User's Guide

Release 5.2

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Alteon WebSystems
Web Speed for e-Business

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Contents

Preface xv
Who Should Use This Book xv
How This Book Is Organized xv
Typographic Conventions xvii
Contacting Alteon Networks xviii

Chapter 1: WebOS Software Features 1-1
Overview 1-1
Standard Features 1-2
- VLANs 1-2
- Jumbo Frames 1-2
- IP Routing 1-3
- Filtering 1-3
- Port Trunk Groups 1-4
- Port Mirroring 1-4
- Virtual Router Redundancy Protocol 1-4
- The WebOS Browser Interface 1-4
- SNMP MIB Support 1-5
- RFC 1573 Interface Extension MIB Compliance 1-5
- Server Dual Homing 1-5

Optional Features 1-6
- Application Redirection Filters 1-6
- Server Load Balancing 1-6
- Global Server Load Balancing 1-6

Chapter 2: The Command-Line Interface 2-1
New in This Release 2-1
Connecting to the Switch 2-2
- Establishing a Console Connection 2-2
- Establishing a Telnet Connection 2-3

Entering Passwords 2-4
The User Account 2-4
The Administrator Account 2-4
Layer 4 Administrator Account 2-4
CLI vs. Setup 2-5
Command-Line History and Editing 2-5
Idle Timeout 2-6

Chapter 3: First-Time Configuration 3-1
New in This Release 3-1
Using the Setup Utility 3-2
Information Needed For Setup 3-2
Starting Setup When You Log In 3-2
Stopping and Restarting Setup Manually 3-3
Setup Part 1: Basic System Configuration 3-4
Setup Part 2: Port Configuration 3-6
Setup Part 3: VLANs 3-8
Setup Part 4: IP Configuration 3-9
Setup Part 5: Final Steps 3-12
Setting Passwords 3-13
Changing the Default Administrator Password 3-13
Changing the Default User Password 3-15
Changing the Default Layer 4 Administrator Password 3-17

Chapter 4: Menu Basics 4-1
New in This Release 4-1
The Main Menu 4-2
Menu Summary 4-2
Menu Map 4-3
Global Commands 4-4
Command-Line History and Editing 4-5
Command-Line Interface Shortcuts 4-6
Command Stacking 4-6
Command Abbreviation 4-6
Tab Completion 4-6

Chapter 5: The Information Menu 5-1
New in This Release 5-1
Accessing the Information Menu 5-2
System Information 5-3
Link Status 5-4
Spanning-Tree Protocol Information 5-5
VLAN Information 5-7
Port Information 5-8
Server Load Balancing Information 5-9
Forwarding Database Information Menu 5-11
IP Information 5-13
IP Routing Information Menu 5-14
ARP Information Menu 5-16
Virtual Router Redundancy Protocol Information 5-18
Trunk Group Information 5-19
Enabled Software Keys 5-19
Information Dump 5-20

Chapter 6: The Statistics Menu 6-1
New in This Release 6-1
Accessing the Statistics Menu 6-2
Port Statistics 6-3
IP Interface (IF) Statistics 6-4
Protocol Statistics 6-4
Forwarding Database Statistics 6-5
Virtual Router Redundancy Protocol Statistics 6-6
Server Load Balancing Statistics 6-7
- Real Server Statistics 6-7
- Real Server Group Statistics 6-9
- Virtual Server Statistics 6-9
- Filter Statistics 6-10
- SLB Port Statistics Menu 6-11
- Global SLB Statistics 6-14
- SLB Maintenance Statistics 6-17

MP-Specific Statistics Menu 6-18
Statistics Dump 6-19

Chapter 7: The Configuration Menu 7-1
New in This Release 7-1
Accessing the Configuration Menu 7-3
Viewing, Applying, and Saving Changes 7-4
- Viewing Pending Changes 7-4
- Applying Pending Changes 7-4
- Saving the Configuration 7-5

Configuring System Parameters 7-6
- Switch Management Security 7-8

Configuring Port Parameters 7-9
- Fast Ethernet and Gigabit Link Menus 7-11

Configuring IP Parameters 7-12
- IP Interface Menu 7-13
- Default Gateway Settings 7-14
- IP Static Route Menu 7-16
- IP Forwarding Menu 7-17
- Routing Information Protocol Menu 7-18
- IP Port Menu 7-20
- Domain Name System Menu 7-21
- Syslog Host 7-22
- Re-ARP 7-23
- Default Gateway Metrics 7-23

Configuring VLAN Parameters 7-24
Configuring Spanning-Tree Parameters 7-26
- Bridge Spanning Tree Menu 7-27
- Spanning-Tree Port Menu 7-29

Configuring SNMP Parameters 7-30
Setup 7-32
Dump 7-32
TFTP Configuration Put and Get 7-33
- Saving the Active Switch Configuration 7-33
- Loading the Active Switch Configuration 7-33

Configuring Port Mirroring 7-34

Configuring Server Load Balancing 7-36
Configuring Real Server Parameters 7-38
The Real Server Group Menu 7-42
The Virtual Server Menu 7-46
Direct Client Access to Real Servers 7-49
Mapping Virtual Ports to Real Ports 7-51
The Filter Menu 7-52
The SLB Port Menu 7-56
The Global SLB Menu 7-57
Configuring Port Trunking 7-61
Configuring VRRP 7-62
VRRP Virtual Router Menu 7-63
VRRP Interface Menu 7-67
VRRP Tracking Menu 7-68

Chapter 8: The Operations Menu 8-1
New in This Release 8-1
Accessing the Operations Menu 8-1
Operations-Level Port Options 8-2
Operations-Level Port Mirroring Options 8-3
Operations-Level Server Load Balancing Options 8-5
Operations-Level VRRP Options 8-6
Activating Optional Software 8-7
Removing Optional Software 8-8

Chapter 9: The Boot Options Menu 9-1
Updating the Switch Software Image 9-2
Downloading New Software to Your Switch 9-2
Selecting a Software Image to Run 9-3
Selecting a Configuration Block 9-4
Resetting the Switch 9-4

Chapter 10: The Maintenance Menu 10-1
New in This Release 10-1
Accessing the Maintenance Menu 10-2
Uuencode Flash Dump 10-2
TFTP System Dump Put 10-3
Clearing Dump Information 10-3
Using the Panic Command 10-4

Unscheduled System Dumps 10-4
The System Maintenance Menu 10-4
The FDB Manipulation Menu 10-5
Using the Debug Menu 10-6
Snap Trace Information 10-6
Accessing the Debug Menu 10-6
Using the ARP Cache Manipulation Menu 10-8
Using the IP Route Manipulation Menu 10-10

Chapter 11: VLANs 11-1
VLAN ID Numbers 11-1
VLAN Tagging 11-2
VLANs and Spanning-Tree 11-2
VLANs and the IP Interfaces 11-2
VLAN Topologies and Design Issues 11-3
Example #1: Multiple VLANS with Tagging Adapters 11-3
Example #2: Parallel Links with VLANs 11-5

Chapter 12: Jumbo Frames 12-1
Isolating Jumbo Frame Traffic using VLANs 12-1
Routing Jumbo Frames to Non-Jumbo Frame VLANs 12-2

Chapter 13: IP Routing 13-1
IP Routing Benefits 13-1
Example of Routing Between IP Subnets 13-1

Chapter 14: Port Trunking 14-1
Port Trunking Overview 14-1
Basics 14-1
Statistical Load Distribution 14-2
Built-In Fault Tolerance 14-2
Port Trunking Example 14-3

Chapter 15: Server Load Balancing 15-1
New in This Release 15-1
Server Load Balancing Overview 15-1
Benefits 15-1
Identifying Your Needs 15-2
How Server Load Balancing Works 15-2
Network Topology Considerations 15-4

Server Load Balancing Examples 15-6
Web Hosting Configuration 15-6
Health-Check Parameters for Real Servers 15-11
Hostname for HTTP Content Health Checks 15-11
RADIUS Server Health Checking 15-13
IMAP Server Health Checking 15-14
Additional Server Load Balancing Options 15-15
Metrics for Real Server Groups 15-15
Weights for Real Servers 15-15
Connection Time-outs for Real Servers 15-15
Maximum Connections for Real Servers 15-16
Backup/Overflow Servers 15-16
IP Proxy Addresses for Complex SLB Networks 15-17

Chapter 16: Filtering 16-1
New in This Release 16-1
Filtering Overview 16-1
Benefits 16-1
Filtering Criteria 16-2
Stacking Filters 16-3
Overlapping Filters 16-4
The Default Filter 16-4
Numbering Filters 16-5
Filter Logs 16-5
Security Example 16-6
Example Configuration for the Security Solution 16-7
Example Configuration for Filter Logs 16-12
TCP ACK Matching for Filters 16-13
Web-Cache Redirection Example 16-16
Web-Cache Redirection Environment 16-17
Example Configuration for the Web-Cache Solution 16-18
IP Proxy Addresses for Transparent Proxies or Complex Networks 16-22
Excluding Non-Cacheable Sites 16-24
Additional Application Redirection Options 16-24
Network Address Translation Examples 16-25
Internal Client Access to Internet 16-25
External Client Access to Server 16-26

Chapter 17: Global Server Load Balancing 17-1
GSLB Overview 17-1
Benefits 17-1
How GSLB Works 17-2
GSLB Configuration Example 17-4
Summary 17-4
Example GSLB Configuration Procedure 17-5
IP Proxy Addresses for Non-HTTP Application Redirects 17-15
Basic Tests for GSLB Operation 17-17

Chapter 18: Troubleshooting 18-1
Definitions 18-1
System Problems 18-2
Switch Management Problems 18-2
Link Problems 18-2
SNAP Traces 18-3
Switch Boot Failure 18-4
Switching Problems 18-6
Connectivity Problems 18-6
Spanning-Tree Protocol Problems 18-7
Switch Receives its own Spanning-Tree BPDU Message 18-7
Spanning-Tree Recalculation 18-8
Server Load Balancing Configurations 18-8
General 18-8
Service Problems 18-9
Miscellaneous 18-9
LED Patterns on Gigabit Ethernet Ports 18-9
Lost Character Output on Console Port 18-9

Figures

Figure 2-1: Administrator Main Menu 2-5

Figure 4-1: Administrator Main Menu 4-2
Figure 4-2: Administrator Menu Hierarchy 4-3

Figure 7-1: Mapped and Non-mapped server access 7-50

Figure 11-1: Example #1: Multiple VLANs with Tagging ACEnic Adapters 11-3
Figure 11-2: Example #2: Parallel Links with VLANs 11-5

Figure 12-1: Jumbo Frame VLANs 12-2

Figure 13-1: The Router Legacy Network 13-2
Figure 13-2: Switch-Based Routing Topology 13-3

Figure 14-1: Port Trunk Group 14-1
Figure 14-2: Example Port Trunk Group Configuration 14-3

Figure 15-1: Traditional vs. Server Load Balanced network configurations 15-3
Figure 15-2: Layer 4 Client/Server traffic routing 15-4
Figure 15-3: Example Network for Client/Server Port Configuration 15-5
Figure 15-4: Web hosting configuration without Layer 4 switching 15-6
Figure 15-5: Web hosting with Layer 4 solutions 15-7

Figure 16-1: Assigning Filters according to Range of Coverage 16-3
Figure 16-2: Assigning Filters to Overlapping Ranges 16-4
Figure 16-3: Assigning a Default Filter 16-4
Figure 16-4: Example Security Topology 16-6
Figure 16-5: Example Filter TCP ACK Matching Network 16-13
Figure 16-6: Traditional network without Web Cache Redirection 16-17
Figure 16-7: Network with Web Cache Redirection 16-17
Figure 16-8: Dynamic NAT 16-25
Figure 16-9: Static NAT 16-26

Figure 17-1: DNS Resolution with Global Server Load Balancing 17-2
Figure 17-2: Global Server Load Balancing Example Topology 17-5
Figure 17-3: POP3 Request fulfilled via IP Proxy 17-15

Figure 18-1: Spanning-Tree Topology 18-7

Tables

Table 1: Typographic Conventions xvii

Table 2-1: Console Configuration Parameters 2-2

Table 4-1: Global Commands 4-4
Table 4-2: Command-Line History and Editing Options 4-5

Table 5-1: Spanning Tree Parameter Descriptions 5-6
Table 5-2: IP Routing Type Parameters 5-15
Table 5-3: IP Routing Tag Parameters 5-16
Table 5-4: ARP Dump Flag Parameters 5-17

Table 6-1: Forwarding Database Statistics 6-5
Table 6-2: Server Load Balancing Maintenance Statistics 6-17

Table 7-1: System Options (/cfg/sys) 7-7
Table 7-2: Port Configuration Options (cfg/port) 7-10
Table 7-3: Fast Link and Gigabit Link Options (/cfg/port) 7-11
Table 7-4: IP Interface Options (/cfg/ip/if) 7-14
Table 7-5: Default Gateway Options (/cfg/ip/gw) 7-15
Table 7-6: IP Static Route Options (/cfg/ip/route) 7-16
Table 7-7: IP Forwarding Options (/cfg/ip/frwd) 7-17
Table 7-8: Local Routing Cache Address Ranges 7-18
Table 7-9: Routing Information Protocol Options (/cfg/ip/rip1) 7-19
Table 7-10: IP Forwarding Port Options (/cfg/ip/port) 7-20
Table 7-11: Domain Name Service Menu Options (/cfg/ip/dns) 7-21
Table 7-12: Default Gateway Metrics (/cfg/ip/metrc) 7-23
Table 7-13: VLAN Options (/cfg/vlan) 7-24
Table 7-14: Spanning-Tree Options (/cfg/stp) 7-26
Table 7-15: Bridge Spanning-Tree Options (/cfg/stp/brg) 7-28
Table 7-16: Spanning-Tree Port Options (/cfg/stp/port) 7-29
Table 7-17: SNMP Options (/cfg/snmp) 7-31
Table 7-18: Port Mirroring Options (/cfg/mirr/port) 7-35
Table 7-19: Server Load Balancing Options (/cfg/slb) 7-36

Table 7-20: SLB Real Server Options (/cfg/slb/real) 7-39
Table 7-21: Real Server Group Options (/cfg/slb/group) 7-42
Table 7-22: Real Server Group Metrics 7-44
Table 7-23: SLB Virtual Server Options (/cfg/slb/virt) 7-46
Table 7-24: Filter Options (/cfg/slb/filt) 7-53
Table 7-25: Filtering IP Address Ranges 7-55
Table 7-26: SLB Port Options (/cfg/slb/port) 7-56
Table 7-27: Global SLB Options (/cfg/slb/gslb) 7-58
Table 7-28: Remote Site Options (/cfg/slb/gslb/site) 7-60
Table 7-29: Trunk Group Options (/cfg/trunk) 7-61
Table 7-30: Virtual Router Redundancy Protocol Options (/cfg/vrrp) 7-62
Table 7-31: VRRP Virtual Router Options (/cfg/vrrp/vr) 7-64
Table 7-32: VRRP Priority Tracking Options (/cfg/vrrp/vr #/track) 7-66
Table 7-33: VRRP Interface Options (/cfg/vrrp/if) 7-68
Table 7-34: VRRP Tracking Options (/cfg/vrrp/track) 7-69

Table 8-1: Operations Port Menu Options (/oper/port) 8-2
Table 8-2: Port Mirroring Menu Options (/oper/mirr) 8-4
Table 8-3: Server Load Balancing Operations Menu Options (/oper/slb) 8-5
Table 8-4: Virtual Router Redundancy Operations Menu Options (/oper/vrrp) 8-6

Table 13-1: Subnet Routing Example: IP Address Assignments 13-4
Table 13-2: Subnet Routing Example: IP Interface Assignments 13-4
Table 13-3: Subnet Routing Example: Optional VLAN Ports 13-6

Table 15-1: Web Host Example: Real Server IP addresses 15-8
Table 15-2: Web Host Example: ACEswitch 180 Port Usage 15-10
Table 15-3: Proxy Example: ACEswitch 180 Port Usage 15-18

Table 16-1: Well-Known Protocol Types 16-2
Table 16-2: Well-Known Application Ports 16-3
Table 16-3: Web-Cache Example: Real Server IP addresses 16-7
Table 16-4: Web-Cache Example: Real Server IP addresses 16-18
Table 16-5: Web Proxy Example: ACEswitch 180 Port Usage 16-23

Table 17-1: GSLB Example: California Real Server IP Addresses 17-7
Table 17-2: GSLB Example: California ACEswitch 180 Port Usage 17-8
Table 17-3: Denver Real Server IP Addresses 17-11
Table 17-4: Web Host Example: ACEswitch 180 Port Usage 17-12

Table 18-1: Pin-outs for Crossover cable 18-3
Table 18-2: Console Configuration Parameters 18-5

Preface

This *User's Guide* describes how to configure and use the WebOS Release 5.2 software included in the Alteon WebSystems family of switches.

For documentation on installing the switches physically, see the hardware installation guide for your particular switch model.

Who Should Use This Book

This *User's Guide* is intended for network installers and system administrators engaged in configuring and maintaining a network. It assumes that you are familiar with Ethernet concepts, IP addressing, the IEEE 802.1d Spanning-Tree Protocol, and SNMP configuration parameters.

How This Book Is Organized

Part 1: Getting Started

These chapters introduce the major features of the switch software, and explain how to access the switch to perform basic configuration.

Chapter 1, "WebOS Software Features," provides an overview of the major features included in this release of the switch software.

Chapter 2, "The Command-Line Interface," describes how to connect to the switch and access the information and configuration menus.

Chapter 3, "First-Time Configuration," describes how to use the Setup utility for initial switch configuration and how to change the system passwords.

Part 2: The Menu System

Each chapter represents a major section within the command-line interface menu system.

Chapter 4, "Menu Basics," provides an overview of the menu system, including a menu map, global commands, and menu shortcuts.

Chapter 5, "The Information Menu," shows how to view switch configuration parameters.

Chapter 6, "The Statistics Menu," shows how to view switch performance statistics.

Chapter 7, "The Configuration Menu," shows how to configure switch system parameters, ports, VLANs, Jumbo Frames, Spanning-Tree Protocol, SNMP, Port Mirroring, IP Routing, Port Trunking, Server Load Balancing, Filtering, and more.

Chapter 8, "The Operations Menu," shows how to use commands which affect switch performance immediately, but do not alter permanent switch configurations (such as temporarily disabling ports). Also describes how to activate or deactivate optional software features.

Chapter 9, "The Boot Options Menu," describes the use of the primary and alternate switch images, how to load a new software image, and how to reset the software to factory defaults.

Chapter 10, "The Maintenance Menu," shows how to generate and access a dump of critical switch state information, how to clear it, and how to clear part or all of the forwarding database.

Part 3: Tutorials and Examples

These chapters will help you plan, implement, and administer the use of the more advanced WebOS software features.

Chapter 11, "VLANs," describes network design and topology considerations for using VLANs.

Chapter 12, "Jumbo Frames," provides additional detail for using Jumbo Frames.

Chapter 13, "IP Routing," provides configuration background and examples for using the switch to perform routing functions.

Chapter 14, "Port Trunking," provides configuration background and examples for trunking multiple ports together.

Chapter 15, "Server Load Balancing," provides a conceptual overview and configuration examples for getting the most from Server Load Balancing.

Chapter 16, "Filtering," provides a conceptual overview and configuration examples for filtering and redirecting traffic.

Chapter 17, "Global Server Load Balancing," provides a conceptual overview and configuration examples for performing Server Load Balancing across multiple geographic sites.

Chapter 18, "Troubleshooting," describes switch configuration troubleshooting techniques.

Typographic Conventions

The following table describes the typographic styles used in this book.

Table 1 Typographic Conventions

Typeface or Symbol	Meaning	Example
`AaBbCc123`	This type is used for names of commands, files, and directories used within the text.	View the `readme.txt` file.
	It also depicts on-screen computer output and prompts.	`Main#`
`AaBbCc123`	This bold type appears in command examples. It shows text that must be typed in exactly as shown.	`Main#` **`sys`**
AaBbCc123	This italicized type appears in command examples as a parameter placeholder. Replace the indicated text with the appropriate real name or value when using the command.	To establish a Telnet session, enter: `host#` **`telnet`** *IP-address*
	This also shows book titles, special terms, or words to be emphasized.	Read your *User's Guide* thoroughly.
[ ]	Command items shown inside brackets are optional and can be used or excluded as the situation demands. Do not type the brackets.	`host#` **`ls`** [**`-a`**]

Contacting Alteon Networks

Use the following information to access Alteon WebSystems support and sales.

- URL for Alteon WebSystems Online:

  `http://www.alteon.com`

  This website includes product information, software updates, release notes, and white papers. The website also includes access to Alteon WebSystems Customer Support for accounts under warranty or that are covered by a maintenance contract.

- E-mail access:

  `support@alteon.com`

  E-mail access to Alteon WebSystems Customer Support is available to accounts that are under warranty or covered by a maintenance contract.

- Telephone access to Alteon WebSystems Customer Support:

  1-888-Alteon0 (or 1-888-258-3660)
  1-408-360-5695

  Telephone access to Alteon WebSystems Customer Support is available to accounts that are under warranty or covered by a maintenance contract. Normal business hours are 8 a.m. to 6 p.m. Pacific Standard Time.

- Telephone access to Alteon WebSystems Sales:

  1-888-Alteon2 (or 1-888-258-3662), and press 2 for Sales
  1-408-360-5600, and press 2 for Sales

  Telephone access is available for information regarding product sales and upgrades.

Part 1: Getting Started

050044B, July 1999

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CHAPTER 1

WebOS Software Features

This chapter briefly describes the major WebOS Release 5.2 software features.

Overview

WebOS Release 5.2 software offers the following features:

- Concurrent Layer 2, Layer 3 and Layer 4 switching.
- Optional Application Redirection software allows the interception and redirection of IP traffic.
- Optional Server Load Balancing software provides up to 256 real servers load balanced by up to 256 virtual servers, with each supporting multiple IP addresses and applications.
- Optional Global Server Load Balancing software lets you balance server traffic load among up to eight remote physical sites.
- Active-Active redundant setup capability for Layer 3 and Layer 4 interfaces, supporting VRRP (RFC 2338) and Alteon WebSystems' extension for virtual servers.
- Content health checks for client applications and servers with support for popular protocols, including POP3, FTP, HTTP, SNMP, NNTP, IMAP, DNS, and RADIUS.
- Layer 3 IP routing software forwards frames between as many as 256 logical interfaces.
- Flexible Layer 3/Layer 4 filtering to create secure server networks.
- VLAN support for up to 246 VLANs per switch.
- Jumbo Frame support for frame sizes up to 9022 octets.
- Cisco EtherChannel™ compatible port trunking support, allowing the creation of up to four Trunk Groups each with between two to four configured switch ports.
- Server Dual Homing support.
- Switch Processor (SP) capability to learn up to 4095 MAC addresses.
- Master Forwarding Database supports up to 8192 MAC address entries per switch.
- IEEE 802.1d Spanning-Tree Protocol support.
- IEEE 802.3x Flow Control support for full-duplex ports.
- IEEE 802.3z Link-Negotiation support.

- IEEE 802.1Q Frame Tagging when ports are enabled with VLAN tagging.
- SNMP support: RFC 1213 MIB-II, RFC 1493 Bridge MIB, RFC 1573 Interface Extensions MIB, and RFC 1643 Ethernet-like MIB. Alteon WebSystems' Enterprise MIB supports the configuration and monitoring of all Alteon WebSystems-specific features.
- Multiple user accounts provided to allow SLB configuration changes and to view switch information and statistics.
- Switch configuration and management via local console port (DCE) or Telnet, and the Web Browser Interface, with three levels of password protection.
  - Command-Line Interface (CLI) enhancements include Setup facility, command-line retrieval and editing capability, and tab completion function for commands and options. Aliases for real servers and real server groups are also supported, making it easier to identify them on information and statistics screens.
  - WebOS Browser Interface (WBI) provides direct browser-to-switch interaction for switch configuration and monitoring.
- TFTP download to flash memory for software, including upgrades, configuration updates, and troubleshooting information.

Standard Features

VLANs

Virtual Local Area Networks (*VLANs*) are commonly used to split up groups of network users into manageable broadcast domains, to create logical segmentation of workgroups, and to enforce security policies among logical segments.

The WebOS Release 5.2 software supports up to 246 VLANs per switch. IEEE 802.1Q VLAN *tagging* is also supported to allow multiple VLANs per port, and to provide standards-based VLAN support for Ethernet systems.

Jumbo Frames

To reduce host frame processing overhead, the Alteon WebSystems switches and the ACEnic adapter, both running operating software version 2.0 or greater, can receive and transmit frames that are larger than maximum frame size allowed on normal Ethernet.

VLANs can be configured on the same adapters and switches to separate regular traffic from Jumbo Frame traffic. End-stations with a ACEnic adapters installed and attached to Alteon WebSystems switches can communicate across both the Jumbo Frame VLANs and regular frame VLANs at the same time.

IP Routing

IP Routing allows the network administrator to seamlessly connect server IP subnets to the rest of the backbone network, using a combination of configurable IP switch interfaces and IP routing options.

The IP Routing feature enhances Alteon WebSystems' server switching solution in the following ways:

- It provides the ability to perform Server Load Balancing (using both Layer 3 and Layer 4 switching in combination) to server subnets which are separate from backbone subnets.
- By automatically fragmenting Jumbo Frames when routing to non-Jumbo Frame subnets or VLANs, it provides another means to invisibly introduce Jumbo Frames technology into the server switched network.
- It provides the ability to seamlessly route IP traffic between multiple VLANs and subnets configured in the switch.

Filtering

Layer 3 (IP) and Layer 4 (Application/Protocol) filtering gives the network administrator a powerful tool to protect their server networks. Up to 224 filters can be created. Every switch port can have up to 224 of these filters applied.

Each filter can allow or deny traffic and can optionally log results, based on any combination of the following user-specified criteria:

- IP source address, by address and mask
- IP destination address, by address and mask
- Protocol type (IP, UDP, TCP, ICMP and others)
- TCP ACK or RST flag
- Application source port, by name, integer or range
- Application destination port, by name, integer or range

Port Trunk Groups

Ports in a trunk group combine their bandwidth to create a single, larger virtual link. This provides the following features:

- Up to four trunk groups are supported per switch.
- Up to four ports can be trunked together to form a single virtual link with bandwidth between 2 and 4 Gigabits per second.
- Trunk groups are inherently fault tolerant: the trunk is active as long as any of its ports are available.
- Traffic on the trunk is statistically load balanced between the ports in the link.
- Trunk connections support third-party devices such as Cisco routers and switches with EtherChannel technology, and Sun's Quad Fast Ethernet Adapter.

Port Mirroring

Port mirroring provides a powerful network debugging tool. When this feature is configured, network packets being sent and/or received on a target port are duplicated and sent to a monitor port. By attaching a network analysis computer to the monitor port, you can collect detailed information about your network performance and usage.

Virtual Router Redundancy Protocol

Virtual Router Redundancy Protocol (VRRP) support on Alteon WebSystems' switches provides redundancy between routers in a LAN. This is accomplished by configuring the same virtual router IP address and ID number on each participating VRRP-capable routing device. One of the virtual routers is then elected as the master, based on a number of priority criteria, and assumes control of the shared virtual router IP address. If the master fails, one of the backup virtual routers will assume routing authority and take control of the virtual router IP address.

Alteon Websystems has extended VRRP to include virtual servers as well, allowing for full active/active redundancy between its Layer 4 switches.

The WebOS Browser Interface

Using Alteon WebSystems' WebOS, the network administrator may access all switch configuration and monitoring functions through a web-based switch management interface. This WebOS Browser Interface (WBI) has all of the same configuration and monitoring functions as the command-line interface, with an intuitive and easy-to-use interface structure.

SNMP MIB Support

The SNMP agent for Alteon WebSystems' switches supports the following standard Management Interface Bases (MIBs): RFC 1213 MIB-II, RFC 1493 Bridge MIB, RFC 1643 Ethernet-like MIB, and RFC 1573 Interface Extensions MIB.

Security is provided through SNMP community strings that can be modified only through the Command Line Interface (CLI). The default community strings are "public" for SNMP GET operations and "private" for SNMP SET operations.

All switch configuration and monitoring data is now accessible via an enterprise WebOS MIB, which can be compiled into MIB-based systems such as HP-OpenView.

RFC 1573 Interface Extension MIB Compliance

Without the RFC 1573 MIB, high-speed LAN technologies such as Fast Ethernet and Gigabit Ethernet can cause frame and octet counters within the MIB-II interface to roll over in a short period of time, ruining their statistical significance.

WebOS supports the RFC 1573 MIB. This IF Extensions MIB allows for higher speed networking environments, providing 64-bit counters on many MIB-II statistics, plus roll-over counters for 32-bit counters.

Server Dual Homing

Server switching networks require the capability to employ resiliency and redundancy similar to FDDI network environments. The combination of Alteon WebSystems adapters and switches provide the Ethernet user with this capability.

For Dual Homing support, you must install two ACEnic adapters in the same host system. These adapters are configured to provide a hot-standby failover service. The switches must be configured to support Spanning-Tree on both Gigabit Ethernet ports to support the ACEnic Dual Homing capability.

Refer to your ACEnic adapter *Installation and User's Guide* for more information about this feature.

Optional Features

The following features are optional and may require additional software licences on some switches. For information on activating these features on your switch (if necessary), see "Activating Optional Software" on page 8-7.

Application Redirection Filters

Repeated client access to common web or application content across the Internet can be an inefficient use of network resources. The same filtering system that provides basic network security can also be used to intercept and redirect client traffic to cache and application servers. By redirecting client requests to a local cache or application server, you increase the speed at which clients access the information and free up valuable network bandwidth.

Server Load Balancing

With Server Load Balancing, your WebOS powered switch is aware of the shared services provided by your server pool. The switch can then balance user session traffic among the available servers. For even greater control, traffic is distributed according to a variety of user-selectable metrics.

By helping to eliminate server over-utilization, important session traffic gets through more easily, reducing user competition for connections on overworked servers.

Intelligent health checks are performed for DNS, FTP, HTTP, NNTP, POP3, IMAP, SMTP, and RADIUS services. If any server in a server pool fails, the remaining servers continue to provide access to vital applications and data. The failed server can be brought back up without interrupting access to services. As users are added and the server pool's capabilities are saturated, new servers can be added to the pool transparently.

Global Server Load Balancing

Global Server Load Balancing (GSLB), lets you balance server traffic load across multiple physical sites. This allows you to smoothly integrate the resources of a world-wide series of server sites and balance web content (or other services) intelligently among them. Alteon WebSystems' GSLB takes into account individual sites' health, response time, and geographic location for a global performance perspective.

CHAPTER 2

The Command-Line Interface

Your Alteon WebSystems' Web switch is ready to perform basic switching functions right out of the box. Some of the more advanced features, however, require some administrative configuration before they can be used effectively.

The extensive WebOS switching software included in your switch provides a variety of options for accessing and configuring the switch:

- A built-in, text-based command-line interface and menu system for access via local terminal or remote Telnet session
- A web-based management interface for interactive network access through your web browser
- SNMP support for access through network management software such as HP-OpenView

The command-line interface is the most direct method for collecting switch information and performing switch configuration. Using a basic terminal, you are presented with a hierarchy of menus that enable you to view information and statistics about the switch, and to perform any necessary configuration.

This chapter explains how to access the Command Line Interface (CLI) to the switch.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New In Release 5.2	Feature Description	Details
Layer 4 Administrator Account	In addition to the standard user and administrator accounts, a new account for Layer 4 switch administration is available.	page 2-4

Connecting to the Switch

You can access the command-line interface in two ways:

- Using a console connection via the console port
- Using a Telnet connection over the network

Establishing a Console Connection

Requirements

To establish a console connection with the switch, you will need the following:

- An ASCII terminal or a computer running terminal emulation software set to the parameters shown in the table below:

  Table 2-1 Console Configuration Parameters

Parameter	Value
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

- A standard serial cable with a male DB9 connector (see your switch hardware installation guide for specifics).

Procedure

1. **Connect the terminal to the Console port using the serial cable.**
2. **Power on the terminal.**
3. **To establish the connection, press <Enter> a few times on your terminal.**

   You will next be required to enter a password for access to the switch (see "Entering Passwords" on page 2-4).

Establishing a Telnet Connection

A Telnet connection offers the convenience of accessing the switch from any workstation connected to the network. Telnet access provides the same options for user access and administrator access as those available through the console port.

To configure the switch for Telnet access, you need to have a device with Telnet software located on the same network as the switch. The switch must have an IP address. The switch can get its IP address in one of two ways:

- Dynamically, from a BOOTP server on your network
- Manually, when you configure the switch IP address (see "Setup Part 1: Basic System Configuration" on page 3-4).

Using a BOOTP Server

By default, the WebOS software is set up to request its IP address from a BOOTP server. If you have a BOOTP server on your network, add the MAC address of the switch to the BOOTP configuration file located on the BOOTP server. The MAC address can be found on a small white label on the back panel of the switch. The MAC address can also be found in the System Information Menu (see "System Information" on page 5-3).

Running Telnet

Once the IP parameters on the switch are configured, you can access the CLI using a Telnet connection. To establish a Telnet connection with the switch, run the Telnet program on your workstation and issue the Telnet command, followed by the switch IP address:

```
telnet IP-address
```

You will next be prompted to enter a password as explained below.

If you have trouble making a Telnet connection to the switch, refer to Chapter 18, "Troubleshooting."

Entering Passwords

Once you are connected to the switch via local console or Telnet, you are prompted to enter a password. There are three levels of access to the switch: user, administrator, and Layer 4 administrator. Each level has a different password and is granted different access privileges.

NOTE – It is recommended that you change default switch passwords after initial configuration and as regularly as required under your network security policies. For more information, see "Setting Passwords" on page 3-13.

The User Account

The user has very limited control of the switch. He or she can view switch information and statistics, but can make no configuration changes. The default password for the user account is `user`.

The Administrator Account

The administrator has complete access to all menus, information, and configuration commands, including the ability to change both the user and administrator passwords. The default password for the administrator account is `admin`.

Layer 4 Administrator Account

The Layer 4 administrator has limited control of the switch. He or she can view all switch information and statistics, but can configure changes only on the Server Load Balancing menus. The default password for the Layer 4 administrator account is `l4admin`.

CLI vs. Setup

Once the administrator password is verified, you are given complete access to the switch. If the switch is still set to its factory default configuration, the system will ask whether you wish to run Setup (see Chapter 3, "First-Time Configuration"), a utility designed to help you through the first-time configuration process. If the switch has already been configured, the Main Menu of the CLI is displayed instead.

The following figure shows the Main Menu with administrator privileges.

```
[Main Menu]
        info  - Information Menu
        stats - Statistics Menu
        cfg   - Configuration Menu
        oper  - Operations Command Menu
        boot  - Boot Options Menu
        maint - Maintenance Menu
        diff  - Show pending config changes  [global command]
        apply - Apply pending config changes [global command]
        save  - Save updated config to FLASH [global command]
        exit  - Exit  [global command, always available]

>> Main#
```

Figure 2-1 Administrator Main Menu

NOTE – If you are accessing a user account or Layer 4 administrator account, some menu options will not be available.

Command-Line History and Editing

For a description of global commands, shortcuts, and command-line editing functions, see Chapter 4, "Menu Basics."

Idle Timeout

By default, the switch will disconnect your console or Telnet session after five minutes of inactivity. This function is controlled by the idle timeout parameter, which can be set from 1 to 60 minutes. For information on changing this parameter, see "Configuring System Parameters" on page 7-6.

CHAPTER 3

First-Time Configuration

To help with the initial process of configuring your switch, the WebOS software includes a Setup utility. The Setup utility prompts you step-by-step to enter all the necessary information for basic configuration of the switch.

Whenever you log in as the system administrator under the factory default configuration, you are asked whether you wish to run the Setup utility. Setup can also be activated manually from the command-line interface any time after login.

This chapter describes how to use the Setup utility and how to change system passwords.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New In Release 5.2	Feature Description	Details
Layer 4 Administrator Account	In addition to the standard user and administrator accounts, a new account for Layer 4 switch administration is available.	page 3-17

Using the Setup Utility

Information Needed For Setup

Setup requests the following information:

- Basic system information
  - Date & time
  - Whether to use BOOTP or not
  - Whether to use Spanning-Tree Protocol or not
- Optional configuration for each port
  - Speed, duplex, flow control, and negotiation mode (as appropriate)
  - Whether to use VLAN tagging or not (as appropriate)
- Optional configuration for each VLAN
  - Name of VLAN
  - Whether the VLAN uses Jumbo Frames or not
  - Which ports are included in the VLAN
- Optional configuration of IP parameters
  - IP address, subnet mask, and broadcast address, and VLAN for each IP interface
  - IP addresses for up to four default gateways
  - Destination, subnet mask, and gateway IP address for each IP static route
  - Whether IP forwarding is enabled or not
  - Whether the RIP supply is enabled or not

Starting Setup When You Log In

The Setup prompt appears automatically whenever you login as the system administrator under the factory default settings.

1. **Connect to the switch console.**

   After connecting, the login prompt will appear as shown below.

```
Enter Password:
```

2. **Enter `admin` as the default administrator password.**

   If the factory default configuration is detected, the system prompts:

```
Connected to Alteon AceSwitch 180
15:38:00 Wed June 17, 1998

The switch is booted with factory default configuration.
  To ease the configuration of the switch, a "Set Up" facility which
  will prompt you with those configuration items that are essential
  to the operation of the switch is provided.
Would you like to run "Set Up" to configure the switch? [y/n]:
```

NOTE – If the default `admin` login is unsuccessful, or if the administrator Main Menu appears instead, the system configuration has probably been changed from the factory default settings. If you are certain that you need to return the switch to its factory default settings, see "Selecting a Configuration Block" on page 9-4.

---

3. **Enter `y` to begin the initial configuration of the switch, or `n` to bypass the Setup facility.**

Stopping and Restarting Setup Manually

Stopping Setup

To abort the Setup utility, press <Ctrl-C> during any Setup question. When you abort Setup, the system will prompt:

```
Would you like to run from top again? [y/n]
```

Enter **n** to abort Setup, or **y** to restart the Setup program at the beginning.

Restarting Setup

You can restart the Setup utility manually at any time by entering the following command at the administrator prompt:

```
# /cfg/setup
```

Setup Part 1: Basic System Configuration

When Setup is started, the system prompts:

```
"Set Up" will walk you through the configuration of
  System Date and Time, BOOTP, Spanning Tree, Port Speed/Mode,
  VLANs, and IP interfaces. [type Ctrl-C to abort "Set Up"]
------------------------------------------------------------

Will you be configuring VLANs? [y/n]
```

1. **Enter y if you will be configuring VLANs. Otherwise enter n.**

   If you decide not to configure VLANs during this session, you can configure them later using the configuration menus, or by restarting the Setup facility. For more information on VLANs issues, see Chapter 11, "VLANs."

   Next, the Setup utility prompts you to input basic system information.

2. **Enter the month of the current system date at the prompt:**

   ```
   System Date:
   Enter month [6]:
   ```

   Enter the month as a number from 1 to 12. To keep the current month, press <Enter>.

3. **Enter the day of the current date at the prompt:**

   ```
   Enter day [17]:
   ```

   Enter the date as a number from 1 to 31. To keep the current day, press <Enter>.

4. **Enter the year of the current date at the prompt:**

   ```
   Enter year [99]:
   ```

   Enter the last two digits of the year as a number from 00 to 99. "00" is considered 2000. To keep the current year, press <Enter>.

