
- active queue management via DBL, QoS on Sup 6-E [41-34, 41-68](#)
- active traffic monitoring, IP SLAs [67-1](#)
- adding members to a community [15-9](#)
- addresses
 - displaying the MAC table [4-44](#)
 - dynamic
 - changing the aging time [4-30](#)
 - defined [4-28](#)
 - learning [4-29](#)
 - removing [4-31](#)
 - IPv6 [53-2](#)
 - MAC, discovering [4-44](#)
 - See MAC addresses
 - static
 - adding and removing [4-36](#)
 - defined [4-28](#)
- address resolution [4-44](#)
- adjacency tables
 - description [34-2](#)
 - displaying statistics [34-9](#)
- administrative VLAN
 - REP, configuring [23-9](#)
- administrative VLAN, REP [23-8](#)
- advertisements
 - LLDP [1-7, 30-2](#)
- advertisements, VTP
 - See VTP advertisements
- aggregation switch, enabling DHCP snooping [51-9](#)

- aging time
 - MAC address table [4-30](#)
- All Auth manager sessions, displaying summary [45-126](#)
- All Auth manager sessions on the switch authorized for a specified authentication method [45-126](#)
- ANCP client
 - enabling and configuring [37-2](#)
 - guidelines and restrictions [37-5](#)
 - identify a port with DHCP option 82 [37-4](#)
 - identify a port with protocol [37-2](#)
 - overview [37-1](#)
- ANCP protocol
 - identifying a port with [37-2](#)
- applying IPv6 ACLs to a Layer 3 interface [52-17](#)
- AQM via DBL, QoS on Sup 6-E [41-34, 41-68](#)
- archiving crashfiles information [2-8](#)
- ARP
 - defined [4-44](#)
 - table
 - address resolution [4-44](#)
 - managing [4-44](#)
- asymmetrical links, and 802.1Q tunneling [28-3](#)
- attachment points, Wireshark [57-6](#)
- attributes, RADIUS
 - vendor-proprietary [45-114](#)
 - vendor-specific [45-112](#)
- authentication
 - NTP associations [4-4](#)
 - RADIUS
 - key [45-104](#)
 - login [45-106](#)
 - See also port-based authentication
 - TACACS+
 - defined [3-16](#)
 - key [3-18](#)
 - login [3-19](#)
- Authentication, Authorization, and Accounting (AAA) [49-1](#)
- Authentication Failed, configuring 80.1X [45-70](#)
- Authentication methods registered with the Auth manager, determining [45-125](#)
- authentication open comand [45-8](#)
- authentication proxy web pages [47-4](#)
- authentication server
 - defined [45-3](#)
 - RADIUS server [45-3](#)
- Auth manager session for an interface, verifying [45-126](#)
- Auth manager summary, displaying [45-126](#)
- authoritative time source, described [4-2](#)
- authorization
 - with RADIUS [45-110](#)
 - with TACACS+ [3-16, 3-21](#)
- authorized and unauthorized ports [45-5](#)
- authorized ports with 802.1X [45-5](#)
- autoconfiguration [3-2](#)
- automatic discovery
 - considerations [15-7](#)
- Auto-MDIX on a port
 - configuring [8-31](#)
 - displaying the configuration [8-32](#)
 - overview [8-30](#)
- autonegotiation feature
 - forced 10/100Mbps [8-21](#)
- Auto SmartPorts built-in macros
 - configuring parameters [20-6](#)
- Auto SmartPorts macros
 - built-in macros [20-5](#)
 - configuration guidelines [20-5](#)
 - default configuration [20-4](#)
 - defined [20-1](#)
 - displaying [20-13](#)
 - enabling [20-4](#)
 - IOS shell [20-2, 20-10](#)
- Auto Smartports macros
 - defined [1-2](#)
- Auto SmartPorts user-defined macros
 - configuring [20-10](#)
- auto-sync command [10-8, 11-7](#)

Auto SmartPorts macros

See also SmartPorts macros

Auto Smartports macros

See also Smartports macros

B

Baby Giants

interacting with [8-29](#)

BackboneFast

adding a switch (figure) [24-3](#)

and MST [21-23](#)

configuring [24-15](#)

link failure (figure) [24-14, 24-15](#)

not supported MST [21-23](#)

understanding [24-13](#)

See also STP

banners

configuring

login [4-27](#)

message-of-the-day login [4-24](#)

default configuration [4-24](#)

when displayed [4-24](#)

b command [72-3](#)

BFD

and hardware support [38-7](#)

configuration example

BFD in a BGP network [38-25](#)

BFD in an EIGRP network with echo mode enabled by default [38-17](#)

BFD in an OSPF network [38-22](#)

support for static routing [38-27](#)

configuring

Echo mode [38-15](#)

session parameters on the interface [38-8](#)

Slow timer [38-16](#)

support for BGP [38-9](#)

support for dynamic routing protocols [38-9](#)

support for EIGRP [38-10](#)

support for OSPF [38-11](#)

support for static routing [38-13](#)

disabling echo mode without asymmetry [38-16](#)

monitoring and troubleshooting [38-17](#)

neighbor relationships [38-3](#)

operation [38-3](#)

prerequisites [38-2](#)

restrictions [38-2](#)

b flash command [72-3](#)

BGP [1-17](#)

routing session with multi-VRF CE [40-9](#)

blocking packets [54-1](#)

blocking state (STP)

RSTP comparisons (table) [21-24](#)

Boolean expressions in tracked lists [58-4](#)

boot bootldr command [3-31](#)

boot command [3-28](#)

boot commands [72-3](#)

boot fields

See configuration register boot fields

bootstrap program

See ROM monitor

boot system command [3-26, 3-31](#)

boot system flash command [3-28](#)

Border Gateway Protocol

See BGP

boundary ports

description [21-27](#)

BPDU Guard

and MST [21-23](#)

configuring [24-15](#)

overview [24-8](#)

BPDUs

and media speed [21-2](#)

pseudobridges and [21-25](#)

what they contain [21-3](#)

bridge ID

See STP bridge ID

bridge priority (STP) [21-17](#)

bridge protocol data units

See BPDUs

Broadcast Storm Control

disabling 55-5

enabling 55-3

Built-in macros and user-defined triggers, configuring mapping 20-9

C

cache engine clusters 70-1

cache engines 70-1

cache farms

See cache engine clusters

Call Home

description 1-24, 66-2

message format options 66-2

messages

format options 66-2

call home 66-1

alert groups 66-6

configuring e-mail options 66-9

contact information 66-4

default settings 66-18

destination profiles 66-5

displaying information 66-14

mail-server priority 66-10

pattern matching 66-9

periodic notification 66-8

rate limit messages 66-9

severity threshold 66-8

smart call home feature 66-2

SMTP server 66-9

testing communications 66-10

call home alert groups

configuring 66-6

description 66-6

subscribing 66-7

call home contacts

assigning information 66-4

call home destination profiles

attributes 66-5

configuring 66-5

description 66-5

displaying 66-16

call home notifications

full-txt format for syslog 66-25

XML format for syslog 66-28

candidates

automatic discovery 15-7

candidate switch, cluster

defined 15-12

capture filter, Wireshark 57-7

capture points, Wireshark 57-6

Capturing control packets

selecting mode 52-7

cautions

Unicast RPF

BGP optional attributes 35-4

cautions for passwords

encrypting 3-22

CDP

automatic discovery in communities 15-7

configuration 29-2

defined with LLDP 30-1

displaying configuration 29-3

enabling on interfaces 29-3

host presence detection 45-8

Layer 2 protocol tunneling 28-13

maintaining 29-3

monitoring 29-3

overview 1-3, 29-1

cdp enable command 29-3

CEF

adjacency tables 34-2

and NSF with SSO 12-5

configuring load balancing 34-7

displaying statistics 34-8

- enabling [34-6, 69-2](#)
- hardware switching [34-4](#)
- load balancing [34-6](#)
- overview [34-1](#)
- software switching [34-4](#)
- certificate authority (CA) [66-3](#)
- CFM
 - and Ethernet OAM, configuring [64-51](#)
 - and Ethernet OAM interaction [64-51](#)
 - clearing [64-31](#)
 - configuration guidelines [64-7, 65-4](#)
 - configuring crosscheck for VLANs [64-11](#)
 - configuring fault alarms [64-16](#)
 - configuring port MEP [64-14](#)
 - configuring static remote MEP [64-13, 64-16, 64-18](#)
 - crosscheck [64-5](#)
 - defined [64-2](#)
 - EtherChannel support [64-7, 65-4](#)
 - fault alarms
 - configuring [64-16](#)
 - IP SLAs support for [64-6](#)
 - IP SLAs with endpoint discovers [64-21](#)
 - maintenance domain [64-2](#)
 - manually configuring IP SLAs ping or jitter [64-19](#)
 - measuring network performance [64-6](#)
 - monitoring [64-32, 64-33](#)
 - port MEP, configuring [64-14](#)
 - remote MEPs [64-5](#)
 - static RMEP, configuring [64-13, 64-16, 64-18](#)
 - static RMEP check [64-5](#)
 - Y.1731
 - described [64-27](#)
- CGMP
 - overview [26-2](#)
- Change of Authorization, RADIUS [45-97](#)
- channel-group group command [5-46, 25-8, 25-10](#)
- Cisco 7600 series Internet router
 - enabling SNMP [71-4, 71-5](#)
- Cisco Discovery Protocol
 - See CDP
- Cisco Express Forwarding
 - See CEF
- Cisco Group Management Protocol
 - See CGMP
- Cisco IOS IP SLAs [67-2](#)
- Cisco IOS NSF-aware
 - support [12-2](#)
- Cisco IOS NSF-capable support [12-2](#)
- Cisco IP Phones
 - configuring [42-3](#)
 - sound quality [42-1](#)
- Cisco TrustSec
 - credentials [44-10](#)
 - switch-to-switch security
 - 802.1x mode [44-11](#)
 - configuration example [44-14](#)
 - manual mode [44-12](#)
- Cisco TrustSec Network Device Admission Control
 - See NDAC
- CiscoWorks 2000 [61-4](#)
- CIST
 - description [21-22](#)
- civic location [30-3](#)
- class level, configure in a service policy [41-31, 41-65](#)
- class of service
 - See CoS
- clear cdp counters command [29-4](#)
- clear cdp table command [29-3](#)
- clear counters command [8-36](#)
- clearing
 - Ethernet CFM [64-31](#)
 - IP multicast table entries [36-28](#)
- clear ip eigrp neighbors command [33-19](#)
- CLI
 - accessing [2-2](#)
 - backing out one level [2-5](#)
 - getting commands [2-5](#)
 - history substitution [2-4](#)

- managing clusters [15-13](#)
- modes [2-5](#)
- monitoring environments [56-1](#)
- ROM monitor [2-7](#)
- software basics [2-4](#)
- client processes, tracking [58-1](#)
- clients
 - in 802.1X authentication [45-3](#)
- clock
 - See system clock
- clustering switches
 - command switch characteristics and VTY [15-12](#)
 - convert to a community [15-10](#)
 - managing
 - through CLI [15-13](#)
 - overview [15-2](#)
 - planning considerations
 - CLI [15-13](#)
 - passwords [15-8](#)
- CoA Request Commands [45-100](#)
- command-line processing [2-3](#)
- command modes [2-5](#)
- commands
 - b [72-3](#)
 - b flash [72-3](#)
 - boot [72-3](#)
 - confreg [72-3](#)
 - dev [72-3](#)
 - dir device [72-3](#)
 - frame [72-5](#)
 - i [72-3](#)
 - listing [2-5](#)
 - meminfo [72-5](#)
 - reset [72-3](#)
 - ROM monitor [72-2 to 72-3](#)
 - ROM monitor debugging [72-5](#)
 - SNMP [71-4](#)
 - sysret [72-5](#)
- command switch, cluster
 - requirements [15-11](#)
- common and internal spanning tree
 - See CIST
- common spanning tree
 - See CST
- community of switches
 - access modes in Network Assistant [15-9](#)
 - adding devices [15-9](#)
 - communication protocols [15-8](#)
 - community name [15-8](#)
 - configuration information [15-9](#)
 - converting from a cluster [15-10](#)
 - host name [15-8](#)
 - passwords [15-8](#)
- community ports [43-3](#)
- community strings
 - configuring [61-7](#)
 - overview [61-4](#)
- community VLANs [43-2, 43-3](#)
 - configure as a PVLAN [43-15](#)
- compiling MIBs [71-4](#)
- config-register command [3-29](#)
- config terminal command [3-9](#)
- configurable leave timer,IGMP [26-4](#)
- configuration examples
 - SNMP [61-15](#)
- configuration files
 - limiting TFTP server access [61-15](#)
 - obtaining with DHCP [3-6](#)
 - saving [3-10](#)
 - system contact and location information [61-14](#)
- configuration guidelines
 - CFM [64-7, 65-4](#)
 - Ethernet OAM [64-35](#)
 - REP [23-7](#)
 - SNMP [61-6](#)
 - VLAN mapping [28-10](#)
- configuration register

- boot fields
 - listing value [3-29](#)
 - modifying [3-28](#)
 - changing from ROM monitor [72-3](#)
 - changing settings [3-28 to 3-29](#)
 - configuring [3-26](#)
 - settings at startup [3-27](#)
 - configure class-level queue-limit in a service policy [41-31, 41-65](#)
 - configure terminal command [3-29, 8-2](#)
 - configuring access-group mode on Layer 2 interface [52-31](#)
 - configuring flow control [8-23](#)
 - configuring interface link and trunk status events [8-37](#)
 - configuring named IPv6 ACLs [52-16](#)
 - configuring named MAC extended ACLs [52-14, 52-15](#)
 - configuring unicast MAC address filtering [52-13](#)
 - configuring VLAN maps [52-17](#)
 - confreg command [72-3](#)
 - Connectivity Fault Management
 - See CFM
 - console configuration mode [2-5](#)
 - console download [72-4 to 72-5](#)
 - console port
 - disconnecting user sessions [9-7](#)
 - monitoring user sessions [9-6](#)
 - contact information
 - assigning for call home [66-4](#)
 - controlling switch access with RADIUS [45-95](#)
 - Control Plane Policing
 - and Layer 2 Control packet QoS, configuration example [49-14](#)
 - configuration guidelines and restrictions [49-8](#)
 - configuring for control plane traffic [49-4](#)
 - configuring for data plane and management plan traffic [49-5](#)
 - defaults [49-4](#)
 - general guidelines [49-3](#)
 - monitoring [49-9](#)
 - understanding [49-2](#)
 - control protocol, IP SLAs [67-4](#)
 - convergence
 - REP [23-4](#)
 - copy running-config startup-config command [3-10](#)
 - copy system:running-config nvram:startup-config command [3-32](#)
 - core system filter, Wireshark [57-6](#)
 - CoS
 - definition [41-3](#)
 - figure [41-2](#)
 - overriding on Cisco IP Phones [42-5](#)
 - priority [42-5](#)
 - counters
 - clearing MFIB [36-28](#)
 - clearing on interfaces [8-36](#)
 - CPU, impact of ACL processing [52-12](#)
 - CPU port sniffing [56-10](#)
 - crashfiles information, archiving [2-8](#)
 - Critical Authentication
 - configure with 802.1X [45-62](#)
 - crosscheck, CFM [64-5, 64-11](#)
 - CST
 - description [21-25](#)
 - IST and [21-22](#)
 - MST and [21-22](#)
 - customer edge devices [40-2](#)
 - C-VLAN [1-2, 28-7](#)
-
- ## D
- database agent
 - configuration examples [51-15](#)
 - enabling the DHCP Snooping [51-13](#)
 - daylight saving time [4-13](#)
 - debug commands, ROM monitor [72-5](#)
 - decoding and displaying packets, Wireshark [57-9](#)
 - default configuration
 - 802.1X [45-27](#)
 - banners [4-24](#)

- DNS [4-23](#)
- Ethernet OAM [64-35](#)
- IGMP filtering [26-30](#)
- IGMP snooping [27-5, 27-6](#)
- IP SLAs [67-6](#)
- IPv6 [53-7](#)
- Layer 2 protocol tunneling [28-16](#)
- LLDP [30-5](#)
- MAC address table [4-30](#)
- MVR [26-23](#)
- NTP [4-4](#)
- private VLANs [43-12](#)
- RADIUS [45-103](#)
- REP [23-7](#)
- resetting the interface [8-40](#)
- RMON [67-3](#)
- SNMP [61-5](#)
- SPAN and RSPAN [56-6](#)
- system message logging [59-3](#)
- TACACS+ [3-18](#)
- VLAN mapping [28-9](#)
- Y.1731 [64-29](#)
- default gateway
 - configuring [3-11](#)
 - verifying configuration [3-11](#)
- default settings, erase command [3-32](#)
- default web-based authentication configuration
 - 802.1X [47-6](#)
- defining/modifying/deleting a capture point, Wireshark [57-12](#)
- denial-of-service attacks
 - IP address spoofing, mitigating [35-5](#)
 - Unicast RPF, deploying [35-5](#)
- denying access to a server on another VLAN [52-23](#)
- deploying 10-Gigabit Ethernet and a Gigabit Ethernet SFP ports [8-12, 8-13](#)
- deploying 10-Gigabit Ethernet and a Gigabit Ethernet SFP ports on WS-X4606-10GE-E and Sup 6-E [8-13](#)
- description command [8-23](#)
- dev command [72-3](#)
- device discovery protocol [30-1](#)
- device IDs
 - call home format [66-21, 66-22](#)
- device sensor
 - configuring [45-118](#)
- DHCP
 - configuring
 - rate limit for incoming packets [51-13](#)
 - denial-of-service attacks, preventing [51-13](#)
 - rate limiting of packets
 - configuring [51-13](#)
- DHCP-based autoconfiguration
 - client request message exchange [3-3](#)
 - configuring
 - client side [3-3](#)
 - DNS [3-5](#)
 - relay device [3-5](#)
 - server-side [3-4](#)
 - TFTP server [3-4](#)
 - example [3-7](#)
 - lease options
 - for IP address information [3-4](#)
 - for receiving the configuration file [3-4](#)
 - overview [3-2](#)
 - relationship to BOOTP [3-3](#)
- DHCP option 82
 - identifying a port with [37-4](#)
 - overview [51-4](#)
- DHCP Snooping
 - enabling, and Option 82 [51-10](#)
- DHCP snooping
 - accepting untrusted packets from edge switch [51-10](#)
 - configuring [51-6](#)
 - default configuration [51-7](#)
 - displaying binding tables [51-19](#)
 - displaying configuration [51-19](#)
 - displaying information [51-18](#)
 - enabling [51-7](#)
 - enabling on private VLAN [51-12](#)

- enabling on the aggregation switch [51-9](#)
- enabling the database agent [51-13](#)
- message exchange process [51-4](#)
- monitoring [51-23](#)
- option 82 data insertion [51-4](#)
- overview [51-1](#)
- Snooping database agent [51-2](#)
- DHCP Snooping Database Agent
 - adding to the database (example) [51-18](#)
 - enabling (example) [51-15](#)
 - overview [51-2](#)
 - reading from a TFTP file (example) [51-17](#)
- Diagnostics
 - online [69-1](#)
 - Power-On-Self-Test
 - causes of failure [69-20](#)
 - how it works [69-10](#)
 - overview [69-10](#)
 - Power-On-Self-Test for Supervisor Engine V-10GE [69-13](#)
- Differentiated Services Code Point values
 - See DSCP values
- DiffServ architecture, QoS [41-2](#)
- Digital optical monitoring transceiver support [8-19](#)
- dir device command [72-3](#)
- disabled state
 - RSTP comparisons (table) [21-24](#)
- disabling
 - broadcast storm control [55-5](#)
- disabling multicast storm control [55-5](#)
- disconnect command [9-7](#)
- discovery, clusters
 - See automatic discovery
- discovery, Ethernet OAM [64-34](#)
- display dection and removal events [14-7](#)
- display filter, Wireshark [57-7](#)
- displaying
 - Auth Manager summary for an interface [45-126](#)
 - MAB details [45-128](#)
 - summary of all Auth manager sessions [45-126](#)
 - summary of all Auth manager sessions on the switch authorized for a specified authentication method [45-126](#)
 - displaying EtherChannel to a Virtual Switch System [25-16](#)
 - displaying storm control [55-6](#)
 - displaying Wireshark information [57-14](#)
 - display PoE consumed by a module [14-8](#)
 - display PoE detection and removal events [14-7](#)
 - DNS
 - and DHCP-based autoconfiguration [3-5](#)
 - default configuration [4-23](#)
 - displaying the configuration [4-24](#)
 - overview [4-22](#)
 - setting up [4-23](#)
 - domain names
 - DNS [4-22](#)
 - Domain Name System
 - See DNS
 - double-tagged packets
 - 802.1Q tunneling [28-2](#)
 - Layer 2 protocol tunneling [28-15](#)
 - downloading MIBs [71-3, 71-4](#)
 - drop threshold for Layer 2 protocol packets [28-16](#)
 - DSCP values
 - definition [41-4](#)
 - IP precedence [41-2](#)
 - Dual_Active Detection
 - using Enhanced PAgP [5-23](#)
 - Dual-Active Detection, using Fast-Hello [5-24](#)
 - duplex command [8-22](#)
 - duplex mode
 - configuring interface [8-20](#)
 - dynamic ARP inspection
 - ARP cache poisoning [50-2](#)
 - configuring
 - ACLs for non-DHCP environments [50-11](#)
 - in DHCP environments [50-5](#)
 - log buffer [50-14](#)

- rate limit for incoming ARP packets [50-16](#)
- denial-of-service attacks, preventing [50-16](#)
- interface trust state, security coverage [50-3](#)
- log buffer
 - configuring [50-14](#)
- logging of dropped packets [50-4](#)
- overview [50-1](#)
- port channels, their behavior [50-5](#)
- priority of static bindings [50-4](#)
- purpose of [50-2](#)
- rate limiting of ARP packets [50-4](#)
 - configuring [50-16](#)
- validation checks, performing [50-19](#)

Dynamic Host Configuration Protocol snooping

- See DHCP snooping

dynamic port VLAN membership

- example [16-29](#)
- limit on hosts [16-28](#)
- reconfirming [16-26](#)
- troubleshooting [16-28](#)

E

EAP frames

- changing retransmission time [45-85](#)
- exchanging (figure) [45-4](#), [45-6](#), [45-13](#)
- request/identity [45-4](#)
- response/identity [45-4](#)
- setting retransmission number [45-86](#)

EAPOL frames

- 802.1X authentication and [45-3](#)
- OTP authentication, example (figure) [45-4](#), [45-13](#)
- start [45-4](#)

Echo mode, configuring BFD [38-15](#)

edge ports

- description [21-27](#)

EGP

- overview [1-17](#)

EIGRP

- configuration examples [33-19](#)
- monitoring and maintaining [33-19](#)

EIGRP (Enhanced IGRP)

- stub routing
 - benefits [33-17](#)
 - configuration tasks [33-18](#)
 - configuring [33-14](#)
 - overview [33-14](#)
 - restrictions [33-17](#)
 - verifying [33-18](#)

EIGRP (enhanced IGRP)

- overview [1-17](#)

eigrp stub command [33-18](#)

EIGRP stub routing, configuring [33-13](#)

ELIN location [30-3](#)

e-mail addresses

- assigning for call home [66-4](#)

e-mail notifications

- Call Home [1-24](#), [66-2](#)

Embedded CiscoView

- displaying information [4-48](#)
- installing and configuring [4-45](#)
- overview [4-45](#)

emergency alarms on Sup Engine 6-E systems [13-5](#)

enable command [3-9](#), [3-28](#)

enable mode [2-5](#)

enabling SNMP [71-4](#), [71-5](#)

encryption keying [44-2](#)

encryption keys, MKA [44-2](#)

Enhanced Interior Gateway Routing Protocol

- See EIGRP

enhanced object tracking

- defined [58-1](#)
- IP routing state [58-2](#)
- line-protocol state [58-2](#)
- tracked lists [58-3](#)

Enhanced PoE support on E-series [14-15](#)

Enhanced PoE support on E-series, configuring Universal PoE [14-16](#)

- environmental monitoring
 - using CLI commands [13-1](#)
- EPM logging [45-129](#)
- errdisable recovery
 - configuring [14-14](#)
- EtherChannel
 - channel-group group command [5-46, 25-8, 25-10](#)
 - configuration guidelines [5-30, 25-5](#)
 - configuring [25-6 to 25-16](#)
 - configuring (tasks) [5-30](#)
 - configuring Layer 2 [25-10](#)
 - configuring Layer 3 [25-7](#)
 - DFC restriction, see CSCdt27074 in the Release Notes
 - displaying to a virtual switch system [25-16](#)
 - interface port-channel command [25-7](#)
 - lACP system-priority
 - command example [25-13](#)
 - modes [25-3](#)
 - overview [25-2](#)
 - PAgP
 - Understanding [25-4](#)
 - physical interface configuration [5-46, 25-7](#)
 - port-channel interfaces [25-2](#)
 - port-channel load-balance command [25-14](#)
 - removing [25-15](#)
 - removing interfaces [25-15](#)
 - understanding [5-2](#)
- EtherChannel guard
 - disabling [24-6](#)
 - enabling [24-6](#)
 - overview [24-6](#)
- Ethernet management port
 - and routing [8-6](#)
 - and routing protocols [8-6](#)
 - configuring [8-10](#)
 - default setting [8-6](#)
 - described [1-29, 8-6](#)
 - for network management [1-29, 8-6](#)
 - specifying [8-10](#)
 - supported features [8-10](#)
 - unsupported features [8-10](#)
- Ethernet management port, internal
 - and routing protocols [8-6](#)
- Ethernet Management Port, using [8-6](#)
- Ethernet OAM [64-34](#)
 - and CFM interaction [64-51](#)
 - configuration guidelines [64-35](#)
 - configuring with CFM [64-51](#)
 - default configuration [64-35](#)
 - discovery [64-34](#)
 - enabling [64-36, 64-52](#)
 - link monitoring [64-34, 64-38](#)
 - messages [64-34](#)
 - protocol
 - defined [64-33](#)
 - monitoring [64-49](#)
 - remote failure indications [64-34](#)
 - remote loopback [64-34, 64-37](#)
 - templates [64-45](#)
- Ethernet OAM protocol CFM notifications [64-51](#)
- Ethernet Remote Defect Indication (ETH-RDI) [64-28](#)
- event triggers, user-defined
 - configuring, 802.1X-based [20-8](#)
 - configuring, MAC address-based [20-9](#)
- explicit host tracking
 - enabling [26-11](#)
- extended range VLANs
 - See VLANs
- Extensible Authentication Protocol over LAN [45-2](#)
- Exterior Gateway Protocol
 - See EGP

F

- Fa0 port
 - See Ethernet management port
- Failure detection, using BFD [38-7](#)
- Fallback Authentication

configure with 802.1X [45-77](#)

FastDrop

overview [36-11](#)

fastethernet0 port

See Ethernet management port

Fast-Hello

dual-active detection [5-24](#)

Fast-Hello dual-active detection, configuring [5-50](#)

fast link notification

on VSL failure [5-14](#)

Fast UDLD

configuring probe message interval [31-8](#)

default configuration [31-4](#)

displaying link status [31-9](#)

enabling globally [31-5](#)

enabling on individual interface [31-7](#)

enabling per-interface [31-6](#)

modes of operation [31-3](#)

resetting disabled LAN interfaces [31-8](#)

use case [31-2](#)

Fast UDLD, overview [31-1](#)

feature interactions, Wireshark [57-10](#)

FIB

description [34-2](#)

See also MFIB

fiber-optics interfaces

disabling UDLD [31-7](#)

Filter-ID ACL and Per-User ACL, configureport-based authentication

configure Per-User ACL and Filter-ID ACL [45-45](#)

filtering

in a VLAN [52-18](#)

non-IP traffic [52-14](#), [52-15](#)

filters, Wireshark [57-6](#)

flags [36-12](#)

Flash memory

configuring router to boot from [3-31](#)

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

security precautions [3-31](#)

Flexible NetFlow

caveats [63-1](#), [63-7](#)

defined [1-4](#), [63-1](#)