   The system displays the date and time settings:

   ```
   System clock set to 13:56:52 Wed June 17, 1999.
   ```

5. **Enter the hour of the current system time at the prompt:**

   ```
   System Time:
   Enter hour in 24-hour format [13]:
   ```

   Enter the hour as a number from 00 to 23. To keep the current hour, press <Enter>.

6. **Enter the minute of the current time at the prompt:**

```
Enter minutes [56]:
```

Enter the minute as a number from 00 to 59. To keep the current minute, press <Enter>.

7. **Enter the seconds of the current time at the prompt:**

```
Enter seconds [52]:
```

Enter the seconds as a number from 00 to 59. To keep the current second, press <Enter>.

The system displays the date and time settings:

```
System clock set to 13:56:52 Wed June 17, 1999.
```

8. **Enable or disable the use of BOOTP at the prompt:**

```
BootP Option:
Current BOOTP usage:            enabled
Enter new BOOTP usage [d/e]:
```

If available on your network, a BOOTP server can supply the switch with IP parameters so that you do not have to enter them manually. BOOTP must be disabled however, before the system will prompt for IP parameters.

Enter **d** to disable the use of BOOTP, or enter **e** to enable the use of BOOTP. To keep the current setting, press <Enter>.

9. **Turn Spanning-Tree Protocol on or off at the prompt:**

```
Spanning Tree:
Current Spanning Tree setting: ON
Turn Spanning Tree OFF? [y/n]
```

Enter **y** to turn off Spanning-Tree, or enter **n** to leave Spanning-Tree on.

Setup Part 2: Port Configuration

NOTE – The port configuration options shown in these steps are for the ACEswitch 180. When configuring port options for other switches, some of the prompts and options may be different.

1. **Select the port to configure, or skip port configuration at the prompt:**

```
Port Config:
Enter port number: (1-9)
```

If you wish to change settings for individual ports, enter the number of the port you wish to configure. To skip port configuration, press <Enter> without specifying any port and go to "Setup Part 3: VLANs" on page 3-8.

2. **If appropriate, configure Ethernet/Fast Ethernet port speed.**

If you selected a port that has an Ethernet/Fast Ethernet connector, the system prompts:

```
Fast Link Configuration:
Port Speed:
Current Port 1 speed setting:   10/100
Enter new speed ["10"/"100"/"any"]:
```

Enter the port speed from the options available, or enter **any** to have the switch auto-sense the port speed. To keep the current setting, press <Enter>.

3. **If appropriate, configure Ethernet/Fast Ethernet port duplex mode.**

If you selected a port that has an Ethernet/Fast Ethernet connector, the system prompts:

```
Port Mode:
Current port 1 mode setting:     any
Enter new speed ["full"/"half"/"any"]
```

Enter **full** for full-duplex, **half** for half-duplex, or **any** to have the switch auto-negotiate. To keep the current setting, press <Enter>.

4. **If appropriate, configure Ethernet/Fast Ethernet port flow control.**

If you selected a port that has an Ethernet/Fast Ethernet connector, the system prompts:

```
Port Flow Control:
Current Port 1 flow control setting:    both
Enter new value ["rx"/"tx"/"both"/"none"]:
```

Enter **rx** to enable receive flow control, **tx** for transmit flow control, **both** to enable both, or **none** to turn flow control off for the port. To keep the current setting, press <Enter>.

5. **If appropriate, configure Ethernet/Fast Ethernet port auto-negotiation mode.**

   If you selected a port that has an Ethernet/Fast Ethernet connector, the system prompts:

```
Port Auto Negotiation:
Current Port 1 autonegotiation:         on
Enter new value ["on"/"off"]:
```

   Enter **on** to enable auto-negotiation, **off** to disable it, or press <Enter> to keep the current setting.

6. **If appropriate, configure Gigabit Ethernet port flow parameters.**

   If you selected a port that has a Gigabit Ethernet connector, the system prompts:

```
Gig Link Configuration:
Port Flow Control:
Current Port 1 flow control setting:    both
Enter new value ["rx"/"tx"/"both"/"none"]:
```

   Enter **rx** to enable receive flow control, **tx** for transmit flow control, **both** to enable both, or **none** to turn flow control off for the port. To keep the current setting, press <Enter>.

7. **If appropriate, configure Gigabit Ethernet port auto-negotiation mode.**

   If you selected a port that has a Gigabit Ethernet connector, the system prompts:

```
Port Auto Negotiation:
Current Port 1 autonegotiation:         on
Enter new value ["on"/"off"]:
```

   Enter **on** to enable port auto-negotiation, **off** to disable it, or press <Enter> to keep the current setting.

8. **If configuring VLANs, enable or disable VLAN tagging for the port.**

   If you have selected to configure VLANs back in Part 1, the system prompts:

```
Port VLAN tagging config (tagged port can be a member of multiple VLANs)
Current TAG flag:               disabled
Enter new TAG status [d/e]:
```

   Enter **d** to disable VLAN tagging for the port or enter **e** to enable VLAN tagging for the port. To keep the current setting, press <Enter>.

9. **The system prompts you to configure the next port:**

```
Enter port number: (1 to 9)
```

   When you are through configuring ports, press <Enter> without specifying any port. Otherwise, repeat the steps in this section.

Setup Part 3: VLANs

If you chose to skip VLANs configuration back in Part 1, skip to "Setup Part 4: IP Configuration" on page 3-9.

1. **Select the VLAN to configure, or skip VLAN configuration at the prompt:**

```
VLAN Config:
Enter VLAN number from 2 to 4094, NULL at end:
```

If you wish to change settings for individual VLANs, enter the number of the VLAN you wish to configure. To skip VLAN configuration, press <Enter> without typing a VLAN number and go to "Setup Part 4: IP Configuration" on page 3-9.

2. **Enter the new VLAN name at the prompt:**

```
VLAN is newly created.
Pending new VLAN name: "VLAN 2"
Enter new VLAN name, without quotes:
```

3. **Enable or disable Jumbo Frame support for the VLAN at the prompt:**

```
VLAN Jumbo Frame Support:
Current Jumbo Frame support:            disabled
Enter new Jumbo Frame support [d/e]:
```

Enter **d** to disable Jumbo Frame support for the VLAN, or enter **e** to enable Jumbo Frame support for the VLAN. To keep the current setting, press <Enter>.

4. **Enter the VLAN port numbers.**

The system prompts you to define the first port in the VLAN:

```
Define ports in VLAN:
Current VLAN 2: empty
Enter port numbers one per line, NULL at end:
```

Type the first port number to add to the current VLAN and press <Enter>. The right angle prompt appears:

```
>
```

For each additional port in the VLAN, type the port number and press <Enter> to move to the next line. Repeat this until all ports for the VLAN being configured are entered. When you are finished adding ports to this VLAN, press <Enter> without specifying any port.

5. **The system prompts you to configure the next VLAN:**

```
VLAN Config:
Enter VLAN number from 2 to 4094, NULL at end:
```

Repeat the steps in this section until all VLANs have been configured. When all VLANs have been configured, press <Enter> without specifying any VLAN.

Setup Part 4: IP Configuration

If BOOTP was enabled back in Part 1, skip to "Setup Part 5: Final Steps" on page 3-12. Otherwise, if you disabled BOOTP, the system prompts for IP parameters.

IP Interfaces

IP interfaces are used for defining subnets to which the switch belongs.

Up to 256 IP interfaces can be configured on the switch. The IP address assigned to each IP interface provide the switch with an IP presence on your network. No two IP interfaces can be on the same IP subnet. The interfaces can be used for connecting to the switch for remote configuration, and for routing between subnets and VLANs (if used).

1. **Select the IP interface to configure, or skip interface configuration at the prompt:**

```
IP Config:

IP interfaces:
Enter interface number: (1-256)
```

If you wish to configure individual IP interfaces, enter the number of the IP interface you with to configure. To skip IP interface configuration, press <Enter> without typing an interface number and go to "Default Gateways" on page 3-10.

2. **For the specified IP interface, enter the IP address in dotted decimal notation:**

```
Current IP address:     0.0.0.0
Enter new IP address:
```

To keep the current setting, press <Enter>.

3. **At the prompt, enter the IP subnet mask in dotted decimal notation:**

```
Current subnet mask:            0.0.0.0
Enter new subnet mask:
```

To keep the current setting, press <Enter>.

4. **At the prompt, enter the broadcast IP address in dotted decimal notation:**

```
Current broadcast address:      0.0.0.0
Enter new broadcast address:
```

To keep the current setting, press <Enter>.

5. **If configuring VLANs, specify a VLAN for the interface.**

This prompt appears if you selected to configure VLANs back in Part 1:

```
Current VLAN:     1
Enter new VLAN:
```

Enter the number for the VLAN to which the interface belongs, or press <Enter> without specifying a VLAN number to accept the current setting.

6. **At the prompt, enter `y` to enable the IP interface, or `n` to leave it disabled**:

```
Enable IP interface? [y/n]
```

7. **The system prompts you to configure another interface:**

```
Enter interface number: (1-256)
```

Repeat the steps in this section until all IP interfaces have been configured. When all interfaces have been configured, press <Enter> without specifying any interface number.

Default Gateways

1. **At the prompt, select a default gateway for configuration, or skip default gateway configuration:**

```
IP default gateways:
Enter default gateway number: (1-4)
```

Enter the number for the default gateway to be configured. To skip default gateway configuration, press <Enter> without typing a gateway number and go to "IP Routing" on page 3-11.

2. **At the prompt, enter the IP address for the selected default gateway:**

```
Current IP address:     0.0.0.0
Enter new IP address:
```

Enter the IP address in dotted decimal notation, or press <Enter> without specifying an address to accept the current setting.

3. **At the prompt, enter y to enable the default gateway, or n to leave it disabled:**

```
Enable default gateway? [y/n]
```

4. **The system prompts you to configure another default gateway:**

```
Enter default gateway number: (1-4)
```

Repeat the steps in this section until all default gateways have been configured. When all default gateways have been configured, press <Enter> without specifying any number.

IP Routing

When IP interfaces are configured for the various subnets attached to your switch, IP routing between them can be performed entirely within the switch. This eliminates the need to bounce inter-subnet communication off an external router device. Routing on more complex networks, where subnets may not have a direct presence on the switch, can be accomplished through configuring static routes or by letting the switch learn routes dynamically.

This part of the Setup program prompts you to configure the various routing parameters.

1. **At the prompt, enable or disable forwarding for IP Routing:**

```
Enable IP forwarding? [y/n]
```

Enter **y** to enable IP forwarding. To disable IP forwarding, enter **n** and proceed to Step 2.To keep the current setting, press <Enter>.

2. **At the prompt, enable or disable the RIP supply:**

```
Enable RIP supply? [y/n]
```

If your network uses Routing Interface Protocol (RIP), enter **y** to enable the RIP supply. Otherwise, enter **n** to disable it. When RIP is enabled, RIP listen is set by default.

Setup Part 5: Final Steps

1. **When prompted, decide whether to restart Setup or continue:**

```
Would you like to run from top again? [y/n]
```

Enter **y** to restart the Setup utility from the beginning, or **n** to continue.

2. **When prompted, decide whether you wish to review the configuration changes:**

```
Review the changes made? [y/n]
```

Enter **y** to review the changes made during this session of the Setup utility. Enter **n** to continue without reviewing the changes. We recommend that you review the changes.

3. **Next, decide whether to apply the changes at the prompt:**

```
Apply the changes? [y/n]
```

Enter **y** to apply the changes, or **n** to continue without applying. Changes are normally applied.

4. **At the prompt, decide whether to make the changes permanent:**

```
Save changes to flash? [y/n]
```

Enter **y** to save the changes to flash. Enter **n** to continue without saving the changes. Changes are normally saved at this point.

5. **If you do not apply or save the changes, the system prompts whether to abort them:**

```
Abort all changes? [y/n]
```

Enter **y** to discard the changes. Enter **n** to return to the "`Apply the changes?`" prompt.

NOTE – After initial configuration is complete, it is recommended that you change the default passwords as shown in the following section.

Setting Passwords

It is recommended that you change the user and administrator passwords after initial configuration and as regularly as required under your network security policies.

To change both the user password and the administrator password, you must login using the administrator password. Passwords cannot be modified from the user command mode.

NOTE – If you forget your administrator password, call your technical support representative for help using the password fix-up mode.

Changing the Default Administrator Password

The administrator has complete access to all menus, information, and configuration commands, including the ability to change both the user and administrator passwords.

The default password for the administrator account is `admin`. To change the default password, follow this procedure:

1. **Connect to the switch and log in using the `admin` password.**
2. **From the Main Menu, use the following command to access the Configuration Menu:**

```
Main# cfg
```

The Configuration Menu is displayed

```
[Configuration Menu]
        sys   - System-wide parameter menu
        port  - Port configuration menu
        ip    - IP configuration menu
        vlan  - VLAN configuration menu
        stp   - Spanning Tree menu
        snmp  - SNMP menu
        setup - Step by step configuration set up
        dump  - Dump current configuration to script file
        mirr  - Mirroring menu
        slb   - Server Load Balancing configuration menu
        trunk - Trunk Group configuration menu

>> Configuration#
```

3. **From the Configuration Menu, use the following command to select the System Menu:**

```
>> Configuration# sys
```

The System Menu is displayed

```
[System Menu]
        date  - Set system date
        time  - Set system time
        usrpw - Set user password
        admpw - Set administrator password
        l4apw - Set L4 administrator password
        idle  - Set timeout for idle CLI sessions
        tnet  - Enable/disable Telnet access
        bootp - Enable/disable use of BOOTP
        http  - Enable/disable HTTP (Web) access
        wport - Set Web server port number
        bannr - Set login banner
        mnet  - Set management network
        mmask - Set management netmask
        cur   - Display current system-wide parameters
>> System#
```

4. **Select the administrator password by entering `admpw` at the `System#` prompt.**

```
System# admpw
```

5. **Enter the current administrator password at the prompt:**

```
Changing ADMINISTRATOR password; validation required...
Enter current administrator password:
```

NOTE – If you forget your administrator password, call your technical support representative for help using the password fix-up mode.

6. **Enter the new administrator password at the prompt:**

```
Enter new administrator password:
```

7. **Enter the new administrator password, again, at the prompt:**

```
Re-enter new administrator password:
```

8. **Apply and save your change by entering the following commands:**

```
System# apply
System# save
```

Changing the Default User Password

The user login has limited control of the switch. Through a user account, you can view switch information and statistics, but you can't make configuration changes.

The default password for the user account is `user`. This password cannot be changed from the user account. Only the administrator has the ability to change passwords, as shown in the following procedure.

1. **Connect to the switch and log in using the `admin` password.**

2. **From the Main Menu, use the following command to access the Configuration Menu:**

```
Main# cfg
```

The Configuration Menu is displayed

```
[Configuration Menu]
        sys   - System-wide parameter menu
        port  - Port configuration menu
        ip    - IP configuration menu
        vlan  - VLAN configuration menu
        stp   - Spanning Tree menu
        snmp  - SNMP menu
        setup - Step by step configuration set up
        dump  - Dump current configuration to script file
        mirr  - Mirroring menu
        slb   - Server Load Balancing configuration menu
        trunk - Trunk Group configuration menu

>> Configuration#
```

3. **From the Configuration Menu, use the following command to select the System Menu:**

```
>> Configuration# sys
```

The System Menu is displayed.

```
[System Menu]
        date  - Set system date
        time  - Set system time
        usrpw - Set user password
        admpw - Set administrator password
        l4apw - Set L4 administrator password
        idle  - Set timeout for idle CLI sessions
        tnet  - Enable/disable Telnet access
        bootp - Enable/disable use of BOOTP
        http  - Enable/disable HTTP (Web) access
        wport - Set Web server port number
        bannr - Set login banner
        mnet  - Set management network
        mmask - Set management netmask
        cur   - Display current system-wide parameters
>> System#
```

4. **Select the user password by entering `usrpw` at the `System#` prompt.**

```
System# usrpw
```

5. **Enter the current administrator password at the prompt.**

   Only the administrator can change the user password. Entering the administrator password confirms your authority.

```
Changing USER password; validation required...
Enter current administrator password:
```

6. **Enter the new user password at the prompt:**

```
Enter new user password:
```

7. **Enter the new user password, again, at the prompt:**

```
Re-enter new user password:
```

8. **Apply and save your changes:**

```
System# apply
System# save
```

Changing the Default Layer 4 Administrator Password

The Layer 4 administrator has limited control of the switch. Through a Layer 4 administrator account, you can view all switch information and statistics, but can configure changes only on the Server Load Balancing menus.

The default password for the Layer 4 administrator account is `l4admin`. To change the default password, follow this procedure:

1. **Connect to the switch and log in using the administrator account.**

   To change any switch password, you must login using the administrator password. Passwords cannot be modified from the Layer 4 administrator account or the user account.

2. **From the Main Menu, use the following command to access the System Menu:**

```
Main# /cfg/sys
```

   The System Menu is displayed.

```
[System Menu]
        date  - Set system date
        time  - Set system time
        usrpw - Set user password
        admpw - Set administrator password
        l4apw - Set L4 administrator password
        idle  - Set timeout for idle CLI sessions
        tnet  - Enable/disable Telnet access
        bootp - Enable/disable use of BOOTP
        http  - Enable/disable HTTP (Web) access
        wport - Set Web server port number
        bannr - Set login banner
        mnet  - Set management network
        mmask - Set management netmask
        cur   - Display current system-wide parameters
>> System#
```

3. **Select the Layer 4 administrator password:**

```
System# l4apw
```

4. **Enter the current *administrator* password (not the Layer 4 administrator password) at the prompt:**

```
Changing L4 ADMINISTRATOR password; validation required...
Enter current administrator password:
```

NOTE – If you forget your administrator password, call your technical support representative for help using the password fix-up mode.

5. **Enter the new Layer 4 administrator password at the prompt:**

```
Enter new L4 administrator password:
```

6. **Enter the new administrator password, again, at the prompt:**

```
Re-enter new L4 administrator password:
```

7. **Apply and save your change by entering the following commands:**

```
System# apply
System# save
```

Part 2: The Menu System

050044B, July 1999

Alteon WebSystems
Web Speed for e-Business

CHAPTER 4

Menu Basics

The switch's command-line interface (CLI) is used for viewing switch information and statistics. In addition, the administrator can use the CLI for performing all levels of switch configuration.

To make the CLI easy to use, the various commands have been logically grouped into a series of menus and sub-menus. Each menu displays a list of commands and/or sub-menus that are available, along with a summary of what each command will do. Below each menu is a prompt where you can enter any command appropriate to the current menu.

This chapter describes the Main Menu commands, and provides a list of commands and shortcuts that are commonly available from all the menus within the CLI.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New In Release 5.2	Feature Description	Details
Command Line History and Editing	Using the command-line interface, you can retrieve and modify previously entered commands with just a few keystrokes.	page 4-5
Tab Completion for Commands and Options	By entering the first letter of a command at the prompt, the command line interface will display all commands starting with that letter.	page 4-6

The Main Menu

The Main Menu appears after a successful connection and login. Figure 4-1 shows the Main Menu for the administrator login. Some features are not available under the user login.

```
[Main Menu]
        info  - Information Menu
        stats - Statistics Menu
        cfg   - Configuration Menu
        oper  - Operations Command Menu
        boot  - Boot Options Menu
        maint - Maintenance Menu
        diff  - Show pending config changes  [global command]
        apply - Apply pending config changes [global command]
        save  - Save updated config to FLASH [global command]
        exit  - Exit  [global command, always available]

>> Main#
```

Figure 4-1 Administrator Main Menu

Menu Summary

- **Information Menu**

  Provides sub-menus for displaying information about the current status of the switch: from basic system settings to VLANs, Layer 4 settings, and more.

- **Statistics Menu**

  Provides sub-menus for displaying switch performance statistics. Included are port, IF, IP, ICMP, TCP, UDP, SNMP, routing, ARP, DNS, VRRP, and Layer 4 statistics.

- **Configuration Menu**

  This menu is available only from an administrator login. It includes sub-menus for configuring every aspect of the switch. Changes to configuration are not active until explicitly applied. Changes can be saved to non-volatile memory.

- **Operations Command Menu**

  This menu is available only from an administrator login. Operations-level commands are used for making immediate and temporary changes to switch configuration. This menu is used for bringing ports temporarily in and out of service, performing port mirroring, and enabling or disabling Server Load Balancing functions. It is also used for activating or deactivating optional software packages.

- **Boot Options Menu**

  This menu is available only from an administrator login. It is used for upgrading switch software, selecting configuration blocks, and for resetting the switch when necessary.

- **Maintenance Menu**

  This menu is available only from an administrator login. This menu is used for debugging purposes, enabling you to generate a dump of the critical state information in the switch, and to clear entries in the forwarding database and the ARP and routing tables.

Menu Map

Figure 4-2 illustrates the administrator menu hierarchy.

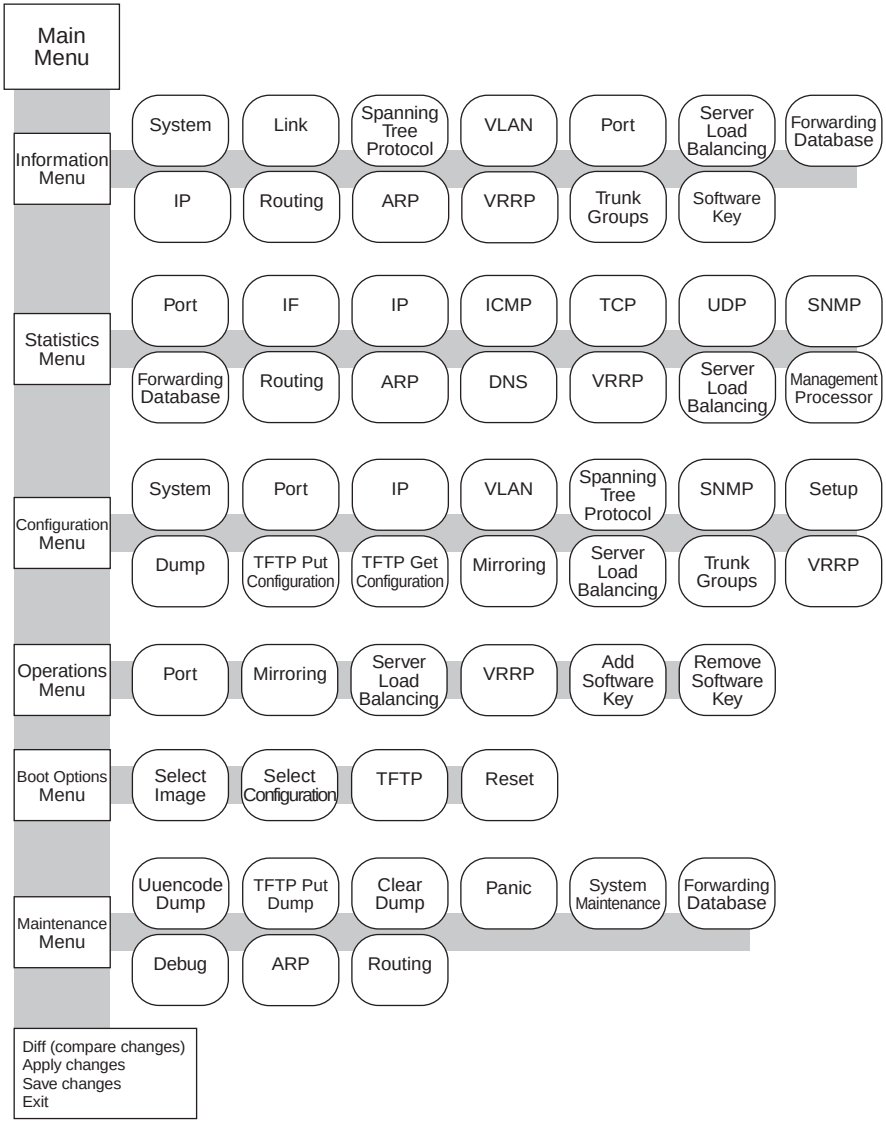


Figure 4-2 Administrator Menu Hierarchy

Global Commands

Some basic commands are recognized throughout the menu hierarchy. These commands are useful for obtaining online help, navigating through menus, and for applying and saving configuration changes:

Table 4-1 Global Commands

Command	Action
? *command*	Provides more information about a specific command on the current menu. When used without the *command* parameter, a summary of the global commands is displayed.
.	Display the current menu.
..	Go up one level in the menu structure.
/	If placed at the beginning of a command, go to the Main Menu. Otherwise, this is used to separate multiple commands placed on the same line.
diff	Show any pending configuration changes.
apply	Apply pending configuration changes.
save	Write configuration changes to non-volatile flash memory.
exit	Exit from the command-line interface and log out.
ping	Use this command to verify station-to-station connectivity across the network. The format is as follows: **ping** *address* [*tries* [*delay*]] Where *address* is the hostname or IP address of the device, *tries* (optional) is the number of attempts (1-32), and *delay* (optional) is the number of milliseconds between attempts. The DNS parameters must be configured if specifying hostnames (see "Domain Name System Menu" on page 7-21).
traceroute	Use this command to identify the route used for station-to-station connectivity across the network. The format is as follows: **traceroute** *address* [*max-hops* [*delay*]] Where *address* is the hostname or IP address of the target station, *max-hops* (optional) is the maximum distance to trace (1-16 devices), and *delay* (optional) is the number of milliseconds for wait for the response. As with `ping`, the DNS parameters must be configured if specifying hostnames.
pwd	Display the command path used to reach the current menu.
lines *n*	Set the number of lines (*n*) that display on the screen at one time; the default is 24 lines. When used without a value, the current setting is displayed.

Table 4-1 Global Commands

Command	Action
verbose *n*	Sets the level of information displayed on the screen: **0** = Quiet: Nothing appears except errors—not even prompts. **1** = Normal: Prompts and requested output are shown, but no menus. **2** = Verbose: Everything is shown. When used without a value, the current setting is displayed.

Command-Line History and Editing

Using the command-line interface, you can retrieve and modify previously entered commands with just a few keystrokes. The following options are available globally at the command line:

Table 4-2 Command-Line History and Editing Options

Option	Description
history	Display a numbered list of the last 10 previously entered commands.
!!	Repeat the last entered command.
!*n*	Repeat the n^{th} command shown on the history list.
<Ctrl-p>	(Also the up arrow key.) Recall the *previous* command from the history list. This can be used multiple times to work backward through the last 10 commands. The recalled command can be entered as is, or edited using the options below.
<Ctrl-n>	(Also the down arrow key.) Recall the *next* command from the history list. This can be used multiple times to work forward through the last 10 commands. The recalled command can be entered as is, or edited using the options below.
<Ctrl-a>	Move the cursor to the beginning of command line.
<Ctrl-e>	Move cursor to the *end* of the command line.
<Ctrl-b>	(Also the left arrow key.) Move the cursor *back* one position to the left.
<Ctrl-f>	(Also the right arrow key.) Move the cursor *forward* one position to the right.
<Backspace>	(Also the Delete key.) Erase one character to the left of the cursor position.
<Ctrl-d>	*Delete* one character at the cursor position.
<Ctrl-k>	*Kill* (erase) all characters from the cursor position to the end of the command line.
<Ctrl-l>	Redraw the screen.

Table 4-2 Command-Line History and Editing Options

Option	Description
<Ctrl-u>	Clear the entire line.
Other keys	Insert new characters at the cursor position.

Command-Line Interface Shortcuts

Command Stacking

As a shortcut, you can type multiple commands on a single line, separated by forward slashes (/). You can connect as many commands as required to access the menu option that you want. For example, the keyboard shortcut to access the Spanning Tree Port Configuration Menu from the Main# prompt is as follows:

```
Main# cfg/stp/port
```

Command Abbreviation

Most commands can be abbreviated by entering the first characters which distinguish the command from the others in the same menu or sub-menu. For example, the command shown above could also be entered as follows:

```
Main# c/st/p
```

Tab Completion

By entering the first letter of a command at any menu prompt and hitting <Tab>, the CLI will display all commands or options in that menu that begin with that letter. Entering additional letters will further refine the list of commands or options displayed. If only one command fits the input text when <Tab> is pressed, that command will be supplied on the command line, waiting to be entered. If the <Tab> key is pressed without any input on the command line, the currently active menu will be displayed.

CHAPTER 5

The Information Menu

You can view configuration information for the switch in both the user and administrator command modes. This chapter discusses how to use the command-line interface to display switch information.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New in Release 5.2	Feature Description	See
VRRP	When virtual routers are configured, you can use this command to view information for each virtual router.	page 5-18
Information Dump	To help you gather data for tuning and debugging switch performance, a new **`/info/dump`** command has been added.	page 5-20

Accessing the Information Menu

The Information Menu can be accessed from the Main Menu using the following command:

```
Main# info
```

The Information Menu is displayed:

```
[Information Menu]
        sys   - Show system information
        link  - Show link status
        stp   - Show STP information
        vlan  - Show VLAN information
        port  - Show port information
        slb   - Show Server Load Balancing information
        fdb   - Forwarding Database information menu
        ip    - Show IP information
        route - IP routing information menu
        arp   - ARP information menu
        vrrp  - Virtual Router Redundancy Protocol Information
        trunk - Show Trunk Group information
        swkey - Show enabled software features
        dump - Dumps all switch information available from the
               Information Menu (10K or more, depending on your
                configuration)

>> Information#
```

Each of these options is discussed in greater detail in the following sections.

NOTE – The sample screens shown in this chapter represent ACEswitch 180 information. Screens, menus, and parameters for other Alteon WebSystems' switches may be slightly different.

System Information

Direct command: **/info/sys**

System information includes:

- System date and time
- Switch model name and number
- Switch name and location
- Time of last boot
- MAC address of the switch management processor
- IP address of IP interface #1
- Hardware version and part number
- Software image file and version number
- Configuration name
- Log-in banner, if one is configured

To view system information, at the `Information#` prompt, enter:

```
Information# sys
```

The system information is displayed:

```
System Information at 16:20:42 Wed Jan 28, 1998

Alteon ACEswitch 180
sysName:       Finance Switch
sysLocation:   Building 3A
Last boot: 15:57:56 Tue Jan 27, 1998 (reset from console)

MAC address: 00:60:cf:11:22:30    IP (If 1) address: 200.10.17.1
Hardware Revision: 2
Hardware Part No: 200009A00
Software Version 5.2.5 (FLASH image1), active configuration
Banner: SLB Switch 01, Southwest Territory

>>Information#
```

Link Status

Direct command: **`/info/link`**

Link status displays configuration information about each port, including:

- Port number
- Port speed (10, 100, 10/100, or 1000)
- Duplex mode (half, full, or auto)
- Flow control for transmit and receive (no, yes, or auto)
- Link status (up or down)

To see the status of the switch ports, at the `Information#` prompt, enter:

```
Information# link
```

The current link status is displayed:

```
Port   Speed    Duplex     Flow Ctrl      Link
----   -----   --------  --TX-----RX--   ------
  1     1000     full     yes    yes       up
  2     1000     full     yes    yes       up
  3     1000     full     yes    yes       up
  4     1000     full     yes    yes      down
  5      100     full     yes    yes       up
  6       10     half      no     no       up
  7     1000     full     yes    yes      down
  8     1000*    full*    yes*    no*      up
  9     1000     full     yes    yes       up
* = value set by configuration; not autonegotiated.

>> Information#
```

Spanning-Tree Protocol Information

Direct command: **/info/stp**

The switch software uses the IEEE 802.1d Spanning-Tree Protocol (STP). In addition to seeing if STP is enabled or disabled, you can view the following STP bridge information:

- Priority
- Hello interval
- Maximum age value
- Forwarding delay
- Aging time

You can also see the following port-specific STP information:

- Port number and priority
- Cost
- State

To view STP information, at the `Information#` prompt, enter:

```
Information# stp
```

The current STP information is displayed:

```
Current Root:            Path-Cost Port Hello MaxAge FwdDel Aging
 8000 00:60:47:92:7e:00      100     6    2     20     15    300

Parameters:  Priority  Hello  MaxAge  FwdDel  Aging
              32768      2      20      15     300

Port  Priority   Cost      State
  1     128       10     FORWARDING
  2     128        0     FORWARDING*
  3     128        0      DISABLED *
  4     128        0      DISABLED
  5     128        5     FORWARDING
  6     128        0      DISABLED
  7     128        0      DISABLED
  8     128        0      DISABLED
  9     128        1     FORWARDING
* = STP turned off for this port.

>> Information#
```

The following table describes the STP parameters.

Table 5-1 Spanning Tree Parameter Descriptions

Parameter	Description
`Priority` (bridge)	The bridge priority parameter controls which bridge on the network will become the STP root bridge.
`Hello`	The hello time parameter specifies, in seconds, how often the root bridge transmits a configuration bridge protocol data unit (BPDU). Any bridge that is not the root bridge uses the root bridge hello value.
`MaxAge`	The maximum age parameter specifies, in seconds, the maximum time the bridge waits without receiving a configuration bridge protocol data unit before it reconfigures the STP network.
`FwdDel`	The forward delay parameter specifies, in seconds, the amount of time that a bridge port has to wait before it changes from learning state to forwarding state.
`Aging`	The aging time parameter specifies, in seconds, the amount of time the bridge waits without receiving a packet from a station before removing the station from the Forwarding Database.
`priority` (port)	The port priority parameter helps determine which bridge port becomes the designated port. In a network topology that has multiple bridge ports connected to a single segment, the port with the lowest port priority becomes the designated port for the segment.
`Cost`	The port path cost parameter is used to help determine the designated port for a segment. Generally speaking, the faster the port, the lower the path cost. A setting of 0 indicates that the cost will be set to the appropriate default after the link speed has been autonegotiated.
`State`	The state field shows the current state of the port. The state field can be either; `BLOCKING`, `LISTENING`, `LEARNING`, `FORWARDING`, or `DISABLED`.

VLAN Information

Direct command: **/info/vlan**

VLAN information includes:

- VLAN Number
- VLAN Name
- Status
- Jumbo Frame usage
- Port membership of the VLAN

To view VLAN information for all VLANs, at the Information# prompt, enter:

```
Information# vlan
```

The current VLAN information is displayed:

```
VLAN                Name                Status Jumbo  Ports
----  --------------------------------- ------ -----  -------------
1     Default VLAN                        ena    n    6-10
1000  Engineering                         ena    n    4 5
4094  Marketing                           ena    n    1-3

>> Information#
```

To view VLAN information for a particular VLAN, at the Information# prompt, enter the VLAN number. For example:

```
Information# vlan 4094
```

The information for the selected VLAN is displayed:

```
VLAN                Name                Status Jumbo  Ports
----  --------------------------------- ------ -----  -------------
4094  Marketing                           ena    n    1-3

>> Information#
```

Port Information

Direct command: **`/info/port`**

Port information includes:

- Port number
- Whether the port uses VLAN Tagging or not
- Port VLAN ID (PVID)
- Port name
- VLAN membership

To view port information, at the `Information#` prompt, enter:

```
Information# port
```

The port information is displayed:

```
Port  Tag  PVID       NAME                  VLAN(s)
----  ---  ----  -------------------  ----------------------------
  1         4094  ACEdirector     4094
  2         4094  ACME hub        4094
  3         4094  ACME router     4094
  4         1000  web-cache 1     1000
  5         1000  web-cache 2     1000
  6            1                     1
  7            1                     1
  8            1  ugroup 1           1
  9            1  ugroup 2           1

>> Information#
```

Server Load Balancing Information

Direct command: **/info/slb**

Server Load Balancing information includes the following:

- Global Server Load Balancing State

  Remote switch number, remote switch IP address, IP subnet mask, and health status.

- Real Server State

  Real server number, real IP address, MAC address, VLAN, physical switch port, layer where health check is performed, and health check result.

- Virtual Server State

  Virtual server number, virtual IP address, virtual MAC address

- Virtual Port State

  Virtual service or port, server port mapping, real server group, group backup server.

- Redirection Filter States

  Filter number, destination port, real server port, real server group, health check layer, group backup server, URL for health checks, and real server group, IP address, backup server, and status.

- Port State

  Physical port number, proxy IP address, filter status, a list of applied filters, and client and/or server Layer 4 activity.

To view Server Load Balancing information, at the `Information#` prompt, enter:

```
Information# slb
```

The Server Load Balancing information is displayed.

```
Global SLB state:
  1: 220.3.78.3,  0.0.0.0,         FAILED

Real server state:
 20: 10.10.10.20, 08:00:20:7f:6b:35, vlan 2,port 2, health 3, FAILED
 21: 10.10.10.21, 08:00:20:0a:a7:7f, vlan 2,port 2, health 4, up

Virtual server state:
  1: 10.10.10.3,  00:60:cf:40:07:8e, dname mycompany.com
    virtual ports:
    http: rport http, group 1, backup none, content /, hname www
        real servers:
          1: 10.10.10.20,   backup none, remote, FAILED
   telnet: rport telnet, group 2, backup none
        real servers:
          3: 10.10.10.8,    backup none, up

Redirection filter state:
  1: dport http, rport http, group 1, health 4, backup none, cnt /
    real servers:
     20: 10.10.10.20,     backup none, FAILED
     21: 10.10.10.21,     backup none, up
  2: dport any, rport 0, group 1, health 3, backup none
    real servers:
     20: 10.10.10.20,     backup none, FAILED
     21: 10.10.10.21,     backup none, up

Port state:
  1: 0.0.0.0
     filt disabled, filters: empty
  2: 0.0.0.0
     filt disabled, filters: empty
  3: 0.0.0.0
     filt disabled, filters: empty
  4: 0.0.0.0
     filt disabled, filters: empty
  5: 0.0.0.0
     filt disabled, filters: empty

>> Information#
```

Forwarding Database Information Menu

Direct command: **/info/fdb**

The forwarding database (FDB) contains information that maps the media access control (MAC) address of each known device to the switch port where the device address was learned. The FDB also shows which other ports have seen frames destined for a particular MAC address.

NOTE – The master forwarding database supports up to 8192 MAC address entries per switch. Each switch port supports up to 4096 entries.

To access the Forwarding Database Menu, at the `Information#` prompt, enter:

```
Information# fdb
```

The Forwarding Database Menu is displayed:

```
[Forwarding Database Menu]
        find  - Show a single FDB entry by MAC address
        port  - Show FDB entries on a single port
        vlan  - Show FDB entries on a single VLAN
        refpt - Show FDB entries referenced by a single port
        dump  - Show all FDB entries

>> Forwarding Database#
```

Show a single FDB entry by MAC address

Direct command: **/info/fdb/find** *MAC-address*

To view information for a particular FDB entry, at the `Forwarding Database#` prompt, enter:

```
Forwarding Database# find
```

You are prompted to enter the MAC address of the device. Enter the MAC address using the format, `xx:xx:xx:xx:xx:xx`. For example, `08:00:20:12:34:56`.

You can also enter the MAC address using the format, `xxxxxxxxxxxx`. For example, `080020123456`.