Flex Links

configuration guidelines [22-6](#)

configuring [22-6](#), [22-7](#)

configuring preferred VLAN [22-9](#)

configuring VLAN load balancing [22-8](#)

monitoring [22-12](#)

flooded traffic, blocking [54-2](#)

flowchart, traffic marking procedure [41-21](#), [41-55](#)

flow control, configuring [8-23](#)

For [14-13](#)

forward-delay time (STP)

configuring [21-19](#)

forwarding information base

See FIB

frame command [72-5](#)

G

gateway

See default gateway

get-bulk-request operation [61-3](#)

get-next-request operation [61-3](#), [61-4](#)

get-request operation [61-3](#), [61-4](#)

get-response operation [61-3](#)

Gigabit Ethernet SFP ports

deploy with 10-Gigabit Ethernet [8-12](#), [8-13](#)

GLBP, introduction [1-15](#)

global configuration mode [2-5](#)

Guest-VLANs

configure with 802.1X [45-57](#)

H

hardware and software ACL support [52-6](#)

hardware switching [34-5](#)

- hello time (STP)
 - configuring [21-17](#)
 - high CPU due to ACLs, troubleshooting [52-6](#)
 - history
 - CLI [2-4](#)
 - history table, level and number of syslog messages [59-9](#)
 - hop counts
 - configuring MST bridges [21-28](#)
 - host
 - limit on dynamic port [16-28](#)
 - host modes, MACsec [44-3](#)
 - host ports
 - kinds of [43-4](#)
 - host presence CDP message [45-8](#)
 - Hot Standby Routing Protocol
 - See HSRP
 - HSRP
 - description [1-16](#)
 - HSRP, introduction [1-16](#)
 - hw-module module num power command [13-22](#)
-
- ICMP
 - enabling [9-12](#)
 - ping [9-7](#)
 - running IP traceroute [9-9](#)
 - time exceeded messages [9-9](#)
 - ICMP Echo operation
 - configuring [67-11](#)
 - IP SLAs [67-11](#)
 - i command [72-3](#)
 - IDS
 - using with SPAN and RSPAN [56-2](#)
 - IEEE 802.1ag [64-2](#)
 - IEEE 802.1s
 - See MST
 - IEEE 802.1w
 - See MST
 - IEEE 802.3ad
 - See LACP
 - IGMP
 - configurable-leave timer [26-4](#)
 - description [36-3](#)
 - enabling [36-14](#)
 - explicit host tracking [26-4](#)
 - immediate-leave processing [26-3](#)
 - leave processing, enabling [27-8](#)
 - overview [26-2](#)
 - report suppression
 - disabling [27-10](#)
 - IGMP filtering
 - configuring [26-31](#)
 - default configuration [26-30](#)
 - described [26-30](#)
 - monitoring [26-34](#)
 - IGMP groups
 - setting the maximum number [26-33](#)
 - IGMP Immediate Leave
 - configuration guidelines [26-9](#)
 - IGMP profile
 - applying [26-32](#)
 - configuration mode [26-31](#)
 - configuring [26-31](#)
 - IGMP Snooping
 - configure
 - leave timer [26-9](#)
 - configuring
 - Learning Methods [26-7](#)
 - static connection to a multicast router [26-8](#)
 - configuring host statically [26-11](#)
 - enabling
 - Immediate-Leave processing
 - explicit host tracking [26-11](#)
 - suppressing multicast flooding [26-12](#)
 - IGMP snooping
 - configuration guidelines [26-5](#)
 - default configuration [27-5, 27-6](#)

- enabling
 - globally [26-6](#)
 - on a VLAN [26-6](#)
- enabling and disabling [27-6](#)
- IP multicast and [36-4](#)
- monitoring [26-14, 27-10](#)
- overview [26-2](#)
- IGMP Snooping, displaying
 - group [26-16](#)
 - hot membership [26-15](#)
 - how to [26-15](#)
 - MAC address entries [26-18](#)
 - multicast router interfaces [26-17](#)
 - on a VLAN interface [26-18](#)
 - Querier information [26-19](#)
- IGMPSnooping Querier, configuring [26-10](#)
- Immediate Leave, IGMP
 - enabling [27-8](#)
- immediate-leave processing
 - enabling [26-8](#)
 - IGMP
 - See fast-leave processing
- ingress packets, SPAN enhancement [56-12](#)
- inline power
 - configuring on Cisco IP phones [42-5](#)
- insufficient inline power handling for Supervisor Engine II-TS [13-22](#)
- Intelligent Power Management [14-4](#)
- interacting with Baby Giants [8-29](#)
- interface
 - displaying operational status [14-6](#)
- interface command [3-9, 8-2](#)
- interface configuration
 - REP [23-10](#)
- interface link and trunk status events
 - configuring [8-37](#)
- interface port-channel command [5-45, 25-7](#)
- interface range command [8-4](#)
- interface range macro command [8-11](#)
- interfaces
 - adding descriptive name [8-23](#)
 - clearing counters [8-36](#)
 - configuring [8-2](#)
 - configuring ranges [8-4](#)
 - displaying information about [8-36](#)
 - Layer 2 modes [18-3](#)
 - maintaining [8-35](#)
 - monitoring [8-35](#)
 - naming [8-23](#)
 - numbers [8-2](#)
 - overview [8-2](#)
 - restarting [8-37](#)
 - See also Layer 2 interfaces
 - using the Ethernet Management Port [8-6](#)
- Internet Control Message Protocol
 - See ICMP
- Internet Group Management Protocol
 - See IGMP
- Internet Protocol version 6
 - See IPv6
- introduction
 - 802.1X Identity-Based Network Security, list of supported features [1-34](#)
 - Bidirectional Forwarding Detection [1-14](#)
 - Cisco Call Home [1-24](#)
 - Cisco Energy Wise [1-24](#)
 - Cisco Express Forwarding [1-14](#)
 - Cisco IOS IP Service Level Agreements [1-24](#)
 - Cisco IOS Mediatrace and Performance Monitor [1-26](#)
 - Cisco Medianet AutoQoS [1-25](#)
 - Cisco Medianet Flow Metadata [1-26](#)
 - Cisco Media Services Proxy [1-25](#)
 - Cisco TrustSec MACsec Encryption [1-35](#)
 - Cisco TrustSec Security Architecture [1-36](#)
 - Debugging Features (platform and debug platform) [1-43](#)
 - Device Sensor [1-14](#)
 - Dynamic Host Control Protocol [1-28](#)

- Easy Virtual Network [1-28](#)
- EIGRP Stub routing [1-14](#)
- Embedded Event Manager [1-29](#)
- Enhanced Object Tracking [1-15](#)
- EtherChannel bundles [1-3](#)
- Ethernet CFM [1-3](#)
- Ethernet Management Port [1-29](#)
- Ethernet OAM Protocol [1-3](#)
- FAT File Management System (Sup 60-E, 6L-E, 4948E, and 4900M) [1-30](#)
- File System Management (Sup 7-E and 7L-E) [1-29](#)
- Flexible Netflow (Sup 7-E and 7L-E) [1-4](#)
- Flex Link and MAC Address-Table Move Update [1-4](#)
- GLBP [1-15](#)
- hard-based Control Plane Policing [1-37](#)
- HSRP [1-16](#)
- In Service Software Upgrade [1-19](#)
- Intelligent Power Management [1-30](#)
- Internet Group Management Protocol (IGMP) Snooping [1-4](#)
- IP Routing protocols [1-17](#)
- IP Source Guard [1-38](#)
- IP Source Guard or Static Hosts [1-38](#)
- IPv6 [1-19](#)
- IPv6 First Hop Security [1-38](#)
- IPv6 Multicast BSR and BSR Scoped Zone Support, introduction [1-5](#)
- IPv6 Multicast Listen Discovery (MLD) and Multicast Listen Discovery Snooping [1-6](#)
- IS-IS [1-18](#)
- Jumbo Frame [1-6](#)
- Layer 2 traceroute [1-42](#)
- Link Aggregation Control Protocol [1-7](#)
- MAC Address Notification [1-30](#)
- NAC
 - Layer 2 802.1X authentication [1-40](#)
 - Layer 2 IP validation [1-40](#)
- NetFlow-lite [1-30](#)
- Network Security with ACLs (IP ACLs, MAC ACLs, Port ACLs, Router, ACLs, and VLAN ACLs) [1-40](#)
- NSF with SSO [1-20](#)
- OSPF [1-18](#)
- OSPF for Routed Access [1-21](#)
- Port Security [1-41](#)
- Power over Ethernet [1-31](#)
- RIP [1-19](#)
- Simple Network Management Protocol [1-31](#)
- SPAN and RSPAN [1-32](#)
- Time Domain Reflectometry [1-43](#)
- Unicast Reverse Path Forwarding [1-22](#)
- Universal Power over Ethernet [1-32](#)
- Virtual Router Redundancy Protocol [1-22](#)
- VRF-lite [1-22](#)
- Web-based Authentication [1-43](#)
- Web Content Coordination Protocol [1-32](#)
- Wireshark [1-33](#)
- XML-PI [1-33](#)
- Intrusion Detection System
 - See IDS
- inventory management TLV [30-3, 30-9](#)
- IOS shell
 - See Auto SmartPorts macros
- IP
 - configuring default gateway [3-11](#)
 - configuring static routes [3-11](#)
 - displaying statistics [34-8](#)
- IP addresses
 - 128-bit [53-2](#)
 - cluster candidate or member [15-12](#)
 - cluster command switch [15-11](#)
 - discovering [4-44](#)
 - IPv6 [53-2](#)
- ip cef command [34-6, 69-2](#)
- IP Enhanced IGRP
 - interfaces, displaying [33-19](#)
- ip icmp rate-limit unreachable command [9-12](#)
- ip igmp profile command [26-31](#)
- ip igmp snooping tcn flood command [26-13](#)
- ip igmp snooping tcn flood query count command [26-14](#)

- ip igmp snooping tcn query solicit command [26-14](#)
- IP information
 - assigned
 - through DHCP-based autoconfiguration [3-2](#)
- ip load-sharing per-destination command [34-7](#)
- ip local policy route-map command [39-11](#)
- ip mask-reply command [9-13](#)
- IP MTU sizes,configuring [33-9](#)
- IP multicast
 - clearing table entries [36-28](#)
 - configuring [36-13](#)
 - default configuration [36-13](#)
 - displaying PIM information [36-23](#)
 - displaying the routing table information [36-24](#)
 - enabling dense-mode PIM [36-15](#)
 - enabling sparse-mode [36-15](#)
 - features not supported [36-13](#)
 - hardware forwarding [36-9](#)
 - IGMP snooping and [26-5, 36-4](#)
 - overview [36-1](#)
 - routing protocols [36-2](#)
 - software forwarding [36-9](#)
 - See also Auto-RP; IGMP; PIM; RP; RPF
- IP multicast routing
 - enabling [36-14](#)
 - monitoring and maintaining [36-23](#)
- ip multicast-routing command [36-14](#)
- IP multicast traffic, load splitting [36-22](#)
- IP phones
 - configuring voice ports [42-3](#)
 - See Cisco IP Phones [42-1](#)
- ip pim command [36-15](#)
- ip pim dense-mode command [36-15](#)
- ip pim sparse-dense-mode command [36-16](#)
- ip policy route-map command [39-8, 39-10](#)
- IP Port Security for Static Hosts
 - on a Layer 2 access port [51-25](#)
 - on a PVLAN host port [51-28](#)
 - overview [51-24](#)
- ip redirects command [9-13](#)
- IP routing tables
 - deleting entries [36-28](#)
- IP Service Level Agreements
 - See IP SLAs
- IP service levels, analyzing [67-1](#)
- IP SLAs
 - benefits [67-2](#)
 - CFM endpoint discovery [64-21](#)
 - configuration guidelines [67-6](#)
 - Control Protocol [67-4](#)
 - default configuration [67-6](#)
 - definition [67-1](#)
 - ICMP echo operation [67-11](#)
 - manually configuring CFM ping or jitter [64-19](#)
 - measuring network performance [67-3](#)
 - multioperations scheduling [67-5](#)
 - operation [67-3](#)
 - reachability tracking [58-9](#)
 - responder
 - described [67-4](#)
 - enabling [67-7](#)
 - response time [67-4](#)
 - scheduling [67-5](#)
 - SNMP support [67-2](#)
 - supported metrics [67-2](#)
 - threshold monitoring [67-6](#)
 - track state [58-9](#)
 - UDP jitter operation [67-8](#)
- IP Source Guard
 - configuring [51-20](#)
 - configuring on private VLANs [51-22](#)
 - displaying [51-22, 51-23](#)
 - overview [51-23](#)
- IP statistics
 - displaying [34-8](#)
- IP traceroute
 - executing [9-9](#)
 - overview [9-8](#)

IP unicast

displaying statistics [34-8](#)

IP Unnumbered support

configuring on a range of Ethernet VLANs [17-5](#)

configuring on LAN and VLAN interfaces [17-4](#)

configuring with connected host polling [17-6](#)

DHCP Option 82 [17-2](#)

displaying settings [17-7](#)

format of agent remote ID suboptions [17-2](#)

troubleshooting [17-8](#)

with connected host polling [17-3](#)

with DHCP server and Relay agent [17-2](#)

ip unreachable command [9-12](#)

IPv4, IPv6, and MAC ACLs, configuring on a Layer 2 interface [52-29](#)

IPv6

addresses [53-2](#)

default configuration [53-7](#)

defined [1-19, 53-1](#)

Enhanced Interior Gateway Routing Protocol (EIGRP)

IPv6 [53-6](#)

Router ID [53-6](#)

OSPF [53-6](#)

IPv6 control traffic, policing [49-16](#)

IPv6 First Hop Security, introduction [1-38](#)

IPX

redistribution of route information with EIGRP [1-17](#)

is [28-19](#)

IS-IS, introduction [1-18](#)

ISL

trunking with 802.1Q tunneling [28-4](#)

isolated port [43-4](#)

isolated VLANs [43-2, 43-3, 43-4](#)

ISSU

compatibility matrix [5-59, 6-14, 7-13](#)

compatibility verification using Cisco Feature Navigator [5-60, 6-15, 7-14](#)

NSF overview [6-3, 7-3](#)

perform the process

aborting a software upgrade [5-76, 6-34, 7-33](#)

configuring the rollback timer as a safeguard [5-77, 6-35, 7-35](#)

displaying a compatibility matrix [5-79, 6-36, 6-40, 7-36](#)

loading the new software on the new standby [5-69, 6-27, 7-26](#)

stopping the rollback timer [5-68, 6-26, 7-25](#)

switching to the standby [5-66, 6-24, 7-23](#)

verify the ISSU state [5-63, 6-20, 7-20](#)

verify the redundancy mode [5-62, 6-19, 7-18](#)

verify the software installation [5-61, 6-18, 7-18](#)

vload the new software on standby [5-65, 6-21, 7-20](#)

prerequisites [5-55, 6-2, 7-2](#)

process overview [6-6, 7-6](#)

restrictions [5-55, 6-2, 7-2](#)

SNMP support [6-15, 7-14](#)

SSO overview [6-3, 7-3](#)

versioning capability in software to support [6-13](#)

IST

and MST regions [21-22](#)

description [21-22](#)

master [21-27](#)

ITU-T Y.1731

See Y.1731

J

jumbo frames

and ethernet ports [8-27](#)

configuring MTU sizes for [8-28](#)

ports and linecards that support [8-26](#)

understanding MTUs [8-26](#)

understanding support [8-26](#)

VLAN interfaces [8-28](#)

K

keyboard shortcuts [2-3](#)

- L**
- l2protocol-tunnel command [28-17](#)
 - labels, definition [41-3](#)
 - LACP
 - system ID [25-4](#)
 - Layer 2 access ports [18-7](#)
 - Layer 2 Control Packet QoS
 - and CoPP configuration example [49-14](#)
 - default configuration [49-11](#)
 - disabling [49-13](#)
 - enabling [49-12](#)
 - guideline and restrictions [49-16](#)
 - understanding [49-11](#)
 - Layer 2 frames
 - classification with CoS [41-2](#)
 - Layer 2 interface
 - applying ACLs [52-31](#)
 - configuring access-mode mode on [52-31](#)
 - configuring IPv4, IPv6, and MAC ACLs [52-29](#)
 - displaying an ACL configuration [52-32](#)
 - Layer 2 interfaces
 - assigning VLANs [16-7](#)
 - configuring [18-5](#)
 - configuring as PVLAN host ports [43-18](#)
 - configuring as PVLAN promiscuous ports [43-17](#)
 - configuring as PVLAN trunk ports [43-19](#)
 - defaults [18-4](#)
 - disabling configuration [18-8](#)
 - modes [18-3](#)
 - show interfaces command [18-6](#)
 - Layer 2 interface type
 - resetting [43-24](#)
 - setting [43-24](#)
 - Layer 2 protocol tunneling
 - default configuration [28-16](#)
 - guidelines [28-16](#)
 - Layer 2 switching
 - overview [18-1](#)
 - Layer 2 Traceroute
 - and ARP [9-10](#)
 - and CDP [9-10](#)
 - host-to-host paths [9-10](#)
 - IP addresses and subnets [9-10](#)
 - MAC addresses and VLANs [9-10](#)
 - multicast traffic [9-10](#)
 - multiple devices on a port [9-10](#)
 - unicast traffic [1-42, 9-9](#)
 - usage guidelines [9-10](#)
 - Layer 2 trunks
 - configuring [18-5](#)
 - overview [18-3](#)
 - Layer 3 interface, applying IPv6 ACLs [52-17](#)
 - Layer 3 interface counters,configuring [33-10](#)
 - Layer 3 interface counters,understanding [33-3](#)
 - Layer 3 interfaces
 - changing from Layer 2 mode [40-16](#)
 - configuration guidelines [33-5](#)
 - configuring VLANs as interfaces [33-7](#)
 - overview [33-1](#)
 - counters [33-3](#)
 - logical [33-2](#)
 - physical [33-2](#)
 - SVI autostate exclude [33-3](#)
 - Layer 3 packets
 - classification methods [41-2](#)
 - Layer 4 port operations
 - configuration guidelines [52-11](#)
 - restrictions [52-10](#)
 - Leave timer, enabling [26-9](#)
 - licenses, managing with PRTU [4-14](#)
 - limitations on using a TwinGig Convertor [8-14](#)
 - Link Aggregation Control Protocol, introduction [1-7](#)
 - link and trunk status events
 - configuring interface [8-37](#)
 - link integrity, verifying with REP [23-4](#)
 - Link Layer Discovery Protocol
 - See CDP

link monitoring, Ethernet OAM [64-34, 64-38](#)

link-state tracking

configuration guidelines [25-21](#)

default configuration [25-21](#)

described [25-18](#)

displaying status [25-22](#)

generic configuration procedure [25-21](#)

link status, displaying UDLD [31-9](#)

listening state (STP)

RSTP comparisons (table) [21-24](#)

LLDP

configuring [30-4](#)

characteristics [30-5](#)

default configuration [30-5](#)

disabling and enabling

globally [30-6](#)

on an interface [30-7](#)

monitoring and maintaining [30-14](#)

overview [30-1](#)

transmission timer and holdtime, setting [30-5](#)

LLDP-MED

configuring

procedures [30-4](#)

TLVs [30-9, 30-11](#)

monitoring and maintaining [30-14](#)

overview [30-1](#)

supported TLVs [30-2](#)

LLDP Media Endpoint Discovery

See LLDP-MED

load balancing

configuring for CEF [34-7](#)

configuring for EtherChannel [25-14](#)

overview [25-5, 34-6](#)

per-destination [34-7](#)

load splitting IP multicast traffic [36-22](#)

Location Service

overview [30-1](#)

location service

configuring [30-12](#)

understanding [30-3](#)

location TLV [30-3, 30-9](#)

logging, EPM [45-129](#)

Logical Layer 3 interfaces

configuring [33-6](#)

logical layer 3 VLAN interfaces [33-2](#)

login authentication

with RADIUS [45-106](#)

with TACACS+ [3-19](#)

login banners [4-24](#)

login timer

changing [9-6](#)

logoutwarning command [9-6](#)

loop guard

and MST [21-23](#)

configuring [24-4](#)

overview [24-3](#)

M

MAC/PHY configuration status TLV [30-2](#)

MAC addresses

aging time [4-30](#)

allocating [21-6](#)

and VLAN association [4-29](#)

building tables [4-28, 18-2](#)

convert dynamic to sticky secure [48-5](#)

default configuration [4-30](#)

disabling learning on a VLAN [4-39](#)

discovering [4-44](#)

displaying [9-3](#)

displaying in DHCP snooping binding table [51-19](#)

dynamic

learning [4-29](#)

removing [4-31](#)

in ACLs [52-14](#)

static

adding [4-37](#)

allowing [4-38](#)

- characteristics of [4-36](#)
 - dropping [4-38](#)
 - removing [4-37](#)
- sticky [48-4](#)
- sticky secure, adding [48-5](#)
- MAC address learning, disabling on a VLAN [4-39](#)
 - configuring [4-39](#)
 - deployment scenarios [4-40](#)
 - feature compatibility [4-42](#)
 - feature incompatibility [4-43](#)
 - feature inompatibility [4-43](#)
 - usage guidelines [4-40](#)
- MAC address table
 - displaying [4-44](#)
- MAC address-table move update
 - configuration guidelines [22-10](#)
 - configuring [22-10](#)
 - monitoring [22-12](#)
- MAC Authentication Bypass
 - configure with 802.1X [45-60](#)
- MAC details, displaying [45-128](#)
- MAC extended access lists [52-14](#)
- macl [52-14](#)
- macros
 - See Auto SmartPorts macros
 - See Auto Smartports macros
 - See Smartports macros
- MACSec
 - 802.1AE Tagging [44-9](#)
- MACsec [44-2](#)
 - configuring on an interface [44-7](#)
 - defined [44-1, 44-2](#)
 - switch-to-switch security [44-1](#)
- MACsec Key Agreement Protocol
 - See MKA
- main-cpu command [10-8, 11-7](#)
- management address TLV [30-2](#)
- management options
 - SNMP [61-1](#)
- Management Port, Ethernet [8-6](#)
- managing software licenses, using PRTU [4-14](#)
- manual preemption, REP, configuring [23-13](#)
- marking
 - hardware capabilities [41-23, 41-57](#)
- marking action drivers [41-21, 41-55](#)
- marking network traffic [41-18, 41-52](#)
- marking support, multi-attribute [41-22, 41-56](#)
- match ip address command [39-6, 39-9](#)
- maximum aging time (STP)
 - configuring [21-18](#)
- MDA
 - configuration guidelines [45-23 to ??](#)
 - described [45-23](#)
- MEC
 - configuration [5-45](#)
 - described [5-14](#)
 - failure [5-15](#)
- Media Access Control Security
 - See MACsec
- members
 - automatic discovery [15-7](#)
- member switch
 - managing [15-13](#)
- member switch, cluster
 - defined [15-2](#)
- meminfo command [72-5](#)
- messages, Ethernet OAM [64-34](#)
- messages, to users through banners [4-24](#)
- Metro features
 - Y.1731 (AIS and RDI), introduction [1-12](#)
- metro tags [28-2](#)
- MFIB
 - CEF [36-6](#)
 - overview [36-12](#)
- MFIB, IP
 - displaying [36-26](#)
- MIBs
 - compiling [71-4](#)

- downloading [71-3, 71-4](#)
 - overview [61-1](#)
 - related information [71-3](#)
 - SNMP interaction with [61-4](#)
- MKA
 - configuring policies [44-6](#)
 - defined [44-2](#)
 - policies [44-2](#)
 - replay protection [44-3](#)
 - statistics [44-4](#)
 - virtual ports [44-3](#)
- MLD Done messages and Immediate-leave [27-4](#)
- MLD messages [27-2](#)
- MLD queries [27-3](#)
- MLD reports [27-4](#)
- MLD Snooping
 - MLD Done messages and Immediate-leave [27-4](#)
 - MLD messages [27-2](#)
 - MLD queries [27-3](#)
 - MLD reports [27-4](#)
 - Multicast client aging robustness [27-3](#)
 - Multicast router discovery [27-3](#)
 - overview [27-1](#)
- Mode of capturing control packets, selecting [52-7](#)
- modules
 - checking status [9-1](#)
 - powering down [13-22](#)
- monitoring
 - 802.1Q tunneling [28-18](#)
 - ACL information [52-35](#)
 - Ethernet CFM [64-32, 64-33](#)
 - Ethernet OAM [64-49](#)
 - Ethernet OAM protocol [64-49](#)
 - Flex Links [22-12](#)
 - IGMP
 - snooping [27-10](#)
 - IGMP filters [26-34](#)
 - IGMP snooping [26-14](#)
 - Layer 2 protocol tunneling [28-18](#)
 - MAC address-table move update [22-12](#)
 - multicast router interfaces [27-11](#)
 - multi-VRF CE [40-14, 40-21, 40-22](#)
 - MVR [26-29](#)
 - object tracking [58-12](#)
 - REP [23-14](#)
 - traffic flowing among switches [67-1](#)
 - tunneling [28-18](#)
 - VLAN filters [52-24](#)
 - VLAN maps [52-24](#)
- monitoring and troubleshooting
 - BFD [38-17](#)
- M-record [21-23](#)
- MST
 - and multiple spanning trees [1-8, 21-22](#)
 - boundary ports [21-27](#)
 - BPDUUs [21-23](#)
 - configuration parameters [21-26](#)
 - configuring [21-29](#)
 - displaying configurations [21-33](#)
 - edge ports [21-27](#)
 - enabling [21-29](#)
 - hop count [21-28](#)
 - instances
 - configuring parameters [21-32](#)
 - description [21-23](#)
 - number supported [21-26](#)
 - interoperability with PVST+ [21-23](#)
 - link type [21-28](#)
 - master [21-27](#)
 - message age [21-28](#)
 - regions [21-26](#)
 - restrictions [21-29](#)
 - to-SST interoperability [21-24](#)
- MSTP
 - EtherChannel guard
 - enabling [24-6](#)
 - M-record [21-23](#)
 - M-tree [21-23](#)

- M-tree [21-23](#)
- MTUS
 - understanding [8-26](#)
- MTU size
 - configuring [8-28, 8-29, 8-38](#)
 - default [16-5](#)
- Multi-authentication
 - described [45-23](#)
- multiauthentication mode [45-8](#)
- multicast
 - See IP multicast
- Multicast client aging robustness [27-3](#)
- multicast Ethernet loopback, using [64-31](#)
- multicast Ethernet loopback (ETH-LB) [64-29](#)
- Multicast Forwarding Information Base (MFIB) [36-12](#)
- multicast groups
 - static joins [27-7](#)
- Multicast HA [36-13](#)
- Multicast implementation
 - HA [36-13](#)
 - MFIB [36-12](#)
 - S/M, 224/4 [36-13](#)
- multicast packets
 - blocking [54-2](#)
- Multicast router discovery [27-3](#)
- multicast router interfaces, displaying [26-17](#)
- multicast router interfaces, monitoring [27-11](#)
- multicast router ports, adding [27-7](#)
- multicast routers
 - flood suppression [26-12](#)
- multicast router table
 - displaying [36-24](#)
- Multicast Storm Control
 - enabling [55-4](#)
 - disabling [55-5](#)
- multicast television application, using MVR [26-21](#)
- Multicast VLAN Registration
 - See MVR
- multichassis EtherChannel
 - see MEC [5-14](#)
- multidomain authentication
 - See MDA
- multidomain authentication mode [45-7](#)
- multioperations scheduling, IP SLAs [67-5](#)
- Multiple AuthorizationAuthentication
 - configuring [45-34](#)
- Multiple Domain Authentication [45-34](#)
- multiple forwarding paths [1-8, 21-22](#)
- multiple-hosts mode [45-7](#)
- Multiple Spanning Tree
 - See MST
- multiple VPN routing/forwarding
 - See multi-VRF CE
- multi-VRF CE
 - components [40-3](#)
 - configuration example [40-17](#)
 - defined [40-1](#)
 - displaying [40-14, 40-21, 40-22](#)
 - monitoring [40-14, 40-21, 40-22](#)
 - network components [40-3](#)
 - packet-forwarding process [40-3](#)
- MVR
 - configuration guidelines and limitations [26-23](#)
 - configuring global parameters [26-24](#)
 - configuring on access ports [26-26](#)
 - configuring on a trunk port [26-27](#)
 - default configuration [26-23](#)
 - displaying information [26-29](#)
 - in a multicast television application [26-21](#)
 - monitoring [26-29](#)
 - setting global parameters [26-24](#)