Show FDB entries on a single port

Direct command: **/info/fdb/port** *port-number*

To show the FDB entries for a particular port, at the Forwarding Database# prompt, enter:

```
Forwarding Database# port port-number
```

Show all FDB entries

Direct command: **/info/fdb/dump**

To show all FDB entries, at the Forwarding Database# prompt, enter:

```
Forwarding Database# dump
```

The current FDB information is displayed:

```
   MAC Address      VLAN  Port  State  Referenced ports...
-----------------   ----  ----  -----  ----------------
00:a0:24:76:be:90     1     1    FWD    1 4
08:00:20:0a:a7:7f     1     2    FWD    2 3
08:00:20:73:b6:29     1     1    FWD    1 2
08:00:20:82:4d:8d     1     3    FWD    3 4
08:00:20:8a:54:2b     1          UNK    1

>> Forwarding Database#
```

An address that is in the forwarding (FWD) state, means that it has been learned by the switch. When in the trunking (TRK) state, the port field represents the trunk group number. If the state for the port is listed as unknown (UNK), the MAC address has not yet been learned by the switch, but has only been seen as a destination address. When an address is in the unknown state, no outbound port is indicated, although ports which reference the address as a destination will be listed under "Reference ports."

If the state for the port is listed as an interface (IF), the MAC address is for a standard VRRP virtual router. If the state is listed as a virtual server (VIP), the MAC address is for a virtual server router; that is, a virtual router with the same IP address as a virtual server.

Clearing entries from the Forwarding Database

To delete a MAC address from the FDB or to clear the entire FDB refer to "The FDB Manipulation Menu" on page 10-5.

IP Information

Direct command: **`/info/ip`**

IP information includes:

- IP interface information: Interface number, IP address, subnet mask, broadcast address, VLAN number, and operational status.
- Default gateway information: Metric for selecting which configured gateway to use, gateway number, IP address, and health status
- IP forwarding information: Enable status, `lnet` and `lmask`
- Port status
- RIP1 information: enable status, update period, and active modes
- DNS information: primary and secondary DNS IP address, and default domain name.

To view IP information, at the `Information#` prompt, enter:

```
Information# ip
```

The IP information is displayed:

```
Interface information:
  1: 10.10.10.52,   255.255.255.0,   10.10.10.255,  vlan 1, up
Default gateway information: metric strict
  1: 10.10.10.226,  up
Current IP forwarding settings:
  OFF, lnet 0.0.0.0, lmask 0.0.0.0
Current IP port settings:
  1: ON
  2: ON
  3: ON
  4: ON
  5: ON
  6: ON
  7: ON
  8: ON
  9: ON
Current RIP settings:
  ON, update 30, LISTEN, DEFAULT, STATIC
  split horizon with poisoned reverse
Current DNS settings:
  10.10.10.200, 10.10.10.254, mycompany.com

>> Information#
```

IP Routing Information Menu

Direct command: **/info/route**

Routing information displays the following for each configured or learned route:

- Route destination IP address, subnet mask, and gateway address
- Type of route
- Tag indicating origin of route
- Metric for RIP tagged routes, specifying the number of hops to the destination (1-15 hops, or 16 for infinite hops)
- The IP interface that the route uses

To access the IP Routing Menu, at the `Information#` prompt, enter:

```
Information# route
```

The IP Routing Menu is displayed:

```
[IP Routing Menu]
        find  - Show a single route by destination IP address
        gw    - Show routes to a single gateway
        type  - Show routes of a single type
        tag   - Show routes of a single tag
        if    - Show routes on a single interface
        dump  - Show all routes

>> IP Routing#
```

You can display all IP routes currently held in the switch, or a portion according to one of the parameters listed on the menu.

Show All Routes

Direct command: **/info/route/dump**

To show all IP routes configured in the switch, at the `IP Routing#` prompt, enter:

```
IP Routing# dump
```

The IP route information is displayed:

```
  Destination         Mask          Gateway        Type      Tag     Mc If
--------------- --------------- --------------- --------- --------- -- --
0.0.0.0         0.0.0.0         205.178.13.226  indirect  static       1
0.0.0.0         255.0.0.0       0.0.0.0         martian   martian
10.0.0.0        255.0.0.0       205.178.13.15   indirect  rip        2  1
127.0.0.0       255.0.0.0       0.0.0.0         martian   martian
192.192.0.0     255.255.255.0   205.178.13.247  indirect  rip        2  1
192.192.192.0   255.255.255.0   205.178.13.2    indirect  rip        2  1
205.178.13.0    255.255.255.0   205.178.13.52   direct    fixed        1
205.178.13.52   255.255.255.255 205.178.13.52   local     addr         1
205.178.13.255  255.255.255.255 205.178.13.255  broadcast broadcast    1
205.178.14.0    255.255.255.0   205.178.13.204  indirect  rip        2  1
208.200.21.0    255.255.255.0   205.178.13.226  indirect  rip        2  1
224.0.0.0       224.0.0.0       0.0.0.0         martian   martian
255.255.255.255 255.255.255.255 255.255.255.255 broadcast broadcast

>> IP Routing#
```

The following table describes the `Type` parameters.

Table 5-2 IP Routing Type Parameters

Parameter	Description
`indirect`	The next hop to the host or subnet destination will be forwarded through a router at the `Gateway` address.
`direct`	Packets will be delivered to a destination host or subnet attached to the switch.
`local`	Indicates a route to one of the switch's IP interfaces.
`broadcast`	Indicates a broadcast route.
`martian`	The destination belongs to a host or subnet which is filtered out. Packets to this destination are discarded.
`multicast`	Indicates a multicast route.

The following table describes the `Tag` parameters.

Table 5-3 IP Routing Tag Parameters

Parameter	Description
`fixed`	The address belongs to a host or subnet attached to the switch.
`static`	The address is a static route which has been configured on the switch.
`icmp`	The address was learned via ICMP.
`snmp`	This address was configured through SNMP.
`addr`	The address belongs to one of the switch's IP interfaces.
`rip`	The address was learned by the Routing Information Protocol (RIP).
`broadcast`	Indicates a broadcast address.
`martian`	The address belongs to a filtered group.
`multicast`	Indicates a multicast address.

ARP Information Menu

Direct command: **`/info/arp`**

To access the Address Resolution Protocol (ARP) Menu, at the `Information#` prompt, enter:

```
Information# arp
```

The Address Resolution Protocol Menu is displayed:

```
[Address Resolution Protocol Menu]
        find  - Show a single ARP entry by IP address
        port  - Show ARP entries on a single port
        vlan  - Show ARP entries on a single VLAN
        refpt - Show ARP entries referenced by a single port
        dump  - Show all ARP entries

>> Address Resolution Protocol#
```

You can display all ARP entries currently held in the switch, or a portion according to one of the parameters listed on the menu.

Show All ARP Entries

Direct command: **`/info/arp/dump`**

The ARP information includes the following:

- IP address and MAC address of each entry
- Address status flag (see below)
- The VLAN and port to which the address belongs
- The ports which have referenced the address (empty if no port has routed traffic to the IP address shown).

To show all ARP entries in the switch, at the `Address Resolution Protocol#` prompt, enter:

```
Address Resolution Protocol# dump
```

The ARP information is displayed:

```
     IP address     Flags    MAC address     VLAN Port Referenced ports
   ---------------- ----- ----------------- ---- ---- ----------------
   205.178.13.41      P 4 00:60:cf:40:07:81        1   1-9
   205.178.13.54      P 4 00:60:cf:40:07:8e        1   1-9
   205.178.13.163         00:a0:c9:89:b9:1f    2   2   empty
   205.178.13.168         00:a0:c9:4b:9e:90    2   2   empty
   205.178.13.176         00:60:08:93:e4:c0    2   2   empty
   205.178.13.184         00:60:08:c5:35:d7    2   2   empty
   205.178.13.220    P    08:00:87:0b:de:15    2       1-9
   205.178.13.223         00:60:cf:20:01:68    2   2   empty
   205.178.13.226         08:00:20:0a:a7:7f    2   2   empty
   205.178.13.235         08:00:20:7f:6b:35    2   2   empty

>> Address Resolution Protocol#
```

The `Flag` field is interpreted as follows:

Table 5-4 ARP Dump Flag Parameters

Flag	Description
P	Permanent entry created for switch IP interface.
P 4	Permanent entry created for Layer 4 proxy IP address or virtual server IP address.
R	Indirect route entry.
U	Unresolved ARP entry. The MAC address has not been learned.

Virtual Router Redundancy Protocol Information

Direct command: **`/info/vrrp`**

Virtual Router Redundancy Protocol (VRRP) support on Alteon WebSystems' switches provides redundancy between routers in a LAN. This is accomplished by configuring the same virtual router IP address and ID number on each participating VRRP-capable routing device. One of the virtual routers is then elected as the master, based on a number of priority criteria, and assumes control of the shared virtual router IP address. If the master fails, one of the backup virtual routers will assume routing authority and take control of the virtual router IP address.

VRRP information includes:

- Virtual router number
- Virtual router ID and IP address
- Interface number
- Ownership status
  - `owner` identifies the preferred master virtual router. A virtual router is the owner when the IP address of the virtual router and its IP interface are the same.
  - `renter` identifies virtual routers which are not owned by this device.
- Priority value. During the election process, the virtual router with the highest priority becomes master.
- Activity status
  - `master` identifies the elected master virtual router.
  - `backup` identifies that the virtual router is in backup mode.
- Server status. The `server` state identifies virtual routers that support Layer 4 services. These are known as virtual *server* routers: any virtual router whose IP address is the same as any configured virtual server IP address.

When virtual routers are configured, you can view the status of each virtual router using the following command at the Information# prompt:

```
Information# vrrp
```

The Virtual Router Redundancy Protocol information is displayed:

```
VRRP information:
  1: vrid 2, 205.178.18.210,  if  1, renter, prio 100, master, server
  2: vrid 1, 205.178.18.202,  if  1, renter, prio 100, backup
  3: vrid 3, 205.178.18.204,  if  1, renter, prio 100, master

>> Information#
```

Trunk Group Information

Direct command: **/info/trunk**

When trunk groups are configured, you can view the state of each port in the various trunk groups using the following command at the Information# prompt:

```
Information# trunk
```

The trunk group information is displayed:

```
Trunk group 1 port state:
  5: forwarding
  6: DOWN
  7: forwarding

Trunk group 2 port state:
  1: BLOCKING
  3: DOWN
  4: BLOCKING

Information#
```

NOTE – If Spanning-Tree Protocol on any port in the trunk group is set to `forwarding`, the remaining ports in the trunk group will also be set to `forwarding`.

Enabled Software Keys

Direct command: **/info/swkey**

You can display a list of all the optional software packages which have been activated or installed on your switch. At the `Information#` prompt, enter:

```
>> Information# swkey
```

For optional Layer 4 switching software, the information would be displayed as follows:

```
Enabled Software features:
  Layer 4: SLB + WCR
  Layer 4: GSLB

>> Information#
```

Information Dump

Direct command: **`/info/dump`**

Use the dump command to gather data for tuning and debugging switch performance.

To dump all switch information available from the Information Menu (10K or more, depending on your configuration), at the `Information#` prompt, enter:

```
Information# dump
```

If you want to capture dump data to a file, set your communication software on your workstation to capture session data prior to issuing the dump commands.

CHAPTER 6

The Statistics Menu

You can view switch performance statistics in both the user and administrator command modes. This chapter discusses how to use the command-line interface to display switch statistics.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New In Release 5.2	Feature Description	Details
FDB Statistics	The forwarding database contains information that maps each device MAC address to the switch port where the device address was learned.	page 6-5
VRRP Statistics	When virtual routers are configured, you can use this command to view the number of VRRP advertisements received, transmitted, and received, but ignored on the network.	page 6-6
High-Water Mark for Real Server Statistics	For more useful Server Load Balancing performance feedback, a new measurement showing the highest number of simultaneous sessions has been added to the real server statistics.	page 6-7
SLB Server Octet Counters	To provide additional information for Server Load Balancing tuning and accounting purposes, real server transmit/receive octet counters have been added to Server Load Balancing statistics.	page 6-8
MP-Specific Statistics	To provide information regarding how switch resources are currently being used, a new menu for MP-specific statistics has been added.	page 6-18
Statistic Dump Command	To help you gather data for tuning and debugging switch performance, a dump command has been added.	page 6-19

Accessing the Statistics Menu

To access the Statistics Menu, enter the following command at the `Main#` prompt:

```
Main# stats
```

The Statistics Menu is displayed:

```
[Statistics Menu]
        port  - Statistics Menu for one port
        if    - IP interface ("if") statistics
        ip    - IP statistics
        icmp  - ICMP statistics
        tcp   - TCP statistics
        udp   - UDP statistics
        snmp  - SNMP statistics
        fdb   - FDB Statistics
        route - Route statistics
        arp   - ARP statistics
        dns   - DNS server statistics
        vrrp  - VRRP Statistics
        slb   - Server Load Balancing statistics menu
        dump  - Dump all statistics

>> Statistics#
```

Each of these options is discussed in greater detail in the following sections.

NOTE – The sample screens shown in this chapter represent ACEswitch 180 information. Screens, menus, and parameters for other Alteon WebSystems' switches may be slightly different.

Port Statistics

Direct command: **/stats/port** *port-number*

The WebOS software provides traffic statistics on a port-by-port basis. Traffic statistics include SNMP Management Information Base (MIB) objects from five groups:

- Bridging (dot1)
- Ethernet (dot3)
- Interface (if)
- Internet Protocol (IP)
- Link

To view traffic statistics for a port, at the `Statistics#` prompt, enter:

```
Statistics# port port-number
```

The Port Statistics Menu is displayed:

```
[Port Statistics Menu]
        brg   - Bridging ("dot1") stats
        ether - Ethernet ("dot3") stats
        if    - Interface ("if") stats
        ip    - Internet Protocol ("IP") stats
        link  - Link stats
        maint - Maintenance stats

>>Port Statistics#
```

Select the type of statistics you want to see for the port by entering the appropriate command from the Port Statistics Menu.

IP Interface (IF) Statistics

Direct command: **/stats/if**

To display interface statistics for the management processors, at the `Statistics#` prompt, enter:

```
Statistics# if
```

Protocol Statistics

You can display switch management processor statistics for the following protocols:

- IP
- ICMP
- TCP
- UDP
- SNMP
- Route
- ARP
- DNS
- VRRP

To display statistics for a particular protocol, at the `Statistics#` prompt, enter the name of the protocol (**ip**, **icmp**, **tcp**, **udp**, **snmp**, **route**, **arp**, **dns** or **vrrp**).

```
Statistics# protocol
```

Forwarding Database Statistics

By selecting the `fdb` Statistics menu option, you can display statistics regarding the use of the forwarding database, including the number of new entries, finds, and unsuccessful searches.

To show Forwarding Database statistics, at the `Statistics#` prompt, enter:

```
Statistics# fdb
```

The FDB Statistics are displayed:

```
FDB statistics:
      creates:          4904   deletes:          4888
      current:            16   hiwat:              19
      lookups:         20562   lookup fails:        8
      finds:            2485   find fails:          3
      find_or_c's:      6421   overflows:           0

>> Statistics#
```

FDB statistics are described in the following table.

Table 6-1 Forwarding Database Statistics

Statistic	Description
`creates`	Number of entries created in the Forwarding Database.
`current`	Current number of entries in the Forwarding Database.
`lookups`	Number of entry lookups in the Forwarding Database.
`finds`	Number of successful searches in the Forwarding Database.
`find_or_c's`	Number of entries found or created in the Forwarding Database.
`deletes`	Number of entries deleted from the Forwarding Database.
`hiwat`	Highest number of entries in the Forwarding Database.
`lookup fails`	Number of unsuccessful searches made in the Forwarding Database.
`find fails`	Number of search failures in the Forwarding Database.
`overflows`	Number of entries overflowing the Forwarding Database.

Virtual Router Redundancy Protocol Statistics

Direct command: **/stats/vrrp**

Virtual Router Redundancy Protocol (VRRP) support on Alteon WebSystems' switches provides redundancy between routers in a LAN. This is accomplished by configuring the same virtual router IP address and ID number on each participating VRRP-capable routing device. One of the virtual routers is then elected as the master, based on a number of priority criteria, and assumes control of the shared virtual router IP address. If the master fails, one of the backup virtual routers will assume routing authority and take control of the virtual router IP address.

When virtual routers are configured, you can display the following protocol statistics for VRRP:

- Advertisements received (`vrrpInAdvers`)
- Advertisements transmitted (`vrrpOutAdvers`)
- Advertisements received, but ignored (`vrrpBadAdvers`)

When the Statistics# prompt is displayed, enter:

```
Statistics# vrrp
```

The statistics for the VRRP LAN are displayed:

```
VRRP statistics:
      vrrpInAdvers:          973614    vrrpBadAdvers:          0
      vrrpOutAdvers:              0

Statistics#
```

Server Load Balancing Statistics

Direct command: **/stats/slb**

You can display the following Server Load Balancing Statistics:

- Real server statistics
- Virtual server statistics
- Filter statistics
- Switch port statistics
- Maintenance statistics

When the Statistics# prompt is displayed, enter:

```
Statistics# slb
```

The SLB Statistics Menu is displayed:

```
[Server Load Balancing Statistics Menu]
        real  - Real server stats
        group - Real server group stats
        virt  - Virtual server stats
        filt  - Filter stats
        port  - SLB switch port stats
        gslb  - Global SLB stats
        maint - Maintenance stats

>> Server Load Balancing Statistics#
```

Real Server Statistics

Direct command: **/stats/slb/real** *real-server-number*

Real server statistics include the following:

- Number of times the real server has failed its health checks
- Number of sessions currently open on the real server
- Total sessions on the real server
- Highest number of simultaneous sessions recorded for each real server
- Real server transmit/receive octets

NOTE – Octets are provided per server, not per service, unless configured as described below.

To view these statistics, from the `Server Load Balancing Statistics#` prompt, enter:

```
Server Load Balancing Statistics# real real-server-number
```

The statistics for the real server you entered are displayed:

```
Real server 1 stats:
Health check failures:              0
Current sessions:                   129
Total sessions:                     65478
Highest sessions:                   4343
Octets                              523824000

>> Server Load Balancing Statistics#
```

Per Service Octet Counters

For each load-balanced real server, the octet counters represent the combined number of transmit and receive frames. These counters are then added to report the total octets for each virtual server.

The octet counters are provided per server–not per service. If you need octet counters on a per-service basis, you can accomplish this through the following configuration:

1. **Configure a separate IP address for each service on each server being load balanced.**

   For instance, you can configure IP address 10.1.1.20 for HTTP services, and 10.1.1.21 for FTP services on the same physical server.

2. **On the switch, configure a real server with a real IP address for each service above.**

   Continuing the example above, two real servers would be configured for the physical server (representing each real service). If there were five physical servers providing the two services (HTTP and FTP), 10 real servers would have to be configured: five for the HTTP services on each physical server, and five for the FTP services on each physical server.

3. **On the switch, configure one real server group for each type of service, and group each appropriate real server IP address into the group that handles the specific service.**

   Thus, in keeping with our example, two groups would be configured: one for handling HTTP and one for handling FTP.

4. **Configure a virtual server for each server group and service.**

Real Server Group Statistics

Direct command: **/stats/slb/group** *real-server-group-number*

Real server group statistics include the following:

- Current and total sessions for each real server in the real server group.
- Current and total sessions for all real servers associated with the real server group.
- Highest number of simultaneous sessions recorded for each real server.
- Real server transmit/receive octets. For per-service octet counters, see the procedure on page 6-8.

To view these statistics, from the `Server Load Balancing Statistics#` prompt, enter:

```
Server Load Balancing Statistics# group real-server-group-number
```

The statistics for the real server group you entered are displayed:

```
Real server group 1 stats:
                       Current      Total  Highest
Real IP address      Sessions   Sessions Sessions           Octets
---- --------------- -------- ---------- --------  ---------------
  1  200.100.10.14         20         60        9           480000
  2  200.100.10.15         20         77       12           616000
---- --------------- -------- ---------- --------  ---------------
                           40        137       21          1096000

>> Server Load Balancing Statistics#
```

Virtual Server Statistics

Direct command: **/stats/slb/virt** *virtual-server-number*

Virtual server statistics include the following:

- Current and total sessions for each real server associated with the virtual server.
- Current and total sessions for all real servers associated with the virtual server.
- Highest number of simultaneous sessions recorded for each real server.
- Real server transmit/receive octets. For per-service octet counters, see the procedure on page 6-8.

To view these statistics, from the `Server Load Balancing Statistics#` prompt, enter:

```
Server Load Balancing Statistics# virt virtual-server-number
```

The statistics for the virtual server you entered are displayed:

```
Virtual server 1 stats:
                      Current      Total  Highest
Real IP address      Sessions   Sessions Sessions           Octets
---- --------------- -------- ---------- --------  ---------------
  1  200.100.10.14         20         60        9           480000
  2  200.100.10.15         20         77       12           616000
---- --------------- -------- ---------- --------  ---------------
     200.100.10.20         40        137       21          1096000

>> Server Load Balancing Statistics#
```

NOTE – The virtual server IP address is shown in the "Totals" area below the real server IP addresses.

Filter Statistics

Direct command: **`/stats/slb/filt`** *filter-number*

You can obtain the total number of times any filter has been used. To view these statistics, from the `Server Load Balancing Statistics#` prompt, enter:

```
Server Load Balancing Statistics# filt filter-number
```

The statistics for the filter you entered are displayed:

```
Filter 1 stats:
Total firings:                      1011

>> Server Load Balancing Statistics#
```

SLB Port Statistics Menu

Direct command: **/stats/slb/port** *port-number*

To view SLB port statistics, from the Server Load Balancing Statistics# prompt, enter:

```
Server Load Balancing Statistics# port port-number
```

The SLB Port Statistics Menu is displayed:

```
[Server Load Balancing Port Statistics Menu]
        real  - Real server stats
        group - Real server group stats
        virt  - Virtual server stats
        filt  - Filter stats
        maint - Maintenance stats

>> Server Load Balancing Port Statistics#
```

SLB Port Real Server Statistics

To view port statistics regarding the real server, from the Server Load Balancing Port Statistics# prompt, enter:

```
Server Load Balancing Port Statistics# real real-server-number
```

The port statistics for the real server you entered are displayed:

```
Port 1 Real server 1 stats:
Current sessions:                    9
Total sessions:                     24
Octets:                         192000

>> Server Load Balancing Port Statistics#
```

SLB Port Real Server Group Statistics

To view port statistics regarding a real server group, from the `Server Load Balancing Port Statistics#` prompt, enter:

```
Server Load Balancing Port Statistics# group real-server-group-number
```

The port statistics for the real server group you entered are displayed:

```
Port 1 Real server group 1 stats:
                       Current      Total  Highest
Real IP address      Sessions   Sessions Sessions           Octets
---- --------------- -------- ---------- --------  ---------------
 20  200.100.10.14          9         24       16           192000
 21  200.100.10.15         12         23       15           184000
---- --------------- -------- ---------- --------  ---------------
                           21         47       31           376000
>> Server Load Balancing Port Statistics#
```

SLB Port Virtual Server Statistics

To view port statistics regarding the virtual server, from the `Server Load Balancing Port Statistics#` prompt, enter:

```
Server Load Balancing Port Statistics# virt virtual-server-number
```

The port statistics for the virtual server you entered are displayed:

```
Port 1 Virtual server 1 stats:
                       Current      Total  Highest
Real IP address      Sessions   Sessions Sessions           Octets
---- --------------- -------- ---------- --------  ---------------
 20  200.100.10.14          9         24       16           192000
 21  200.100.10.15         12         23       15           184000
---- --------------- -------- ---------- --------  ---------------
     200.100.13.1           21         47       31           376000

>> Server Load Balancing Port Statistics#
```

NOTE – The virtual server IP address is shown in the "Totals" area below the real server IP addresses.

SLB Port Filter Statistics

You can obtain the total number of times any filter has been on a specific port. To view these statistics, from the `Server Load Balancing Statistics#` prompt, enter:

```
Server Load Balancing Port Statistics# filt filter-number
```

The statistics for the filter you entered are displayed:

```
Filter 1 stats:
Total firings:                        1011

>> Server Load Balancing Statistics#
```

SLB Port Maintenance Statistics

To view SLB port maintenance statistics, from the `Server Load Balancing Port Statistics#` prompt, enter:

```
Server Load Balancing Port Statistics# maint
```

The SLB Maintenance statistics are displayed:

```
Port 1 SLB Maintenance stats:
Current sessions:                     0
Allocation failures:                  0
Non TCP/IP frames:                    0
TCP fragments:                        0
UDP datagrams:                        0
Incorrect VIPs:                       0
Incorrect Vports:                     0
No available real server:             0
Filtered (denied) frames:             0

Server Load Balancing Port Statistics#
```

These statistics are described in Table 6-2 on page 6-17.

Global SLB Statistics

Direct command: **/stats/slb/gslb**

To view global server load balancing statistics, enter the following command at the Server Load Balancing Statistics# prompt:

```
Server Load Balancing Statistics# gslb
```

The Global SLB Statistics Menu is displayed:

```
[Global SLB Statistics Menu]
        real  - Real server distributed stats
        group - Real server group distributed stats
        virt  - Virtual server distributed stats
        maint - Global maintenance stats

>> Global SLB Statistics#
```

Real Server Global Statistics

For any remote real server configured for Global Server Load Balancing, the following statistics can be viewed:

- Number of DNS handoffs to the remote server
- Number of HTTP redirects to the remote server

To view these statistics, from the Global SLB Statistics# prompt, enter:

```
Global SLB Statistics# real real-server-number
```

Where the real server number represents the real server ID on this switch, under which the remote server is configured. The statistics for the remote real server are displayed:

```
Real server 1 global stats:
DNS handoffs:                       3210
HTTP redirects:                       12

>> Global SLB Statistics#
```

Real Server Group Global Statistics

Real server group global statistics include the following:

- Number of DNS handoffs to each remote real server in the group
- Number of HTTP redirects to each remote real server in the group
- Total DNS handoffs and HTTP redirects to the remote real servers in the group

To view these statistics, from the `Global SLB Statistics#` prompt, enter:

```
Global SLB Statistics# group real-server-group-number
```

The statistics for the real server group you entered are displayed:

```
Real server group 1 Global SLB stats:
  Real server IP address          DNS Handoffs  HTTP Redirects
  ----------- --------------- ----------------  ---------------
        1     205.178.13.54           1240              30
        2     205.178.13.223           608              12
  ----------- --------------- ----------------  ---------------
     Totals                           1848              42

>> Global SLB Statistics#
```

Virtual Server Global Statistics

Virtual server global statistics include the following:

- Service: type of service running on the virtual server
- Server: type of server configuration and server ID number.
  - **v**# represents a local virtual server number
  - **r**# represents a remote site. Since each remote sites is configured on its peers as if it were a real server (with certain special properties), the number represents the real server ID on this switch, under which the remote server is configured.
- IP address of the server
- Response time: the average time (present weighted) that each service takes to respond to information exchanges with its peers. The time is specified in ticks of 65 milliseconds.
- Min sessions available: the current number of sessions available for serving client requests. This number will change as client traffic loads change, or as real servers under the virtual server or remote sites go in or out of service.

To view these statistics, from the `Global SLB Statistics#` prompt, enter:

```
Global SLB Statistics# virt virtual-server-number
```

The statistics for the virtual server you entered are displayed:

```
Virtual server 1 Global SLB stats:
  Service Server IP address      Response time Min sessions avail
  ------- ------ --------------- ------------- ------------------
  http     v1    205.178.13.55           16             21190
  http     r1    205.178.13.54           10             24120

  telnet   v1    205.178.13.55            4             31032

>> Global SLB Statistics#
```

Global SLB Maintenance Statistics

Global SLB maintenance statistics include the following:

- The number of Distributed Site State Protocol (DSSP) updates received from remote sites.
- The number of bad DSSP updates received from remote sites. Bad updates usually indicate that there is a GSLB switch configuration problem. If bad updates occur, check your `syslog` for configuration error messages.

To view these statistics, from the `Global SLB Statistics#` prompt, enter:

```
Global SLB Statistics# maint
```

The maintenance statistics are displayed as follows:

```
Global SLB maintenance stats:
Updates received:              0
Bad updates received:          0

>> Global SLB Statistics#
```

SLB Maintenance Statistics

Direct command: **/stats/slb/maint**

SLB Maintenance statistics can be viewed from the Server Load Balancing Statistics# prompt. At the prompt, enter:

```
Server Load Balancing Statistics# maint
```

The SLB Maintenance statistics are displayed.

```
SLB Maintenance stats:
Current sessions:                    0
Allocation failures:                 0
TCP fragments:                       0
UDP datagrams:                       0
Non TCP/IP frames:                   0
Incorrect VIPs:                      0
Incorrect Vports:                    0
No available real server:            0
Backup server activations:           0
Overflow server activations:         0
Filtered (denied) frames:            0

Server Load Balancing Statistics#
```

SLB Maintenance statistics are described in the following table.

Table 6-2 Server Load Balancing Maintenance Statistics

Statistic	Description
Current Sessions	Number of session bindings currently in use.
Allocation Failures	Indicates instances where the switch ran out of available bindings for a port.
TCP Fragments	Indicates the number of TCP fragments encountered by the switch. Layer 4 processing might not handle TCP fragments, depending on configuration.
UDP Datagrams	Indicates that the virtual server IP address and MAC are receiving UDP frames when UDP balancing is not turned on.
Non TPC/IP Frames	Indicates the number of non-IP based frames received by the virtual server.
Incorrect VIPs	This indicates the number of times the switch has received a Layer 4 request for a virtual server which was not configured.

Table 6-2 Server Load Balancing Maintenance Statistics

Statistic	Description
Incorrect Vports	This dropped frames counter indicates that the virtual server has received frames for TCP/UDP services that have not been configured. Normally this indicates a mis-configuration on the virtual server or the client, but it may be an indication of a potential security probing application like SATAN.
No Server Available	This dropped frames counter indicates that all real servers are either out of service or at their `mcon` limit.
Backup Server Activations	This indicates the number of times a real server failure has occurred and caused a backup server to be brought online.
Overflow Server Activations	This indicates the number of times a real server has reached the `mcon` limit and caused an overflow server to be brought online.
Filtered (Denied) Frames	This indicates the number of frames that where dropped because they matched an active filter with the "`deny`" action set.

MP-Specific Statistics Menu

Direct command: **`/stats/mp`**

Use this command to view information on how switch management processes and resources are currently being allocated.

To view MP-specific statistics, from the `Statistics#` prompt, enter:

```
Server Load Balancing Statistics# port port-number
```

The MP-Specific Statistics Menu is displayed:

```
[MP-specific Statistics Menu]
        mem  - STEM memory stats
        amem - All STEM memory blocks in use
        dma  - DMA exception counts
        pkt  - Packet stats
        uart - General counters

>> MP-specific Statistics#
```

Statistics Dump

Direct command: **/stats/dump**

Use the dump command to gather data for tuning and debugging switch performance.

To dump all switch statistics available from the Statistics Menu (40K or more, depending on your configuration), at the Statistics# prompt, enter:

```
Statistics# dump
```

If you want to capture dump data to a file, set your communication software on your workstation to capture session data prior to issuing the dump commands.

CHAPTER 7

The Configuration Menu

This chapter discusses how to use command-line interface for making, viewing, and saving switch configuration changes.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New In Release 5.2	Feature Description	Details
Improved Switch Management Security	A new feature allows you to limit access to the switch's Management Processor without having to configure filters for each switch port.	page 7-8
Addition of criticality indicators to SYSLOG messages	When an Alteon WebSystems' switch generates SYSLOG messages, the criticality level of the message is now included.	page 7-22
TFTP Configuration Put and Get	New commands have been added which allow the switch to `put` (save) or `get` (load) the active switch configuration via TFTP.	page 7-33
Direct Access to Real Servers	When enabled, Direct Access Mode allows any client to communicate with any Real Server to its load-balanced service. The same clients may also communicate to the VIP and have their requests load balanced.	page 7-36
IMAP Health Check	To perform application health checking for user mail service access, a new IMAP authentication option has been added.	page 7-42
RADIUS Health Check	To perform application health checking for remote server access, new RADIUS authentication options have been added.	page 7-42

New In Release 5.2	Feature Description	Details
Real Server Alias	Define a descriptive name of up to 15 characters for each real server.	page 7-39
HTTP Content Health Checks	HTTP-based health checks can now include hostname and domain name when formulating HTTP GET requests.	page 7-42
Real Server Group Alias	Define a natural-language name of up to 15 characters for each real server group.	page 7-42
TCP ACK Matching for Filters	To provide greater filtering flexibility, the `ack` filter criteria has been added.	page 7-52
Topology Restrictions Removed	The SLB Port Menu no longer requires switch ports to be configured exclusively for one type of Layer 4 processing.	page 7-56
GSLB Local Site Preference	For Global Server Load Balancing, a new feature has been added which allows the switch to always respond to DNS queries with a local virtual IP address.	page 7-57
Increased Granularity of DNS TTL	For GSLB, the parameter for DNS TTL (time to live) has been changed to allow settings from 0-65535 seconds.	page 7-57
VRRP	Virtual Router Redundancy Protocol (VRRP) provides redundancy for routers within a LAN. Alteon Websystems has extended VRRP to include virtual servers as well, allowing for full active/active redundancy between Layer 4 switches.	page 7-62

Accessing the Configuration Menu

You must be logged in using the administrator password before you can access the configuration menus. To access the Configuration Menu, at the `Main#` prompt, enter:

```
Main# cfg
```

The Configuration Menu is displayed:

```
[Configuration Menu]
        sys    - System-wide parameter menu
        port   - Port configuration menu
        ip     - IP configuration menu
        vlan   - VLAN configuration menu
        stp    - Spanning Tree menu
        snmp   - SNMP menu
        setup  - Step by step configuration set up
        dump   - Dump current configuration to script file
        ptcfg  - Backup current configuration to tftp server
        gtcfg  - Restore current configuration from tftp server
        mirr   - Mirroring menu
        slb    - Server Load Balancing configuration menu
        trunk  - Trunk Group configuration menu
       vrrp   - Virtual Router Redundancy Protocol configuration menu

>> Configuration#
```

Each of these options is discussed in greater detail in the following sections.

NOTE – The sample screens shown in this chapter represent ACEswitch 180 information. Screens, menus, and parameters for other Alteon WebSystems' switches may be slightly different.

Viewing, Applying, and Saving Changes

As you use the configuration menus to set switch parameters, the changes you make do not take effect immediately. All changes are considered "pending" until you explicitly apply them. Also, any changes are lost the next time the switch boots unless the changes are explicitly saved.

While configuration changes are in the pending state, you can do the following:

- View the pending changes
- Apply the pending changes
- Save the changes to flash memory

Viewing Pending Changes

You can view all pending configuration changes by entering **`diff`** at the menu prompt.

NOTE – The `diff` command is a global command. Therefore, you can enter **`diff`** at any prompt in the CLI.

Applying Pending Changes

To make your configuration changes active, you must apply them. To apply configuration changes, enter **`apply`** at any prompt in the CLI.

```
# apply
```

NOTE – The `apply` command is a global command. Therefore, you can enter **`apply`** at any prompt in the administrative interface.

NOTE – All configuration changes take effect immediately when applied, except for starting Spanning-Tree Protocol. To turn STP on or off, you must apply the changes, save them (see below), and then reset the switch (see "Resetting the Switch" on page 9-4).

Saving the Configuration

In addition to applying the configuration changes, you can save them to flash memory on the switch.

NOTE – If you do not save the changes, they will be lost the next time the system is rebooted.

To save the new configuration, enter the following command at any CLI prompt:

```
# save
```

When you save configuration changes, the changes are saved to the *active* configuration block. The configuration being replaced by the save is first copied to the *backup* configuration block. If you do not want the previous configuration block copied to the backup configuration block, enter the following instead:

```
# save noback
```

You can decide which configuration you want to run the next time you reset the switch. Your options include:

- The active configuration block
- The backup configuration block
- Factory default configuration

For instructions on selecting the configuration to run at the next system reset, see "Selecting a Configuration Block" on page 9-4."

Configuring System Parameters

Direct command: **/cfg/sys**

System parameters affect the operation of the switch globally. System parameters that can be modified include:

- System date and time
- User and Administrator passwords
- Idle timeout for CLI sessions
- Allow/disallow Telnet connections (from local console only)
- BOOTP usage
- Allow/disallow WebOS web-based connections and set the web-server port number (from local console or telnet only)

To modify system parameters, at the Configuration# prompt, enter:

```
Configuration# sys
```

The System Menu is displayed:

```
[System Menu]
        date  - Set system date
        time  - Set system time
        usrpw - Set user password
        admpw - Set administrator password
        l4apw - Set L4 administrator password
        idle  - Set timeout for idle CLI sessions
        tnet  - Enable/disable Telnet access
        bootp - Enable/disable use of BOOTP
        http  - Enable/disable HTTP (Web) access
        wport - Set Web server port number
        bannr - Set login banner
        mnet  - Set management network
        mmask - Set management netmask
        cur   - Display current system-wide parameters
>> System#
```

The following table describes the System Menu options.

Table 7-1 System Options (/cfg/sys)

Option	Description
`date`	Configures the system date.
`time`	Configures the system time using a 24-hour clock format.
`usrpw`	Configures the user password; the user password can have a maximum of 15 characters.
`admpw`	Configures the administrator password; the administrator password can have a maximum of 15 characters.
`l4apw`	Configures the layer 4 administrator password; the L4 administrator password can have a maximum of 15 characters. The Layer 4 administrator can view all switch information and statistics, but can configure changes only on the Server Load Balancing menus.
`idle`	Configures the idle timeout for command-line interface sessions; the range is 1 to 60 minutes. The default is 5 minutes.
`telnet`	Enable or disable telnet access to the command-line interface sessions. This command is available only from a local console connection.
`bootp`	Enable or disable the use of BOOTP; if you enable BOOTP, the switch will query its BOOTP server for all of the switch IP parameters.
`http`	Enable or disable access to the web-based interface.
`wport`	Set the switch port to be used for serving switch web content. The default is HTTP port 80. If Global Server Load Balancing is to be used, change this parameter to use a different port (such as 8080).
`bannr`	Configures a login banner of up to 80 characters. When a user or administrator logs into the switch via Telnet, the login banner is displayed; it is also displayed as part of the output from the `/info/sys` command.
`mnet`	Sets the base source IP address allowed to access switch management through Telnet, SNMP, RIP, or the WebOS web interface. A range of IP addresses is produced when used with `mmask` (below). Specify an IP address in dotted-decimal notation.
`mmask`	This IP address mask is used with `mnet` to set a range of source IP addresses allowed access to switch management functions. Specify the mask in dotted-decimal notation.
`cur`	Displays current system parameters.

NOTE – By default, when `http` (above) is enabled, WebOS serves web-interface content over port 80 on the switch IP interface. If Global Server Load Balancing is enabled, it also uses port 80 for peer health and performance updates. Both services cannot use the same port. If using the web-based interface and GSLB together on the switch, use `wport` (above) to configure the web-based management interface for a different service port.

Switch Management Security

To limit access to the switch's Management Processor without having to configure filters for each switch port, you can set a source IP address (or range) that will be allowed to connect to the switch IP interface through Telnet, SNMP, or the WebOS web-interface. This will also help prevent spoofing or attacks on the switch's TCP/IP stack.

The allowed management IP address range is configured using the system `mnet` and `mmask` options available on the command-line interface System Menu (`/cfg/sys`).

NOTE – The `mnet` and `mmask` commands in the `/cfg/slb` menu are used for a different purpose.

When an IP packet reaches the Management Processor, the source IP address is checked against the range of addresses defined by `mnet` and `mmask`. If the source address of the host or hosts are within this range, then they are allowed to attempt to log in. Any packet addressed to a switch IP interface with a source IP address outside this range is discarded silently.

Example: Assume that the `mnet` is set to 192.192.192.0, and the `mmask` is set to 255.255.255.128. This defines the following range of IP addresses: 192.192.192.0 to 192.192.192.127.