N

- NAC Layer 2 802.1X authentication, intro [1-40](#)
- NAC Layer 2 IP validation, intro [1-40](#)
- named IPv6 ACLs, configuring

- ACLs
 - configuring named IPv6 ACLs [52-16](#)
- named MAC extended ACLs
 - ACLs
 - configuring named MAC extended [52-14, 52-15](#)
- native VLAN
 - and 802.1Q tunneling [28-4](#)
 - specifying [18-5](#)
- NDAC [44-9](#)
 - defined [44-9](#)
 - MACsec [44-1](#)
- NEAT
 - configuring [45-88](#)
 - overview [45-24](#)
- neighbor offset numbers, REP [23-5](#)
- NetFlow-lite
 - clear commands [62-9](#)
 - display commands [62-8](#)
- NetFlow packet sampling
 - about [62-2](#)
- Network Assistant
 - and VTY [15-12](#)
 - configure
 - enable communication with switch [15-13, 15-17](#)
 - default configuration [15-3](#)
 - overview of CLI commands [15-3](#)
- Network Device Admission Control (NDAC) [44-9](#)
- Network Edge Access Topology
 - See NEAT
- network fault tolerance [1-8, 21-22](#)
- network management
 - configuring [29-1](#)
 - RMON [67-1](#)
 - SNMP [61-1](#)
- network performance, measuring with IP SLAs [67-3](#)
- network policy TLV [30-2, 30-9](#)
- Network Time Protocol
 - See NTP
- network traffic, marking [41-18, 41-52](#)
- New Software Features in Release 7.7
 - TDR [9-3](#)
- Next Hop Resolution Protocol
 - See NHRP
- NHRP
 - support [1-18](#)
- non-fiber-optics interfaces
 - disabling UDLD [31-7](#)
- non-IP traffic filtering [52-14, 52-15](#)
- non-RPF traffic
 - description [36-10](#)
 - in redundant configurations (figure) [36-11](#)
- Nonstop Forwarding
 - See NSF
- nonvolatile random-access memory
 - See NVRAM
- normal-range VLANs
 - See VLANs
- NSF
 - defined [12-1](#)
 - guidelines and restrictions [12-9](#)
 - operation [12-4](#)
- NSF-aware
 - supervisor engines [12-3](#)
 - support [12-2](#)
- NSF-capable
 - supervisor engines [12-3](#)
 - support [12-2](#)
- NSF with SSO supervisor engine redundancy
 - and CEF [12-5](#)
 - overview [12-3](#)
 - SSO operation [12-4](#)
- NTP
 - associations
 - authenticating [4-4](#)
 - defined [4-2](#)
 - enabling broadcast messages [4-7](#)
 - peer [4-6](#)
 - server [4-6](#)

- default configuration [4-4](#)
- displaying the configuration [4-11](#)
- overview [4-2](#)
- restricting access
 - creating an access group [4-9](#)
 - disabling NTP services per interface [4-10](#)
- source IP address, configuring [4-10](#)
- stratum [4-2](#)
- synchronizing devices [4-6](#)
- time
 - services [4-2](#)
 - synchronizing [4-2](#)

Introduction

- PPPoE Intermediate Agent [1-41](#)
- Storm Control [1-42](#)
- uRPF Strict Mode [1-42](#)

NVRAM

- saving settings [3-10](#)

O

OAM

- client [64-34](#)
- features [64-34](#)
- sublayer [64-34](#)

OAM manager

- configuring [64-52](#)
- with CFM and Ethernet OAM [64-51](#)

OAM PDUs [64-35](#)

OAM protocol data units [64-33](#)

OBFL, displaying for the 9000W AC [13-4](#)

object tracking

- monitoring [58-12](#)

OIR

- overview [8-33](#)

on-demand online diagnostics [69-2](#)

online diagnostic

- troubleshooting [69-8](#)

Online Diagnostics [69-1](#)

online diagnostics

- configuring on-demand [69-2](#)
- data path, displaying test results [69-7](#)
- displaying tests and test results [69-4](#)
- linecard [69-8](#)
- scheduling [69-2](#)
- starting and stopping tests [69-3](#)

online insertion and removal

- See OIR

Open Shortest Path First

- See OSPF

operating system images

- See system images

Option 82

- enabling DHCP Snooping [51-10](#)

OSPF

- area concept [1-18](#)
- description [1-18](#)
- for IPv6 [53-6](#)

OSPF, introduction [1-18](#)

OSPF for Routed Access, introduction [1-21](#)

P

packets

- modifying [41-9](#)

packet type filtering

- overview [56-14](#)
- SPAN enhancement [56-14](#)

PACL

- using with access-group mode [52-30](#)

PACL configuration guidelines [52-28](#)

PACL with VLAN maps and router ACLs [52-32](#)

PAgP

- understanding [25-4](#)

PAgP, dual-active detection [5-23](#)

passwords

- configuring enable password [3-14](#)
- configuring enable secret password [3-14](#)

- encrypting [3-22](#)
- in clusters [15-8](#)
- recovering lost enable password [3-25](#)
- setting line password [3-14](#)
- PBR (policy-based routing)
 - configuration (example) [39-12](#)
 - enabling [39-6, 39-9](#)
 - features [39-2](#)
 - overview [39-1](#)
 - route-map processing logic [39-3](#)
 - route-map processing logic example [39-4](#)
 - route maps [39-2](#)
 - when to use [39-5](#)
- percentage thresholds in tracked lists [58-6](#)
- Permanent Right-To_Use [4-14](#)
- per-port and VLAN Access Control List [51-19](#)
- per-port per-VLAN QoS
 - enabling [41-36, 41-70](#)
 - overview [41-10](#)
- Per-User ACL and Filter-ID ACL, configure [45-45](#)
- Per-VLAN Rapid Spanning Tree [21-6](#)
 - enabling [21-20](#)
 - overview [21-6](#)
- PE to CE routing, configuring [40-9](#)
- physical layer 3 interfaces [33-2](#)
- Physical Layer 3 interfaces, configuring [33-12](#)
- PIM
 - configuring dense mode [36-15](#)
 - configuring sparse mode [36-15](#)
 - displaying information [36-23](#)
 - displaying statistics [36-27](#)
 - enabling sparse-dense mode [36-15, 36-16](#)
 - overview [36-3](#)
- PIM-DM [36-3](#)
- PIM on an interface, enabling [36-14](#)
- PIM-SM [36-3](#)
- PIM-SSM mapping, enabling [36-17](#)
- ping
 - executing [9-8](#)
 - overview [9-7](#)
 - ping command [9-8, 36-23](#)
- PoE [14-7, 14-8](#)
 - configuring power consumption, powered devices [14-5](#)
 - configuring power consumption for single device [14-5, 14-16](#)
 - displaying operational status for an interface [14-6](#)
 - Enhanced PoE support on E-series [14-15](#)
 - policing and monitoring [14-12](#)
 - power consumption for powered devices
 - Intelligent Power Management [14-4](#)
 - powering down a module [13-22](#)
 - power management modes [14-2](#)
- PoE policing
 - configuring errdisable recovery [14-14](#)
 - configuring on an interface [14-13](#)
 - displaying on an interface [14-14](#)
 - power modes [14-12](#)
- point-to-point
 - in 802.1X authentication (figure) [45-3](#)
- policing
 - how to implement [41-18, 41-52](#)
 - See QoS policing
- policing, PoE [14-12](#)
- policing IPv6 control traffic [49-16](#)
- policy associations, QoS on Sup 6-E [41-39, 41-73](#)
- policy-map command [41-16, 41-51](#)
- policy map marking action, configuring [41-23, 41-57](#)
- port ACLs
 - and voice VLAN [52-4](#)
 - defined [52-3](#)
- Port Aggregation Protocol
 - see PAgP
- port-based authentication
 - 802.1X with voice VLAN [45-22](#)
 - Authentication Failed VLAN assignment [45-17](#)
 - authentication server
 - defined [47-2](#)

- changing the quiet period [45-84](#)
- client, defined [45-3, 47-2](#)
- configuration guidelines [45-29, 47-6](#)
- configure ACL assignments and redirect URLs [45-38](#)
- configure switch-to-RADIUS server communication [45-32](#)
- configure with Authentication Failed [45-70](#)
- configure with Critical Authentication [45-62](#)
- configure with Guest-VLANs [45-57](#)
- configure with MAC Authentication Bypass [45-60](#)
- configure with VLAN User Distribution [45-68](#)
- configure with Voice VLAN [45-72](#)
- configuring
 - Multiple Domain Authentication and Multiple Authorization [45-34](#)
 - RADIUS server [47-10](#)
 - RADIUS server parameters on the switch [47-9](#)
- configuring Fallback Authentication [45-77](#)
- configuring Guest-VLAN [45-32](#)
- configuring manual re-authentication of a client [45-94](#)
- configuring with Unidirectional Controlled Port [45-66](#)
- controlling authorization state [45-5](#)
- default configuration [45-27, 47-6](#)
- described [45-1](#)
- device roles [45-2, 47-2](#)
- displaying statistics [45-125, 47-14](#)
- enabling [45-29](#)
 - 802.1X authentication [47-9](#)
- enabling multiple hosts [45-83](#)
- enabling periodic re-authentication [45-81](#)
- encapsulation [45-3](#)
- host mode [45-6](#)
- how 802.1X fails on a port [45-25](#)
- initiation and message exchange [45-4](#)
- method lists [45-29](#)
- modes [45-6](#)
- multidomain authentication [45-23](#)
- multiple-hosts mode, described [45-7](#)
- port security
 - multiple-hosts mode [45-7](#)
- ports not supported [45-5](#)
- pre-authentication open access [45-8](#)
- resetting to default values [45-95](#)
- setting retransmission number [45-86](#)
- setting retransmission time [45-85](#)
- switch
 - as proxy [47-2](#)
- switch supplicant
 - configuring [45-88](#)
 - overview [45-24](#)
- topologies, supported [45-26](#)
- using with ACL assignments and redirect URLs [45-20](#)
- using with port security [45-19](#)
- voice aware 802.1x security
 - configuring [45-74](#)
 - described [45-22, 45-73](#)
 - with Critical Authentication [45-14](#)
 - with Guest VLANs [45-11](#)
 - with MAC Authentication Bypass [45-12](#)
 - with Unidirectional Controlled Port [45-15](#)
 - with VLAN assignment [45-10](#)
 - with VLAN User Distribution [45-16](#)
- port-channel
 - see EtherChannel
- port-channel interfaces
 - See also EtherChannel
 - creating [5-45, 25-7](#)
 - overview [25-2](#)
- port-channel load-balance
 - command [25-13](#)
 - command example [25-13](#)
- port-channel load-balance command [25-14](#)
- port cost (STP)
 - configuring [21-15](#)
- port description TLV [30-2](#)
- PortFast

- and MST [21-23](#)
- BPDU filter, configuring [24-9](#)
- configuring or enabling [24-15](#)
- overview [24-6](#)
- PortFast BPDU filtering
 - and MST [21-23](#)
 - enabling [24-9](#)
 - overview [24-9](#)
- port numbering with TwinGig Convertors [8-13](#)
- port priority
 - configuring MST instances [21-32](#)
 - configuring STP [21-13](#)
- ports
 - blocking [54-1](#)
 - checking status [9-2](#)
 - dynamic VLAN membership
 - example [16-29](#)
 - reconfirming [16-26](#)
 - forwarding, resuming [54-3](#)
 - REP [23-6](#)
 - See also interfaces
- port security
 - aging [48-5](#)
 - configuring [48-7](#)
 - displaying [48-28](#)
 - guidelines and restrictions [48-33](#)
 - on access ports [48-7, 48-22](#)
 - on private VLAN [48-14](#)
 - host [48-14](#)
 - promiscuous [48-16](#)
 - topology [48-15, 48-18, 48-32](#)
 - on trunk port [48-17](#)
 - guidelines and restrictions [48-15, 48-18, 48-32](#)
 - port mode changes [48-22](#)
 - on voice ports [48-22](#)
 - sticky learning [48-5](#)
 - using with 802.1X [45-19](#)
 - violations [48-6](#)
 - with 802.1X Authentication [48-32](#)
 - with DHCP and IP Source Guard [48-31](#)
 - with other features [48-33](#)
- port states
 - description [21-5](#)
- port VLAN ID TLV [30-2](#)
- power
 - inline [42-5](#)
 - power dc input command [13-21](#)
 - powered devices, configuring power consumption [14-5](#)
 - power handling for Supervisor Engine II-TS [14-12](#)
 - power inline command [14-3](#)
 - power inline consumption command [14-5](#)
 - power management
 - Catalyst 4500 series [13-7](#)
 - Catalyst 4500 Switch power supplies [13-14](#)
 - Catalyst 4948 series [13-23](#)
 - configuring combined mode [13-13](#)
 - configuring redundant mode [13-12](#)
 - overview [13-1](#)
 - redundancy [13-7](#)
 - power management for Catalyst 4500 Switch
 - combined mode [13-9](#)
 - redundant mode [13-9](#)
 - power management limitations in Catalyst 4500 Switch [13-10](#)
 - power management mode
 - selecting [13-10](#)
 - power management TLV [30-2, 30-3, 30-9](#)
 - power negotiation
 - through LLDP [30-11](#)
 - Power-On-Self-Test diagnostics [69-10, 69-20](#)
 - Power-On-Self-Test for Supervisor Engine V-10GE [69-13](#)
 - power policing, displaying on an interface [14-14](#)
 - power redundancy-mode command [13-13](#)
 - power supplies
 - available power for Catalyst 4500 Switch [13-14](#)
 - fixed [13-8](#)
 - variable [13-8, 13-23](#)