- A host with a source IP address of 192.192.192.21 falls within the defined range and would be allowed to access the switch Management Processor.
- A host with a source IP address of 192.192.192.192 falls outside the defined range and is not granted access. To make this source IP address valid, you would need to shift the host to an IP address within the valid range specified by the `mnet` and `mmask`, or modify the `mnet` to be 192.192.192.128 and the `mmask` to be 255.255.255.128. This would put the 192.192.192.192 host within the valid range allowed by the `mnet` and `mmask` (192.192.192.128-255).

NOTE – When the `mnet` and `mmask` Management Processor filter is applied, RIP updates received by the switch will be discarded if the source IP address of the RIP packet(s) falls outside the specified range. This can be corrected by configuring static routes.

Configuring Port Parameters

Direct command: **/cfg/port** *port-number*

The Port Menu allows you to configure the settings for individual switch ports. To configure a port, at the Configuration# prompt, enter:

```
Configuration# port port-number
```

The Port Menu is displayed:

```
[Port 1 Menu]
        pref  - Set preferred phy
        back  - Set backup phy
        fast  - Fast phy menu
        gig   - Gig phy menu
        dis   - Disable port
        ena   - Enable port
        tag   - 1 if port uses VLAN tagging, else 0 for untagged
        pvid  - Set default port VLAN id
        name  - Set port name
        cur   - Display current port configuration

>> Port 1#
```

NOTE – The port configuration options shown are for the ACEswitch 180. If you are configuring port options for other models of Alteon WebSystems' switch, some of the options might not be available or will behave differently. Any important differences are noted in the text.

The port configuration options are described in the following table.

Table 7-2 Port Configuration Options (cfg/port)

Option	Description
`pref`	If dual physical connectors are available on the port, this option defines the preferred physical connector. Choices are: • Fast Ethernet Port, RJ-45 connector • Gigabit Ethernet Port, SC fiber connector (default)
`back`	If dual physical connectors are available on the port, this option defines the physical connector to use when the preferred choice fails or is unavailable. Choices are: • Fast Ethernet Port, RJ-45 connector (default) • Gigabit Ethernet Port, SC fiber connector • None
`fast`	If a port is configured to support Fast Ethernet, this option displays the Fast Ethernet Physical Link menu.
`gig`	If a port is configured to support Gigabit Ethernet, this option displays the Gigabit Ethernet Physical Link menu.
`dis`	Disables the port. (To temporarily disable a port without changing its configuration attributes, refer to "Temporarily Disabling a Port" on page 7-12.)
`ena`	Enables the port.
`tag`	Set to 1 if the port uses VLAN tagging. Otherwise, set to 0.
`pvid`	Set the default VLAN number which will be used to forward frames which are not VLAN tagged.
`name`	Set a name for the port. The assigned port name appears next to the port number on some information and statistics screens.
`cur`	Displays current port parameters.

NOTE – Depending on the Alteon WebSystems' switch being configured, the physical link menu options described in "Fast Ethernet and Gigabit Link Menus" on page 7-11 may appear as options under the Port Configuration Menu.

Fast Ethernet and Gigabit Link Menus

Direct command: **/cfg/port** *port-number* **fast**
or **/cfg/port** *port-number* **gig**

If a Fast Ethernet or Gigabit Ethernet port is available on the switch, the link parameters can be configured using the appropriate command. For example, to configure a Fast Ethernet port, enter the following command at the Port Menu:

```
Port# fast
```

The Fast Link Menu for the selected port appears:

```
[Fast Link Menu]
        speed - Set link speed
        mode  - Set full or half-duplex mode
        fctl  - Set flow control
        auto  - Control autonegotiation
        cur   - Set current fast link configuration

>> Fast Link
```

NOTE – Since the `speed` and `mode` parameters cannot be set for Gigabit Ethernet ports, these options do not appear on the Gigabit Link Menu.

Link menu options are described in Table 7-3 and appear on the `fast` and `gig` port configuration menus (as noted) for the ACEswitch 180, and on the Port Menu for some models of Alteon WebSystems' switches. Using these configuration menus, you can set port parameters such as speed, flow control, and negotiation mode for the port link.

Table 7-3 Fast Link and Gigabit Link Options (/cfg/port)

Option	Description
`speed`	Sets the link speed; the choices include: • "Any," for automatic detection (default) • 10 Mbps • 100 Mbps
`mode`	Sets the operating mode; the choices include: • "Any," for autonegotiation (default) • Full-duplex • Half-duplex

Table 7-3 Fast Link and Gigabit Link Options (/cfg/port)

Option	Description
`fctl`	Sets the flow control; the choices include: • Autonegotiation (default) • Receive flow control • Transmit flow control • Both receive and transmit flow control • No flow control
`auto`	Enable or disable auto-negotiation for the port.
`cur`	Displays current port parameters.

Temporarily Disabling a Port

To temporarily disable a port without changing its stored configuration attributes, enter the following command at any prompt:

```
Main# /oper/port port-number/dis
```

Because this sets a temporary state for the port, you do not need to use `apply` or `save`. See "The Operations Menu" on page 8-1 for other operations-level commands.

Configuring IP Parameters

Direct command: **`/cfg/ip`**

The IP Menu provides access to the switch IP parameters. IP parameters are configured to provide Telnet and SNMP management access to the switch, as well as for defining routing and forwarding information.

To configure IP parameters, at the `Configuration#` prompt, enter:

```
Configuration# ip
```

The IP Menu is displayed:

```
[IP Menu]
        if    - Interface menu
        gw    - Default gateway menu
        route - Static route menu
        frwd  - Forwarding menu
        rip1  - Routing Information Protocol menu
        port  - IP port menu
        dns   - Domain Name System menu
        log   - Set IP address of syslog host
        rearp - Set re-ARP period in minutes
        metrc - Set default gateway metric
        cur   - Display current IP configuration

>> IP#
```

These commands are described in detail in the following sections.

IP Interface Menu

Direct command: **`/cfg/ip/if`** *interface-number*

The switch can be configured with up to 256 IP interfaces. Each IP interface represents the switch on an IP subnet on your network. To configure IP interfaces, enter the following command at the IP Menu:

```
IP# if interface-number
```

The IP Interface Menu for the selected interface (1 to 256) appears:

```
[IP Interface 1 Menu]
        addr  - Set IP address
        mask  - Set subnet mask
        broad - Set broadcast address
        vlan  - Set VLAN number
        ena   - Enable IP interface
        dis   - Disable IP interface
        del   - Delete IP interface
        cur   - Display current interface configuration

>> IP Interface 1#
```

The following table describes the IP Interface Menu options.

Table 7-4 IP Interface Options (/cfg/ip/if)

Option	Description
`addr`	Configures the IP address of the switch interface using dotted decimal notation.
`mask`	Configures the IP subnet address mask for the interface using dotted decimal notation.
`broad`	Configures the IP broadcast address for the interface using dotted decimal notation.
`vlan`	Configures the VLAN number for this interface. Each interface can belong to one VLAN, though any VLAN can have multiple IP interfaces in it.
`ena`	Enable the interface.
`dis`	Disable the interface.
`del`	Delete this interface.
`cur`	Display the current interface settings.

Default Gateway Settings

Default Gateway Menu

Direct command: **`/cfg/ip/gw`** *gateway-number*

The switch can be configured with up to four default IP gateways. To configure the default IP gateways, enter the following command at the IP Menu:

```
IP# gw gateway-number
```

The Default Gateway Menu for the selected gateway (1 to 4) appears:

```
[Default gateway 1 Menu]
        addr  - Set IP address
        intr  - Set interval between ping attempts
        retry - Set number of failed attempts to declare gateway DOWN
        ena   - Enable default gateway
        dis   - Disable default gateway
        del   - Delete default gateway
        cur   - Display current default gateway configuration

>> Default gateway 1#
```

The following table describes the Default Gateway Menu options.

Table 7-5 Default Gateway Options (/cfg/ip/gw)

Option	Description
`addr`	Configures the IP address of the default IP gateway using dotted decimal notation.
`intr`	The switch pings the default gateway to verify that the gateway is up. The `intr` option lets you choose the time between health checks. The range is from 1 to 120 seconds. The default interval is 2 seconds.
`retry`	Set the number of failed health check attempts required before declaring this default gateway inoperative. The range is from 1 to 120 attempts. The default is 8 attempts.
`ena`	Enable the gateway for use.
`dis`	Disable the gateway.
`del`	Delete this gateway from the configuration.
`cur`	Display the current gateway settings.

Default Gateway Metrics

For information about configuring which gateway is selected when multiple default gateways are enabled, see page 7-23.

IP Static Route Menu

Direct command: **/cfg/ip/route**

To access the IP Static Route Menu, enter the following command at the IP Menu:

```
IP# route
```

The IP Static Route Menu appears:

```
[IP Static Route Menu]
        add   - Add static route
        rem   - Remove static route
        cur   - Display current static routes

>> IP Static Route Menu#
```

The following table describes the IP Static Route Menu options.

Table 7-6 IP Static Route Options (/cfg/ip/route)

Option	Description
`add`	Add a static route. You will be prompted to enter a destination IP address, destination subnet mask, and gateway address. Enter all addresses using dotted decimal notation.
`rem`	Remove a static route. The destination address of the route to remove must be specified using dotted decimal notation.
`cur`	Display the current IP static routes.

IP Forwarding Menu

Direct command: **/cfg/ip/frwd**

The IP Forwarding Menu is used for setting the local network address and netmask for the route cache, and to turn IP forwarding (routing) on or off. To access the menu, enter the following at the IP Menu:

```
IP# frwd
```

The IP Forwarding Menu appears:

```
[IP Forwarding Menu]
        lnet  - Set local IP network for route cache
        lmask - Set local IP netmask for route cache
        on    - Globally turn IP Forwarding ON
        off   - Globally turn IP Forwarding OFF
        cur   - Display current static routes

>> IP Forwarding Menu#
```

The following table describes the IP Forwarding Menu options.

Table 7-7 IP Forwarding Options (/cfg/ip/frwd)

Option	Description
`lnet`	Sets the base destination IP address for a range of routes which will cached on the switch. See details below.
`lmask`	This IP address mask is used with the `lnet` to identify routes which will be included in the local route cache. See details below.
`on`	Enable IP forwarding (routing).
`off`	Disable IP forwarding (routing).
`cur`	Display the current IP forwarding settings.

Defining IP Address Ranges for the Local Route Cache

The Local Route Cache lets you more efficiently use switch resources. The `lnet` and `lmask` parameters define a range of addresses which will be cached on the switch. The `lnet` is used to define the base IP address in the range which will be cached, and the `lmask` is the mask which is applied to produce the range. To determine if a route should be added to the memory cache, the destination address is masked (bitwise AND) with the `lmask` and checked against the `lnet`.

By default, the `lnet` and `lmask` are both set to 0.0.0.0. This produces a range that includes all Internet addresses for route caching: 0.0.0.0 through 255.255.255.255.

To limit the route cache to your local hosts, you could configure the parameters as in the following examples:

Table 7-8 Local Routing Cache Address Ranges

Local Host Address Range	lnet	lmask
0.0.0.0 - 127.255.255.255	0.0.0.0	128.0.0.0
128.0.0.0 - 255.255.255.255	128.0.0.0	128.0.0.0
205.32.0.0 - 205.32.255.255	205.32.0.0	255.255.0.0

NOTE – All addresses that fall outside the defined range are forwarded to the default gateway. The default gateways must be within range.

Routing Information Protocol Menu

Direct command: **`/cfg/ip/rip1`**

The RIP1 Menu is used for configuring Routing Information Protocol version 1 parameters.

NOTE – Do not configure RIP1 parameters if your routing equipment uses RIP version 2.

To configure RIP1 parameters, enter the following from the IP Menu:

```
IP# rip1
```

The Routing Information Protocol Menu appears:

```
[Routing Information Protocol Menu]
        spply - Enable/disable supplying route updates
        lsten - Enable/disable listening to route updates
        deflt - Enable/disable listening to default routes
        statc - Enable/disable supplying static routes
        poisn - Enable/disable poisoned reverse
        updat - Set update period in seconds
        on    - Globally turn RIP ON
        off   - Globally turn RIP OFF
        cur   - Display current RIP configuration

>> Routing Information Protocol Menu#
```

The following table describes the RIP1 options.

Table 7-9 Routing Information Protocol Options (/cfg/ip/rip1)

Option	Description
`spply`	When enabled, the switch supplies routes to other routers.
`lsten`	When enabled, the switch learns routes from other routers.
`deflt`	When enabled, the switch accepts RIP default routes from other routers and gives them priority over configured default gateways. When disabled, the switch rejects RIP default routes.
`statc`	When enabled, the switch supplies RIP information about any configured ***static*** routes to other routers.
`poisn`	When enabled, the switch uses split horizon with poisoned reverse. When disabled, the switch uses only split horizon.
`updat`	Specifies the time period between routing updates. The time is specified in seconds between 1 and 120. If an entry fails to be updated on four consecutive attempts, the entry is aged out of the routing table.
`on`	Enable Routing Information Protocol (RIP).
`off`	Disable RIP.
`cur`	Display the current RIP settings.

IP Port Menu

Direct command: **`/cfg/ip/port`** *port-number*

The IP Port Menu allows you to turn IP forwarding on or off on a port by port basis. To access the menu, enter the following at the IP Menu:

```
IP# port port-number
```

The IP Forwarding Port Menu appears for the selected port:

```
[IP Forwarding Port 1 Menu]
        on    - Turn IP Forwarding ON
        off   - Turn IP Forwarding OFF
        cur   - Display current port configuration

>> IP Forwarding Port 1#
```

The following table describes the IP Forwarding Port Menu options.

Table 7-10 IP Forwarding Port Options (/cfg/ip/port)

Option	Description
`on`	Enable IP forwarding for the current port.
`off`	Disable IP forwarding for the current port.
`cur`	Display the current IP forwarding settings.

Domain Name System Menu

Direct command: **/cfg/ip/dns**

The Domain Name System (DNS) Menu is used for defining the primary and secondary DNS servers on your local network, and for setting the default domain name served by the switch services. DNS parameters must be configured prior to using hostname parameters with the `ping`, `traceroute`, and `tftp` commands.

To configure Domain Name System (DNS) parameters, enter the following at the IP Menu:

```
IP# dns
```

The Domain Name System Menu appears:

```
[Domain Name System Menu]
        prima - Set IP address of primary DNS server
        secon - Set IP address of secondary DNS server
        dname - Set default domain name
        cur   - Display current DNS configuration

>> Domain Name System#
```

The following table describes the menu options.

Table 7-11 Domain Name Service Menu Options (/cfg/ip/dns)

Option	Description
`prima`	You will be prompted to set the IP address for your primary DNS server. Use dotted decimal notation.
`secon`	You will be prompted to set the IP address for your secondary DNS server. If the primary DNS server fails, the configured secondary will be used instead. Enter the IP address using dotted decimal notation.
`dname`	Set the default domain name used by the switch. For example: `mycompany.com`
`cur`	Display the current Domain Name System settings.

Syslog Host

Direct command: **`/cfg/ip/log`** *IP-address*

This command is used for setting the IP address of the syslog host:

```
IP# log IP-address
```

The IP address is specified using dotted-decimal notation.

Each syslog message has a criticality level associated with it, included in text form as a prefix to the log message. One of eight different prefixes is used, depending on the condition that the administrator is being notified of, as shown below.

- EMERG, indicates the system is unusable
- ALERT: Indicates action should be taken immediately
- CRIT: Indicates critical conditions
- ERR: indicates error conditions or errored operations
- WARNING: indicates warning conditions
- NOTICE: indicates a normal but significant condition
- INFO: indicates an information message
- DEBUG: indicates a debut-level message

Example: If configured, the switch software logs the following types of messages to syslog host:

```
Apr 1 17:28:52 ALERT slb: cannot contact real server 215.118.113.74
Apr 1 17:29:10 NOTICE console: admin login
Apr 1 17:26:35 INFO web server: new configuration applied
Apr 1 17:26:35 WARNING slb: filter 10 fired on port 4
Apr 1 17:28:03 ERR telnet: no apply needed
```

Re-ARP

Direct command: **/cfg/ip/rearp** *re-arp-interval*

The switch periodically sends ARP (Address Resolution Protocol) requests to refresh its address database. This command is used for setting the interval between ARP refresh requests. From the IP Menu, enter the following:

```
IP# rearp re-ARP-interval
```

Where *re-ARP-interval* is the number of minutes (from 2 to 120) between refreshes of the next IP address in the database.

Default Gateway Metrics

Direct command: **/cfg/ip/metrc** *metric-name*

If multiple default gateways are configured and enabled, a metric can be set to determine which primary gateway is selected. There are two metrics; each is described in the table below:

Table 7-12 Default Gateway Metrics (/cfg/ip/metrc)

Option	Description
`strict`	The gateway number determines its level of preference. Gateway #1 acts as the preferred default IP gateway until it fails or is disabled, at which point the next in line will take over as the default IP gateway.
`roundrobin`	This provides basic gateway load balancing. The switch sends each new gateway request to the next healthy, enabled gateway in line. All gateway requests to the same destination IP address are resolved to the same gateway.

Configuring VLAN Parameters

Direct command: **/cfg/vlan** *VLAN-number*

The commands in this menu configure VLAN attributes, change the status of the VLAN, delete the VLAN, and change the Port membership of the VLAN. For a more information on configuring VLANs, see "Setup Part 3: VLANs" on page 3-8, and also Chapter 11, "VLANs."

To configure VLANs, at the `Configuration#` prompt, enter:

```
Configuration# vlan VLAN-number
```

The VLAN Menu for the VLAN you selected is displayed:

```
[VLAN 1 Menu]
        name  - Assign VLAN name
        jumbo - Enable/disable Jumbo Frame support
        del   - Delete VLAN
        ena   - Enable VLAN
        dis   - Disable VLAN
        add   - Add port to VLAN
        rem   - Remove port from VLAN
        def   - Define VLAN as list of ports
        cur   - Display current VLANs

>> VLAN 1#
```

VLAN configuration options are described in the following table.

Table 7-13 VLAN Options (/cfg/vlan)

Option	Description
`name`	Assigns a name to the VLAN or changes the existing name.
`jumbo`	Enables or disables support for Jumbo Frames on this VLAN.
`del`	Deletes the VLAN.
`ena`	Enables the VLAN.
`dis`	Disables the VLAN without removing it from the configuration.
`add` *port*	Add a port to the VLAN membership.
`rem` *port*	Remove a port from the VLAN membership.

Table 7-13 VLAN Options (/cfg/vlan)

Option	Description
`def` *port* [*port...*]	Define the VLAN membership as a list of specified ports. To specify multiple ports, separate each port by a space. When this command is used, the existing port list is cleared, and the specified ports are added to the VLAN. Any ports not specified are removed from the VLAN.
`cur`	Displays all currently configured VLANs.

NOTE – You cannot add a port to more than one VLAN unless the port has VLAN tagging turned on (see "Configuring Port Parameters" on page 7-9).

NOTE – All ports must belong to at least one VLAN. Any port which is removed from a VLAN and which is not a member of any other VLAN is automatically added to default VLAN #1. You cannot remove a port from VLAN #1 if the port has no membership in any other VLAN.

Configuring Spanning-Tree Parameters

Direct command: **/cfg/stp**

WebOS supports the IEEE 802.1d Spanning-Tree Protocol (STP). STP is used to prevent loops in the network topology.

NOTE – When VRRP is used for active/active redundancy, STP must be enabled.

To configure STP parameters, at the Configuration# prompt, enter:

```
Configuration# stp
```

The Spanning-Tree Menu is displayed:

```
[Spanning Tree Menu]
        brg   - Bridge parameter menu
        port  - Port parameter menu
        on    - Globally turn Spanning Tree ON
        off   - Globally turn Spanning Tree OFF
        cur   - Display current bridge parameters

>> Spanning Tree#
```

The following table describes the Spanning-Tree Menu options.

Table 7-14 Spanning-Tree Options (/cfg/stp)

Option	Description
brg	Displays the bridge parameter menu.
port	Displays the port parameter menu.
on	Globally enables STP.
off	Globally disables STP.
cur	Displays current STP parameters.

Bridge Spanning Tree Menu

Direct command: **/cfg/stp/brg**

Spanning-Tree bridge parameters affect the global STP operation of the switch. STP bridge parameters include:

- Bridge priority
- Bridge hello time
- Bridge maximum age
- Forwarding delay
- Bridge aging time

To configure STP bridge parameters, at the `Spanning-Tree#` prompt, enter:

```
Spanning Tree# brg
```

The Bridge Spanning-Tree Menu is displayed:

```
[Bridge Spanning Tree Menu]
        prior - Set bridge Priority (0-65535)
        hello - Set bridge Hello Time (1-10 secs)
        mxage - Set bridge Max Age (6-40 secs)
        fwd   - Set bridge Forward Delay (4-30 secs)
        aging - Set bridge Aging Time (1-65535 secs, 0 to disable)
        cur   - Display current bridge parameters

>> Bridge Spanning Tree#
```

Bridge Spanning-Tree Menu options are described in the following table.

Table 7-15 Bridge Spanning-Tree Options (/cfg/stp/brg)

Option	Description
`prior`	Configures the bridge priority. The bridge priority parameter controls which bridge on the network is the STP root bridge. To make this switch the root bridge, configure the bridge priority lower than all other switches and bridges on your network. The lower the value, the higher the bridge priority. The range is 0 to 65535, and the default is 32768.
`hello`	Configures the bridge hello time.The hello time specifies how often the root bridge transmits a configuration bridge protocol data unit (BPDU). Any bridge that is not the root bridge uses the root bridge hello value. The range is 1 to 10 seconds, and the default is 2 seconds.
`mxage`	Configures the bridge maximum age. The maximum age parameter specifies the maximum time the bridge waits without receiving a configuration bridge protocol data unit before it reconfigures the STP network. The range is 6 to 40 seconds, and the default is 20 seconds.
`fwd`	Configures the bridge forward delay parameter. The forward delay parameter specifies the amount of time that a any bridge port has to wait before it changes from learning state to forwarding state. The range is 4 to 30 seconds, and the default is 15 seconds.
`aging`	Configures the forwarding database aging time. The aging time specifies the amount of time the bridge waits without receiving a packet from a station before removing the station from the forwarding database. The range is 1 to 65535 seconds, and the default is 300 seconds. To disable aging, set this parameter to 0.
`cur`	Displays current bridge STP parameters.

When configuring STP bridge parameters, the following formulas must be followed:

- $2*(fwd-1) \geq mxage$
- $2*(hello+1) \leq mxage$

Spanning-Tree Port Menu

Direct command: **/cfg/stp/port** *port-number*

Spanning-Tree port parameters are used to modify STP operation on an individual port basis. STP port parameters include:

- Port priority
- Port path cost

To configure STP port parameters, at the `Spanning Tree#` prompt, enter:

```
Spanning Tree# port port-number
```

The Spanning-Tree Port Menu is displayed:

```
[Spanning Tree Port 1 Menu]
        on     -  Turn port's Spanning Tree ON
        off    -  Turn port's Spanning Tree OFF
        prior  -  Set port Priority (0-255)
        cost   -  Set port Path Cost (1-65535)
        cur    -  Display current port Spanning Tree parameters

>> Spanning Tree Port 1#
```

The Spanning-Tree Port Menu options are described in the following table.

Table 7-16 Spanning-Tree Port Options (/cfg/stp/port)

Option	Description
`on`	Enables STP on the port.
`off`	Disables STP on the port.
`prior`	Configures the port priority. The port priority helps determine which bridge port becomes the designated port. In a network topology that has multiple bridge ports connected to a single segment, the port with the lowest port priority becomes the designated port for the segment. The range is 0 to 255, and the default is 128.
`cost`	Configures the port path cost. The port path cost is used to help determine the designated port for a segment. Generally speaking, the faster the port, the lower the path cost. The range is 1 to 65535. The default is 10 for 100Mbps ports, and 1 for gigabit ports. A value of 0 indicates that the default cost will be computed for an autonegotiated link speed.
`cur`	Displays current STP port parameters.

Configuring SNMP Parameters

Direct command: **`/cfg/snmp`**

The WebOS software supports SNMP-based network management. If you are running an SNMP network management station on your network, you can manage the switch using the following standard SNMP MIBs:

- MIB II (RFC 1213)
- Ethernet MIB (RFC 1643)
- Bridge MIB (RFC 1493)

SNMP parameters that can be modified include:

- System name
- System location
- System contact
- Use of the SNMP system authentication trap function
- Read community string
- Write community string
- Trap hosts
- Trap community strings

To configure SNMP parameters, at the `Configuration#` prompt enter:

```
Configuration# snmp
```

The SNMP Menu is displayed:

```
[SNMP Menu]
        name  - Set SNMP "sysName"
        locn  - Set SNMP "sysLocation"
        cont  - Set SNMP "sysContact"
        auth  - Disable/enable SNMP "sysAuthenTrap"
        rcomm - Set SNMP read community string
        wcomm - Set SNMP write community string
        trap1 - Set IP addr of first SNMP trap host
        trap2 - Set IP addr of second SNMP trap host
        t1comm - Set community string for first trap host
        t2comm - Set community string for second trap host
        linkt - Disable/enable SNMP link up/down trap
        cur   - Display current SNMP information
>> SNMP#
```

The SNMP Menu options are described in the following table.

Table 7-17 SNMP Options (/cfg/snmp)

Option	Description
`name`	Configures the name for the system. The name can have a maximum of 64 characters.
`locn`	Configures the name of the system location. The system location can have a maximum of 64 characters.
`cont`	Configures the name of the system contact. The system contact can have a maximum of 64 characters.
`auth`	Enables or disables the use of the system authentication trap facility. The default setting is disabled.
`rcomm`	Configures the SNMP read community string. The read community string controls SNMP "get" access to the switch. It can have a maximum of 32 characters.
`wcomm`	Configures the SNMP write community string. The write community string controls SNMP "set" and "get" access to the switch. It can have a maximum of 32 characters.
`trap1`	Configures the IP address of the first SNMP trap host using dotted decimal notation. The SNMP trap host is the device that receives SNMP trap messages from the switch.
`trap2`	Configures the IP address of the second SNMP trap host using dotted decimal notation.
`t1comm`	Configures the community string for the first trap host.
`t2comm`	Configures the community string for the second trap host.
`linkt`	Enables or disables the sending of SNMP link up and link down traps.
`cur`	Displays current SNMP information.

Setup

Direct command: **/cfg/setup**

The setup program steps you through configuring the system date and time, BOOTP, IP, Spanning Tree, port, and VLAN parameters.

To start the setup program, at the Configuration# prompt, enter:

```
Configuration# setup
```

For a complete description of how to use Setup see Chapter 3, "First-Time Configuration."

Dump

Direct command: **/cfg/dump**

The dump program writes the current switch configuration to the terminal screen. To start the dump program, at the Configuration# prompt, enter:

```
Configuration# dump
```

The configuration is displayed in the form of a configuration script. The screen display can be captured, edited, and placed in a configuration script file.

The configuration script file can be used to configure other switches through a Telnet connection. When using Telnet to configure a new switch, paste the configuration commands from the script file at the command line prompt of the switch. The active configuration can also be saved or loaded via TFTP, as described in "TFTP Configuration Put and Get" on page 7-33.

TFTP Configuration Put and Get

Using the commands described in this section, you can put (save) or get (load) the active switch configuration via TFTP.

Saving the Active Switch Configuration

Direct command: **/cfg/ptcfg**

When the ptcfg command is used, the switch's active configuration commands (as displayed using /cfg/dump) will be uploaded to the specified script configuration file on the TFTP server. To start the switch configuration upload, at the Configuration# prompt, enter:

```
Configuration# ptcfg server filename
```

Where *server* is the TFTP server IP address or hostname, and *filename* is the name of the target script configuration file.

NOTE – If the TFTP server is running SunOS or the Solaris operating system, the specified ptcfg file must exist prior to executing the ptcfg command, and must be writable (set with proper permission, and not locked by any application). The contents of the specified file will be replaced with the current configuration data.

Loading the Active Switch Configuration

Direct command: **/cfg/gtcfg**

When the gtcfg command is used, the active configuration will be replaced with the commands found in the specified configuration file. The file can contain a full switch configuration or a partial switch configuration. The configuration loaded using gtcfg is not activated until the apply command is used. If the apply command is found in the configuration script file loaded using this command, the apply action will be performed automatically.

To start the switch configuration download, at the Configuration# prompt, enter:

```
Configuration# gtcfg server filename
```

Where *server* is the TFTP server IP address or hostname, and *filename* is the name of the target script configuration file.

Configuring Port Mirroring

Direct command: **`/cfg/mirr/port`**

The Port Mirroring Menu is used to configure, enable, and disable the port monitor. When enabled, network packets being sent and/or received on a target port are duplicated and sent to a monitor port. By attaching a network analyzer to the monitor port, you can collect detailed information about your network performance and usage.

NOTE – Port Mirroring cannot be used simultaneously with Layer 4 services (Server Load Balancing or Application Redirection) on any switch port connected to a server either directly, or through another switch or hub.

For Server Load Balancing, this applies to any switch port configured in the "`server`" state. For Application Redirection, this applies to any switch port that has a cache server attached to it directly or indirectly. Use your network analyzer with a full-duplex pass-through connection or an Ethernet hub when troubleshooting a switch port for a server used for Layer 4 services.

The Port Mirroring Menu is configured from the Configuration Menu:

```
Configuration# mirr/port
```

The Port Mirroring Menu is displayed.

```
[Port Mirroring Menu]
        to    - Set "Monitoring" port
        from  - Set "Mirrored" port
        dir   - Set Direction [in, out, both]
        tmout - Set Mirroring Timeout value in seconds
        dis   - Disable Port Mirroring
        ena   - Enable Port Mirroring
        cur   - Display current Port Mirroring configuration

>> Port Mirroring#
```

The Port Mirroring Menu options are described in the following table.

Table 7-18 Port Mirroring Options (/cfg/mirr/port)

Option	Description
`to`	This defines the monitoring port. When port mirroring is enabled, packets received and/or transmitted by the mirrored port will be duplicated to the switch port specified in this command.
`from`	This defines the mirrored port. When port mirroring is enabled, packets received and/or sent by the port specified in this command will be sent to the monitor port.
`dir`	This determines which type of packets will be sent to the monitor port: `in` = packets received at the mirrored port `out` = packets sent from the mirrored port `both` = packets sent and received by the mirrored port
`tmout`	Port mirroring will be automatically disabled (regardless of port state) after the time-out period specified in this command. Valid times are from 0 (does not time-out) to 86400 seconds.
`dis`	Turns port mirroring off.
`ena`	Turns port mirroring on.
`cur`	Displays the current parameter settings.

Configuring Server Load Balancing

Direct command: **/cfg/slb**

From the Operations# prompt, enter:

```
Configuration# slb
```

The Server Load Balancing Menu is then displayed:

```
[Server Load Balancing Menu]
        real  - Real server menu
        group - Real server group menu
        virt  - Virtual server menu
        filt  - Filtering menu
        port  - Layer 4 port menu
        gslb  - Global SLB menu
        on    - Globally turn Layer 4 processing ON
        off   - Globally turn Layer 4 processing OFF
        direc - Enable/disable Direct Access mode
        imask - Set virtual and real IP address mask
        mnet  - Set management network
        mmask - Set management subnet mask
        secrt - Set Radius secret
        cur   - Display current Server Load Balancing configuration

>> Server Load Balancing#
```

The following table describes the Server Load Balancing Menu options.

Table 7-19 Server Load Balancing Options (/cfg/slb)

Option	Description
real	Menu for configuring real servers.
group	Menu for placing real servers into real server groups.
virt	Menu for defining virtual servers.
filt	Menu for Filtering and Application Redirection.
port	Menu for setting physical switch port states for Layer 4 activity.
gslb	Menu for configuring Global Server Load Balancing

Table 7-19 Server Load Balancing Options (/cfg/slb)

Option	Description
`on`	Turn on Layer 4 software services for Server Load Balancing and Application Redirection. This option can be performed only once the optional Layer 4 software is enabled (see "Activating Optional Software" on page 8-7). Enabling Layer 4 services is not necessary for using filters only to allow, deny, or NAT traffic (see note below).
`off`	Disable Layer 4 services. All configuration information will remain in place (if `applied` or `saved`), but the software processes will no longer be active in the switch.
`direc`	Enable/disables Direct Access Mode to real servers/services. This option also allows any virtual server to load balance any real server. For more information, see "Direct Access Mode" on page 7-38.
`imask`	Configures the real and virtual IP address mask using dotted decimal notation. For more information, see "Configuring the imask" on page 7-38.
`mnet`	If defined, management traffic with this source IP address will be allowed direct (non-Layer 4) access to the real servers. Specify an IP address in dotted decimal notation. A range of IP addresses is produced when used with the `mmask` option.
`mmask`	This IP address mask is used with the `mnet` to select management traffic which is allowed direct real server access.
`secrt`	To perform application health checking to a RADIUS server, the network administrator must configure two parameters in the switch: the `/cfg/slb/secrt` value and the `cntnt` parameter with a *username:password* value. The `secrt` value is a field of 16 alphanumeric characters that is used by the switch to encrypt a password during the RSA Message Digest Algorithm (MD5) and by the RADIUS server to decrypt the password during verification.
`cur`	Displays current system parameters.

Filtering and Layer 4

Filters configured to allow, deny, or NAT traffic do not require Layer 4 software to be activated. These filters are not affected by the Server Load Balancing `on` and `off` commands in this menu.

Application Redirection filters, however, require Layer 4 software services. Layer 4 processing must be turned on before redirection filters will work.

Direct Access Mode

Some clients may need direct access to the real servers, to, for example, monitor a real server from a management workstation. When Direct Access Mode (`/cfg/slb/direc`) is enabled on a switch, any client can communicate with any real server to its load-balanced service. Also, in Direct Access Mode, any number of virtual services can be configured to load balance a real service.

NOTE – When Direct Access Mode is enabled on a server, Layer 4 port mapping and default gateway load balancing is not supported.

Traffic sent directly to real server IP addresses is excluded from load balancing decisions. The same clients may also communicate to the virtual server IP address and have their requests load balanced.

Configuring the imask

The imask determines how many different IP addresses each real and virtual server will represent and respond to. By default, the imask setting is 255.255.255.255, which means that each real and virtual server represents a single IP address. An imask setting of 255.255.255.0 would mean that each real and virtual server represents 256 IP addresses. For example, consider the following:

- A virtual server is configured with an IP address of 172.16.10.1.
- Real servers 172.16.20.1 and 172.16.30.1 are assigned to service the virtual server.
- The imask is set to 255.255.255.0.

If the client request was sent to virtual IP address 172.16.10.45, the unmasked portion of the virtual IP address (0.0.0.45) gets mapped directly to whichever real IP address is selected by the Server Load Balancing algorithm. Thus, the request would be sent to either 172.16.20.45 or 172.16.30.45.

Configuring Real Server Parameters

Direct command: **`/cfg/slb/real`** *real-server-number*

This menu is used for configuring information about the real servers which will participate in the server pool for Server Load Balancing or Application Redirection. The required minimum of parameters to configure is as follows:

- Real server IP address
- Enabling the real server

To configure SLB real server parameters, at the `Server Load Balancing#` prompt, enter:

```
Server Load Balancing# real real-server-number
```

Where the real-server-number (1 to 256) represents a real server that you wish to configure.

The menu for the real server you entered is displayed:

```
[Real server 1 Menu]
      rip   - Set IP addr of real server
      name  - Set name of real server
      wght  - Set server weight
      mcon  - Set maximum number of connections
      tmout - Set minutes inactive connection remains open
      bkup  - Set backup real server
      intr  - Set interval between health checks
      retry - Set number of failed attempts to declare server DOWN
      restr - Set number of successful attempts to declare server UP
      remot - Enable/disable remote site operation
      proxy - Enable/disable client proxy operation
      ena   - Enable real server
      dis   - Disable real server
      del   - Delete real server
      cur   - Display current real server configuration

>> Real server 1 #
```

Real server configuration options are described in the following table.

Table 7-20 SLB Real Server Options (/cfg/slb/real)

Option	Description
`rip`	Set the IP address of the real server in dotted decimal format. When this command is used, the address entered is `PING`ed to determine if the server is up, and the administrator will be warned if the server does not respond.
`name`	Define a 15-character alias for each Real Server. This will enable the network administrator to quickly identify the server by a natural language keyword value.

Table 7-20 SLB Real Server Options (/cfg/slb/real)

Option	Description
`wght`	Set the weighting value (1 to 48) that this real server will be given in the load balancing algorithms. Higher weighting values force the server to receive more connections than the other servers configured in the same real server group. By default, each real server is given a weight setting of 1. A setting of 10 would assign the server roughly 10 times the number of connections as a server with a weight of 1. Weights are not applied when using the `hash` or `minmisses` metrics (see "Server Load Balancing Metrics" on page 7-44).
`mcon`	Set the maximum number of connections that this server should simultaneously support. This option sets a threshold as an artificial barrier, such that new connections will not be issued to this server if the `mcon` limit is reached. New connections will be issued again to this server once the number of current connections has decreased below the `mcon` setting. If all servers in a real server group for a virtual server reach their `mcon` limit at the same time, client requests will be dropped by the virtual server.
`tmout`	Set the number of minutes an inactive session remains open (in even numbered increments). Every client-to-server session being load balanced is recorded in the switch's Session Binding Table. When a client makes a request, the session is recorded in the binding table, the data is transferred until the client ends the session, and the binding table entry is then removed. In certain circumstances, such as when a client application is abnormally terminated by the client's system, TCP/UDP connections will remain registered in the switch's binding table. In order to prevent table overflow, these orphaned entries must be aged out of the binding table. Using the `tmout` option, you can set the number of minutes to wait before removing orphan table entries. Settings must be specified in even numbered increments between 2 and 60 minutes. The default setting is 10. This option is also used with the Persistent option (see `/cfg/slb/virt/pbind`). When Persistent is activated, this option sets how long an idle client is allowed to remain associated with a particular server.
`bkup`	Set the real server used as the backup/overflow server for this real server. To prevent loss of service if a particular real server fails, use this option to assign a backup real server number. Then, if the real server becomes inoperative, the switch will activate the backup real server until the original becomes operative again. The backup server is also used in overflow situations. If the real server reaches its `mcon` (maximum connections) limit, the backup comes online to provide additional processing power until the original server becomes desaturated. The same backup/overflow server may be assigned to more than one real server at the same time.

Table 7-20 SLB Real Server Options (/cfg/slb/real)

Option	Description
`intr`	Set the interval between real server health verification attempts. Determining the health of each real server is a necessary function for Layer 4 switching. For TCP services, the switch verifies that real servers and their corresponding services are operational by opening a TCP connection to each service, using the defined service ports configured as part of each virtual service. For UDP services, the switch pings servers to determine their status. The `intr` option lets you choose the time between health checks. The range is from 1 to 60 seconds. The default interval is 2 seconds.
`retry`	Set the number of failed health check attempts required before declaring this real server inoperative. The range is from 1 to 63 attempts. The default is 4 attempts.
`restr`	Set the number of successful health check attempts required before declaring a UDP service operational. The range is from 1 to 63 attempts. The default is 8 attempts.
`remot`	Enable or disable remote site operation for this server. This should be enabled when the real IP address supplied above represents a remote server (real or virtual) this switch will access as part of its Global Server Load Balancing network. For more information see Chapter 17, "Global Server Load Balancing."
`proxy`	Enable or disable proxy IP address translation. With this option enabled (default), a client request from any application can be proxied using a load-balancing Proxy IP address (PIP).
`ena`	You *must* perform this command to enable this real server for Layer 4 service. When enabled, the real server can process virtual server requests associated with its real server group. This option, when the `apply` and `save` commands are used, enables this real server for operation until explicitly disabled. See `/oper/slb/ena` on page 8-5 for an operations-level command.
`dis`	Disable this real server from Layer 4 service. Any disabled server will no longer process virtual server requests as part of the real server group to which it is assigned. This option, when the `apply` is are used, disables this real server until it is explicitly re-enabled. This option *does not* perform a graceful server shutdown. See `/oper/slb/dis` on page 8-5 for an operations-level command.
`del`	Delete this real server from the Layer 4 switching software configuration. This removes the real server from operation within its real server groups. Use this command with caution, as it will delete any configuration options that have been set for this real server. This option *does not* perform a graceful server shutdown.
`cur`	Display the current configuration information for this real server.

The Real Server Group Menu

Direct command: **`/cfg/slb/group`** *real-server-group-number*

This menu is used for combining real servers into real server groups. Each real server group should consist of all the real servers which provide a specific service for load balancing. Each group must consist of at least one real server. Each real server can belong to more than one group. Real server groups are used both for Server Load Balancing and Application Redirection.

To configure SLB real server group options, at the `Server Load Balancing#` prompt, enter:

```
Server Load Balancing# group real-server-group-number
```

Where *real-server-group-number* (1 to 256) represents the number of the real server group that you wish to configure.

The menu for the real server group you entered is displayed:

```
[Real server group 1 Menu]
        add   - Add real server
        rem   - Remove real server
        metrc - Set metric used to select next server in group
        cntnt - Set health check content
        healt - Set health check type
        bkup  - Set backup real server
        name  - Set real server group name
        del   - Delete real server group
        cur   - Display current group configuration

>> Real server group 1#
```

Real server group configuration options are described in the following table.

Table 7-21 Real Server Group Options (/cfg/slb/group)

Option	Description
`add`	Add a real server to this real server group. You will be prompted to enter the number (1 to 256) of the real server to add to this group.
`rem`	Remove a real server from this real server group. You will be prompted for the ID number for the real server to remove from this group.
`metrc`	Set the load balancing metric used for determining which real server in the group will be the target of the next client request. See the information below.
`cntnt`	This option defines the specific content which is examined during health checks. The content depends on the type of health check specified in the `healt` option (see below).

Table 7-21 Real Server Group Options (/cfg/slb/group)

Option	Description
`healt`	Set the type of health checking performed. The options are as follows: `icmp` For Layer 3 health checking, `ping` the server. `tcp` For TCP service, open and close a TCP/IP connection to the server. `http` For HTTP service, uses HTTP 1.1 `GETS` when a `HOST:` header is required to check that the URL content specified in `cntnt` is accessible on the server. Otherwise, an `HTTP/1.0 GET` occurs. See examples on page 15-11. `dns` For Domain Name Service, check that the domain name specified in `cntnt` can be resolved by the server. `pop3` For user mail service, check that the *user*:*password* account specified in `cntnt` exists on the server. `smtp` For mail-server to mail-server services, check that the user specified in `cntnt` is accessible on the server. `nntp` For newsgroup services, check that the newsgroup name specified in `cntnt` is accessible on the server. `ftp` For FTP services, check that the filename specified in `cntnt` is accessible on the server through anonymous login. `imap` For user mail service, check that the *user:password* value specified in `cntnt` exists on the serve `radius` For remote access (RADIUS) server authentication, check that the *user:password* value specified in `cntnt` exists on the switch and the server. To perform application health checking to a RADIUS server, the network administrator must also configure the `/cfg/slb/secrt` parameter. The `secrt` value is a field of 16 alphanumeric characters that is used by the switch to encrypt a password during the RSA Message Digest Algorithm (MD5) and by the RADIUS server to decrypt the password during verification.
`bkup`	Set the real server used as the backup/overflow server for this real server group. To prevent loss of service if the entire real server group fails, use this option to assign a backup real server number. Then, if the real server group becomes inoperative, the switch will activate the backup real server until one of the original real servers becomes operative again. The backup server is also used in overflow situations. If all the servers in the real server group reach their `mcon` (maximum connections) limit, the backup comes online to provide additional processing power until one of the original servers becomes desaturated. The same backup/overflow server may be assigned to more than one real server group at the same time.

Table 7-21 Real Server Group Options (/cfg/slb/group)

Option	Description
`name`	Define a 15-character alias for each Real Server Group. This will enable the network administrator to quickly identify the server group by a natural language keyword value.
`del`	Delete this real server group from the Layer 4 software configuration. This removes the group from operation under all virtual servers it is assigned to. Use this command with caution: if you remove the only group assigned to a virtual server, the virtual server will become inoperative.
`cur`	Displays the current configuration parameters for this real server group.

Server Load Balancing Metrics

Using the *metrc* command, you can set a number of metrics for selecting which real server in a group gets the next client request. These metrics are described in the following table:

Table 7-22 Real Server Group Metrics

Option	Description
`minmisses`	Minimum misses. This metric is optimized for Application Redirection, Firewall Load Balancing and Router Load Balancing. We recommend its use for all Application Redirection situations. When `minmisses` is specified for a real server group performing Application Redirection, all requests for a specific IP destination address will be sent to the same server. This is particularly useful in caching applications, helping to maximize successful cache hits. Best statistical load balancing is achieved when the IP address destinations of load balanced frames are spread across a broad range of IP subnets. Minmisses can also be used for Server Load Balancing. When specified for a real server group performing Server Load Balancing, all requests from a specific client will be sent to the same server. This is useful for applications where client information must be retained on the server between sessions. Server load with this metric becomes most evenly balanced as the number of active clients increases.

Table 7-22 Real Server Group Metrics

Option	Description
`hash`	Like `minmisses`, the `hash` metric uses IP address information in the client request to select a server. For Application Redirection, all requests for a specific IP destination address will be sent to the same server. This is particularly useful for maximizing successful cache hits. For Server Load Balancing, all requests from a specific client will be sent to the same server. This is useful for applications where client information must be retained between sessions. The `hash` metric should be used if the statistical load balancing achieved using `minmisses` is not as optimal as desired. Although the `hash` metric can provide more even load balancing at any given instance, it is not as effective as `minmisses` when servers leave and reenter service. If the Load Balancing statistics indicate that one server is processing significantly more requests over time than other servers, consider using the `hash` metric.
`leastconns`	Least connections. With this option, the number of connections currently open on each real server is measured in real time. The server with the fewest current connections is considered to be the best choice for the next client connection request. This option is the most self-regulating, with the fastest servers typically getting the most connections over time, due to their ability to accept, process, and shut down connections faster than slower servers.
`roundrobin`	Round robin. With this option, new connections are issued to each server in turn: the first real server in this group gets the first connection, the second real server gets the next connection, followed by the third real server, and so on. When all the real servers in this group have received at least one connection, the issuing process starts over with the first real server.

NOTE – Under the `leastconns` and `roundrobin` metrics, when real servers are configured with weights (see the `wght` option on page 7-40), a higher proportion of connections are given to servers with higher weights. This can improve load balancing among servers of different performance levels. Weights are not applied when using `hash` or `minmisses`.

The Virtual Server Menu

Direct command: **`/cfg/slb/virt`** *virtual-server-number*

This menu is used for configuring the virtual servers which will be the target for client requests for Server Load Balancing. The required minimum of parameters to configure is as follows:

- Virtual server IP address
- Adding a virtual TCP/UDP port and real server group
- Enabling the virtual server

To configure SLB virtual server parameters, at the `Server Load Balancing#` prompt, enter:

```
Server Load Balancing# virt virtual-server-number
```

Where *virtual-server-number* (1 to 256) represents the number of the virtual server that you wish to configure. The menu for the virtual server you entered is then displayed:

```
[Virtual server 1 Menu]
        vip   - Set IP addr of virtual server
        dname - Set domain name of virtual server
        layr3 - Enable/disable layer 3 only balancing
        add   - Add virtual port and real server group
        rem   - Remove virtual port
        map   - Map virtual port to real port
        hname - Set hostname of virtual port
        udp   - Enable/disable UDP balancing for virtual port
        pbind - Enable/disable persistent bindings for virtual port
        ena   - Enable virtual server
        dis   - Disable virtual server
        del   - Delete virtual server
        cur   - Display current virtual configuration

>> Virtual server 1#
```

Virtual server configuration options are described in the following table.

Table 7-23 SLB Virtual Server Options (/cfg/slb/virt)

Option	Description
`vip`	Set the IP address of the virtual server using dotted decimal notation. The virtual server created within the switch will respond to ARPs and PINGs from network ports as if it was a normal server. Client requests directed to the virtual server's IP address will be balanced among the real servers available to it through real server group assignments.

Table 7-23 SLB Virtual Server Options (/cfg/slb/virt)

Option	Description
`dname`	Set the domain name for this virtual server. The domain name typically includes the name of the company or organization, and the Internet group code (.com, .edu, .gov, .org, etcetera). An example would be foocorp.com. It does not include the hostname portion (www, www2, ftp, etcetera). To define the hostname, see `hname` below. To clear the `dname`, specify the name as **none**.
`layr3`	Normally, the client IP address is used with the client Layer 4 port number to produce a session identifier. When the `layr3` option is used, the switch uses only the client IP address as the session identifier, associating all the connections from the same client with the same real server while any connection exists between them. This is necessary for some server applications where state information about the client system is divided across different simultaneous connections, and also in applications where TCP fragments are generated. If the real server that the client is assigned to becomes unavailable, the Layer 4 software will allow the client to connect to a different server.
`add`	Assign a virtual port to this virtual server, and a real server group to service it. Up to eight services can be defined for each virtual server. If more services are needed for a particular virtual IP address, two or more virtual servers can be created with the same virtual IP address, each with up to eight services. For any specific virtual server IP address, each service added must be unique (for example, HTTP services cannot be added to two different virtual servers with the same virtual IP address). At least one virtual port and group is required for each virtual server. The format for this command is as follows: # **add** *virtual-port real-server-group* The virtual port is the TCP/UDP port to which the clients will be sending connection requests. The *virtual-port* number or name can be specified. You can define your own virtual port, or use one of the well-known ports as follows: Number Name — Number Name 20 ftp-data — 111 sunrpc 21 ftp — 119 nntp 22 ssh — 123 ntp 23 telnet — 143 imap 25 smtp — 144 news 37 time — 161 snmp 42 name — 162 snmptrap 43 whois — 179 bgp 53 domain — 194 irc 69 tftp — 220 imap3 70 gopher — 389 ldap 79 finger — 443 https 80 http — 520 rip 109 pop2 — 554 rtsp 110 pop3 — 1985 hsrp

Table 7-23 SLB Virtual Server Options (/cfg/slb/virt)

Option	Description
	Each real server in the real server group is expected to have a server process operational and listening to the virtual port(s) that are configured on this virtual server. See the `map` command below for information about mapping well known server TCP/UDP ports to administrator selected TCP/UDP port numbers
`rem`	Remove a virtual port from this virtual server. You must select this command to deactivate a particular virtual service from this virtual server. You will be prompted to enter the TCP/UDP port number or name for the service to be deactivated.
`map`	Map a virtual port number or name to real server port number or name. See examples, below.
`hname`	Set the virtual port and hostname for a service added. This is used in conjunction with dname (above) to create a full host/domain name for individual services. The format for this command is as follows: # **`hname`** *virtual-port hostname* For example, to add a hostname for web services, you could specify "http" as the virtual port and "www" as the hostname. If a `dname` of "foocorp.com" was defined (above), "www.foocorp.com" would be the full host/domain name for the service. To clear the hostname for a service, use the following command: # **`hname`** *virtual-port* **`none`**
`udp`	Enable/disable UDP balancing for a virtual port. You can configure this option if the services to be load balanced include UDP instead of, or in addition to, TCP. For example, NFS in some older networking environments might use UDP instead of TCP. In those environments, you must activate UDP balancing for the particular virtual servers that clients will communicate with using UDP.
`pbind`	Enable/disable persistent bindings for a real server. This may be necessary for some server applications where state information about the client system is retained on the server over a series of sequential connections, such as with SSL (Secure Socket Layer, https), Web site search results, or multi-page web forms. This option uses the client IP address as an identifier, and associates all the connections from the same client with the same real server until the client becomes inactive and the connection is aged out of the binding table. The connection timeout value (set on the Real Server Menu) is used to control how long these inactive but persistent connections remain associated with their real servers. When the client resumes activity *after* their connection has been aged out, they will be connected to the most appropriate real server based on the load balancing algorithm. An alternative approach may be to use the real server group metrics `minmisses` or `hash` (see "Server Load Balancing Metrics" on page 7-44).
`ena`	Enable this virtual server and its services. This option activates the virtual server within the switch so that it can service client requests sent to its defined IP address.

Table 7-23 SLB Virtual Server Options (/cfg/slb/virt)

Option	Description
`dis`	This option is used to disable the virtual server so that it no longer services client requests.
`del`	This command removes this virtual server from operation within the switch and deletes it from the Layer 4 switching software configuration. Use this command with caution, as it will delete the options that have been set for this virtual server.
`cur`	Displays the current parameters for the virtual server.

Direct Client Access to Real Servers

Some clients may need direct access to the real servers, to, for example, monitor a real server from a management workstation. This access can be provided in a number of ways, listed below and described in this section:

- Direct Access Mode
- Multiple IP addresses on the server
- Proxy IP addresses
- Port mapping
- Management network

Direct Access Mode

When Direct Access Mode (`/cfg/slb/direc`) is enabled on a switch, any client can communicate with any real server to its load-balanced service. Also, in Direct Access Mode, any number of virtual services can be configured to load balance a real service.

Traffic sent directly to real server IP addresses is excluded from load balancing decisions. The same clients may also communicate to the virtual server IP address and have their requests load balanced.

Multiple IP Addresses on the Server

One way to provide both Layer 4 access and direct access to a real server, is to assign multiple IP addresses to the real server. For example, one IP address could be established exclusively for Layer 4 Server Load Balancing, and another could be used for direct access needs.

Proxy IP Addresses

Proxy IP addresses are used primarily to eliminate Server Load Balancing topology restrictions in complex networks (see "Network Topology Considerations" on page 15-4). Proxy IP addresses can also provide direct access to real servers.

If the switch port to the client is configured with a proxy IP address (see "IP Proxy Addresses for Complex SLB Networks" on page 15-17), the client can access each real server directly using the real server's IP address. This requires that the switch port connected to the real server has server and client processing disabled (see the `servr` and `clien` options under `/cfg/slb/port` on page 7-56).

Server Load Balancing is still accessed using the virtual server IP address.

Port Mapping

When Server Load Balancing is used without proxy IP addresses, the virtual server *must* process both the client-to-server requests *and* the server-to-client responses. If a client were to access the real server IP address and port directly, bypassing Layer 4 preparation, the server-to-client response could be mishandled by Layer 4 processing as it returns through the switch.

NOTE – When Direct Access Mode is enabled on a server, Layer 4 port mapping and default gateway load balancing is not supported.

First, two port processes must be executed on the real server. One real server port will handle the direct traffic, and the other will handle Layer 4 traffic. Then, the virtual server port must be mapped to the proper real server port.

In the following figure, clients can access Layer 4 services through well-known TCP port 80 at the virtual server's IP address. This is mapped to TCP port 8000 on the real server. For direct access that bypasses the virtual server and Server Load Balancing, clients can specify well-known TCP port 80 at the real server's IP address.

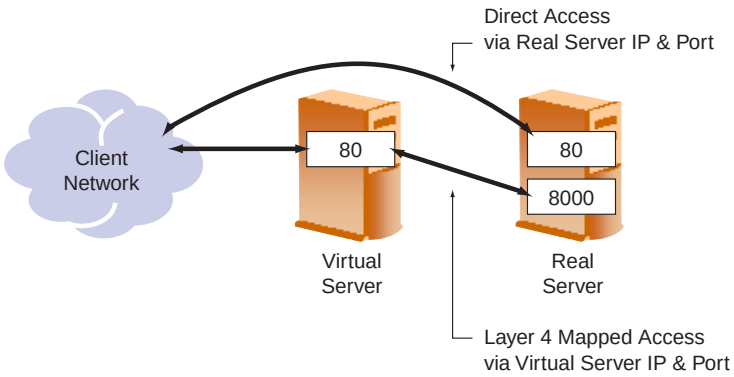


Figure 7-1 Mapped and Non-mapped server access

Management Network

Typically, the management network is used by network administrators to monitor real servers and services. By configuring the `mnet` and `mmask` options of the SLB Configuration Menu (`cfg/slb/`) you can access the real services being load balanced.

NOTE – Clients on the management network do not have access to Layer 4 services and cannot access the virtual services being load balanced.

The `mnet` and `mmask` options are described below:

- `mnet`: If defined, management traffic with this source IP address will be allowed direct (non-Layer 4) access to the real servers. Specify an IP address in dotted decimal notation. A range of IP addresses is produced when used with the `mmask` option
- `mmask`: This IP address mask is used with the `mnet` to select management traffic which is allowed direct real server access.

Mapping Virtual Ports to Real Ports

In addition to providing direct real server access in some situations, mapping is required when administrators choose to execute their real server processes on different TCP/UDP port than the well known TCP/UDP ports. Otherwise, virtual server ports are mapped directly to real server ports by default and require no mapping configuration.

The format for the `map` command is as follows:

```
Virtual server 1# map virtual-server-port  real-server-port
```

NOTE – This option will not work if Direct Access Mode is enabled.

The Filter Menu

Direct command: **`/cfg/slb/filt`** *filter-number*

The switch supports up to 224 traffic filters. Each filter can be configured to allow, deny, redirect or NAT traffic according to a variety of address and protocol specifications, and each physical switch port can be configured to use any combination of filters.

The required minimum of parameters to configure is as follows:

- Set the address, masks, and/or protocol which will be affected by the filter
- Set the action which the filter takes
- Enable the filter
- Add the filter to a switch port
- Enable filtering on the switch port

To configure Filtering parameters, at the `Server Load Balancing#` prompt, enter:

```
Server Load Balancing# filt filter-number
```

The menu is displayed for the selected filter:

```
[Filter 1 Menu]
        sip   - Set source IP address
        smask - Set source IP mask
        dip   - Set destination IP address
        dmask - Set destination IP mask
        proto - Set IP protocol
        sport - Set source TCP/UDP port or range
        dport - Set destination TCP/UDP port or range
        actio - Set action
        group - Set real server group for redirection
        rport - Set real server port for redirection
        proxy - Enable/disable client proxy
        inver - Enable/disable filter inversion
        ack   - Enable/disable TCP ack matching
        nat   - Set which addresses are network address translated
        cache - Enable/disable caching sessions that match filter
        log   - Enable/disable logging
        ena   - Enable filter
        dis   - Disable filter
        del   - Delete filter
        cur   - Display current filter configuration

>> Filter 1#
```

Filter configuration options are described in the following table.

Table 7-24 Filter Options (/cfg/slb/filt)

Option	Description
`sip`	If defined, traffic with this source IP address will be affected by this filter. Specify an IP address in dotted decimal notation, or "**any**". A range of IP addresses is produced when used with the `smask` below.
`smask`	This IP address mask is used with the `sip` to select traffic which this filter will affect. See details below for more information on producing address ranges.
`dip`	If defined, traffic with this destination IP address will be affected by this filter. Specify an IP address in dotted decimal notation, or "**any**". A range of IP addresses is produced when used with the `dmask` below.
`dmask`	This IP address mask is used with the `dip` to select traffic which this filter will affect. See details below for more information on producing address ranges.
`proto`	If defined, traffic from the specified protocol is affected by this filter. The protocol number, name, or "**any**" can be specified: Number Name 1 icmp 2 igmp 6 tcp 17 udp 89 ospf 112 vrrp
`sport`	If defined, traffic with the specified TCP or UDP source port will be affected by this filter. The port number, range, name, or "**any**" can be specified. The well-known ports are as follows: Number Name — Number Name 20 ftp-data — 111 sunrpc 21 ftp — 119 nntp 22 ssh — 123 ntp 23 telnet — 143 imap 25 smtp — 144 news 37 time — 161 snmp 42 name — 162 snmptrap 43 whois — 179 bgp 53 domain — 194 irc 69 tftp — 220 imap3 70 gopher — 389 ldap 79 finger — 443 https 80 http — 520 rip 109 pop2 — 554 rtsp 110 pop3 — 1985 hsrp

Table 7-24 Filter Options (/cfg/slb/filt)

Option	Description
	A number range can be specified by placing a dash between the low and high port number. For example: `31000-33000`
`dport`	If defined, traffic with the specified real server TCP or UDP destination port will be affected by this filter. The port number, range, name, or "**`any`**" can be specified, just as with `sport` above.
`actio`	Specify the action this filter takes: `allow` Allow the frame to pass. `deny` Discard frames that fit this filter's profile. This can be used for building basic security profiles. `redir` Redirect frames that fit this filter's profile, such as for web-cache redirection. In addition, Layer 4 processing must be activated (see the `/cfg/slb/on` command on page 7-37). `nat` Perform generic Network Address Translation (NAT). This can be used to map the source or destination IP address and port information of a private network scheme to/from the advertised network IP address and ports. This is used in conjunction with the `nat` option below and can also be combined with proxies (see "Network Address Translation Examples" on page 16-25).
`group`	This option applies only when `redir` is specified at the filter action. Define a real server group (1 to 256) to which redirected traffic will be sent.
`rport`	This option applies only when `redir` is specified at the filter action. This defines the real server TCP or UDP port to which redirected traffic will be sent. For valid Layer 4 health checks, this must be configured whenever TCP protocol traffic is redirected. Also, if transparent proxies are used for Network Address Translation (NAT) on the switch (see the `pip` option on page 7-57), `rport` must be configured for all Application Redirection filters.
`proxy`	This option applies only when `redir` or `nat` is specified at the filter action. Enable or disable proxy IP address translation for traffic matching the filter criteria. By default, this option is enabled. If disabled, any proxy defined for the switch port using the `pip` command (see page 7-57) is not performed for traffic that meets the filter criteria. This is useful when some types of traffic must retain original IP address information, or when other forms of translation (such as Application Redirection or NAT) are preferred.
`inver`	Invert the filter logic. If the conditions of the filter are met, *don't* act. If the conditions for the filter are *not met,* perform the assigned action.
`ack`	Filters with this option enabled match only those frames that have the `TCP ACK` or `RST` flag set. This prevents servers from beginning a TCP connection (with a `TCP SYN`) from source TCP port 25. The server will drop any frames that have the `ACK` flag "spoofed" in them and will not allocate space for a new connection.

Table 7-24 Filter Options (/cfg/slb/filt)

Option	Description
nat	When nat is set as the filter action (above), this command specifies whether the source or the destination information is re-mapped. If **source** is specified, the frame's source IP address (sip) and port number (sport) are replaced with the dip and dport values. If **dest** is specified, the frame's destination IP address (dip) and port number (dport) are replaced with the sip and sport values.
cache	Enable or disable caching of session information for this filter. Enabling this option can increase session performance, but takes session binding resources. If you experience an unacceptable number of binding failures as shown in the Server Load Balancing Maintenance Statistics (/stats/slb/maint), disable the session cache on filters which have lower performance priority.
log	When enabled, a message is sent to the syslog whenever the filter encounters traffic that meets the profile. Message output, used primarily with filters that deny traffic for security purposes, shows the filter number, port, source IP address, and destination IP address. To prevent a high-volume of syslog messages, do not use this option with filters that are triggered frequently.
ena	Turn this filter on.
dis	Disable this filter.
del	Remove this filter from the switch configuration.
cur	Displays current filter parameters.

Defining IP Address Ranges for Filters

You can specify a range of IP address for filtering both the source and/or destination IP address for traffic. When a range of IP addresses is needed, the sip (source) or dip (destination) defines the base IP address in the desired range, and the smask (source) or dmask (destination) is the mask which is applied to produce the range.

For example, to determine if a client request's destination IP address should be redirected to the cache servers attached to a particular switch, the destination IP address is masked (bitwise AND) with the dmask and then compared to the dip.

As another example, you could configure the switch with two filters so that each would handle traffic filtering for one half of the Internet. To do this, you could define the following parameters:

Table 7-25 Filtering IP Address Ranges

Filter	Internet Address Range	dip	dmask
#1	0.0.0.0 - 127.255.255.255	0.0.0.0	128.0.0.0
#2	128.0.0.0 - 255.255.255.255	128.0.0.0	128.0.0.0

The SLB Port Menu

Direct command: **`/cfg/slb/port`** *port-number*

Switch software allows you to enable or disable processing independently for each type of Layer 4 traffic (client and server), expanding your topology options.

To configure switch port parameters, at the `Server Load Balancing#` prompt, enter:

```
Server Load Balancing# port port-number
```

The menu for the port you entered is displayed.:

```
[SLB port 1 Menu]
        clien - Enable/disable client processing
        servr - Enable/disable server processing
        pip   - Set Proxy IP address for port
        filt  - Enable/disable filtering
        add   - Add filter to port
        rem   - Remove filter from port
        cur   - Display current port configuration

>> SLB port#
```

SLB Configuration options are described in the following table.

Table 7-26 SLB Port Options (/cfg/slb/port)

Option	Description
`clien`	For Server Load Balancing, the port can be enabled/disabled to process client Layer 4 traffic. Ports configured to process client request traffic bind servers to clients and provide address translation from the virtual IP address to the real server IP address, re-mapping virtual server IP addresses and port values to real server IP addresses and ports. Traffic not associated with virtual servers is switched normally. Maximizing the number of these ports on the Layer 4 switch will improve the switch's potential for effective Server Load Balancing.
`servr`	Ports configured to provide real server responses to client requests require real servers to be connected to the Layer 4 switch, directly or through a hub, router, or another switch. When server processing is enabled, the switch port re-maps real server IP addresses and Layer 4 port values to virtual server IP addresses and Layer 4 ports. Traffic not associated with virtual servers is switched normally.

Table 7-26 SLB Port Options (/cfg/slb/port)

Option	Description
`pip`	Set the proxy IP address for this port using dotted decimal notation. When defined, client address information in Layer 4 requests is replaced with this proxy address. In Server Load Balancing applications, this forces response traffic to return through switch as required, rather than around it as possible in complex routing environments. For configuration examples, see "IP Proxy Addresses for Complex SLB Networks" on page 15-17. Proxies are also useful for Application Redirection and Network Address Translation (NAT). When `pip` is used with Application Redirection filters, each filter's `rport` parameter must also be defined (see `rport` on page 7-53). For configuration examples, see "IP Proxy Addresses for Transparent Proxies or Complex Networks" on page 16-22, and also "Network Address Translation Examples" on page 16-25.
`filt`	Enable or disable filtering on this port.
`add`	Add a filter for use on this port.
`rem`	Remove a filter from use on this port.
`cur`	Displays current system parameters.

NOTE – When changing the filters on a given port, it may take some time before the port session information is updated so that the filter changes take effect. To make port filter changes take effect immediately, clear the session binding table for the port (see the `clear` command under Table 8-3 on page 8-5).

The Global SLB Menu

Direct command: **`/cfg/slb/gslb`**

To configure Global Server Load Balancing parameters, at the `Server Load Balancing#` prompt, enter:

```
Server Load Balancing# gslb
```

The Global SLB Menu is displayed:

```
[Global SLB Menu]
        site  - Remote Site menu
        dns   - Enable/disable DNS handoffs
        ttl   - Set Time To Live of DNS resource records
        local - Enable/disable DNS responses with only local
                addresses
        http  - Enable/disable HTTP redirects
        intr  - Set interval between remote site updates
        on    - Globally turn Global SLB ON
        off   - Globally turn Global SLB OFF
        cur   - Display current global SLB configuration

>> Global SLB menu#
```

Global SLB configuration options are described in the following table.

Table 7-27 Global SLB Options (/cfg/slb/gslb)

Option	Description
`site`	Display the Remote Site Menu for one of up to eight remote sites.
`dns`	Enable or disable DNS handoffs to peer sites by this switch. This should be enabled for proper GSLB operation. If disabled, whenever the switch receives a DNS request for a configured service, it will respond only with its own virtual IP address, regardless of performance or load considerations.
`ttl`	Specify the duration (from 0 to 65535 seconds) that the DNS response from the switch (indicating site of best service) will remain in the cache of DNS servers. A lower value may increase the ability of the GSLB system to adjust to sudden changes in traffic load, but will generate more DNS traffic. Higher numbers may reduce the amount of DNS traffic, but may slow GSLB's response to sudden traffic changes.
`local`	Enable or disable switch responses to DNS queries with local virtual IP addresses. When enabled, the switch will always respond to DNS queries by providing a local virtual IP address, as long as the virtual IP address has healthy real servers with an aggregate of at least 1024 available connections (the total from each server's configured `maxcons` value, minus the server's current number of connections). When the real servers for the local virtual IP addresses are unavailable or saturated, the switch will respond to DNS requests using normal GSLB rules.
`http`	Enable or disable HTTP Redirects to peer sites by this switch. When enabled, this switch will redirect client requests to peer sites if its own real servers fail or have reached their maximum connection limits. If disabled, the switch will not perform HTTP Redirects, but will instead drop requests for new connections and cause the client's browser to eventually issue a new DNS request.

Table 7-27 Global SLB Options (/cfg/slb/gslb)

Option	Description
`intr`	Set the time between Distributed Site State Protocol (DSSP) updates between this switch and its peers. The range is between 1 and 120 minutes.
`on`	Activate Global Server Load Balancing (GSLB) for this switch. This option can be performed only once the optional GSLB software is activated (see "Activating Optional Software" on page 8-7).
`off`	Turn GSLB off for this switch. Any active remote sites will still perform GSLB services with each other, but will not hand off requests to this switch.
`cur`	Displays current GSLB parameters.

The Remote Site Menu

Up to eight remote sites can be configured. To configure remote site parameters, from the `Global SLB Menu#` prompt, enter:

```
Global SLB menu# site site-number
```

The menu for the selected site will be displayed:

```
[Remote site 1 Menu]
        prima - Set primary switch IP address of remote site
        secon - Set secondary switch IP address of remote site
        updat - Enable/disable remote site updates
        ena   - Enable remote site
        dis   - Disable remote site
        del   - Delete remote site
        cur   - Display current remote site configuration

>> Remote site 1#
```

Remote site configuration options are described in the following table.

Table 7-28 Remote Site Options (/cfg/slb/gslb/site)

Option	Description
`prima`	Define the IP interface IP address of the primary switch at the remote site used for Global Server Load Balancing. Use dotted decimal notation.
`secon`	If the remote site is configured with a redundant switch, enter the IP address of the remote secondary switch here. If the remote site primary switch fails, the local switch will address the remote site secondary switch instead.
`updat`	Enable or disable remote site updates. If enabled, this switch will send regular Distributed Site State Protocol (DSSP) updates to its remote peers using HTTP port 80. If disabled, the switch will not send state updates. If your local firewall does not permit this traffic, disable the updates.
`ena`	Enable this remote site for use with Global Server Load Balancing.
`dis`	Disable this remote site. The switch will no longer use this remote site for Global Server Load Balancing.
`del`	Remove this remote site from operation, and delete its configuration.
`cur`	Displays current system parameters.

NOTE – When `updat` (above) is enabled, Global Server Load Balancing uses service port 80 on the IP interface for DSSP updates. By default, the WebOS web-based interface also uses port 80. Both services cannot use the same port. If both are enabled, configure the WebOS interface to use a different service port (see the `/cfg/sys` options under Table 7-1 on page 7-7).

Configuring Port Trunking

Trunk groups can provide super-bandwidth connections between Alteon WebSystems' switches or other trunk capable devices. A "trunk" is a group of ports that act together, combining their bandwidth to create a single, larger port. Up to four trunk groups can be configured on the switch. The following restrictions apply:

- Any physical switch port can belong to no more than one trunk group.
- Up to four ports can belong to the same trunk group.
- Best performance is achieved when all ports in any given trunk group are configured for the same speed.
- Trunking from non-Alteon WebSystems' devices must comply with Cisco® EtherChannel® technology.

To configure trunking parameters, enter the following at the Configuration Menu:

```
Configuration# trunk trunk-group-number
```

The Trunk Group Menu for the selected group is displayed:

```
[Trunk group 1 Menu]
        add   - Add port to trunk group
        rem   - Remove port from trunk group
        ena   - Enable trunk group
        dis   - Disable trunk group
        del   - Delete trunk group
        cur   - Display current Trunk Group configuration

>> Trunk group 1#
```

Trunk group configuration options are described in the following table.

Table 7-29 Trunk Group Options (/cfg/trunk)

Option	Description
`add`	Add a physical port to the current trunk group.
`rem`	Remove a physical port from the current trunk group.
`ena`	Enable the current trunk group.
`dis`	Turn the current trunk group off.
`del`	Remove the current trunk group configuration.
`cur`	Displays current trunk group parameters.

Configuring VRRP

Direct Command: **/cfg/vrrp**

Virtual Router Redundancy Protocol (VRRP) support on Alteon WebSystems' switches provides redundancy between routers in a LAN. This is accomplished by configuring the same virtual router IP address and ID number on each participating VRRP-capable routing device. One of the virtual routers is then elected as the master, based on a number of priority criteria, and assumes control of the shared virtual router IP address. If the master fails, one of the backup virtual routers will assume routing authority and take control of the virtual router IP address.

Alteon Websystems has extended VRRP to include virtual servers as well, allowing for full active/active redundancy between its Layer 4 switches.

To configure VRRP parameters, at the `Configuration#` prompt, enter:

```
Configuration# vrrp
```

The Virtual Router Redundancy Protocol Menu is displayed:

```
[Virtual Router Redundancy Protocol Menu]
        vr    - VRRP Virtual Router menu
        if    - VRRP Interface menu
        track - VRRP Priority Tracking menu
        on    - Globally turn VRRP ON
        off   - Globally turn VRRP OFF
        cur   - Display current VRRP configuration

>> Virtual Router Redundancy Protocol#
```

The following table describes the options available on this menu:

Table 7-30 Virtual Router Redundancy Protocol Options (/cfg/vrrp)

Option	Description
`vr`	Displays the VRRP virtual router menu. This menu is used for configuring up to 256 virtual routers on this switch.
`if`	Displays the VRRP virtual router interface menu. This menu is used for setting VRRP authentication parameters for the IP interfaces.
`track`	Displays the VRRP tracking menu. This menu is used for weighting the criteria used when modifying priority levels in the master router election process.
`on`	Globally enables VRRP on this switch.

Table 7-30 Virtual Router Redundancy Protocol Options (/cfg/vrrp)

Option	Description
`off`	Globally disables VRRP on this switch.
`cur`	Displays current VRRP parameters.

VRRP Virtual Router Menu

Direct Command: **`/cfg/vrrp/vr`** *virtual-router-number*

This menu is used for configuring up to 256 virtual routers for this switch. A virtual router is defined by its virtual router ID and an IP address. On each VRRP-capable routing device participating in redundancy for this virtual router, a virtual router will be configured to share the same virtual router ID and IP address.

To configure virtual router parameters, at the `Virtual Router Redundancy Protocol#` prompt, enter:

```
Virtual Router Redundancy Protocol# vr virtual-router-number
```

Where the *virtual-router-number* (1 to 256) represents the virtual router that you wish to configure.

The menu for the virtual router you entered is displayed:

```
[VRRP Virtual Router 1 Menu]
        vrid  - Set virtual router ID
        addr  - Set IP address
        if    - Set interface number
        prio  - Set renter priority
        adver - Set advertisement interval
        preem - Enable/disable preemption
        share - Enable/disable sharing
        track - Priority tracking menu
        ena   - Enable virtual router
        dis   - Disable virtual router
        del   - Delete virtual router
        cur   - Display current VRRP virtual router configuration

>> VRRP Virtual Router 1#
```

Virtual router configuration options are described in the following table.

Table 7-31 VRRP Virtual Router Options (/cfg/vrrp/vr)

Option	Description
`vrid`	Define the virtual router ID. This is used in conjunction with `addr` (below) to define a virtual router on this switch. To create a pool of VRRP-enabled routing devices which can provide redundancy to each other, each participating VRRP device must be configured with the same virtual router: one that shares the same `vrid` and `addr` combination. The `vrid` for standard virtual routers (where the virtual router IP address is not the same as any virtual server) can be any integer between 1 and 255. The `vrid` for virtual server routers (where the virtual router IP address matches a virtual server IP address) must be an *odd number* between 1 and 255 when Layer 3 binding is enabled (`/cfg/slb/virt #/layr3`). The `vrid` for virtual server routers with Layer 3 binding disabled must be an *even number* between 2 and 254. All `vrid` values but must be unique within the VLAN to which the virtual router's IP interface (see `if` below) belongs.
`addr`	Define the IP address for this virtual router using dotted decimal notation. This is used in conjunction with the `vrid` (above) to configure the same virtual router on each participating VRRP device.
`if`	Select a switch IP interface (between 1 and 256). If the IP interface has the same IP address as the `addr` option above, this switch is considered the "owner" of the defined virtual router. An owner has a special priority of 255 (highest) and will always assume the role of master router, even if it must preempt another virtual router which has assumed master routing authority. This preemption occurs even if the `preem` option below is disabled.
`prio`	Define the election priority bias for this virtual server. This can be any integer between 1 and 254. The default value is 100. During the master router election process, the routing device with the highest virtual router priority number wins. If there is a tie, the device with the highest IP interface address wins. If this virtual router's IP address (`addr`) is the same as the one used by the IP interface, the priority for this virtual router will automatically be set to 255 (highest). When priority tracking is used (`/cfg/vrrp/track` or `/cfg/vrrp/vr #/track`), this base priority value can be modified according to a number of performance and operational criteria.
`adver`	Define the time interval between VRRP master advertisements. This can be any integer between 1 and 255 seconds. The default is 1.

Table 7-31 VRRP Virtual Router Options (/cfg/vrrp/vr)

Option	Description
`preem`	Enable or disable master preemption. When enabled, if this virtual router is in backup mode but has a higher priority than the current master, this virtual router will preempt the lower priority master and assume control. Note that even when `preem` is disabled, this virtual router will always preempt any other master if this switch is the owner (the IP interface address and virtual router `addr` are the same).
`share`	Enable or disable virtual router sharing, an Alteon Websystems proprietary extension to VRRP. When enabled, this switch will process any traffic addressed to this virtual router, even when in backup mode.
`track`	Displays the VRRP priority tracking menu for this virtual router. Tracking is an Alteon Websystems proprietary extension to VRRP, used for modifying the standard priority system used for electing the master router. Sharing (`share`) should be disabled in order for tracking to be used effectively.
`ena`	Enable this virtual router.
`dis`	Disable this virtual router.
`del`	Delete this virtual router from the switch configuration.
`cur`	Display the current configuration information for this virtual router.

VRRP Virtual Router Priority Tracking Menu

Direct Command: **`/cfg/vrrp/vr`** *virtual-router-number*`/track`

This menu is used for modifying the priority system used when electing the master router from a pool of virtual routers. Various tracking criteria can be used to bias the election results. Each time one of the tracking criteria is met, the priority level for the virtual router is increased by an amount defined through the VRRP Tracking Menu (see page 7-68).

Criteria are tracked dynamically, continuously updating virtual router priority levels when enabled. If the virtual router preemption option (see `preem` in Table 7-31 on page 7-64) is enabled, this virtual router can assume master routing authority when its priority level rises above that of the current master.