- pre-authentication open access [45-8](#)
 - pre-authentication open access. See port-based authentication.
 - preempt delay time, REP [23-5](#)
 - primary edge port, REP [23-4](#)
 - primary VLANs [43-2, 43-4](#)
 - associating with secondary VLANs [43-16](#)
 - configuring as a PVLAN [43-15](#)
 - priority
 - overriding CoS of incoming frames [42-5](#)
 - priority queuing, QoS on Sup 6-E [41-30, 41-64](#)
 - private VLAN
 - configure port security [48-14, 48-15](#)
 - enabling DHCP Snooping [51-12](#)
 - private VLANs
 - across multiple switches [43-5](#)
 - and SVIs [43-10](#)
 - benefits of [43-2](#)
 - community ports [43-3](#)
 - community VLANs [43-2, 43-3](#)
 - default configuration [43-12](#)
 - end station access to [43-3](#)
 - isolated port [43-4](#)
 - isolated VLANs [43-2, 43-3, 43-4](#)
 - ports
 - community [43-3](#)
 - isolated [43-4](#)
 - promiscuous [43-4](#)
 - primary VLANs [43-2, 43-4](#)
 - promiscuous ports [43-4](#)
 - secondary VLANs [43-2](#)
 - subdomains [43-2](#)
 - traffic in [43-9](#)
 - privileged EXEC mode [2-5](#)
 - privileges
 - changing default [3-23](#)
 - configuring levels [3-23](#)
 - exiting [3-24](#)
 - logging in [3-24](#)
 - promiscuous ports
 - configuring PVLAN [43-17](#)
 - defined [43-4](#)
 - setting mode [43-24](#)
 - protocol timers [21-4](#)
 - provider edge devices [40-2](#)
 - PRTU, managing software licenses [4-14](#)
 - pruning, VTP
 - See VTP pruning
 - pseudobridges
 - description [21-25](#)
 - PVACL [51-19](#)
 - PVID (port VLAN ID)
 - and 802.1X with voice VLAN ports [45-22](#)
 - PVLAN promiscuous trunk port
 - configuring [43-11, 43-17, 43-21](#)
 - PVLANS
 - 802.1q support [43-14](#)
 - across multiple switches [43-5](#)
 - configuration guidelines [43-12](#)
 - configure port security [48-14, 48-16, 48-18](#)
 - configure port security in a wireless setting [48-32](#)
 - configuring [43-11](#)
 - configuring a VLAN [43-15](#)
 - configuring promiscuous ports [43-17](#)
 - host ports
 - configuring a Layer 2 interface [43-18](#)
 - setting [43-24](#)
 - overview [43-1](#)
 - permitting routing, example [43-23](#)
 - promiscuous mode
 - setting [43-24](#)
 - setting
 - interface mode [43-24](#)
-
- Q**
- QoS
 - classification [41-6 to ??](#)

- definitions [41-3](#)
- enabling per-port per-VLAN [41-36, 41-70](#)
- overview [41-1](#)
- overview of per-port per-VLAN [41-10](#)
- packet modification [41-9](#)
- traffic shaping [41-9](#)
- See also COS; DSCP values; transmit queues
- QoS active queue management
 - tracking queue length [41-9](#)
- QoS labels
 - definition [41-3](#)
- QoS marking
 - description [41-5](#)
- QoS on Sup 6-E
 - Active Queue management via DBL [41-34, 41-68](#)
 - active queue management via DBL [41-27, 41-34, 41-61, 41-68](#)
 - classification [41-16, 41-50](#)
 - configuring [41-13, 41-47](#)
 - configuring CoS mutation [41-45, 41-79](#)
 - configuring the policy map marking action [41-23, 41-57](#)
 - hardware capabilities for marking [41-23, 41-57](#)
 - how to implement policing [41-18, 41-52](#)
 - marking action drivers [41-21, 41-55](#)
 - marking network traffic [41-18, 41-52](#)
 - MQC-based QoS configuration [41-13, 41-48](#)
 - multi-attribute marking support [41-22, 41-56](#)
 - platform hardware capabilities [41-15, 41-49](#)
 - platform restrictions [41-18, 41-52](#)
 - platform-supported classification criteria and QoS features [41-13, 41-14, 41-48](#)
 - policing [41-17, 41-51](#)
 - policy associations [41-39, 41-73](#)
 - prerequisites for applying a service policy [41-15, 41-49](#)
 - priority queuing [41-30, 41-64](#)
 - queue-limiting [41-31, 41-65](#)
 - restrictions for applying a service policy [41-15, 41-50](#)
 - shaping [41-25, 41-59](#)
 - sharing(bandwidth) [41-27, 41-61](#)

- sharing(bandwidth), shapring, and priority queuing [41-25, 41-59](#)
- software QoS [41-40, 41-74](#)
- traffic marking procedure flowchart [41-21, 41-55](#)
- QoS policing
 - definition [41-5](#)
 - described [41-8](#)
- QoS policy
 - attaching to interfaces [41-8](#)
- QoS service policy
 - prerequisites [41-15, 41-49](#)
 - restrictions for applying [41-15, 41-50](#)
- QoS transmit queues
 - burst [41-9](#)
 - maximum rate [41-9](#)
 - sharing link bandwidth [41-9](#)
- quad-supervisor
 - uplink forwarding [5-6](#)
- Quality of service
 - See QoS
- queueing [41-8](#)
- queue-limiting, QoS on Sup 6-E [41-31, 41-65](#)

R

RADIUS

- attributes
 - vendor-proprietary [45-114](#)
 - vendor-specific [45-112](#)
- change of authorization [45-97](#)
- configuring
 - accounting [45-111](#)
 - authentication [45-106](#)
 - authorization [45-110](#)
 - communication, global [45-104, 45-112](#)
 - communication, per-server [45-103, 45-104](#)
 - multiple UDP ports [45-104](#)
- default configuration [45-103](#)
- defining AAA server groups [45-108](#)

- displaying the configuration [45-116](#)
- identifying the server [45-103](#)
- limiting the services to the user [45-110](#)
- method list, defined [45-103](#)
- operation of [45-97](#)
- server load balancing [45-116](#)
- suggested network environments [45-96](#)
- tracking services accessed by user [45-111](#)
- understanding [45-96](#)
- RADIUS, controlling switch access with [45-95](#)
- RADIUS Change of Authorization [45-97](#)
- RADIUS server
 - configure to-Switch communication [45-32](#)
 - configuring settings [45-34](#)
 - parameters on the switch [45-32](#)
- RA Guard
 - configuring [52-36](#)
 - deployment [52-36](#)
 - examples [52-37](#)
 - introduction [52-35](#)
 - usage guidelines [52-38](#)
- range command [8-4](#)
- range macros
 - defining [8-11](#)
- ranges of interfaces
 - configuring [8-4](#)
- Rapid Spanning Tree
 - See RSTP
- rcommand command [15-13](#)
- reachability, tracking IP SLAs IP host [58-9](#)
- re-authentication of a client
 - configuring manual [45-94](#)
 - enabling periodic [45-81](#)
- redirect URLs, port-based authentication [45-20](#)
- reduced MAC address [21-2](#)
- redundancy
 - configuring [10-7, 11-7](#)
 - guidelines and restrictions [10-5, 11-5](#)
 - changes made through SNMP [10-11, 11-11](#)
 - NSF-aware support [12-2](#)
 - NSF-capable support [12-2](#)
 - overview [10-2, 11-2](#)
 - redundancy command [10-8, 11-7](#)
 - understanding synchronization [10-4, 11-5](#)
- redundancy (NSF) [12-1](#)
 - configuring
 - BGP [12-11](#)
 - CEF [12-10](#)
 - EIGRP [12-16](#)
 - IS-IS [12-13](#)
 - OSPF [12-12](#)
 - routing protocols [12-5](#)
- redundancy (RPR)
 - route processor redundancy [10-2, 11-3](#)
 - synchronization [10-5, 11-5](#)
- redundancy (SSO)
 - redundancy command [12-10](#)
 - route processor redundancy [10-3, 11-3](#)
 - synchronization [10-5, 11-5](#)
- reload command [3-28, 3-29](#)
- Remote Authentication Dial-In User Service
 - See RADIUS
- remote failure indications [64-34](#)
- remote loopback, Ethernet OAM [64-34, 64-37](#)
- Remote Network Monitoring
 - See RMON
- rendezvous point, configuring [36-17](#)
- rendezvous point, configuring single static [36-20](#)
- REP
 - administrative VLAN [23-8](#)
 - administrative VLAN, configuring [23-9](#)
 - and STP [23-6](#)
 - configuration guidelines [23-7](#)
 - configuring interfaces [23-10](#)
 - convergence [23-4](#)
 - default configuration [23-7](#)
 - manual preemption, configuring [23-13](#)
 - monitoring [23-14](#)

- neighbor offset numbers [23-5](#)
- open segment [23-2](#)
- ports [23-6](#)
- preempt delay time [23-5](#)
- primary edge port [23-4](#)
- ring segment [23-2](#)
- secondary edge port [23-4](#)
- segments [23-1](#)
 - characteristics [23-2](#)
- SNMP traps, configuring [23-14](#)
- supported interfaces [23-1](#)
- triggering VLAN load balancing [23-6](#)
- verifying link integrity [23-4](#)
- VLAN blocking [23-13](#)
- VLAN load balancing [23-4](#)
- replication
 - description [36-9](#)
- report suppression, IGMP
 - disabling [27-10](#)
- reserved-range VLANs
 - See VLANs
- reset command [72-3](#)
- resetting an interface to default configuration [8-40](#)
- resetting a switch to defaults [3-32](#)
- Resilient Ethernet ProtocolSee REP
- responder, IP SLAs
 - described [67-4](#)
 - enabling [67-7](#)
- response time, measuring with IP SLAs [67-4](#)
- restricting access
 - NTP services [4-8](#)
 - RADIUS [45-95](#)
 - TACACS+ [3-15](#)
- retransmission number
 - setting in 802.1X authentication [45-86](#)
- retransmission time
 - changing in 802.1X authentication [45-85](#)
- RFC
 - 1157, SNMPv1 [61-2](#)
 - 1305, NTP [4-2](#)
 - 1757, RMON [67-2](#)
 - 1901, SNMPv2C [61-2](#)
 - 1902 to 1907, SNMPv2 [61-2](#)
 - 2273-2275, SNMPv3 [61-2](#)
- RFC 5176 Compliance [45-98](#)
- RIP
 - description [1-19](#)
 - for IPv6 [53-5](#)
- RIP, introduction [1-19](#)
- RMON
 - default configuration [67-3](#)
 - displaying status [67-6](#)
 - enabling alarms and events [67-3](#)
 - groups supported [67-2](#)
 - overview [67-1](#)
- ROM monitor
 - boot process and [3-26](#)
 - CLI [2-7](#)
 - commands [72-2 to 72-3](#)
 - debug commands [72-5](#)
 - entering [72-1](#)
 - exiting [72-6](#)
 - overview [72-1](#)
- root bridge
 - configuring [21-9](#)
 - selecting in MST [21-22](#)
- root guard
 - and MST [21-23](#)
 - enabling [24-2](#)
 - overview [24-2](#)
- routed packets
 - ACLs [52-26](#)
- route-map (IP) command [39-6, 39-9](#)
- route maps
 - defining [39-6, 39-9](#)
 - PBR [39-2](#)
- router ACLs
 - description [1-41, 52-3](#)

- using with VLAN maps [52-25](#)
 - router ACLs, using PACL with VLAN maps [52-32](#)
 - route targets
 - VPN [40-3](#)
 - Routing Information Protocol
 - See RIP
 - RPF
 - See Unicast RPF
 - RSPAN
 - configuration guidelines [56-16](#)
 - destination ports [56-5](#)
 - IDS [56-2](#)
 - monitored ports [56-4](#)
 - monitoring ports [56-5](#)
 - received traffic [56-3](#)
 - sessions
 - creating [56-17](#)
 - defined [56-3](#)
 - limiting source traffic to specific VLANs [56-23](#)
 - monitoring VLANs [56-21](#)
 - removing source (monitored) ports [56-20](#)
 - specifying monitored ports [56-17](#)
 - source ports [56-4](#)
 - transmitted traffic [56-4](#)
 - VLAN-based [56-5](#)
 - RSTP
 - compatibility [21-23](#)
 - description [21-22](#)
 - port roles [21-24](#)
 - port states [21-24](#)
- S**
-
- S/M, 224/4 [36-13](#)
 - SAID
 - See 802.10 SAID
 - SAP
 - defined [44-9](#)
 - negotiation [44-9](#)
 - support [44-1](#)
 - scheduling [41-8](#)
 - scheduling, IP SLAs operations [67-5](#)
 - secondary edge port, REP [23-4](#)
 - secondary root switch [21-12](#)
 - secondary VLANs [43-2](#)
 - associating with primary [43-16](#)
 - permitting routing [43-23](#)
 - security
 - configuring [49-1](#)
 - Security Association Identifier
 - See 802.10 SAID
 - Security Exchange Protocol
 - See SXP
 - Security Exchange Protocol
 - See SAP
 - selecting a power management mode [13-10](#)
 - selecting X2/TwinGig Convertor Mode [8-14](#)
 - sequence numbers in log messages [59-7](#)
 - server IDs
 - description [66-23](#)
 - service policy, configure class-level queue-limit [41-31, 41-65](#)
 - service-policy input command [32-2](#)
 - service-provider networks
 - and customer VLANs [28-2](#)
 - session keys, MKA [44-2](#)
 - set default interface command [39-7, 39-8, 39-9, 39-10](#)
 - set interface command [39-7, 39-9](#)
 - set ip default next-hop command [39-7, 39-9](#)
 - set ip next-hop command [39-6, 39-7, 39-9, 39-12](#)
 - set-request operation [61-4](#)
 - severity levels, defining in system messages [59-8](#)
 - shaping, QoS on Sup 6-E [41-25, 41-59](#)
 - sharing(bandwidth), QoS on Sup 6-E [41-27, 41-61](#)
 - Shell functions
 - See Auto SmartPorts macros
 - See Auto Smartports macros
 - Shell triggers