Some tracking criteria (`vrs`, `ifs`, and `ports` below) apply to standard virtual routers, otherwise called "virtual interface routers." Other tracking criteria (`l4pts`, `reals`, and `hsrp`) apply to extended virtual routers, or "virtual server routers," which perform Layer 4 Server Load Balancing functions in addition to their standard VRRP operation. A virtual *server* router is defined as any virtual router whose IP address (`addr`) is the same as any configured virtual server IP address.

To configure virtual router priority tracking parameters, at the `VRRP Virtual Router#` prompt, enter:

```
VRRP Virtual Router 1# track
```

The VRRP Virtual Router Priority Tracking Menu is displayed

```
[VRRP Virtual Router 1 Priority Tracking Menu]
        vrs   - Enable/disable tracking other virtual routers
        ifs   - Enable/disable tracking other interfaces
        ports - Enable/disable tracking VLAN switch ports
        l4pts - Enable/disable tracking L4 switch ports
        reals - Enable/disable tracking L4 real servers
        hsrp  - Enable/disable tracking HSRP
        cur   - Display current VRRP virtual router configuration

>> VRRP Virtual Router 1 Priority Tracking#
```

Virtual router priority tracking configuration options are described in the following table:

Table 7-32 VRRP Priority Tracking Options (/cfg/vrrp/vr #/track)

Option	Description
`vrs`	When enabled, the priority for this virtual router will be increased for each other virtual router in master mode on this switch. This is useful for making sure that traffic for any particular client/server pairing are handled by the same switch, increasing routing and load balancing efficiency.
`ifs`	When enabled, the priority for this virtual router will be increased for each other IP interface active on this switch. An IP interface is considered active when there is at least one active port on the same VLAN. This helps elect the virtual routers with the most available routes as the master.
`ports`	When enabled, the priority for this virtual router will be increased for each active port on the same VLAN. This helps elect the virtual routers with the most available ports as the master.
`l4pts`	When enabled for virtual server routers, the priority for this virtual router will be increased for each physical switch port which has active Layer 4 processing on this switch. This helps elect the main Layer 4 switch as the master.

Table 7-32 VRRP Priority Tracking Options (/cfg/vrrp/vr #/track)

Option	Description
`reals`	When enabled for virtual server routers, the priority for this virtual router will be increased for each healthy real server behind the virtual server IP address of the same IP address as the virtual router on this switch. This helps elect the switch with the largest server pool as the master, increasing Layer 4 efficiency.
`hsrp`	Hot Standby Router Protocol (HSRP) is used with some types of routers for establishing router failover. In networks were HSRP is used, enable this switch option to increase the priority of this virtual router for each Layer 4 client-only port that receives HSRP advertisements. This helps elect the switch closest to the master HSRP router as the master, optimizing routing efficiency.
`cur`	Display the current configuration for priority tracking for this virtual router.

VRRP Interface Menu

Direct Command: **`/cfg/vrrp/if`** *virtual-router-interface-number*

This menu is used for configuring VRRP authentication parameters for the IP interfaces used with the virtual routers. To configure these parameters, at the `Virtual Router Redundancy Protocol#` prompt, enter:

```
Virtual Router Redundancy Protocol# if interface-number
```

Where the *interface-number* (1 to 256) represents the IP interface on which authentication parameters must be configured.

The menu for the IP interface you entered is displayed:

```
[VRRP Interface 1 Menu]
        auth  - Set authentication types
        passw - Set plain-text password
        del   - Delete interface
        cur   - Display current VRRP interface configuration

>> VRRP Interface 1#
```

VRRP interface configuration options are described in the following table.

Table 7-33 VRRP Interface Options (/cfg/vrrp/if)

Option	Description
`auth` *type*	Define the type of authentication: `none` No authentication used. `password` Password authentication will be used.
`passw`	Define a plain-text password up to eight characters long. This password will be added to each VRRP packet transmitted by this interface when password authentication is chosen (see `auth` above).
`del`	Clear the authentication configuration parameters for this IP interface. The IP interface itself is not deleted.
`cur`	Display the current configuration for this IP interface's authentication parameters.

VRRP Tracking Menu

Direct Command: **`/cfg/vrrp/track`**

This menu is used for setting weights for the various criteria used to modify priority levels during the master router election process. Each time one of the tracking criteria is met (see "VRRP Virtual Router Priority Tracking Menu" on page 7-65), the priority level for the virtual router is increased by an amount defined through this menu.

To configure VRRP tracking parameters, at the `Virtual Router Redundancy Protocol#` prompt, enter:

```
Virtual Router Redundancy Protocol# track
```

The VRRP Tracking Menu is displayed:

```
[VRRP Tracking Menu]
     vrs   - Set priority increment for virtual router tracking
     ifs   - Set priority increment for IP interface tracking
     ports - Set priority increment for VLAN switch port tracking
     l4pts - Set priority increment for L4 switch port tracking
     reals - Set priority increment for L4 real server tracking
     hsrp  - Set priority increment for HSRP tracking
     cur   - Display current VRRP Priority Tracking configuration

>> VRRP Tracking#
```

VRRP tracking configuration options are described in the following table.

Table 7-34 VRRP Tracking Options (/cfg/vrrp/track)

Option	Description
`vrs`	Define the priority increment value (1 through 254) for virtual routers in master mode detected on this switch.
`ifs`	Define the priority increment value (1 through 254) for active IP interfaces detected on this switch.
`ports`	Define the priority increment value (1 through 254) for active ports on the virtual router's VLAN.
`l4pts`	Define the priority increment value (1 through 254) for physical switch ports with active Layer 4 processing.
`reals`	Define the priority increment value (1 through 254) for healthy real servers behind the virtual server router.
`hsrp`	Define the priority increment value (1 through 254) for switch ports with Layer 4 client-only processing that receive HSRP broadcasts.
`cur`	Display the current configuration of priority tracking increment values.

NOTE – These priority tracking options only define increment values. These options do not affect the VRRP master router election process until options under the VRRP Virtual Router Priority Tracking Menu (see page 7-65) are enabled.

CHAPTER 8

The Operations Menu

The Operations Menu is generally used for commands which affect switch performance immediately, but do not alter permanent switch configurations. For example, you can use the Operations Menu to immediately disable a port (without the need to apply or save the change), with the understanding that when the switch is reset, the port returns to its normally configured operation.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New In Release 5.2	Feature Description	Details
VRRP	To manually transition a specific master virtual router to backup router, a new command has been added.	page 8-6

Accessing the Operations Menu

The Operations Menu is available from the Main Menu. At the Main Menu prompt, enter:

```
# oper
```

The Operations Menu is displayed:

```
[Operations Menu]
        port  - Operational Port items menu
        mirr  - Operational Mirroring menu
        slb   - Operational Server Load Balancing menu
        vrrp  - Operational Virtual Router Redundancy menu
        swkey - Enter key to enable software feature
        rmkey - Enter software feature to be removed

>> Operations#
```

Each of these options is discussed in greater detail in the following sections.

Operations-Level Port Options

Direct command: **`/oper/port`** *port-number*

Operations-level port options are used for temporarily disabling or enabling a port, and for changing RMON status on a port. The Operations Port Menu is available from the `Operations#` prompt:

```
>> Operations # port port-number
```

The Operations Port Menu appears:

```
[Operations Port 1 Menu]
        dis   - Disable port
        ena   - Enable port
        cur   - Current port state

>> Operations Port 1#
```

The options are described in the following table.

Table 8-1 Operations Port Menu Options (/oper/port)

Option	Description
`dis`	Temporarily disable the port. The port will be returned to its configured operation mode when the switch is reset.
`ena`	Temporarily enable the port. The port will be returned to its configured operation mode when the switch is reset.
`cur`	Display the current settings for the port.

Operations-Level Port Mirroring Options

Direct command: **/oper/mirr**

The Port Mirroring Menu is used to configure, enable, and disable the port monitor. When enabled, Layer 2 network packets being sent and/or received on a target port are duplicated and sent to a monitor port. By attaching a network analyzer to the monitor port, you can collect detailed information about your network performance and usage.

NOTE – Layer 3 and Layer 4 traffic is not mirrored through this facility.

NOTE – Port Mirroring cannot be used simultaneously with Layer 4 services (Server Load Balancing or Application Redirection) on any switch port connected to a server either directly, or through another switch or hub. For Server Load Balancing, this applies to any switch port configured with server processing enabled. For Application Redirection, this applies to any switch port that has a cache server attached to it directly or indirectly. Use your network analyzer with a full-duplex pass-through connection or an Ethernet hub when troubleshooting a switch port connected to a server providing Layer 4 services.

Port Mirroring parameters are configured from the Operations Menu:

```
>> Operations # mirr
```

The Port Mirroring Menu is displayed.

```
[Port Mirroring Menu]
        to    - Set "Monitoring" port
        from  - Set "Mirrored" port
        dir   - Set Direction [in, out, both]
        tmout - Set Mirroring Timeout value
        dis   - Disable Port Mirroring
        ena   - Enable Port Mirroring
        cur   - Display current Port Mirroring configuration

>> Port Mirroring#
```

The Port Mirroring Menu options are described in the following table.

Table 8-2 Port Mirroring Menu Options (/oper/mirr)

Option	Description
`to`	This defines the monitoring port. When port mirroring is enabled, packets received and/or transmitted by the mirrored port will be duplicated to the switch port specified in this command.
`from`	This defines the mirrored port. When port mirroring is enabled, packets received and/or sent by the port specified in this command will be sent to the monitor port.
`dir`	This determines which type of packets will be sent to the monitor port: `in` = packets received at the mirrored port `out` = packets sent from the mirrored port `both` = packets sent and received by the mirrored port
`tmout`	Port mirroring will be automatically disabled (regardless of port state) after the time-out period specified in this command. Valid times are from 0 (does not time-out) to 86400 seconds.
`dis`	Turns port mirroring off.
`ena`	Turns port mirroring on.
`cur`	Displays the current parameter settings.

Operations-Level Server Load Balancing Options

Direct command: **/oper/slb**

When the optional Layer 4 software is enabled, the operations-level Server Load Balancing options are used for temporarily disabling or enabling real servers and synchronizing the configuration between the active/active switches. The menu is available from the `Operations#` prompt:

```
>> Operations # slb
```

The Server Load Balancing Operations Menu appears:

```
[Server Load Balancing Operations Menu]
        ena   - Enable real server
        dis   - Disable real server
        synch - Synchronize SLB and VRRP configuration on peer
        clear - Clear session table on port
        cur   - Current SLB operational state

>> Server Load Balancing Operations#
```

The options are described in the following table.

Table 8-3 Server Load Balancing Operations Menu Options (/oper/slb)

Option	Description
`ena`	Temporarily enable a real server. The real server will be returned to its configured operation mode when the switch is reset.
`dis`	Temporarily disable a real server, removing it from operation within its real server group and virtual server. The real server will be returned to its configured operation mode when the switch is reset.
`synch` *ip-address*	Synchronize the SLB and VRRP configuration on a peer switch (a switch that owns the IP address). To take effect, VRRP must be globally enabled on the peer switch. This command does not synchronize filter configurations.
`clear`	Clear the session table for a specific port, and allow port filter changes to take effect immediately. Note: This disrupts current Server Load Balancing and Application Redirection sessions.
`cur`	Display the current settings for the port.

Operations-Level VRRP Options

Direct command: **/oper/vrrp**

This menu is used to force a master virtual router to become backup router.

The menu is available from the Operations# prompt:

```
>> Operations # vrrp
```

The Virtual Router Redundancy Operations Menu appears:

```
[VRRP Operations Menu]
        back   - Set virtual router to backup

>> VRRP Operations#
```

The options are described in the following table.

Table 8-4 Virtual Router Redundancy Operations Menu Options (/oper/vrrp)

Option	Description
back *virtual-router-#*	Force the specified master virtual router on this switch into backup mode. This is generally used for passing master control back to a preferred switch once the preferred switch has been returned to service after a failure. When this command is executed, the current master gives up control and initiates a new election by temporarily advertising its own priority level as 0 (lowest). After the new election, the virtual router forced into backup mode by this command will resume master control in the following cases: ■ This switch owns the virtual router (the IP addresses of the virtual router and its IP interface are the same) ■ This switch's virtual router has a higher priority and preemption is enabled. ■ There are no other virtual routers available to take master control.

Activating Optional Software

Direct command: **`/oper/swkey`**

The `swkey` option is used for activating any optional software you have purchased for your switch.

Before you can activate optional software, you must obtain a software license from your Alteon WebSystems representative or authorized reseller. One software license is needed for each switch where the optional software is to be used. You will receive a Licence Certificate for each software license purchased.

To obtain a software key, you must register each License Certificate with Alteon WebSystems, and provide the MAC address of the WebOS switch that will run the optional software. Alteon WebSystems will then provide a License Password.

NOTE – Each License Password will work only on the specific switch which has the MAC address you provided when registering your Licence Certificate.

Once you have your License Password, perform the following actions:

1. **Connect to the switch's command-line interface and log in as the administrator (see Chapter 2, "The Command-Line Interface").**

2. **At the `Main#` prompt, enter:**

```
Main# oper
```

3. **At the `Operations#` prompt, enter:**

```
Operations# swkey
```

4. **When prompted, enter your 16-digit software key code. For example:**

```
Enter Software Key: 123456789ABCDEF
```

If the correct code is entered, you will see the following message:

```
Valid software key entered.
Software feature enabled.
```

Removing Optional Software

Direct command: **/oper/rmkey**

The rmkey option is used for deactivating any optional software. Deactivated software is still present in switch memory and can be reactivated at any later time.

To deactivate optional software, enter the following at the Operations Menu:

```
Operations# rmkey
```

When prompted, enter the code for software to be removed. For example:

```
Enter Software Feature to be removed: [SLB]|GSLB|WCR: SLB
```

CHAPTER 9

The Boot Options Menu

To use the Boot Options Menu, you must be logged in to the switch as the administrator. The Boot Options Menu provides options for:

- Selecting a switch software image to be used when the switch is next reset
- Selecting a configuration block to be used when the switch is next reset
- Downloading a new software image to the switch via TFTP

To access the Boot Options Menu, at the Main Menu prompt, enter:

```
Main# boot
```

The Boot Options Menu is displayed:

```
[Boot Options Menu]
        image - Select software image to use on next boot
        conf  - Select config block to use on next boot
        tftp  - Download new software image via TFTP
        reset - Reset switch [WARNING: Restarts Spanning Tree]
        cur   - Display current boot options

>> Boot Options#
```

Each of these options is discussed in greater detail in the following sections.

Updating the Switch Software Image

The switch software image is the executable code running on the switch. A version of the image ships with the switch, and comes pre-installed on the device. As new versions of the image are released, you can upgrade the software running on your switch.

Upgrading the software image on your switch requires the following:

- Loading the new image onto a TFTP server on your network
- Downloading the new image from the TFTP server to your switch
- Selecting the new software image to be loaded into switch memory the next time the switch is reset

Downloading New Software to Your Switch

The switch can store up to two different software images, called `image1` and `image2`, as well as boot software, called `boot`. When you download new software, you must specify where it should be placed: either into `image1`, `image2`, or `boot`.

For example, if your active image is currently loaded into `image1`, you would probably load the new image software into `image2`. This lets you test the new software and reload the original active image (stored in `image1`), if needed.

To download a new software to your switch, you will need the following:

- The image or boot software loaded on a TFTP server on your network
- The hostname or IP address of the TFTP server
- The name of the new software image or boot file

NOTE – The DNS parameters must be configured if specifying hostnames. See "Domain Name System Menu" on page 7-21).

When the above requirements are met, use the following procedure to download the new software to your switch.

1. **At the `Boot Options#` prompt, enter:**

```
Boot Options# tftp
```

2. **Enter the name of the switch software to be replaced:**

```
Enter name of switch software image to be replaced
 ["image1"/"image2"/"boot"]:
```

3. **Enter the hostname or IP address of the TFTP server.**

```
Enter hostname or IP address of TFTP server:
```

4. **Enter the name of the new software file on the server.**

```
Enter name of file on TFTP server:
```

The exact form of the name will vary by TFTP server. However, the file location is normally relative to the TFTP directory (usually `/tftpboot`).

5. **The system prompts you to confirm your request.**

You should next select a software image to run, as described below.

Selecting a Software Image to Run

You can select which software image (`image1` or `image2`) you want to run in switch memory for the next reboot.

1. **At the `Boot Options#` prompt, enter:**

```
Boot Options# image
```

2. **Enter the name of the image you want the switch to use upon the next boot.**

The system informs you of which image is currently set to be loaded at the next reset, and prompts you to enter a new choice:

```
Currently set to use switch software "image1" on next reset.
Specify new image to use on next reset ["image1"/"image2"]:
```

Selecting a Configuration Block

When you make configuration changes to the switch, you must save the changes so that they are retained beyond the next time the switch is reset. When you perform the `save` command, your new configuration changes are placed in the *active* configuration block. The previous configuration is copied into the *backup* configuration block.

There is also a *factory* configuration block. This holds the default configuration set by the factory when your switch was constructed. Under certain circumstances, it may be desirable to reset the switch configuration to the default. This can be useful when a custom-configured switch is moved to a network environment where it will be reconfigured for a different purpose.

Use the following procedure to set which configuration block you want the switch to load the next time it is reset:

1. **At the `Boot Options#` prompt, enter:**

```
Boot Options# conf
```

2. **Enter the name of the configuration block you want the switch to use:**

The system informs you of which configuration block is currently set to be loaded at the next reset, and prompts you to enter a new choice:

```
Currently set to use active configuration block on next reset.
Specify new block to use ["active"/"backup"/"factory"]:
```

Resetting the Switch

You can reset the switch to make your software image file and configuration block changes occur.

NOTE – Resetting the switch causes the Spanning-Tree Protocol to restart. This process can be lengthy, depending on the topology of your network.

To reset the switch, at the `Boot Options#` prompt, enter:

```
>> Boot Options# reset
```

You are prompted to confirm your request.

CHAPTER 10

The Maintenance Menu

The Maintenance Menu is used to manage dump information and forward database information. It also includes a debugging menu to help with troubleshooting.

Dump information contains internal switch state data that is written to flash memory on the switch after any one of the following occurs:

- The switch administrator forces a switch *panic*. The `panic` option, found in the Maintenance Menu, causes the switch to dump state information to flash memory, and then causes the switch to reboot.
- The switch administrator enters the switch reset key combination on a device attached to the console port. The switch reset key combination is <Shift-Ctrl-6>.
- The watchdog timer forces a switch reset. The purpose of the watchdog timer is to reboot the switch if the switch software freezes.
- The switch detects a hardware or software problem that requires a reboot.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New In Release 5.2	Feature Description	Details
TFTP System Dump Put	This command allows you to put (save) the system dump via TFTP.	page 10-3
System Maintenance Menu	Reserved for use by Alteon WebSystems Customer Support to perform system debugging.	page 10-4

Accessing the Maintenance Menu

To use the Maintenance Menu, you must be logged in to the switch as the administrator. To access the Maintenance Menu, at the `Main#` prompt, enter:

```
Main# maint
```

The Maintenance Menu is displayed:

```
[Maintenance Menu]
        uudmp - Uuencode FLASH dump
        ptdmp - tftp put FLASH dump to tftp server
        cldmp - Clear FLASH dump
        panic - Dump state information to FLASH and reboot
        sys   - System Maintenance Menu
        fdb   - Forwarding Database Manipulation Menu
        debug - Debugging Menu
        arp   - ARP Cache Manipulation Menu
        route - IP Route Manipulation Menu

>> Maintenance#
```

Uuencode Flash Dump

Direct command: **`/maint/uudmp`**

Using this command, dump information is presented in uuencoded format. This format makes it easy to capture the dump information as a file or a string of characters. You can then contact Alteon WebSystems Customer Support for help analyzing the information.

If you want to capture dump information to a file, set your communication software on your workstation to capture session data prior to issuing the `uudmp` command. This will ensure that you do not lose any information. Once entered, the `uudmp` command will cause approximately 1460 lines of data to be displayed on your screen and copied into the file.

Using the `uudmp` command, dump information can be read multiple times. The command does not cause the information to be updated or cleared from flash memory.

NOTE – Dump information is not cleared automatically. In order for any subsequent dump information to be written to flash memory, you must manually clear the dump region. For more information on clearing the dump region, see "Clearing Dump Information" on page 10-3.

To access dump information, at the `Maintenance#` prompt, enter:

```
Maintenance# uudmp
```

The dump information is displayed on your screen and, if you have configured your communication software to do so, captured to a file. If the dump region is empty, the following appears:

```
No FLASH dump available.
```

TFTP System Dump Put

Direct command: **ptdmp** *server filename*

Where *server* is the TFTP server IP address or hostname, and *filename* is the target dump file.

Using this command, you can put (save) the system dump via TFTP.

NOTE – If the TFTP server is running SunOS or the Solaris operating system, the specified ptdmp file must exist *prior* to executing the ptdmp command, and must be writable (set with proper permission, and not locked by any application). The contents of the specified file will be replaced with the current dump data.

To save dump information via TFTP, at the Maintenance# prompt, enter:

```
Maintenance# ptdmp server filename
```

Where *server* is the TFTP server IP address or hostname, and *filename* is the target dump file.

Clearing Dump Information

Direct command: **/maint/cldmp**

To clear dump information from flash memory, at the Maintenance# prompt, enter:

```
Maintenance# cldmp
```

The switch clears the dump region of flash memory and displays the following message:

```
FLASH dump region cleared.
```

If the flash dump region is already clear, the switch displays the following message:

```
FLASH dump region is already clear.
```

Using the Panic Command

Direct command: **/maint/panic**

The `panic` command causes the switch to immediately dump state information to flash memory and automatically reboot.

To select `panic`, at the `Maintenance#` prompt, enter:

```
Maintenance# panic
```

Enter **y** to confirm the command:

```
Confirm dump and reboot [y/n]: y
```

The following messages are displayed:

```
Starting system dump...done.

Reboot at 11:54:08 Thursday June 26, 1997...

Boot version 1.0.1

Alteon ACEswitch 180

Rebooted because of console PANIC command.

Booting complete 11:55:01 Thursday June 26, 1997:
```

Unscheduled System Dumps

If there is an unscheduled system dump to flash memory, the following message is displayed when you log on to the switch:

```
Note: A system dump exists in FLASH. The dump was saved
      at 13:43:22 Fri Jun 27, 1997. Use /maint/uudmp to
      extract the dump for analysis and /maint/cldmp to
      clear the FLASH region. The region must be cleared
      before another dump can be taken.
```

The System Maintenance Menu

Direct command: **/maint/sys**

This menu is reserved for use by Alteon WebSystems' Customer Support. The options are used to perform system debugging.

The FDB Manipulation Menu

Direct command: **/maint/fdb**

The Forwarding Database Manipulation Menu can be used to view information, and to delete a MAC address from the forwarding database or clear the entire forwarding database. This is helpful in identifying problems associated with MAC address learning and packet forwarding decisions.

To access the FDB Manipulation Menu, at the `Maintenance#` prompt, enter:

```
Maintenance# fdb
```

The FDB Manipulation Menu is displayed:

```
[FDB Manipulation Menu]
        find  - Show a single FDB entry by MAC address
        port  - Show FDB entries for a single port
        vlan  - Show FDB entries for a single VLAN
        refpt - Show FDB entries referenced by a single port
        dump  - Show all FDB entries
        del   - Delete an FDB entry
        clear - Clear entire FDB

>> FDB Manipulation#
```

Delete an FDB entry

To delete a MAC address from the FDB, at the `Forwarding Database#` prompt, enter:

```
Forwarding Database# del MAC-address
```

Clear Entire FDB

To clear the entire FDB, at the `Forwarding Database#` prompt, enter:

```
Forwarding Database# clear
```

The FDB is cleared of all the entries.

The other information viewing choices on the Forwarding Database Menu are covered under "Forwarding Database Information Menu" on page 5-11.

Using the Debug Menu

The Debug Menu displays trace buffer information about certain events that can be helpful in understanding the switch operation. You can view the following information using the debug menu:

- Events traced by the Management Processor (MP)
- Events traced by the Switch Processor (SP)
- Events traced to a buffer area when a reset occurs

If the switch resets for any reason, the MP trace buffer and SP trace buffers are saved into the snap trace buffer area.

The output from these commands can be interpreted by the Alteon Networks Customer Support organization.

Snap Trace Information

A snap trace is taken when the switch resets and a message is sent to the console. Possible causes for a snap trace to be taken are:

- Watchdog timer: The processor is reset if the Management Processor fails to refresh the on-board timer. A snap trace is initiated which resets the switch.
- Software reset: Upon encountering certain error conditions or anomalies, the software triggers a panic. A snap trace is generated which dumps information to a file, and resets the switch.

Actions that can be taken if a snap trace is generated are:

- Record console messages and send them to Alteon Networks Customer Support.
- Retrieve the dump file by using the Maintenance Menu and choosing `uudmp`. Refer to "Uuencode Flash Dump" on page 10-2 for more information.

Accessing the Debug Menu

Direct command: **`/maint/debug`**

To access the Debug Menu, at the `Maintenance#` prompt, enter:

```
Maintenance# debug
```

The Miscellaneous Debug Menu is displayed:

```
[Miscellaneous Debug Menu]
        tbuf  - Display MP trace buffer
        snap  - Display MP snap (or post-mortem) trace buffer
        sptb  - Display SP trace buffer

>> Miscellaneous Debug#
```

Display Management Processor Trace Buffer

Direct command: **/maint/debug/tbuf**

To view events traced by the MP, at the Debug# prompt, enter:

```
Debug# tbuf
```

Header information similar to the following is displayed:

```
MP trace buffer at 18:27:37 Mon Dec 29, 1997; mask: 0x2ffff748
```

The buffer information is displayed after the header.

Display Switch Processor Trace Buffer

Direct command: **/maint/debug/sptb** *port-number*

To view events traced by the SP, at the Debug# prompt, enter:

```
Debug# sptb port-number
```

Header information similar to the following is displayed:

```
Port 1 trace buffer at 18:27:41 Mon Dec 29, 1997; mask:0x018007eb
```

The buffer information is displayed after the header.

Display MP Snap Trace Buffer

Direct command: **/maint/debug/snap**

To view buffer information traced at the time that a reset occurred, at the Debug# prompt, enter:

```
Debug# snap
```

Using the ARP Cache Manipulation Menu

Direct command: **/maint/arp**

To access the ARP Cache Manipulation Menu, at the Maintenance# prompt, enter:

```
Maintenance# arp
```

The Address Resolution Protocol Menu is displayed:

```
[Address Resolution Protocol Menu]
        find  - Show a single ARP entry by IP address
        port  - Show ARP entries on a single port
        vlan  - Show ARP entries on a single VLAN
        refpt - Show ARP entries referenced by a single port
        dump  - Show all ARP entries
        add   - Add a permanent ARP entry
        del   - Delete an ARP entry
        clear - Clear ARP cache
        addr  - Show ARP address list

>> Address Resolution Protocol#
```

Show ARP Entries

You can display all ARP entries currently held in the switch, or a portion according to one of the options listed on the menu above (find, port, vlan, refpt, dump). For more information, see "ARP Information Menu" on page 5-16.

Add an ARP Entry

Direct command: **/maint/arp/add** *IP-address*

To add a single ARP entry from switch memory, enter the following at the ARP Menu:

```
>> Address Resolution Protocol# add I-address
```

Delete an ARP Entry

Direct command: **/maint/arp/del** *IP-address*

To remove a single ARP entry from switch memory, enter the following at the ARP Menu:

```
>> Address Resolution Protocol# del I-address
```

Clear All ARP Entries

Direct command: **/maint/arp/clear**

To clear the entire ARP list from switch memory, enter the following at the ARP Menu:

```
>> Address Resolution Protocol# clear
```

Show ARP Address List

Direct command: **/maint/arp/addr**

To show the list of IP addresses that the switch will respond to ARP requests for, enter the following at the ARP Menu:

```
>> Address Resolution Protocol# addr
```

Using the IP Route Manipulation Menu

Direct command: **/maint/route**

To access the IP Route Manipulation Menu, at the Maintenance# prompt, enter:

```
Maintenance# route
```

The IP Routing Menu is displayed:

```
[IP Routing Menu]
        find  - Show a single route by destination IP address
        gw    - Show routes to a single gateway
        type  - Show routes of a single type
        tag   - Show routes of a single tag
        if    - Show routes on a single interface
        dump  - Show all routes
        clear - Clear route table

>> IP Routing#
```

Show Routes

See "IP Routing Information Menu" on page 5-14.

Clear the Routing Table

Direct command: **/maint/route/clear**

To clear all dynamic routes from switch memory, enter the following at the IP Routing Menu:

```
>> IP Routing# clear
```

Part 3: Tutorials and Examples

050044B, July 1999

Alteon WebSystems
Web Speed for e-Business

CHAPTER 11

VLANs

Virtual Local Area Networks (*VLANs*) are commonly used to split up groups of network users into manageable broadcast domains, to create logical segmentation of workgroups, and to enforce security policies among logical segments.

Basic VLANs can be configured during initial switch configuration (see "Using the Setup Utility" on page 3-2). More comprehensive VLAN configuration can be done from the command-line interface (see "Configuring VLAN Parameters" on page 7-24 as well as "Configuring Port Parameters" on page 7-9).

VLAN ID Numbers

WebOS supports up to 246 VLANs per switch. Even though the maximum number of VLANs supported at any given time is 246, each can be identified with any number between 1 and 4094.

VLANs are defined on a per-port basis. Each port on the switch can belong to one or more VLANs, and each VLAN can have any number of switch ports in its membership. Any port that belongs to multiple VLANs, however, must have VLAN *tagging* enabled (see below).

Each port in the switch has a configurable default VLAN number, known as its *PVID*. The factory default value of all PVIDs is 1. This places all ports on the same VLAN initially, although each port's PVID is configurable to any VLAN number between 1 and 4094.

Any non-tagged frames (those with no VLAN specified) are classified with the sending port's PVID.

VLAN Tagging

The WebOS software supports 802.1Q VLAN *tagging*, providing standards-based VLAN support for Ethernet systems.

Tagging places the VLAN identifier in the frame header, allowing multiple VLANs per port. When you configure multiple VLANs on a port, you must also enable tagging on that port.

Since tagging fundamentally changes the format of frames transmitted on a tagged port, you must carefully plan network designs to prevent tagged frames from being transmitted to devices that do not support 802.1Q VLAN tags.

VLANs and Spanning-Tree

When *Spanning-Tree* is enabled on the switch, it detects and eliminates logical loops in a bridged or switched network. When multiple paths exist, Spanning-Tree configures the network so that a switch uses only the most efficient path. If that path fails, Spanning-Tree automatically sets up another active path on the network to sustain network operations.

If you configure the switch with Spanning-Tree, there will be a single instance of Spanning-Tree per switch regardless of number of configured VLANs in an enabled state.

VLANs and the IP Interfaces

Careful consideration must be made when creating VLANs within the switch, such that communication with the switch Management Processor (MP) remains possible where it is required.

Access to the switch for remote configuration, trap messages, and other management functions can only be accomplished from stations that are on VLANs which include an IP interface to the switch (see "IP Interface Menu" on page 7-13). Likewise, access to management functions can be cut off to any VLAN by excluding IP interfaces from its membership.

For example, if all IP interfaces are left on VLAN #1 (the default), and all other ports are configured for VLANs other than VLAN #1, then switch management features are effectively cut off. If an IP interface is added to one of the other VLANs, the stations in that VLAN all have access to switch management features.

VLAN Topologies and Design Issues

By default, the WebOS software has a single VLAN configured on every port. This groups all ports into the same broadcast domain. This VLAN has an 802.1Q VLAN PVID of 1. Since in this default only a single VLAN is configured per port, VLAN tagging is turned off.

Since VLANs are most commonly used to create individual broadcast domains and/or separate IP subnets, it is useful for host systems to be able to have presence on more than one VLAN simultaneously. Alteon WebSystems' Web switches and ACEnic adapters have the unique capability of being able to support multiple VLANS on a per port or per interface basis, allowing very flexible configurations.

You can configure multiple VLANs on a single ACEnic adapter, with each VLAN being configured through a logical interface and logical IP address on the host system. Each VLAN configured on the adapter must also be configured on the switch port to which it is connected. If multiple VLANs are configured on the port, tagging must be turned on.

Using this flexible multi-VLAN system, you can logically connect users and segments to a host with a single ACEnic adapter that supports many logical segments or subnets.

Example #1: Multiple VLANS with Tagging Adapters

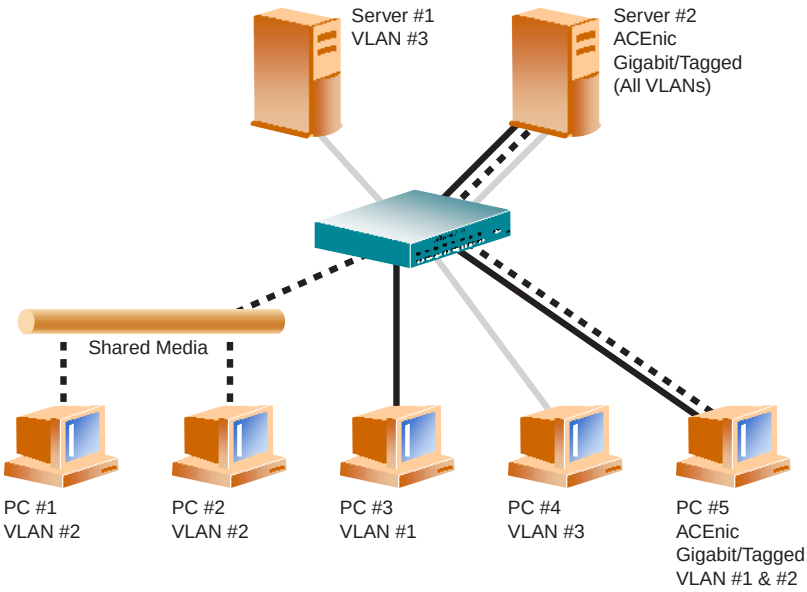


Figure 11-1 Example #1: Multiple VLANs with Tagging ACEnic Adapters

The features of this VLAN are described below:

Component	Description
WebOS Web switch	This switch is configured for three VLANs that represent three different IP subnets. Two servers and five clients are attached to the switch.
Server #1	This server is part of the VLAN #3 and only has presence in one IP subnet. The port that it is attached to is configured only for VLAN #3, so VLAN tagging is off.
Server #2	A high-use server that needs to be accessed from all VLANs and IP subnets. This server has an Alteon WebSystems ACEnic adapter installed with VLAN tagging turned on. The adapter is attached to one of the WebOS Web switch's Gigabit Ethernet ports, which is configured for VLANs #1, #2, and #3, and also has tagging turned on. Because of the VLAN tagging capabilities of both the adapter and the switch, the server is able to communicate on all three IP subnets in this network, but continues to maintain broadcast separation between all three VLANs and subnets.
PCs #1 and #2	These PCs are attached to a shared media hub that is then connected to the switch. They belong to VLAN #2, and are logically in the same IP subnet as Server #2 and PC #5. Tagging is not enabled on their switch port.
PC #3	A member of VLAN #1, this PC can only communicate with Server #2 and PC #5.
PC #4	A member of VLAN #3, this PC can only communicate with Server #1 and Server #2.
PC #5	A member of both VLAN #1 and VLAN #2, this PC has an Alteon WebSystems' ACEnic Gigabit Ethernet Adapter installed. It is able to communicate with Server #2 via VLAN #1, and to PC #1 and PC #2 via VLAN #2. The switch port to which it is connected is configured for both VLAN #1 and VLAN #2, and has tagging turned on.

NOTE – VLAN tagging is only required on ports that are connected to other Alteon WebSystems' web switches, or on ports that connect to tag-capable end-stations, such as servers with Alteon WebSystems' ACEnic Gigabit Ethernet Adapters.

Example #2: Parallel Links with VLANs

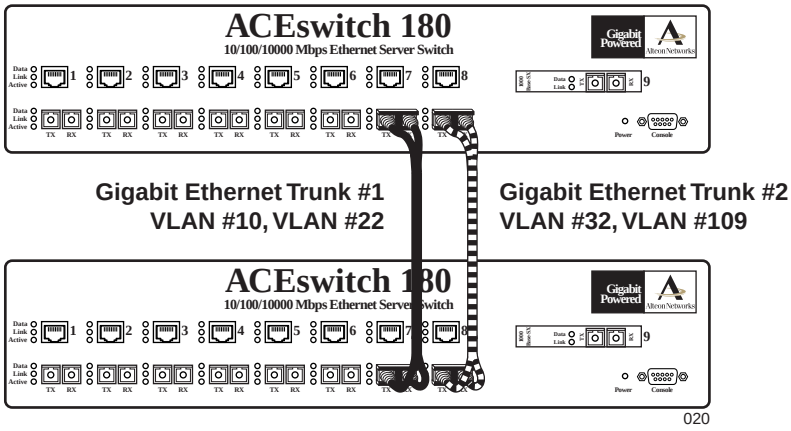


Figure 11-2 Example #2: Parallel Links with VLANs

The following items describe the features of this example:

- Example #2 shows how, through the use of VLANs, it is possible to create configurations where there are multiple links between two switches, without creating broadcast loops.
- Two Alteon WebSystems' WebOS switches are connected with two different Gigabit Ethernet links. Without VLANs, this configuration would create a broadcast loop, but the Spanning-Tree Protocol (STP) Topology Resolution process resolves parallel loop-creating links.
- With VLANs, neither switch-to-switch link shares the same VLAN and thus, are separated into their own broadcast domains.
- Ports #1 and #2 on both switches are on VLAN #10; Ports #3 and #4 on both switches are on VLAN #22. Ports #5 and #6 on both switches are on VLAN #32; and port #9 on both switches are on VLAN #109.
- It is necessary to turn off Spanning-Tree on at least one of the switch-to-switch links, or alternately turned off in both switches. Spanning-Tree executes on a per-network level, not a per-VLAN level. STP Bridge PDUs will be transmitted out both connected Gigabit Ethernet ports and be interpreted by the connected switch that there is a loop to resolve.
- Spanning-Tree is not VLAN-aware. Therefore, any VLAN configuration that might involve a parallel link from an STP perspective must be taken into account during network design. Alteon WebSystems recommends that you avoid topologies such as these, if at all possible.

CHAPTER 12

Jumbo Frames

To reduce host frame processing overhead, the Alteon WebSystems' ACEnic adapters and WebOS Web switches, both running operating software version 2.0 or greater, can receive and transmit frames that are far larger than the maximum normal Ethernet frame. By sending one Jumbo Frame instead of myriad smaller frames, the same task is accomplished with less processing.

The switches and the ACEnic adapter support Jumbo Frame sizes up to 9022 octets. These can be transmitted and received between ACEnic adapter-enabled hosts through the switch across any VLAN.

Isolating Jumbo Frame Traffic using VLANs

Jumbo Frame traffic must not be used on a VLAN where there is any device that cannot process frame sizes larger than Ethernet maximum frame size.

Additional VLANs can be configured on the adapters and switches to support non-Jumbo Frame VLANs for servers and workstations that do not support extended frame sizes. End-stations with an ACEnic adapters installed and attached to switches can communicate across both the Jumbo Frame VLANs and regular frame VLANs at the same time.

In the example illustrated in Figure 12-1 on page 12-2, the two servers can handle Jumbo Frames but the two clients cannot; therefore Jumbo Frames should only be enabled and used on the VLAN represented by the solid lines, but not for the VLAN with the dashed lines. Jumbo Frames are not supported on ports configured for half-duplex mode.

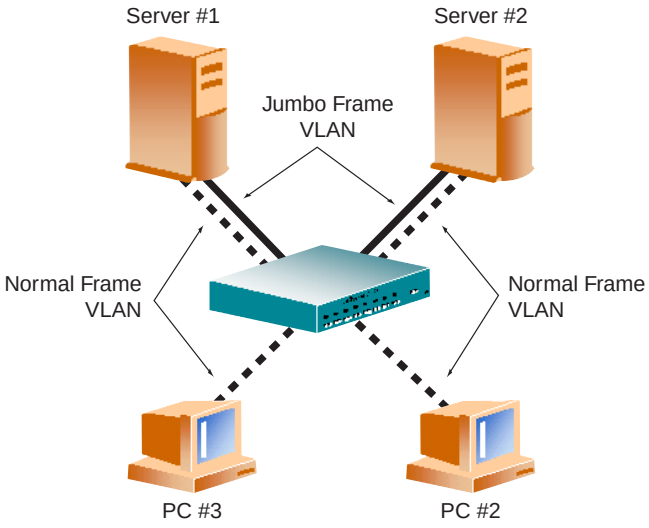


Figure 12-1 Jumbo Frame VLANs

Routing Jumbo Frames to Non-Jumbo Frame VLANs

When IP Routing is used to route traffic between VLANs, the switch will fragment jumbo UDP datagrams when routing from a Jumbo Frame VLAN to a non-Jumbo Frame VLAN. The resulting Jumbo Frame to regular frame conversion makes implementation even easier.

CHAPTER 13

IP Routing

IP Routing Benefits

IP Routing allows the network administrator to seamlessly connect server IP subnets to the rest of the backbone network, using a combination of configurable IP switch interfaces and IP routing options.

The IP Routing feature enhances Alteon WebSystems' Server Switching solution in the following ways:

- It provides the ability to perform Server Load Balancing (using both Layer 3 and Layer 4 switching in combination) to server subnets which are separate from backbone subnets.
- By automatically fragmenting UDP Jumbo Frames when routing to non-Jumbo Frame VLANs or subnets, it provides another means to invisibly introduce Jumbo Frames technology into the Server Switched network.
- It provides the ability to seamlessly route IP traffic between multiple VLANs configured in the switch.

Example of Routing Between IP Subnets

The physical layout of most corporate networks has evolved over time. Classic hub/router topologies have given way to faster switched topologies, particularly now that switches are increasingly intelligent. ACElerate powered switches, in fact, are now smart enough and fast enough to perform routing functions on par with wire speed Layer 2 switching.

The combination of faster routing and switching in a single device provides another service: it allows you to build versatile topologies that account for legacy configurations.

For example, consider the following topology migration:

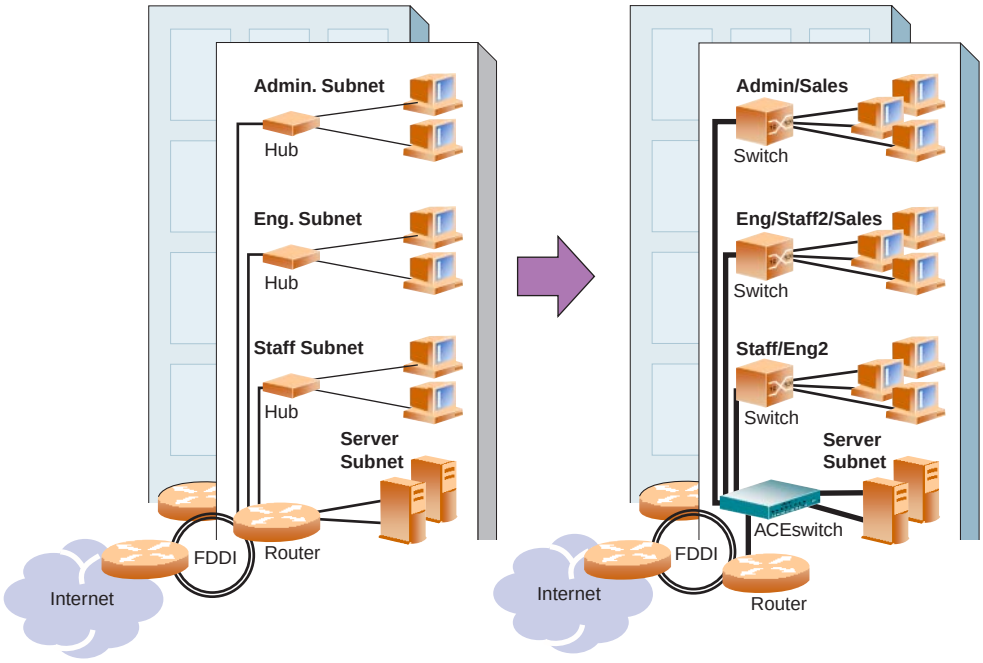


Figure 13-1 The Router Legacy Network

In this example, a corporate campus has migrated from a router-centric topology to a faster, more powerful switch-based topology. As is often the case, the legacy of network growth and redesign has left the system with a hodge-podge of illogically distributed subnets. This is a situation that switching alone cannot cure. Instead, the router is flooded with cross-subnet communication. This compromises efficiency in two ways:

- Routers can be slower than switches. The cross-subnet side trip from the switch to the router and back again adds two hops for the data, slowing throughput considerably.
- Traffic to the router increases, worsening any congestion.

Even if every end-station on the network could be moved to better logical subnets (a daunting task), competition for access to common server pools on different subnets still burdens the routers.

This problem is solved by using Alteon WebSystem's web switches with built-in IP Routing capabilities. Cross-subnet LAN traffic can now be routed within the WebOS-powered switches with wire speed Layer 2 switching performance. This not only eases the load on the router, but saves the network administrators from reconfiguring each and every end-station with new IP addresses.

Take a closer look at the ACEswitch 180 in the example configuration:

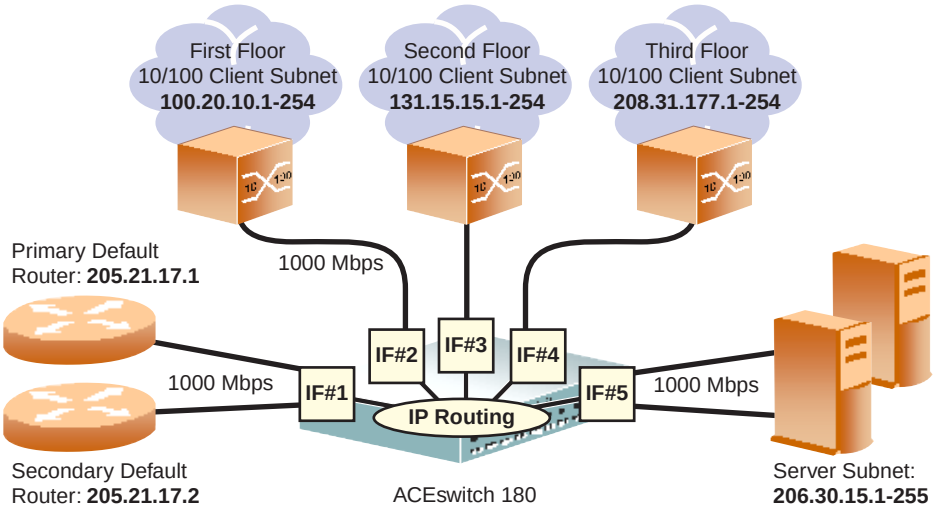


Figure 13-2 Switch-Based Routing Topology

The ACEswitch 180 connects the Gigabit Ethernet and Fast Ethernet trunks from various switched subnets throughout one building. Common servers are placed on another subnet attached to the switch. A primary and backup router are attached to the switch on yet another subnet.

Without Layer 3 IP Routing on the switch, cross-subnet communication is relayed to the default gateway (in this case, the router) for the next level of routing intelligence. The router fills in the necessary address information and sends the data back to the switch, which relays the packet to the proper destination subnet using Layer 2 switching.

With Layer 3 IP Routing in place on the Alteon WebSystems' switch, routing between different IP subnets can be accomplished entirely within the switch. This leaves the routers free to handle inbound and outbound traffic for this group of subnets.

As an added benefit, UDP Jumbo Frame traffic is automatically fragmented to regular Ethernet frame sizes when routing to non-Jumbo Frame subnets. For instance, this allows servers to communicate with each other using Jumbo Frames, and to non-Jumbo Frame devices using regular frames, all transparently to the user.

Example ACEswitch 180 Configuration for Subnet Routing

Prior to configuration, you must be connected to the switch command-line interface as the administrator (see Chapter 2, "The Command-Line Interface").

NOTE – For details about any of the menu commands described in this example, see "Configuring IP Parameters" on page 7-12.

---

1. **Assign an IP address (or document the existing one) for each real server, router, and client workstation.**

   In our example topology in Figure 13-2 on page 13-3, the following IP addresses are used:

Table 13-1 Subnet Routing Example: IP Address Assignments

Subnet	Devices	IP Addresses
#1	Primary and Secondary Default Routers	205.21.17.1 and 205.21.17.2
#2	First Floor Client Workstations	100.20.10.1-254
#3	Second Floor Client Workstations	131.15.15.1-254
#4	Third Floor Client Workstations	208.31.177.1-254
#5	Common Servers	206.30.15.1-254

2. **On the switch, assign an IP interface for each subnet attached to the switch.**

   Since there are five IP subnets connected to the switch, five IP interfaces are needed:

Table 13-2 Subnet Routing Example: IP Interface Assignments

Interface	Devices	IP Interface Address
IF #1	Primary and Secondary Default Routers	205.21.17.3
IF #2	First Floor Client Workstations	100.20.10.16
IF #3	Second Floor Client Workstations	131.15.15.1
IF #4	Third Floor Client Workstations	208.31.177.2
IF #5	Common Servers	206.30.15.200

These are configured using the following commands at the CLI:

```
>> Main# /cfg/ip/if 1                    (Select IP interface 1)
>> IP Interface 1# addr 205.21.17.3      (Assign IP address for the interface)
>> IP Interface 1# ena                   (Enable IP interface 1)
>> IP Interface 1# ../if 2               (Select IP interface 2)
>> IP Interface 2# addr 100.20.10.16     (Assign IP address for the interface)
>> IP Interface 2# ena                   (Enable IP interface 2)
>> IP Interface 2# ../if 3               (Select IP interface 3)
>> IP Interface 3# addr 131.15.15.1      (Assign IP address for the interface)
>> IP Interface 3# ena                   (Enable IP interface 3)
>> IP Interface 3# ../if 4               (Select IP interface 4)
>> IP Interface 4# addr 208.31.177.2     (Assign IP address for the interface)
>> IP Interface 4# ena                   (Enable IP interface 4)
>> IP Interface 4# ../if 5               (Select IP interface 5)
>> IP Interface 5# addr 206.30.15.200    (Assign IP address for the interface)
>> IP Interface 5# ena                   (Enable IP interface 5)
```

3. **Set each server and workstation's default gateway to point to the appropriate switch IP interface (the one in the same subnet as the server or workstation).**

4. **On the switch, configure the default gateways to point to the routers.**

   This allows the switch to send outbound traffic to the routers:

```
>> IP Interface 5# /cfg/ip/gw 1          (Select primary default gateway)
>> Default gateway 1# addr 205.21.17.1   (Point to primary router)
>> Default gateway 1# ena                (Enable primary default gateway)
>> Default gateway 1# ../gw 2            (Select secondary default gateway)
>> Default gateway 2# addr 205.21.17.2   (Point to secondary router)
>> Default gateway 2# ena                (Enable secondary default gateway)
```

5. **On the switch, enable, apply, and verify the configuration.**

```
>> Default gateway 2# ../fwrd            (Select the IP Forwarding Menu)
>> IP Forwarding# on                     (Turn IP forwarding on)
>> IP Forwarding# apply                  (Make your changes active)
>> IP Forwarding# ../cur                 (View current IP settings)
```

   Examine the resulting information. If any settings are incorrect, make any appropriate changes.

6. **On the switch, save your new configuration changes.**

```
>> IP# save                              (Save for restore after reboot)
```

Another Option: Adding VLANs to the Routing Example

The routers, servers, and clients in the example above are all in the same broadcast domain. If limiting broadcasts is desired in your network, you could use VLANs to create distinct broadcast domains. For example, you could create one VLAN for the routers, one for the servers, and one for the client trunks.

In this exercise, we are adding to the previous configuration.

1. **Determine which switch ports and IP interfaces belong to which VLANs.**

   The following table adds ports and VLANs information:

Table 13-3 Subnet Routing Example: Optional VLAN Ports

VLAN	Devices	IP Interface	Switch Port
#1	First Floor Client Workstations	3	1
	Second Floor Client Workstations	4	2
	Third Floor Client Workstations	5	3
#2	Primary Default Router	1	4
	Secondary Default Router	2	5
#3	Common Servers #1	6	6
	Common Servers #2	7	7

2. **On the switch, set the default VLAN for each port:**

```
>> # /cfg/port 1                    (Select port for First Floor)
>> Port 1# pvid 1                  (Set default to VLAN 1)
>> Port 1# ../port 2               (Select port for Second Floor)
>> Port 2# pvid 1                  (Set default to VLAN 1)
>> Port 2# ../port 3               (Select port for Third Floor)
>> Port 3# pvid 1                  (Set default to VLAN 1)
>> Port 3# ../port 4               (Select port for default router 1)
>> Port 4# pvid 2                  (Set default to VLAN 2)
>> Port 4# ../port 5               (Select port for default router 2)
>> Port 5# pvid 2                  (Set default to VLAN 2)
>> Port 5# ../port 6               (Select port for common server 1)
>> Port 6# pvid 3                  (Set default to VLAN 3)
>> Port 6# ../port 7               (Select port for common server 2)
>> Port 7# pvid 3                  (Set default to VLAN 3)
```

3. **On the switch, enable the VLANs.**

```
>> Port 7# /cfg/vlan 1                    (Select VLAN 1, the client VLAN)
>> VLAN 1# ena                            (enable VLAN 1)
>> VLAN 1# ../vlan 2                      (Select VLAN 2, the def. router VLAN)
>> VLAN 2# ena                            (enable VLAN 2)
>> VLAN 2# ../vlan 3                      (Select VLAN 3, the server VLAN)
>> VLAN 3# ena                            (enable VLAN 3)
```

4. **On the switch, add each IP interface to the appropriate VLAN.**

   Now that the ports are separated into three VLANs, the IP interface for each subnet must be placed in the appropriate VLAN. From Table 13-3 on page 13-6, the settings are made as follows:

```
>> VLAN 3# /cfg/ip/if 1                   (Select IP interface 1 for def. routers)
>> IP Interface 1# vlan 2                 (Set to VLAN 2)
>> IP Interface 1# ../if 2                (Select IP interface 2 for first floor)
>> IP Interface 2# vlan 1                 (Set to VLAN 1)
>> IP Interface 2# ../if 3                (Select IP interface 3 for second floor)
>> IP Interface 3# vlan 1                 (Set to VLAN 1)
>> IP Interface 3# ../if 4                (Select IP interface 4 for third floor)
>> IP Interface 4# vlan 1                 (Set to VLAN 1)
>> IP Interface 4# ../if 5                (Select IP interface 5 for servers)
>> IP Interface 5# vlan 3                 (Set to VLAN 3)
```

5. **On the switch, apply and verify the configuration.**

```
>> IP Interface 5# apply                  (Make your changes active)
>> IP Interface 5# /info/vlan             (View current VLAN information)
>> Information# port                      (View current port information)
```

   Examine the resulting information. If any settings are incorrect, make the appropriate changes.

6. **On the switch, save your new configuration changes.**

```
>> Information# save                      (Save for restore after reboot)
```

CHAPTER 14

Port Trunking

Port Trunking Overview

Basics

Trunk groups can provide super-bandwidth, multi-link connections between Alteon WebSystems' WebOS switches or other trunk-capable devices. A "trunk group" is a group of ports that act together, combining their bandwidth to create a single, larger virtual link.

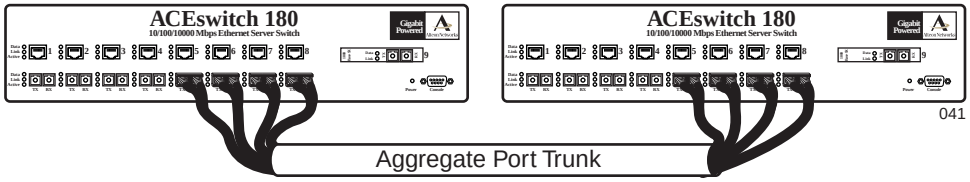


Figure 14-1 Port Trunk Group

When using port trunk groups between two ACEswitch 180 switches, for example, the network administrator can create a virtual link between the switches operating up to 4 Gigabits per second, depending on how many physical ports are combined. The switch supports up to 4 trunk groups per switch, each with 2 to 4 links.

Trunk groups are also useful for connecting an Alteon WebSystems' switch to third-party devices that support link aggregation, such as Cisco routers and switches with EtherChannel technology (*not* ISL Trunking technology), and Sun's Quad Fast Ethernet Adapter. Alteon WebSystems' trunk group technology is compatible with these devices when they are configured manually.

Statistical Load Distribution

Network traffic is statistically load balanced between the ports in a trunk group. The WebOS-powered switch uses both the Layer 2 MAC address and Layer 3 IP address information present in each transmitted frame for determining load distribution.

The addition of Layer 3 IP address examination is an important advance for traffic distribution in trunk groups. In some port trunking systems, only Layer 2 MAC addresses are considered in the distribution algorithm. Each packet's particular combination of source and destination MAC addresses results in selecting one line in the trunk group for data transmission. If there are enough Layer 2 devices feeding the trunk lines, then traffic distribution becomes relatively even. In some topologies, however, only a limited number of Layer 2 devices (such as a handful of routers and servers) feed the trunk lines. When this occurs, the limited number of MAC address combinations encountered results in a lopsided traffic distribution that can reduce the effective combined bandwidth of the trunked ports.

By adding Layer 3 IP address information to the distribution algorithm, a far wider variety of address combinations is seen. Even with just a few routers feeding the trunk, the normal source/destination IP address combinations (even within a single LAN) can be widely varied. This results in a wider statistical load distribution and maximizes the use of the combined bandwidth available to trunked ports.

Built-In Fault Tolerance

Since each trunk group is comprised of multiple physical links, the trunk group is inherently fault tolerant. As long as one connection between the switches is available, the trunk remains active.

Statistical load balancing is maintained whenever a port in a trunk group is lost or returned to service.

Port Trunking Example

In this example, three ports will be trunked between two ACEswitch 180s.

Prior to configuring each switch in this example, you must connect to the appropriate switch's command-line interface as the administrator (see Chapter 2, "The Command-Line Interface").

NOTE – For details about any of the menu commands described in this example, see "Configuring Port Trunking" on page 7-61.

1. **Connect the switch ports which will be involved in the trunk group:**

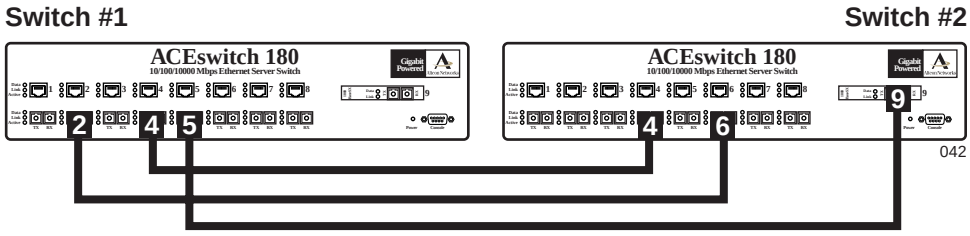


Figure 14-2 Example Port Trunk Group Configuration

2. **On Switch #1, define a Trunk Group.**

```
>> Main # /cfg/trunk 1                (Select trunk group #1)
>> Trunk group 1# add 2               (Add port 2 to trunk group #1)
>> Trunk group 1# add 4               (Add port 4 to trunk group #1)
>> Trunk group 1# add 5               (Add port 5 to trunk group #1)
>> Trunk group 1# ena                 (Enable trunk group #1)
```

3. **On Switch #1, apply and verify the configuration.**

```
>> Trunk group 1# apply               (Make your changes active)
>> Trunk group 1# cur                 (View current trunking configuration)
```

Examine the resulting information. If any settings are incorrect, make the appropriate changes.

4. **On Switch #1, save your new configuration changes.**

```
>> Trunk group 1# save                (Save for restore after reboot)
```

5. **On Switch #2, repeat the process.**

```
>> Main # /cfg/trunk 3                    (Select trunk group #3)
>> Trunk group 3# add 4                   (Add port 4 to trunk group #3)
>> Trunk group 3# add 6                   (Add port 6 to trunk group #3)
>> Trunk group 3# add 9                   (Add port 9 to trunk group #3)
>> Trunk group 3# ena                     (Enable trunk group #3)
>> Trunk group 3# apply                   (Make your changes active)
>> Trunk group 3# cur                     (View current trunking configuration)
>> Trunk group 3# save                    (Save for restore after reboot)
```

Switch #1 trunk group #1 is now connected to Switch #2 trunk group #3.

NOTE – In this example, both switches are Alteon WebSystems' Web switches. If a third-party device supporting link aggregation is used (such as Cisco routers and switches with EtherChannel technology, or Sun's Quad Fast Ethernet Adapter), then trunk groups on the third-party device should be configured manually. Connection problems could arise when using automatic trunk group negotiation on the third-party device.

---

6. **Examine the trunking information on each switch.**

```
>> /info/trunk                            (View trunking information)
```

Information about each port in each configured trunk group will be displayed. Make sure that trunk groups consist of the expected ports, and that each port is in the expected state.

CHAPTER 15

Server Load Balancing

This chapter describes how to configure and use the optional Layer 4 software for Server Load Balancing. For information on activating this optional software if required, see "Activating Optional Software" on page 8-7.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New In Release 5.2	Feature Description	Details
Hostname for HTTP Content Health Checks	HTTP-based health checks can now include virtual server hostname and domain name attributes when formulating HTTP GET requests.	page 15-11
Port Restrictions Removed	The SLB Port Menu no longer requires switch ports to be configured exclusively for one type of Layer 4 processing.	page 15-4

Server Load Balancing Overview

Benefits

Server Load Balancing benefits your network in a number of ways:

- Increased efficiency for server utilization and network bandwidth

  With Server Load Balancing, your WebOS powered switch is aware of the shared services provided by your server pool. The switch can then balance user session traffic among the available servers. For even greater control, traffic is distributed according to a variety of user-selectable rules.

  By helping to eliminate server over-utilization, important session traffic gets through more easily, reducing user competition for connections on overworked servers.

- Increased reliability of services to users

  If any server in a server pool fails, the remaining servers continue to provide access to vital applications and data. The failed server can be brought back up without interrupting access to services.

- Increased scalability of services

  As users are added and the server pool's capabilities are saturated, new servers can be added to the pool transparently.

Identifying Your Needs

Server Load Balancing may be the right option for addressing these vital network concerns:

- A single server no longer meets the demand for its particular application.
- The connection from your LAN to your server overloads the server's capacity.
- Your NT and UNIX servers hold critical application data and must remain available even in the event of a server failure.
- Your website is vital, being used as a way to do business and for taking orders from customers. It must not become overloaded or unavailable.
- You want to use multiple servers or hot-standby servers for maximum network uptime.
- You must be able to scale your applications to meet client and LAN request capacity.
- You can't afford to continue using an inferior load balancing technique such as DNS Round Robin, or a software-only system.

How Server Load Balancing Works

In an average network that employs multiple servers without server load balancing, each server usually specializes in providing one or two unique services. If one of these servers provides access to applications or data which is in high demand, it can become overutilized. Placing this kind of strain on a server can decrease the performance of the entire network as user requests are rejected by the server and then resubmitted by the user stations. Ironically, over-utilization of key servers often happens in networks where other servers are actually under-utilized.

The solution to getting the most from your servers is the Layer 4 switching feature of Server Load Balancing. With this software feature, your switch is aware of the services provided by each server, and can direct user session traffic to the appropriate server based on a variety of balancing algorithms.

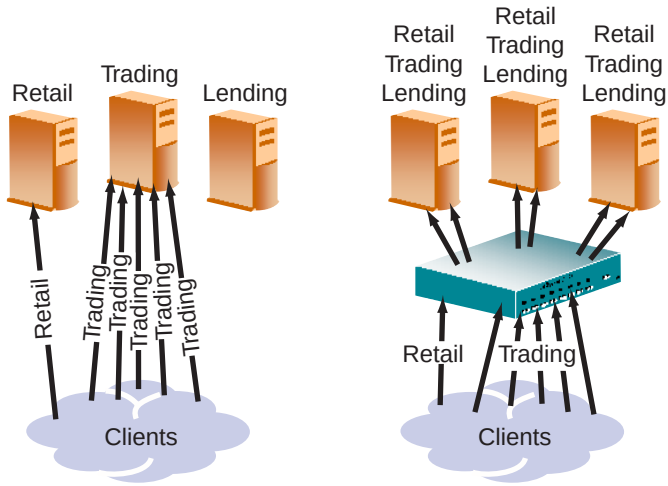


Figure 15-1 Traditional vs. Server Load Balanced network configurations

To provide Server Load Balancing for any particular type of service, each server in the pool must have access to identical content, either directly (duplicated on each server) or through a back-end network (mounting the same file system or database server).

The switch with Layer 4 software acts as a front-end to the servers, interpreting user session requests and distributing them among the available servers. To accomplish this, the switch is configured to act as a virtual server and is given a virtual IP address (or range of addresses) for each collection of services it will distribute. There can be as many as 256 virtual servers on the switch, each distributing up to eight different services.

Each virtual server is assigned a list of the real IP addresses (or range of addresses) of the real servers in the pool where its services reside. When the user stations request connections to a service, they will communicate with a virtual server on the switch. When the switch receives the request, it binds the session request to the real IP address of the best available real server, and remaps the fields in each frame from virtual addresses to real addresses.

Network Topology Considerations

When deploying Layer 4 switching features, here are a few key aspects to consider:

- All client requests to a virtual IP address and all responses from the real servers *must* pass through the switch. If alternate paths exist between the client and the real servers (as shown in the figure below), the Layer 4 switch can be configured with proxies in order to guarantee that Layer 4 traffic uses the correct path (see "IP Proxy Addresses for Complex SLB Networks" on page 15-17).

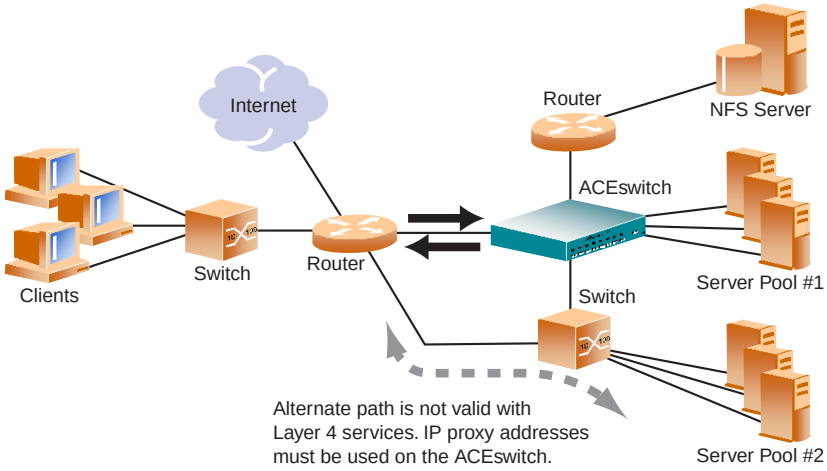


Figure 15-2 Layer 4 Client/Server traffic routing

- Identical content must be available to each server in the same pool. Either of these methods can be used:
  - Static applications and data are duplicated on each real server in the pool.
  - Each real server in the pool has access to the same data through use of a shared file system or back-end database server.
- Some services require that a series of client requests go to the same real server so that session-specific state data can be retained between connections. Services of this nature include web search results, multi-page forms that the user fills in, or custom web-based applications typically created using `cgi-bin` scripts. Connections for these types of services must be configured as "persistent" (see the `pbind` option in Table 7-23 on page 7-46), or must use the `minmisses` or `hash` metrics (see "Server Load Balancing Metrics" on page 7-44).

- As of Release 5.2 of the Alteon WebSystems' WebOS Software, clients and servers can be connected through the same switch port. Each port in use on the switch can be configured to process client requests, server traffic, or both. You can enable or disable processing on a port independently for each type of Layer 4 traffic, expanding your topology options.
  - Layer 4 server processing. Ports configured to provide real server responses to client requests require real servers to be connected to the Layer 4 switch, directly or through a hub, router, or another switch.
  - Layer 4 client processing. Ports configured to process client request traffic provide address translation from the virtual IP to the real server IP address. Maximizing the number of these ports on the Layer 4 switch will improve the switch's potential for effective Server Load Balancing.

NOTE – Switch ports configured for Layer 4 client/server processing can simultaneously provide Layer 2 switching and IP Routing functions.

Consider the following network topology:

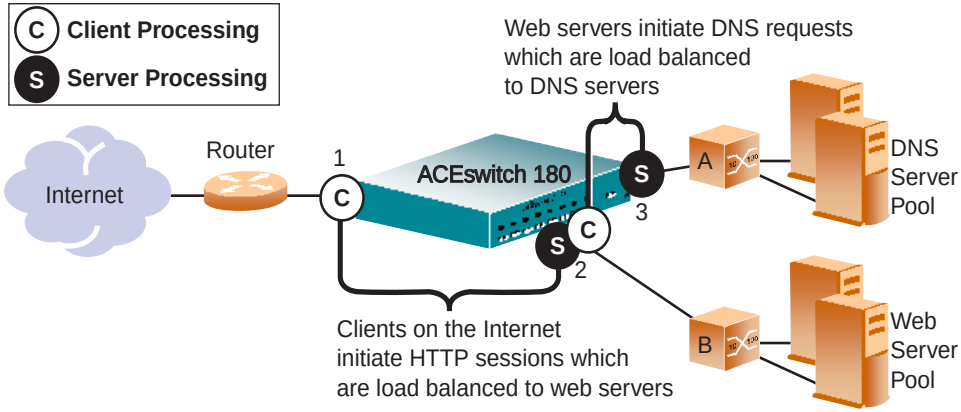


Figure 15-3 Example Network for Client/Server Port Configuration

In this figure, the switch load balances traffic to a web server pool and to a DNS server pool. The switch port connected to the web server pool is asked to perform both server and client processing. Under previous switch software releases, this example topology would be invalid since Layer 4 client and server processing could not both occur on the same switch port. As of Release 5.2, this restriction is removed.

Some topologies require special configuration. For example, if clients were added to switch "B" in the example above, these clients could not access the web server pool using Layer 4 services except through a proxy IP address configured on port 2 of the ACEswitch 180.

Server Load Balancing Examples

Web Hosting Configuration

Consider a situation where customer web sites are being hosted by a popular web hosting company and/or Internet Service Provider (ISP). The web content is relatively static and is kept on a single NFS server for easy administration. As the customer base increases, so does the number of simultaneous web connection requests.

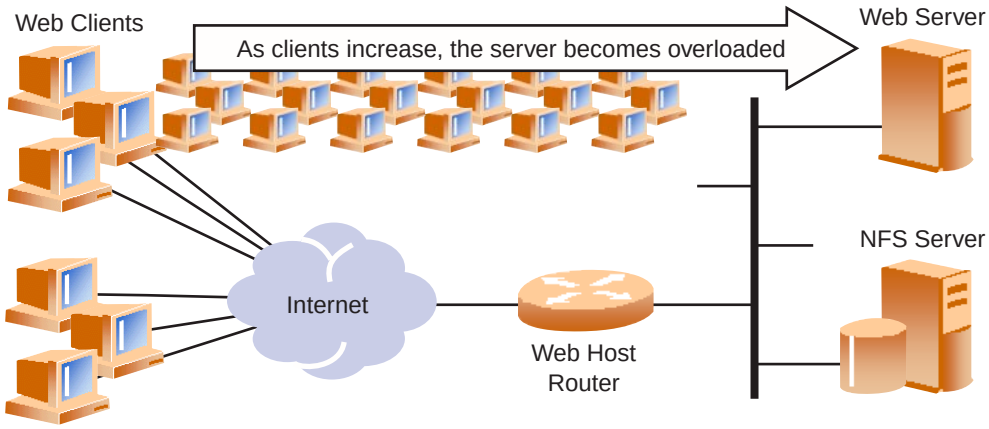


Figure 15-4 Web hosting configuration without Layer 4 switching

Such a company has three primary needs:

- Increased server availability
- Server performance scalable to match new customer demands
- Easy administration of network and servers

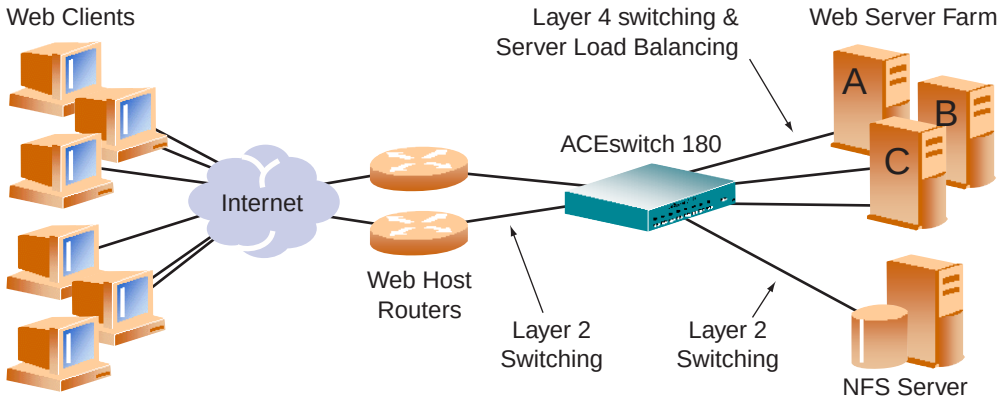


Figure 15-5 Web hosting with Layer 4 solutions

Each concern about this company's site can be addressed by adding an ACEswitch 180 with optional Layer 4 software.

- Reliability is increased by providing multiple paths from the clients to the Layer 4 switch, and by access to a pool of servers that have identical content. If one server fails, the others can take up the additional load.
- Performance is improved by balancing the web request load across multiple servers. More servers can be added at any time to increase processing power.
- For ease of maintenance, servers can be added or removed dynamically without interrupting shared services.

Example ACEswitch 180 Configuration for the Web Hosting Solution

In the following examples, many of the Server Load Balancing options are left to their default values. See "Additional Server Load Balancing Options" on page 15-15 for more options.

The following is required prior to configuration:

- You must be connected to the switch command-line interface as the administrator (see Chapter 2, "The Command-Line Interface").
- The optional Server Load Balancing software must be enabled (see "Activating Optional Software" on page 8-7).

NOTE – For details about any of the menu commands described in this example, see "Configuring Server Load Balancing" on page 7-36.

---

1. **Assign an IP address to each of the real servers in the server pool.**

   The real servers in any given real server group must have an IP route to the switch that will perform the Server Load Balancing functions. This is most easily accomplished by placing the switches and servers on the same IP subnet, although advanced routing techniques can be used as long as they do not violate the topology rules outlined in "Network Topology Considerations" on page 15-4.

   For this example, the three web-host real servers have the following IP addresses on the same IP subnet:

   Table 15-1 Web Host Example: Real Server IP addresses

Real Server	IP address
Server A	200.200.200.2
Server B	200.200.200.3
Server C	200.200.200.4

2. **Define an IP interface on the switch.**

   The switch must have an IP route to all of the real servers which receive Layer 4 switching services. For Server Load Balancing, the switch uses this path to determine the level of TCP/IP reachability of the real servers.

   To configure an IP interface for this example, enter this command from the CLI:

```
>> Main# /cfg/ip/if 1                          (Select IP interface #1)
>> IP Interface 1# addr 200.200.200.100       (Assign IP address for the interface)
>> IP Interface 1# ena                         (Enable IP interface #1)
```

NOTE – The IP interface and the real servers must belong to the same VLAN. This example assumes that all ports and IP interfaces use default VLAN #1, requiring no special VLAN configuration for the ports or IP interface.

3. **On the switch, define each Real Server.**

   For each real server, you must assign a real server number, specify its actual IP address, and enable the real server. For example:

```
>> IP Interface 1# /cfg/slb/real 1          (Server A is real server 1)
>> Real server 1 # rip 200.200.200.2        (Assign Server A IP address)
>> Real server 1 # ena                      (Enable real server 1)
>> Real server 1 # ../real 2                (Server B is real server 2)
>> Real server 2 # rip 200.200.200.3        (Assign Server B IP address)
>> Real server 2 # ena                      (Enable real server 2)
>> Real server 2 # ../real 3                (Server C is real server 3)
>> Real server 3 # rip 200.200.200.4        (Assign Server C IP address)
>> Real server 3 # ena                      (Enable real server 3)
```

4. **On the switch, define a Real Server Group.**

   This combines the three real servers into one service group:

```
>> Real server 3 # /cfg/slb/group 1         (Select real server group 1)
>> Real server group 1# add 1               (Add real server 1 to group 1)
>> Real server group 1# add 2               (Add real server 2 to group 1)
>> Real server group 1# add 3               (Add real server 3 to group 1)
```

5. **On the switch, define a Virtual Server.**

   All client requests will be addressed to a virtual IP on a virtual server defined on the switch. Clients acquire the virtual IP through normal DNS resolution. HTTP uses well-known TCP port 80. In this example, HTTP is configured as the only service running on this virtual IP, and is associated with our real server group. For example:

```
>> Real server group 1 # /cfg/slb/virt 1    (Select virtual server 1)
>> Virtual server 1# vip 200.200.200.1      (Assign a virtual server IP address)
>> Virtual server 1# add http 1             (Associate virtual port to real group)
>> Virtual server 1# ena                    (Enable the virtual server)
```

NOTE – This configuration is not limited to HTTP web service. Other TCP/IP services can be configured in a similar fashion. For a list of other well-known services and ports, see the command option information on page 7-47.

6. **On the switch, define the Port Configuration.**

In this example, the following ports are being used on the ACEswitch 180:

Table 15-2 Web Host Example: ACEswitch 180 Port Usage

Port	Host	L4 Processing Enabled
1	Server A	Server
2	Server B	Server
3	Server C	Server
4	Back-end NFS server. All three real servers get their web content from this machine. This port does not require Layer 4 switching.	None
5	Client router A. This connects the switch to the Internet where all client requests originate.	Client
6	Client router B. This also connects the switch to the Internet where all client requests originate.	Client

The ports are configured as follows:

```
>> Virtual server 1# /cfg/slb/port 1          (Select physical switch port 1)
>> SLB port 1# servr ena                      (Enable server processing on port 1)
>> SLB port 1# ../port 2                      (Select physical switch port 2)
>> SLB port 2# servr ene                      (Enable server processing on port 2)
>> SLB port 2# ../port 3                      (Select physical switch port 3)
>> SLB port 3# servr ena                      (Enable server processing on port 3)
>> SLB port 3# ../port 5                      (Select physical switch port 5)
>> SLB port 5# clien ena                      (Enable client processing on port 5)
>> SLB port 5# ../port 6                      (Select physical switch port 6)
>> SLB port 6# clien ena                      (Enable client processing on port 6)
```

7. **On the switch, enable, apply, and verify the configuration.**

```
>> SLB port 6# ..                             (Select the SLB Menu)
>> Server Load Balancing# on                  (Turn Server Load Balancing on)
>> Server Load Balancing# apply               (Make your changes active)
>> Server Load Balancing# cur                 (View current settings)
```

Examine the resulting information. If any settings are incorrect, make any appropriate changes.