- See Auto SmartPorts macros
- See Auto Smartports macros
- show adjacency command [34-9](#)
- show boot command [3-32](#)
- show catalyst4000 chassis-mac-address command [21-3](#)
- show cdp command [29-2, 29-3](#)
- show cdp entry command [29-4](#)
- show cdp interface command [29-3](#)
- show cdp neighbors command [29-4](#)
- show cdp traffic command [29-4](#)
- show ciscoview package command [4-48](#)
- show ciscoview version command [4-48](#)
- show cluster members command [15-13](#)
- show configuration command [8-23](#)
- show debugging command [29-4](#)
- show environment command [13-2](#)
- show history command [2-4](#)
- show interfaces command [8-28, 8-29, 8-36, 8-38](#)
- show interfaces status command [9-2](#)
- show ip cef command [34-8](#)
- show ip eigrp interfaces command [33-19](#)
- show ip eigrp neighbors command [33-19](#)
- show ip eigrp topology command [33-19](#)
- show ip eigrp traffic command [33-19](#)
- show ip interface command [36-23](#)
- show ip local policy command [39-11](#)
- show ip mroute command [36-23](#)
- show ip pim interface command [36-23](#)
- show l2protocol command [28-18](#)
- show lldp traffic command [30-15](#)
- show mac-address-table address command [9-3](#)
- show mac-address-table interface command [9-3](#)
- show mls entry command [34-8](#)
- show module command [9-1, 21-6](#)
- show PoE consumed [14-8](#)
- show power inline command [14-6](#)
- show power supplies command [13-13](#)
- show protocols command [8-36](#)
- show running-config command
 - adding description for an interface [8-23](#)
 - checking your settings [3-9](#)
 - displaying ACLs [52-19, 52-21, 52-30, 52-31](#)
- show startup-config command [3-10](#)
- show users command [9-6](#)
- show version command [3-29](#)
- shutdown, command [8-37](#)
- shutdown threshold for Layer 2 protocol packets [28-16](#)
- shutting down
 - interfaces [8-37](#)
- Simple Network Management Protocol
 - See SNMP
- single-host mode [45-7](#)
- single spanning tree
 - See SST
- single static RP, configuring [36-20](#)
- slot numbers, description [8-2](#)
- Slow timer, configuring BFD [38-16](#)
- smart call home [66-1](#)
 - description [66-2](#)
 - destination profile (note) [66-5](#)
 - registration requirements [66-3](#)
 - service contract requirements [66-3](#)
 - Transport Gateway (TG) aggregation point [66-2](#)
- SMARTnet
 - smart call home registration [66-3](#)
- Smartports macros
 - applying global parameter values [19-8, 19-15](#)
 - applying macros [19-8](#)
 - applying parameter values [19-9](#)
 - configuration guidelines [19-6, 19-14](#)
 - configuring [19-2](#)
 - creating [19-8](#)
 - default configuration [19-4, 19-13](#)
 - defined [1-10, 19-1](#)
 - displaying [19-13](#)
 - tracing [19-7, 19-14](#)
- SNMP
 - accessing MIB variables with [61-4](#)

- agent
 - described [61-4](#)
 - disabling [61-7](#)
- and IP SLAs [67-2](#)
- authentication level [61-10](#)
- community strings
 - configuring [61-7](#)
 - overview [61-4](#)
- configuration examples [61-15](#)
- configuration guidelines [61-6](#)
- default configuration [61-5](#)
- enabling [71-4, 71-5](#)
- engine ID [61-6](#)
- groups [61-6, 61-9](#)
- host [61-6](#)
- informs
 - and trap keyword [61-11](#)
 - described [61-5](#)
 - differences from traps [61-5](#)
 - enabling [61-14](#)
- limiting access by TFTP servers [61-15](#)
- limiting system log messages to NMS [59-9](#)
- manager functions [61-3](#)
- notifications [61-5](#)
- overview [61-1, 61-4](#)
- status, displaying [61-16](#)
- system contact and location [61-14](#)
- trap manager, configuring [61-13](#)
- traps
 - described [61-3, 61-5](#)
 - differences from informs [61-5](#)
 - enabling [61-11](#)
 - enabling MAC address notification [4-31](#)
 - enabling MAC move notification [4-33](#)
 - enabling MAC threshold notification [4-35](#)
 - overview [61-1, 61-4](#)
 - types of [61-11](#)
- users [61-6, 61-9](#)
- versions supported [61-2](#)
- SNMP commands [71-4](#)
- SNMP traps
 - REP [23-14](#)
- SNMPv1 [61-2](#)
- SNMPv2C [61-2](#)
- SNMPv3 [61-2](#)
- software
 - upgrading [10-13, 11-12](#)
- software configuration register [3-26](#)
- software QoS, on Sup 6-E [41-40, 41-74](#)
- software switching
 - description [34-5](#)
 - interfaces [34-6](#)
 - key data structures used [36-8](#)
- source IDs
 - call home event format [66-22](#)
- SPAN
 - and ACLs [56-5](#)
 - configuration guidelines [56-7](#)
 - configuring [56-7 to 56-10](#)
 - destination ports [56-5](#)
 - IDS [56-2](#)
 - monitored port, defined [56-4](#)
 - monitoring port, defined [56-5](#)
 - received traffic [56-3](#)
 - sessions
 - defined [56-3](#)
 - source ports [56-4](#)
 - transmitted traffic [56-4](#)
 - VLAN-based [56-5](#)
- SPAN and RSPAN
 - concepts and terminology [56-3](#)
 - default configuration [56-6](#)
 - displaying status [56-24](#)
 - overview [56-1](#)
 - session limits [56-6](#)
- SPAN enhancements
 - access list filtering [56-13](#)
 - configuration example [56-15](#)

- CPU port sniffing [56-10](#)
- encapsulation configuration [56-12](#)
- ingress packets [56-12](#)
- packet type filtering [56-14](#)
- spanning-tree backbonefast command [24-16](#)
- spanning-tree cost command [21-15](#)
- spanning-tree guard root command [24-2](#)
- spanning-tree portfast bpduguard command [24-8](#)
- spanning-tree portfast command [24-7](#)
- spanning-tree port-priority command [21-13](#)
- spanning-tree uplinkfast command [24-12](#)
- spanning-tree vlan
 - command [21-9](#)
 - command example [21-9](#)
- spanning-tree vlan command [21-8](#)
- spanning-tree vlan cost command [21-16](#)
- spanning-tree vlan forward-time command [21-19](#)
- spanning-tree vlan hello-time command [21-18](#)
- spanning-tree vlan max-age command [21-18](#)
- spanning-tree vlan port-priority command [21-13](#)
- spanning-tree vlan priority command [21-17](#)
- spanning-tree vlan root primary command [21-10](#)
- spanning-tree vlan root secondary command [21-12](#)
- speed
 - configuring interface [8-20](#)
- speed command [8-21](#)
- SSO
 - configuring [12-10](#)
- SSO operation [12-4](#)
- SST
 - description [21-22](#)
 - interoperability [21-24](#)
- static ACL, removing the requirement [52-28](#)
- static addresses
 - See addresses
- static routes
 - configuring [3-11](#)
 - verifying [3-12](#)
- statistics
- 802.1X [47-14](#)
- displaying 802.1X [45-125](#)
- displaying PIM [36-27](#)
- LLDP [30-14](#)
- LLDP-MED [30-14](#)
- MKA [44-4](#)
- SNMP input and output [61-16](#)
- sticky learning
 - configuration file [48-6](#)
 - defined [48-5](#)
 - disabling [48-6](#)
 - enabling [48-5](#)
 - saving addresses [48-6](#)
- sticky MAC addresses
 - configuring [48-7](#)
 - defined [48-4](#)
- storing captured packets to a .pcap file, Wireshark [57-8](#)
- Storm Control
 - displaying [55-6](#)
 - enabling Broadcast [55-3](#)
 - enabling Multicast [55-4](#)
 - hardware-based, implementing [55-2](#)
 - overview [55-1](#)
 - software-based, implementing [55-2](#)
- STP
 - and REP [23-6](#)
 - bridge ID [21-2](#)
 - configuring [21-7 to 21-20](#)
 - creating topology [21-5](#)
 - defaults [21-7](#)
 - disabling [21-20](#)
 - enabling [21-8](#)
 - enabling extended system ID [21-9](#)
 - enabling Per-VLAN Rapid Spanning Tree [21-20](#)
 - EtherChannel guard
 - disabling [24-6](#)
 - forward-delay time [21-19](#)
 - hello time [21-17](#)
 - Layer 2 protocol tunneling [28-13](#)

- maximum aging time [21-18](#)
 - overview [21-1, 21-3](#)
 - per-VLAN rapid spanning tree [21-6](#)
 - port cost [21-15](#)
 - port priority [21-13](#)
 - root bridge [21-9](#)
- stratum, NTP [4-2](#)
- stub routing (EIGRP)
 - benefits [33-17](#)
 - configuration tasks [33-18](#)
 - configuring [33-14](#)
 - overview [33-13, 33-14](#)
 - restrictions [33-17](#)
 - verifying [33-18](#)
- subdomains, private VLAN [43-2](#)
- summer time [4-13](#)
- supervisor engine
 - accessing the redundant [10-14, 11-14](#)
 - configuring [3-8 to 3-13](#)
 - copying files to standby [10-14, 11-14](#)
 - default configuration [3-1](#)
 - default gateways [3-11](#)
 - environmental monitoring [13-1](#)
 - redundancy [12-1](#)
 - ROM monitor [3-26](#)
 - startup configuration [3-25](#)
 - static routes [3-11](#)
 - synchronizing configurations [10-11, 11-10](#)
- Supervisor Engine 7L-E, selecting the uplink port [8-18](#)
- Supervisor Engine II-TS
 - insufficient inline power handling [13-22, 14-12](#)
- Smartports macros
 - See also Auto Smartports macros
- SVI Autostate Exclude
 - understanding [33-3](#)
- SVI Autostate exclude
 - configuring [33-7](#)
- S-VLAN [1-2, 28-7](#)
- switch [53-2](#)
 - switch access with RADIUS, controlling [45-95](#)
 - switched packets
 - and ACLs [52-25](#)
 - Switched Port Analyzer
 - See SPAN
 - switchport
 - show interfaces [8-28, 8-29, 8-38](#)
 - switchport access vlan command [18-5, 18-7](#)
 - switchport block multicast command [54-2](#)
 - switchport block unicast command [54-2](#)
 - switchport mode access command [18-7](#)
 - switchport mode dot1q-tunnel command [28-6](#)
 - switchport mode dynamic command [18-5](#)
 - switchport mode trunk command [18-5](#)
 - switch ports
 - See access ports
 - switchport trunk allowed vlan command [18-5](#)
 - switchport trunk encapsulation command [18-5](#)
 - switchport trunk native vlan command [18-5](#)
 - switchport trunk pruning vlan command [18-6](#)
 - switch-to-RADIUS server communication
 - configuring [45-32](#)
- sysret command [72-5](#)
- system
 - reviewing configuration [3-10](#)
 - settings at startup [3-27](#)
- system alarms
 - overview [13-6](#)
- system and network statistics, displaying [36-23](#)
- system capabilities TLV [30-2](#)
- system clock
 - configuring
 - daylight saving time [4-13](#)
 - manually [4-11](#)
 - summer time [4-13](#)
 - time zones [4-12](#)
 - displaying the time and date [4-12](#)
 - overview [4-2](#)
 - See also NTP

- system description TLV [30-2](#)
 - system images
 - loading from Flash memory [3-30](#)
 - modifying boot field [3-27](#)
 - specifying [3-30](#)
 - system message logging
 - default configuration [59-3](#)
 - defining error message severity levels [59-8](#)
 - disabling [59-4](#)
 - displaying the configuration [59-12](#)
 - enabling [59-4](#)
 - facility keywords, described [59-12](#)
 - level keywords, described [59-9](#)
 - limiting messages [59-9](#)
 - message format [59-2](#)
 - overview [59-1](#)
 - sequence numbers, enabling and disabling [59-7](#)
 - setting the display destination device [59-5](#)
 - synchronizing log messages [59-6](#)
 - timestamps, enabling and disabling [59-7](#)
 - UNIX syslog servers
 - configuring the daemon [59-10](#)
 - configuring the logging facility [59-11](#)
 - facilities supported [59-12](#)
 - system MTU
 - 802.1Q tunneling [28-5](#)
 - maximums [28-5](#)
 - system name
 - manual configuration [4-22](#)
 - See also DNS
 - system name TLV [30-2](#)
 - system prompt, default setting [4-21](#)
- T**
- TACACS+ [49-1](#)
 - accounting, defined [3-16](#)
 - authentication, defined [3-16](#)
 - authorization, defined [3-16](#)
 - configuring
 - accounting [3-21](#)
 - authentication key [3-18](#)
 - authorization [3-21](#)
 - login authentication [3-19](#)
 - default configuration [3-18](#)
 - displaying the configuration [3-22](#)
 - identifying the server [3-18](#)
 - limiting the services to the user [3-21](#)
 - operation of [3-17](#)
 - overview [3-15](#)
 - tracking services accessed by user [3-21](#)
- tagged packets
 - 802.1Q [28-3](#)
 - Layer 2 protocol [28-13](#)
 - TCAM programming and ACLs [52-7](#)
 - for Sup II-Plust thru V-10GE [52-6](#)
 - TCAM programming and ACLs for Sup 6-E [52-10](#)
 - TDR
 - checking cable connectivity [9-3](#)
 - enabling and disabling test [9-3](#)
 - guidelines [9-3](#)
 - Telnet
 - accessing CLI [2-2](#)
 - disconnecting user sessions [9-7](#)
 - executing [9-5](#)
 - monitoring user sessions [9-6](#)
 - telnet command [9-6](#)
 - templates, Ethernet OAM [64-45](#)
 - Terminal Access Controller Access Control System Plus
 - See TACACS+
 - TFTP
 - configuration files in base directory [3-5](#)
 - configuring for autoconfiguration [3-4](#)
 - limiting access by servers [61-15](#)
 - TFTP download
 - See also console download
 - threshold monitoring, IP SLAs [67-6](#)
 - time

- See NTP and system clock
- Time Domain Reflectometer
 - See TDR
- time exceeded messages [9-9](#)
- timer
 - See login timer
- timestamps in log messages [59-7](#)
- time zones [4-12](#)
- TLV
 - host presence detection [45-8](#)
- TLVs
 - defined [1-7, 30-2](#)
 - LLDP-MED [30-2](#)
- Token Ring
 - media not supported (note) [16-5, 16-10](#)
- Topology change notification processing
 - MLD Snooping
 - Topology change notification processing [27-4](#)
- TOS
 - description [41-4](#)
- trace command [9-9](#)
- traceroute
 - See IP traceroute
 - See Layer 2 Traceroute
- traceroute mac command [9-11](#)
- traceroute mac ip command [9-11](#)
- tracked lists
 - configuring [58-3](#)
 - types [58-3](#)
- tracked objects
 - by Boolean expression [58-4](#)
 - by threshold percentage [58-6](#)
 - by threshold weight [58-5](#)
- tracking interface line-protocol state [58-2](#)
- tracking IP routing state [58-2](#)
- tracking objects [58-1](#)
- tracking process [58-1](#)
- track state, tracking IP SLAs [58-9](#)
- traffic
 - blocking flooded [54-2](#)
- traffic control
 - using ACLs (figure) [52-4](#)
 - using VLAN maps (figure) [52-5](#)
- traffic marking procedure flowchart [41-21, 41-55](#)
- traffic shaping [41-9](#)
- translational bridge numbers (defaults) [16-5](#)
- traps
 - configuring MAC address notification [4-31](#)
 - configuring MAC move notification [4-33](#)
 - configuring MAC threshold notification [4-35](#)
 - configuring managers [61-11](#)
 - defined [61-3](#)
 - enabling [4-31, 4-33, 4-35, 61-11](#)
 - notification types [61-11](#)
 - overview [61-1, 61-4](#)
- troubleshooting
 - with CiscoWorks [61-4](#)
 - with system message logging [59-1](#)
 - with traceroute [9-8](#)
- troubleshooting high CPU due to ACLs [52-6](#)
- trunk failover
 - See link-state tracking
- trunk ports
 - configure port security [48-17](#)
 - configuring PVLAN [43-19 to 43-21](#)
- trunks
 - 802.1Q restrictions [18-4](#)
 - configuring [18-5](#)
 - configuring access VLANs [18-5](#)
 - configuring allowed VLANs [18-5](#)
 - default interface configuration [18-5](#)
 - enabling to non-DTP device [18-3](#)
 - specifying native VLAN [18-5](#)
 - understanding [18-3](#)
- trustpoint [66-3](#)
- tunneling
 - defined [28-1](#)
- tunnel ports

- 802.1Q, configuring [28-6](#)
 - described [28-2](#)
 - incompatibilities with other features [28-5](#)
 - TwinGig Convertors
 - limitations on using [8-14](#)
 - port numbering [8-13](#)
 - selecting X2/TwinGig Convertor mode [8-14](#)
 - type length value
 - See TLV
 - type of service
 - See TOS
-
- ## U
- UDLD
 - configuring probe message interval per-interface [31-8](#)
 - default configuration [31-4](#)
 - disabling on fiber-optic interfaces [31-7](#)
 - disabling on non-fiber-optic interfaces [31-7](#)
 - displaying link status [31-9](#)
 - enabling globally [31-5](#)
 - enabling per-interface [31-6](#)
 - modes of operation [31-3](#)
 - resetting disabled LAN interfaces [31-8](#)
 - use case [31-2](#)
 - UDLD, overview [31-1](#)
 - UDP jitter, configuring [67-9](#)
 - UDP jitter operation, IP SLAs [67-8](#)
 - unauthorized ports with 802.1X [45-5](#)
 - unicast
 - See IP unicast
 - unicast flood blocking
 - configuring [54-1](#)
 - unicast MAC address filtering
 - and adding static addresses [4-38](#)
 - and broadcast MAC addresses [4-37](#)
 - and CPU packets [4-37](#)
 - and multicast addresses [4-37](#)
 - and router MAC addresses [4-37](#)
 - configuration guidelines [4-37](#)
 - described [4-37](#)
 - unicast MAC address filtering, configuring
 - ACLs
 - configuring unicast MAC address filtering [52-13](#)
 - Unicast RPF (Unicast Reverse Path Forwarding)
 - applying [35-5](#)
 - BGP attributes
 - caution [35-4](#)
 - CEF
 - requirement [35-2](#)
 - tables [35-7](#)
 - configuring [35-9](#)
 - (examples) [?? to 35-12](#)
 - BOOTP [35-8](#)
 - DHCP [35-8](#)
 - enterprise network (figure) [35-6](#)
 - prerequisites [35-9](#)
 - routing table requirements [35-7](#)
 - tasks [35-9](#)
 - verifying [35-10](#)
 - deploying [35-5](#)
 - description [1-22, 35-1](#)
 - disabling [35-11](#)
 - enterprise network (figure) [35-6](#)
 - FIB [35-2](#)
 - implementing [35-4](#)
 - packets, dropping (figure) [35-4](#)
 - prerequisites [35-9](#)
 - restrictions
 - basic [35-8](#)
 - routing asymmetry [35-7](#)
 - routing asymmetry (figure) [35-8](#)
 - routing table requirements [35-7](#)
 - security policy
 - applying [35-5](#)
 - attacks, mitigating [35-5](#)
 - deploying [35-5](#)

- tunneling [35-5](#)
- source addresses, validating [35-3](#)
 - (figure) [35-3, 35-4](#)
 - failure [35-3](#)
- traffic filtering [35-5](#)
- tunneling [35-5](#)
- validation
 - failure [35-3, 35-4](#)
 - packets, dropping [35-3](#)
 - source addresses [35-3](#)
- verifying [35-10](#)
- unicast traffic
 - blocking [54-2](#)
- Unidirectional Controlled Port, configuring 802.1X [45-66](#)
- unidirectional ethernet
 - enabling [32-2](#)
 - example of setting [32-2](#)
 - overview [32-1](#)
- UniDirectional Link Detection Protocol
 - See UDLD
- Universal PoE, configuring [14-16](#)
- UNIX syslog servers
 - daemon configuration [59-10](#)
 - facilities supported [59-12](#)
 - message logging configuration [59-11](#)
- UplinkFast
 - and MST [21-23](#)
 - enabling [24-15](#)
 - MST and [21-23](#)
 - overview [24-11](#)
- uplink forwarding
 - quad-supervisor [5-6](#)
- uplink mode, selecting on supervisor engine 6-E [8-16](#)
- uplink port, selecting on a supervisor engine 7L-E [8-18](#)
- usage examples, Wireshark [57-18](#)
- user-defined event triggers
 - configuring, 802.1X-based [20-8](#)
 - configuring, MAC address-based [20-9](#)

- User-defined triggers and built-in macros, configuring mapping [20-9](#)
- user EXEC mode [2-5](#)
- user sessions
 - disconnecting [9-7](#)
 - monitoring [9-6](#)

V

- VACLs
 - Layer 4 port operations [52-10](#)
- virtual configuration register [72-3](#)
- virtual LANs
 - See VLANs
- virtual ports, MKA [44-3](#)
- Virtual Router Redundancy Protocol, introduction [1-22](#)
- Virtual Switch System(VSS), displaying EtherChannel to [25-16](#)
- VLAN ACLs
 - See VLAN maps
- VLAN blocking, REP [23-13](#)
- vlan command [16-6](#)
- vlan dot1q tag native command [28-4](#)
- VLAN ID
 - service provider [28-9](#)
- VLAN ID, discovering [4-44](#)
- VLAN ID translation
 - See VLAN mapping
- VLAN load balancing
 - REP [23-4](#)
- VLAN load balancing, triggering [23-6](#)
- VLAN load balancing on flex links [22-2](#)
 - configuration guidelines [22-6](#)
- VLAN Management Policy Server
 - See VMPS
- VLAN mapping
 - 1-to-1 [28-8](#)
 - 1-to-1, configuring [28-11](#)
 - configuration guidelines [28-10](#)

- configuring [28-11](#)
 - configuring on a trunk port [28-11](#)
 - default [28-9](#)
 - described [1-2, 28-7](#)
 - selective QinQ [28-8](#)
 - selective Q-in-Q, configuring [28-12](#)
 - traditional QinQ [28-8](#)
 - traditional Q-in-Q, configuring [28-12](#)
 - types of [28-8](#)
- VLAN maps
- applying to a VLAN [52-21](#)
 - configuration example [52-22](#)
 - configuration guidelines [52-18](#)
 - configuring [52-17](#)
 - creating and deleting entries [52-19](#)
 - defined [1-41](#)
 - denying access example [52-23](#)
 - denying packets [52-19](#)
 - displaying [52-24](#)
 - order of entries [52-18](#)
 - permitting packets [52-19](#)
 - router ACLs and [52-25](#)
 - using (figure) [52-5](#)
 - using in your network [52-22](#)
- VLAN maps, PACL and Router ACLs [52-32](#)
- VLANs
- allowed on trunk [18-5](#)
 - configuration guidelines [16-3](#)
 - configuring [16-5](#)
 - configuring as Layer 3 interfaces [33-7](#)
 - customer numbering in service-provider networks [28-3](#)
 - default configuration [16-4](#)
 - description [1-11](#)
 - extended range [16-3](#)
 - IDs (default) [16-5](#)
 - interface assignment [16-7](#)
 - limiting source traffic with RSPAN [56-23](#)
 - monitoring with RSPAN [56-21](#)
 - name (default) [16-5](#)
 - normal range [16-3](#)
 - overview [16-1](#)
 - reserved range [16-3](#)
 - See also PVLANS
- VLAN Trunking Protocol
- See VTP
- VLAN trunks
- overview [18-3](#)
- VLAN User Distribution, configuring 802.1X [45-68](#)
- VMPS
- configuration file example [16-32](#)
 - configuring dynamic access ports on client [16-25](#)
 - configuring retry interval [16-27](#)
 - database configuration file [16-32](#)
 - dynamic port membership
 - example [16-29](#)
 - reconfirming [16-26](#)
 - reconfirming assignments [16-26](#)
 - reconfirming membership interval [16-26](#)
 - server overview [16-21](#)
- VMPS client
- administering and monitoring [16-27](#)
 - configure switch
 - configure reconfirmation interval [16-26](#)
 - dynamic ports [16-25](#)
 - entering IP VMPS address [16-24](#)
 - reconfirmation interval [16-27](#)
 - reconfirm VLAM membership [16-26](#)
 - default configuration [16-24](#)
 - dynamic VLAN membership overview [16-23](#)
 - troubleshooting dynamic port VLAN membership [16-28](#)
- VMPS server
- fall-back VLAN [16-22](#)
 - illegal VMPS client requests [16-23](#)
 - overview [16-21](#)
 - security modes
 - multiple [16-22](#)

- open [16-21](#)
 - secure [16-22](#)
- voice aware 802.1x security
 - port-based authentication
 - configuring [45-74](#)
 - described [45-22, 45-73](#)
- voice interfaces
 - configuring [42-1](#)
- Voice over IP
 - configuring [42-1](#)
- voice ports
 - configuring VVID [42-3](#)
- voice traffic [14-2, 42-5](#)
- voice VLAN
 - IP phone data traffic, described [42-2](#)
 - IP phone voice traffic, described [42-2](#)
- Voice VLAN, configure 802.1X [45-72](#)
- voice VLAN ports
 - using 802.1X [45-22](#)
- VPN
 - configuring routing in [40-8](#)
 - forwarding [40-3](#)
 - routes [40-2](#)
 - routing and forwarding table
 - See VRF
- VRF
 - defining [40-3](#)
 - tables [40-1](#)
- VRF-aware services
 - ARP [40-6, 40-15, 40-17](#)
 - configuring [40-6, 40-15](#)
 - ftp [40-16](#)
 - ping [40-15](#)
 - tftp [40-16](#)
 - traceroute [40-16](#)
 - uRPF [40-16](#)
- VRF-lite
 - description [1-22](#)
- VSS
 - dual-active detection
 - displaying [5-51](#)
 - Enhanced PAgP, advantages [5-23](#)
 - enhanced PAgP, configuring [5-49](#)
 - Enhanced PAgP, description [5-23](#)
 - fast-hello, configuring [5-50](#)
- VTP
 - client, configuring [16-16](#)
 - configuration guidelines [16-12](#)
 - default configuration [16-13](#)
 - disabling [16-16](#)
 - Layer 2 protocol tunneling [28-14](#)
 - monitoring [16-19](#)
 - overview [16-8](#)
 - pruning
 - configuring [16-15](#)
 - See also VTP version 2
 - server, configuring [16-16](#)
 - statistics [16-19](#)
 - transparent mode, configuring [16-16](#)
 - version 2
 - enabling [16-15](#)
- VTP advertisements
 - description [16-9](#)
- VTP domains
 - description [16-8](#)
- VTP modes [16-9](#)
- VTP pruning
 - overview [16-11](#)
- VTP versions 2 and 3
 - overview [16-9](#)
 - See also VTP
- VTY and Network Assistant [15-12](#)
- VVID (voice VLAN ID)
 - and 802.1X authentication [45-22](#)
 - configuring [42-3](#)

W**WCCP**

- configuration examples [70-10](#)
- configuring on a router [70-2, 70-11](#)
- features [70-4](#)
- restrictions [70-5](#)
- service groups [70-6](#)

web-based authentication

- authentication proxy web pages [47-4](#)
- description [1-43, 45-14, 47-1](#)

web-based authentication, interactions with other features [47-4](#)**Web Cache Communication Protocol**

- See WCCP [70-1](#)

web caches

- See cache engines

web cache services

- description [70-4](#)

web caching

- See web cache services
- See also WCCP

web scaling [70-1](#)**weight thresholds in tracked lists** [58-5](#)**Wireshark**

- activating and deactivating, capture points, conceptual [57-9](#)
- attachment points [57-6](#)
- capture filter [57-7](#)
- capture points [57-6](#)
- core system filter [57-6](#)
- decoding and displaying packets [57-9](#)
- display filter [57-7](#)
- feature interactions [57-10](#)
- filters [57-6](#)
- storing captured packets to a .pcap filter [57-8](#)
- usage examples [57-18](#)

Wireshark, about [57-5](#)**Wireshark, activating and deactivating a capture point** [57-13](#)**Wireshark, defining/modifying/deleting a capture point** [57-12](#)**Wireshark, displaying information** [57-14](#)**WS-X46490-CSFP-E, support on a 10-slot chassis** [8-17](#)**Y****Y.1731**default configuration [64-29](#)described [64-27](#)**ETH-AIS**

Ethernet Alarm Signal function (ETH-AIS)

[64-28](#)**ETH-RDI** [64-28](#)multicast Ethernet loopback [64-31](#)multicast ETH-LB [64-29](#)terminology [64-27](#)