8. **On the switch, save your new configuration changes.**

```
>> Server Load Balancing# save          (Save for restore after reboot)
```

9. **On the switch, check the Server Load Balancing information.**

```
>> Server Load Balancing# /info/slb     (View SLB information)
```

Check that all Server Load Balancing parameters are working according to expectation. If necessary, make any appropriate configuration changes and then check the information again.

Health-Check Parameters for Real Servers

By default, the switch checks the status of each service on each real server every two seconds. Sometimes, the real server may be too busy processing connections to respond to health checks. By default, if a service does not respond to four consecutive health checks, the switch declares the service unavailable. Both the health check interval and the number of retries can be changed:

```
>> # /cfg/slb/real real-server-number   (Select the real server)
>> Real server# intr 4                  (Check real server every 4 seconds)
>> Real server# retry 6                 (If 6 consecutive health checks fail,
                                         declare real server down)
```

Hostname for HTTP Content Health Checks

HTTP-based health checks can include the hostname for `HOST:` headers. The `HOST:` header and health check URL are constructed from the following components:

Item	Option	Configured Under	Maximum Length
Virtual server hostname	`hname`	`/cfg/slb/virt`	9 characters
Domain name	`dname`	`/cfg/slb/virt`	35 characters
Server group health check field	`cntnt`	`/cfg/slb/group`	34 characters

If the `HOST:` header is required, an `HTTP/1.1 GET` will occur, otherwise an `HTTP/1.0 GET` will occur.

Example 1:

```
hname   = compute
dname   = alteon.com
cntnt   = index.html
```

Health check is performed using:

```
GET /index.html HTTP/1.1
Host: compute.alteon.com
```

Example 2:

```
hname   = (none)
dname   = raleighduram.cityguru.com
cntnt   = /page/gen/?_template=alteon
```

Health check is performed using:

```
GET /page/gen/?_template=alteon HTTP/1.1
Host: raleighduram.cityguru.com
```

Example 3:

```
hname   = (none)
dname   = compute
cntnt   = index.html
```

Health check is performed using:

```
GET /index.html HTTP/1.1
Host: compute
```

Example 4:

```
hname   = (none)
dname   = (none)
cntnt   = index.html
```

Health check is performed using:

`GET /index.html HTTP/1.0` (since no `HTTP HOST:` header is required)

Example 5:

```
hname   = (none)
dname   = (none)
cntnt   = //compute/index.html
```

Health check is performed using:

```
GET /index.html HTTP/1.1
Host: compute
```

RADIUS Server Health Checking

The RADIUS (Remote Authentication Dial In User Service) protocol is used to authenticate dial-up users to remote access servers (RAS) and the client application they will use during the dial-up connection.

RADIUS is stateless and uses UDP as its transport protocol. RADIUS servers listen to well-known UDP port 1812. To support RADIUS health checking, the network administrator must configure two parameters in the switch: the `/cfg/slb/secrt` value and the `cntnt` parameter with a *username:password* value.

>> # **/cfg/slb/group** *real-server-group-number*	*(Select the real server group.)*
>> # **slb/group/healt# *radius***	*(Specify the type of health checking to be performed.)*
>> # **slb/group/cntnt** *username:password*	*(Specify the RADIUS username:password value.)*
>> # **slb/secrt** *RADIUS-coded-value*	*(Enter 16 alphanumeric characters used to encrypt and decrypt password.)*

- The `secrt` value is a field of 16 alphanumeric characters that is used by the switch to encrypt a password during the RSA Message Digest Algorithm (MD5) and by the RADIUS server to decrypt the password during verification.
- The `cntnt` option specifies the *user:password* value that the server tries to match in its user database. In addition to verifying the username and password, the database may specify the client(s) or port(s) to which the user is allowed access.

IMAP Server Health Checking

IMAP (Internet Message Access Protocol) is a mail server protocol that is used between a client system and a mail server to allow a user to retrieve and manipulate mail messages they have received.

NOTE – IMAP is not used for mail transfers between mail servers or from clients to a mail server.

IMAP servers listen to TCP port 143. To support IMAP health checking, the network administrator must configure a *username:password* value in the switch, using the `cntnt` option on the SLB Real Server Group Menu (`/cfg/slb/group`).

>> # **`/cfg/slb/group`** *real-server-group-number*	*(Select the real server group.)*
>> # **`slb/group/healt`** ***`imap`***	*(Specify the type of health checking to be performed.)*
>> # **`slb/group/cntnt`** *username:password*	*(Specify the IMAP username:password value.)*

The `cntnt` option specifies the *user:password* value that the server tries to match in its user database. In addition to verifying the username and password, the database may specify the client(s) or port(s) to which the user is allowed access.

Additional Server Load Balancing Options

In the examples above, many of the Server Load Balancing options are left to their default values. The following configuration options can be used to tune the system.

NOTE – You must `apply` any changes in order for them to take effect, and you must `save` them if you wish them remain in effect after switch reboot.

Metrics for Real Server Groups

Metrics are used for selecting which real server will receive the next client connection (see page 7-44). The default metric is Least Connections (`leastconns`). To change a real server group metric, to `minmisses` for example, enter:

```
>> # /cfg/slb/group group-number              (Select the real server group)
>> Real server group# metrc minmisses         (Use round robin metric)
```

Weights for Real Servers

Weights can be assigned to each real server. These weights bias load balancing to give the fastest real servers a bigger share of connections during load balancing. Weight is specified as a number from 1 (the default) to 48. Each increment increases the number of connections the real server gets. By default, each real server is given a weight setting of 1. A setting of 10 would assign the server roughly 10 times the number of connections as a server with a weight of 1. To set weights, enter the following commands:

```
>> # /cfg/slb/real real-server-number         (Select the real server)
>> Real server# wght 10                       (8 times the number of connections)
```

Connection Time-outs for Real Servers

In some cases, open TCP/IP sessions are not closed properly (for example, the switch receives the `SYN` for the session, but no `FIN` is sent). If a session is inactive for 10 minutes (the default), it is released from the switch. To change the time-out period, enter the following:

```
>> # /cfg/slb/real real-server-number         (Select the real server)
>> Real server# tmout 4                       (Specify an even numbered interval)
```

Maximum Connections for Real Servers

You can set the number of open connections each real server is allowed to handle for Server Load Balancing. To set the connection limit, enter the following:

```
>> # /cfg/slb/real real-server-number          (Select the real server)
>> Real server# mcon 1600                      (Allow 1600 connections maximum)
```

Values average between about 500 HTTP connections for slower servers to 1,500 for quicker, multi-processor servers. The appropriate value also depends on the duration each session lasts, as well as how much CPU capacity is occupied by processing each session. Connections that use a lot of Java or `CGI-bin` scripts for forms or searches require more server resources and thus a lower `mcon` limit. You may wish to use a performance bench-mark tool to determine how many connections your real servers can handle.

Backup/Overflow Servers

A real server can backup other real servers, and can handle overflow traffic when the maximum connection limit is reached. Each backup real server must be assigned a real server number and real IP address. It must then be enabled. Finally, the backup must be assigned to each real server it will backup. The following defines Real Server #4 as a backup for Real Servers #1 and #2:

```
>> # /cfg/slb/real 4                          (Select real server #4 as backup)
>> Real server 4 # rip 200.200.200.5          (Assign backup IP address)
>> Real server 4 # ena                        (Enable real server #4)
>> Real server 4 # ../real 1                  (Select real server #1)
>> Real server 1 # bkup 4                     (Real server #4 is backup for #1)
>> Real server 1 # ../real 2                  (Select real server #2)
>> Real server 2 # bkup 4                     (Real server #4 is backup for #2)
```

In a similar fashion, a backup/overflow server can be assigned to a real server group. If all real servers in a real server group fail or overflow, the backup comes online.

```
>> # /cfg/slb/group real-server-group-number  (Select real server group)
>> Real server group# bkup 4                  (Assign real server #4 as backup)
```

IP Proxy Addresses for Complex SLB Networks

For proper Server Load Balancing, all client-to-server requests to a particular virtual server and all related server-to-client responses *must* pass through the *same* Layer 4 switch.

In complex network topologies, routers and other devices can create alternate paths around the switch managing Layer 4 functions (see Figure 15-2 on page 15-4). Under such conditions, the client switch ports must use a proxy IP address.

When the client requests services from the switch's virtual server, the client sends its own IP address for use as a return address. If a proxy IP address is configured for the client port on the switch, the switch replaces the client's source IP address with the switch's own proxy IP address before sending the request to the real server. This creates the illusion that the switch originated the request. The real server uses the switch's proxy IP address as the destination address for any response. This forces the Layer 4 traffic to return through the proper switch, regardless of alternate paths. Once the switch receives the proxied data, it puts the original client IP address into the destination address and sends the packet to the client.

NOTE – Because requests appear to come from the switch proxy IP address rather than the client source IP address, use of proxy addresses can generate misleading access information for network statistics or debugging.

The proxy IP address can also be used for direct access to the real servers (see "Direct Client Access to Real Servers" on page 7-49).

When implementing proxies, switch ports should be reconfigured to disable server processing. Re-examining the "Example ACEswitch 180 Configuration for the Web Hosting Solution" on page 15-7, the port conditions listed in Table 15-3 on page 15-18 are used.

Table 15-3 Proxy Example: ACEswitch 180 Port Usage

Port	Host	L4 Processing Enabled
1	Server A	None
2	Server B	None
3	Server C	None
4	Back-end NFS server. All three real servers get their web content from this machine. This port does not require Layer 4 switching.	None
5	Client router A. This connects the switch to the Internet where all client requests originate.	Client
6	Client router B. This also connects the switch to the Internet where all client requests originate.	Client

The following commands are used to disable server processing on ports 1-3:

```
>> # /cfg/slb/port 1                    (Select switch port #1)
>> SLB port 1# servr dis                 (Disable server processing on port #1)
>> SLB port 1# ../port 2                 (Select switch port #2)
>> SLB port 2# servr dis                 (Disable server processing on port #2)
>> SLB port 2# ../port 3                 (Select switch port #3)
>> SLB port 3# servr dis                 (Disable server processing on port #3)
```

Only the "`client`" ports require proxy IP addresses. Each proxy IP address must be unique on your network. The following shows commands used to configure proxies for this example:

```
>> # /cfg/slb/port 5                    (Select network port #5)
>> SLB port 5# pip 200.200.200.68       (Set proxy IP address for port #5)
>> SLB port 5# ../port 6                (Select network port #6)
>> SLB port 6# pip 200.200.200.69       (Set proxy IP address for port #6)
```

The Layer 4 proxies are transparent to the user. No additional client configuration is needed.

NOTE – Remember that you must `apply` any changes in order for them to take effect, and you must `save` them if you wish them remain in effect after switch reboot. Also, the `/info/slb` command is useful for checking the state of Server Load Balancing operations.

CHAPTER 16

Filtering

This chapter describes configuring and using filters for security and redirection applications.

New in This Release

The following list summarizes the main enhancements and features implemented in WebOS Release 5.2 that are described in this chapter:

New In Release 5.2	Feature Description	Details
Enhanced Filter Logs	For additional troubleshooting and session inspection capability, packet source and destination IP address are now included in filter log messages.	page 16-5
TCP ACK Matching for Filters	To provide greater filtering flexibility, the `ack` filter criteria has been added.	page 16-13

NOTE – For Application Redirection, the optional Layer 4 software must be enabled (see "Filtering and Layer 4" on page 7-37).

Filtering Overview

Benefits

Layer 3 (IP) and Layer 4 (Application) filtering gives the network administrator a powerful tool with the following benefits:

- Filtering increases security for server networks.

  Filters can be configured to allow or deny traffic according to various IP address, protocol, and port criteria. This gives the administrator fine control over the types of traffic permitted through the switch. Optionally, any filter can generate `syslog` messages for increased security visibility.

- Generic Network Address Translation

  NAT can be used to map the source or destination IP address and port of private network traffic to/from an advertised network IP address and port.

- Application Redirection improves network bandwidth and provides unique network solutions.

  Filters can be created which redirect traffic to cache and application servers. Repeated client access to common web or application content across the Internet can be an inefficient use of network resources. By redirecting client requests to a local web-cache or application server, you increase the speed at which clients access the information and free up valuable network bandwidth.

Filtering Criteria

Up to 224 filters can be configured on the switch. Each filter can be set to allow, deny, redirect, or translate traffic based on any combination of the following criteria:

- Source IP Address or range
- Destination IP Address or range
- Protocol type (for example: IP, UDP, TCP, ICMP, and others)
- TCP ACK or RST (reset) flag matching
- Application, source port or range (For example: FTP, HTTP, Telnet, 31000-33000, etc.)
- Application, destination port or range (For example: FTP, HTTP, Telnet, 31000-33000, etc.)
- Inverse: activate the filter whenever the specified conditions are *not* met.

For example, you can create a single filter that blocks external Telnet traffic to your main server, except from a trusted IP address. Another filter could warn you if FTP access is attempted from a specific IP address. Another filter could redirect all incoming e-mail traffic to a master post-office where it can be analyzed for spam. The options are nearly endless.

Below are a list of the well-known protocols and applications.

Table 16-1 Well-Known Protocol Types

Number	Protocol Name
1	icmp
2	igmp
6	tcp
17	udp
89	ospf
112	VRRP

Table 16-2 Well-Known Application Ports

Number	TCP/UDP Application	Number	TCP/UDP Application	Number	TCP/UDP Application
20	ftp-data	70	gopher	161	snmp
21	ftp	79	finger	162	snmptrap
22	ssh	80	http	179	bgp
23	telnet	109	pop2	194	irc
25	smtp	110	pop3	220	imap3
37	time	111	sunrpc	389	ldap
42	name	119	nntp	443	https
43	whois	123	ntp	520	rip
53	domain	143	imap	554	rtsp
69	tftp	144	news	1985	hsrp

Stacking Filters

Once configured, filters are assigned and enabled on a per port basis. Each filter can be used by itself or in combination with any other filter on any given switch port. The filters are numbered 1 through 224. When multiple filters are stacked together on a port, the filter's number determines its order of precedence: the filter with the lowest number is checked first. When traffic is encountered at the switch port, if the filter matches, its configured action takes place and the rest of the filters are ignored. If the filter criteria doesn't match, the next filter is tried.

As long as the filters do not overlap, you can improve filter performance by making sure that the most heavily utilized filters are applied first. For example, consider a filter system where the Internet is divided according to destination IP address:

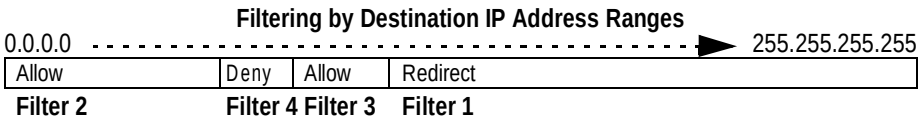


Figure 16-1 Assigning Filters according to Range of Coverage

Assuming that traffic is distributed evenly across the Internet, the largest area would be the most utilized and is assigned to filter 1. The smallest area is assigned to filter 4.

Overlapping Filters

Filters are permitted to overlap, although special care should be taken to ensure the proper order of precedence. When overlapping filters are present, the more specific filters (those that target fewer addresses or ports) should be applied before the generalized filters.

Example:

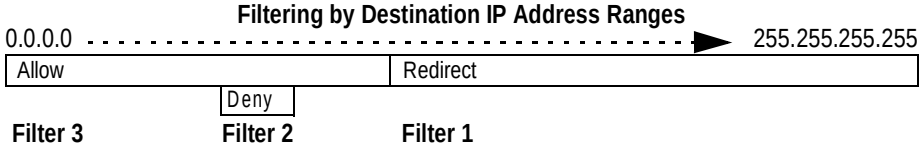


Figure 16-2 Assigning Filters to Overlapping Ranges

In this example, the "deny" filter must be processed prior to the "allow" filter. If the "allow" filter was allowed to take precedence, the "deny" filter could never be triggered.

The Default Filter

Before filtering can be enabled on any given port, a default filter should be configured. This filter handles any traffic not covered by any other filter. All the criteria in the default filter must be set to the full range possible ("`any`"). For example:

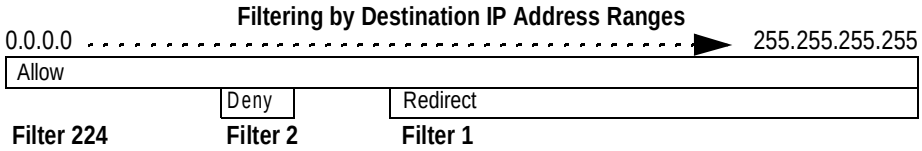


Figure 16-3 Assigning a Default Filter

In this example, filter 224 is the default filter. If no other filter acts on the traffic, filter 224 handles it. All criteria in filter 224 is set to the "**any**" state.

Although recommended when configuring filters for IP traffic control and redirection, default filters are not required. Using default filters can increase session performance, but takes some of the session binding resources. If you experience an unacceptable number of binding failures as shown in the Server Load Balancing Maintenance Statistics (`/stats/slb/maint`), you may wish to remove some of the default filters.

Numbering Filters

You may wish to consider numbering your filters by increments of 5 or 10 (for example: 5, 10, 15, 20, etc.). This allows for filters to be easily inserted between others in the list, if required.

Filter Logs

To provide enhanced troubleshooting and session inspection capability, packet source and destination IP addresses are included in filter log messages. Filter log messages are generated when a Layer 3/Layer 4 filter is triggered and has logging enabled. The messages are output to the console port, system host log (`syslog`), and the web-based interface message window.

Example: A network administrator has noticed a significant number of ICMP frames on one portion of the network, and wants to determine the specific sources of the ICMP messages. The administrator uses the command-line interface to create and apply the following filter:

```
>> # /cfg/slb/filt 15                    (Select filter 15)
>> Filter 15# sip any                     (From any source IP address)
>> Filter 15# dip any                     (To any destination IP address)
>> Filter 15# proto icmp                  (For the ICMP protocol)
>> Filter 15# log enabled                 (Create a log entry when matched)
>> Filter 15# ena                         (Enable the filter)
>> Filter 15# /cfg/slb/port 7             (Select a port to filter)
>> SLB port 7# add 15                     (Add the filter to the port)
>> SLB port 7# filt ena                   (Enable filtering on the port)
>> SLB port 7# apply                      (Apply the configuration changes)
>> SLB port 7# save                       (Save the configuration changes)
```

When applied to one or more switch ports, this simple filter rule will produce log messages that show when the filter is triggered, and what the IP source and destination addresses were for the ICMP frames traversing those ports.

Example: Filter log message output is shown below, displaying the filter number, port, source IP address, and destination IP address:

```
slb: filter 15 fired on port 7, 206.118.93.110 -> 20.10.1.10
```

Security Example

Consider the following sample network:

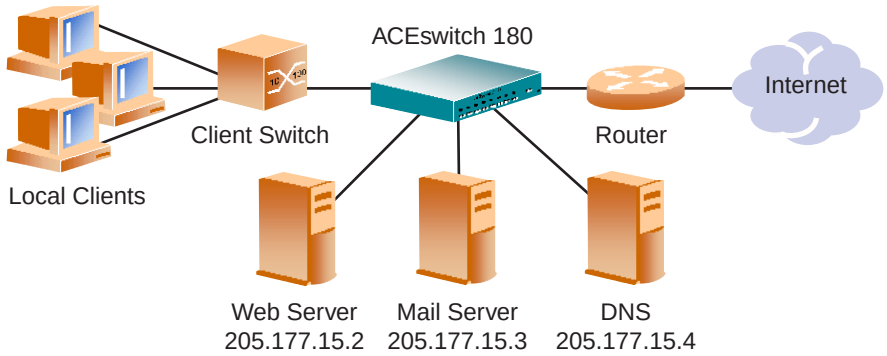


Figure 16-4 Example Security Topology

In this example, the network is made of local clients on a collector switch, a web server, a mail server, a domain name server, and a connection to the Internet. All the local devices are on the same subnet.

For best security, deny everything except for those services you definitely want to allow. In this example, the administrator wishes to install basic security filters to allow only the following traffic:

- External HTTP access to the local web server
- External POP3 (mail) access to the local mail server
- Local clients browsing the World Wide Web
- Local clients using Telnet to access sites outside the intranet
- Domain Name System

All other traffic will be denied and logged.

NOTE – Since IP address and port information can be manipulated by external sources, filtering does not replace the necessity for a well-constructed network firewall.

Example Configuration for the Security Solution

Prior to configuration, you must be connected to the switch command-line interface as the administrator (see Chapter 2, "The Command-Line Interface").

NOTE – For details about any of the menu commands described in this example, see "The Filter Menu" on page 7-52.

In this example, *all filters will be applied only to the switch port which connects to the Internet.* If intranet restrictions were required, filters could be placed on switch ports connecting to local devices.

Also, filtering is not limited to the few protocols and TCP or UDP applications shown in this example. See the tables on page 16-2 for a list of other well-known protocols and services.

1. **Assign an IP address to each of the network devices.**

   For this example, the network devices have the following IP addresses on the same IP subnet:

   Table 16-3 Web-Cache Example: Real Server IP addresses

Network Device	IP address
Local Subnet	205.177.15.0 - 205.177.15.255
Web Server	205.177.15.2
Mail Server	205.177.15.3
Domain Name Server	205.177.15.4

2. **On the switch, create a default filter that will deny and log unwanted traffic.**

   The default filter is defined as filter 224 in order to give it the lowest order of precedence:

```
>> # /cfg/slb/filt 224                (Select the default filter)
>> Filter 224# sip any                 (From any source IP addresses)
>> Filter 224# dip any                 (To any destination IP addresses)
>> Filter 224# proto any               (For any protocols)
>> Filter 224# actio deny              (Deny matching traffic)
>> Filter 224# log enable              (Log matching traffic to syslog)
>> Filter 224# ena                     (Enable the default filter)
```

NOTE – When the `proto` parameter is *not* `tcp` or `udp`, then `sport` and `dport` are ignored.

---

3. **On the switch, create a filter that will allow external HTTP requests to reach the web server.**

   The filter must recognize and allow TCP traffic with the web-server's destination IP address and HTTP destination port:

```
>> Filter 224# ../filt 1                    (Select the menu for Filter #1)
>> Filter 1# sip any                        (From any source IP address)
>> Filter 1# dip 205.177.15.2               (To web-server dest. IP address)
>> Filter 1# dmask 255.255.255.255          (Fill mask for exact dest. address)
>> Filter 1# proto tcp                      (For TCP protocol traffic)
>> Filter 1# sport any                      (From any source port)
>> Filter 1# dport http                     (To an HTTP destination port)
>> Filter 1# actio allow                    (Allow matching traffic to pass)
>> Filter 1# ena                            (Enable the filter)
```

4. **On the switch, create a pair of filters to allow incoming and outgoing mail to and from the mail server.**

   Filter 2 allows incoming mail to reach the mail server, and filter 3 allows outgoing mail to reach the Internet:

```
>> Filter 1# ../filt 2                      (Select the menu for Filter #2)
>> Filter 2# sip any                        (From any source IP address)
>> Filter 2# dip 205.177.15.3               (To mail-server dest. IP address)
>> Filter 2# dmask 255.255.255.255          (Fill mask for exact dest. address)
>> Filter 2# proto tcp                      (For TCP protocol traffic)
>> Filter 2# sport any                      (From any source port)
>> Filter 2# dport pop3                     (To a POP3 destination port)
>> Filter 2# actio allow                    (Allow matching traffic to pass)
>> Filter 2# ena                            (Enable the filter)
>> Filter 2# ../filt 3                      (Select the menu for Filter #3)
>> Filter 3# sip 205.177.15.3               (From mail-server source IP address)
>> Filter 3# smask 255.255.255.255          (Fill mask for exact source address)
>> Filter 3# dip any                        (To any destination IP address)
>> Filter 3# proto tcp                      (For TCP protocol traffic)
>> Filter 3# sport pop3                     (From a POP3 port)
>> Filter 3# dport any                      (To any destination port)
>> Filter 3# actio allow                    (Allow matching traffic to pass)
>> Filter 3# ena                            (Enable the filter)
```

5. **On the switch, create a filter that will allow local clients to browse the web.**

   The filter must recognize and allow TCP traffic to reach the local client destination IP addresses if originating from any HTTP source port:

```
>> Filter 3# ../filt 4                    (Select the menu for Filter #4)
>> Filter 4# sip any                      (From any source IP address)
>> Filter 4# dip 205.177.15.0             (To base local network dest. address)
>> Filter 4# dmask 255.255.255.0          (For entire subnet range)
>> Filter 4# proto tcp                    (For TCP protocol traffic)
>> Filter 4# sport http                   (From any source HTTP port)
>> Filter 4# dport any                    (To any destination port)
>> Filter 4# actio allow                  (Allow matching traffic to pass)
>> Filter 4# ena                          (Enable the filter)
```

6. **On the switch, create a filter that will allow local clients to Telnet anywhere outside the local intranet.**

   The filter must recognize and allow TCP traffic to reach the local client destination IP addresses if originating from a Telnet source port:

```
>> Filter 4# ../filt 5                    (Select the menu for Filter #5)
>> Filter 5# sip any                      (From any source IP address)
>> Filter 5# dip 205.177.15.0             (To base local network dest. address)
>> Filter 5# dmask 255.255.255.0          (For entire subnet range)
>> Filter 5# proto tcp                    (For TCP protocol traffic)
>> Filter 5# sport telnet                 (From a Telnet port)
>> Filter 5# dport any                    (To any destination port)
>> Filter 5# actio allow                  (Allow matching traffic to pass)
>> Filter 5# ena                          (Enable the filter)
```

7. **On the switch, create a series of filters to allow Domain Name System (DNS) traffic.**

   DNS traffic requires four filters. One pair is needed for UDP traffic: incoming and outgoing. Another pair is needed for TCP traffic: incoming and outgoing.

For UDP:

```
>> Filter 5# ../filt 6                    (Select the menu for Filter #6)
>> Filter 6# sip any                      (From any source IP address)
>> Filter 6# dip 205.177.15.4             (To local DNS Server)
>> Filter 6# dmask 255.255.255.255        (Fill mask for exact dest. address)
>> Filter 6# proto udp                    (For UDP protocol traffic)
>> Filter 6# sport any                    (From any source port)
>> Filter 6# dport domain                 (To any DNS destination port)
>> Filter 6# actio allow                  (Allow matching traffic to pass)
>> Filter 6# ena                          (Enable the filter)
>> Filter 6# ../filt 7                    (Select the menu for Filter #7)
>> Filter 7# sip 205.177.15.4             (From local DNS Server)
>> Filter 7# smask 255.255.255.255        (Fill mask for exact source address)
>> Filter 7# dip any                      (To any destination IP address)
>> Filter 7# proto udp                    (For UDP protocol traffic)
>> Filter 7# sport domain                 (From a DNS source port)
>> Filter 7# dport any                    (To any destination port)
>> Filter 7# actio allow                  (Allow matching traffic to pass)
>> Filter 7# ena                          (Enable the filter)
```

Similarly, for TCP:

```
>> Filter 7# ../filt 8                    (Select the menu for Filter #8)
>> Filter 8# sip any                      (From any source IP address)
>> Filter 8# dip 205.177.15.4             (To local DNS Server)
>> Filter 8# dmask 255.255.255.255        (Fill mask for exact dest. address)
>> Filter 8# proto tcp                    (For TCP protocol traffic)
>> Filter 8# sport any                    (From any source port)
>> Filter 8# dport domain                 (To any DNS destination port)
>> Filter 8# actio allow                  (Allow matching traffic to pass)
>> Filter 8# ena                          (Enable the filter)
>> Filter 8# ../filt 9                    (Select the menu for Filter #9)
>> Filter 9# sip 205.177.15.4             (From local DNS Server)
>> Filter 9# smask 255.255.255.255        (Fill mask for exact source address)
>> Filter 9# dip any                      (To any destination IP address)
>> Filter 9# proto tcp                    (For TCP protocol traffic)
>> Filter 9# sport domain                 (From a DNS source port)
>> Filter 9# dport any                    (To any destination port)
>> Filter 9# actio allow                  (Allow matching traffic to pass)
>> Filter 9# ena                          (Enable the filter)
```

8. **On the switch, assign the filters to the switch port that connects to the Internet:**

```
>> Filter 9# ../port 5                  (Select the SLB port 5 to the Internet)
>> SLB Port 5 # add 1                   (Add filter 1 to port 5)
>> SLB Port 5 # add 2                   (Add filter 2 to port 5)
>> SLB Port 5 # add 3                   (Add filter 3 to port 5)
>> SLB Port 5 # add 4                   (Add filter 4 to port 5)
>> SLB Port 5 # add 5                   (Add filter 5 to port 5)
>> SLB Port 5 # add 6                   (Add filter 6 to port 5)
>> SLB Port 5 # add 7                   (Add filter 7 to port 5)
>> SLB Port 5 # add 8                   (Add filter 8 to port 5)
>> SLB Port 5 # add 9                   (Add filter 9 to port 5)
>> SLB Port 5 # add 224                 (Add the default filter to port 5)
>> SLB Port 5 # filt enable             (Enable filtering for port 5)
```

9. **On the switch, apply and verify the configuration.**

```
>> SLB Port 5 # ..                      (Select Server Load Balancing Menu)
>> Server Load Balancing# apply         (Make your changes active)
>> Server Load Balancing# cur           (View current settings)
```

Examine the resulting information. If any settings are incorrect, make appropriate changes.

10. **On the switch, save your new configuration changes.**

```
>> Server Load Balancing# save          (Save for restore after reboot)
```

11. **On the switch, check the Server Load Balancing information.**

```
>> Server Load Balancing# /info/slb     (View SLB information)
```

Check that all Server Load Balancing parameters are working according to expectation. If necessary, make any appropriate configuration changes and then check the information again.

NOTE – Changes to filters on a given port do not take effect until the port's session information is updated (every two minutes or so). To make filter changes take effect immediately, clear the session binding table for the port (see the `clear` command under Table 8-3 on page 5).

Example Configuration for Filter Logs

To aid in network troubleshooting and session inspection, packet source and destination IP addresses are now included in the filter log messages. Log messages are generated when a Layer 3/Layer 4 filter is triggered and has logging enabled. The messages are output to the console port, system host log (`syslog`), and the web-based interface message window.

Example: A network administrator has noticed a significant number of ICMP frames on one portion of the network, and wants to determine the specific sources of the ICMP messages. The administrator uses the command-line interface to create and apply the following filter:

```
>> # /cfg/slb/filt 15                (Select filter 15)
>> Filter 15# sip any                 (From any source IP address)
>> Filter 15# dip any                 (To any destination IP address)
>> Filter 15# proto icmp              (For the ICMP protocol)
>> Filter 15# log enabled             (Create a log entry when matched)
>> Filter 15# ena                     (Enable the filter)
>> Filter 15# /cfg/slb/port 7         (Select a port to filter)
>> SLB port 7# add 15                 (Add the filter to the port)
>> SLB port 7# filt ena               (Enable filtering on the port)
>> SLB port 7# apply                  (Apply the configuration changes)
>> SLB port 7# save                   (Save the configuration changes)
```

When applied to one or more switch ports, this simple filter rule will produce log messages that show when the filter is triggered, and what the IP source and destination addresses were for the ICMP frames traversing those ports.

Below is an example of the filter log message output, showing the filter number, port, source IP address, and destination IP address:

```
slb: filter 15 fired on port 7, 206.118.93.110 -> 20.10.1.10
```

TCP ACK Matching for Filters

The ack filter criteria provides greater filtering flexibility. When ack is enabled, the filter matches only those frames set with the TCP ACK or RST flag.

The ack criteria appears in the WebOS web interface, and in the command line interface on the Filter Menu (/cfg/slb/filt) shown on page 7-52.

Example: Consider the following network:

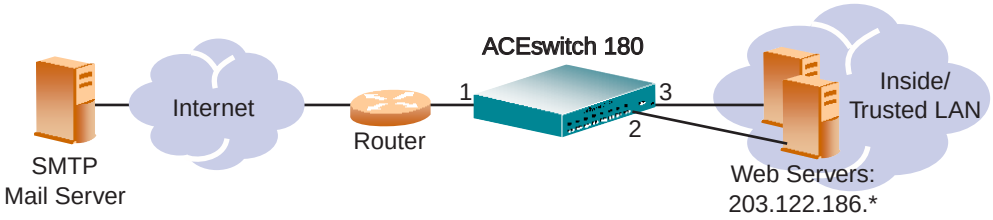


Figure 16-5 Example Filter TCP ACK Matching Network

In this network, the web servers inside the LAN must be able to transfer mail to any SMTP-based mail server out on the Internet. At the same time, we wish to prevent access to the LAN from the Internet, except for HTTP.

SMTP traffic uses well-known TCP port 25. The web servers will originate TCP sessions to the SMTP server using destination TCP port 25, and the SMTP server will acknowledge each TCP session and data transfer using source TCP port 25.

Filtering with the ACK flag closes one potential security hole. Without it, the switch would permit a TCP SYN connection request to reach any listening destination TCP port on the web servers inside the LAN, as long as it originated from TCP source port 25. The server would listen to the TCP SYN, allocate buffer space for the connection, and reply to the connect request. In some SYN attack scenarios, this could cause the server's buffer space to fill, crashing the server or at least making it unavailable.

This filter with the ACK flag requirement prevents external servers from beginning a TCP connection (with a TCP SYN) from source TCP port 25. The server will drop any frames that have the ACK flag "spoofed" in them, and will not allocate space for a new connection.

The following filters are required:

1. **One filter must allow the web servers to pass SMTP requests to the Internet.**

```
>> # /cfg/slb/filt 10                  (Select a filter for trusted SMTP requests)
>> Filter 10# sip 203.122.186.0        (From the web servers' source IP address)
>> Filter 10# smask 255.255.255.0      (For the entire subnet range)
>> Filter 10# sport any                (From any source port)
>> Filter 10# proto tcp                (For TCP traffic)
>> Filter 10# dip any                  (To any destination IP address)
>> Filter 10# dport smtp               (To well-known destination SMTP port)
>> Filter 10# actio allow              (Allow matching traffic to pass)
>> Filter 10# ena                      (Enable the filter)
```

2. **One filter must allow SMTP traffic from the Internet to pass through the switch *only* if the destination is one of the web servers and the frame is an acknowledgment (ACK) of a TCP session.**

```
>> Filter 10# ../filt 15               (Select a filter for Internet SMTP ACKs)
>> Filter 15# sip any                  (From any source IP address)
>> Filter 15# sport smtp               (From well-known source SMTP port)
>> Filter 15# proto tcp                (For TCP traffic)
>> Filter 15# ack ena                  (For acknowledgments only)
>> Filter 15# dip 203.122.186.0        (To the web servers' IP address)
>> Filter 15# dmask 255.255.255.0      (To the entire subnet range)
>> Filter 15# dport any                (To any destination port)
>> Filter 15# actio allow              (Allow matching traffic to pass)
>> Filter 15# ena                      (Enable the filter)
```

3. **One filter must allow trusted HTTP traffic from the Internet to pass through the switch to the web servers.**

```
>> Filter 15# ../filt 16               (Select a filter for incoming HTTP traffic)
>> Filter 16# sip any                  (From any source IP address)
>> Filter 16# sport http               (From well-known source HTTP port)
>> Filter 16# proto tcp                (For TCP traffic)
>> Filter 16# dip 203.122.186.0        (To the web servers' IP address)
>> Filter 16# dmask 255.255.255.0      (To the entire subnet range)
>> Filter 15# dport http               (To well-known destination HTTP port)
>> Filter 16# actio allow              (Allow matching traffic to pass)
>> Filter 16# ena                      (Enable the filter)
```

4. **One filter must allow HTTP responses from the web servers to pass through the switch to the Internet.**

```
>> Filter 16# ../filt 17                  (Select a filter for outgoing HTTP traffic)
>> Filter 17# sip 203.122.186.0           (From the web servers' source IP address)
>> Filter 17# smask 255.255.255.0         (From the entire subnet range)
>> Filter 17# sport http                  (From well-known source HTTP port)
>> Filter 17# proto tcp                   (For TCP traffic)
>> Filter 17# dip any                     (To any destination IP address)
>> Filter 17# dport http                  (To well-known destination HTTP port)
>> Filter 17# actio allow                 (Allow matching traffic to pass)
>> Filter 17# ena                         (Enable the filter)
```

5. **One default filter is required to deny everything else:**

```
>> Filter 17# ../filt 224                 (Select a default filter)
>> Filter 220# sip any                    (From any source IP address)
>> Filter 220# dip any                    (To any destination IP address)
>> Filter 220# actio deny                 (Block matching traffic)
>> Filter 220# ena                        (Enable the filter)
```

6. **Next, the filters must be applied to the appropriate switch ports.**

```
>> Filter 220# ../port 1                  (Select the Internet-side port)
>> SLB port 1# add 15                     (Add the SMTP ACK filter to the port)
>> SLB port 1# add 16                     (Add the incoming HTTPS filter)
>> SLB port 1# add 224                    (Add the default filter to the port)
>> SLB port 1# filt ena                   (Enable filtering on the port)
>> SLB port 1# ../port 2                  (Select the first web server port)
>> SLB port 2# add 10                     (Add the outgoing SMTP filter to the port)
>> SLB port 2# add 17                     (Add the outgoing HTTP filter to the port)
>> SLB port 2# add 224                    (Add the default filter to the port)
>> SLB port 2# filt ena                   (Enable filtering on the port)
>> SLB port 2# ../port 3                  (Select the other web server port)
>> SLB port 3# add 10                     (Add the outgoing SMTP filter to the port)
>> SLB port 3# add 17                     (Add the outgoing HTTP filter to the port)
>> SLB port 3# add 224                    (Add the default filter to the port)
>> SLB port 3# filt ena                   (Enable filtering on the port)
>> SLB port 3# apply                      (Apply the configuration changes)
>> SLB port 3# save                       (Save the configuration changes)
```

Web-Cache Redirection Example

For many companies, the Internet is an indispensable source for business and technical information. Much of the information brought into your company from the Internet, however, is not unique. Often, clients will access the same information many times as they return to a web-page for additional information or to explore other links.

Duplicate information may be requested more inadvertently as the myriad components that make up Internet data (pictures, buttons, frame, text, and so on) are reloaded from page to page. Add multiple clients to the picture, and the amount of repeated data that comes in through your Internet router can account for a great deal of its congestion. Redundant requests also decrease the amount of your available bandwidth to the Internet.

Web-cache redirection can help alleviate the congestion seen at your Internet router. When Application Redirection filters are properly configured for your WebOS powered switch, outbound client requests for Internet data are intercepted and redirected to a group of web-cache servers on your network. The web-cache servers duplicate and store inbound Internet data that has been requested by your clients. If the web-cache servers recognize a client's outbound request as one that can be filled with cached information, the web-cache servers will supply the information, rather than sending the request out across the Internet.

In addition to increasing the efficiency of your network, access to locally cached information can be granted much faster than by pulling the same information across the Internet.

Web-Cache Redirection Environment

Consider a network where client HTTP requests begin to regularly overload the Internet router.

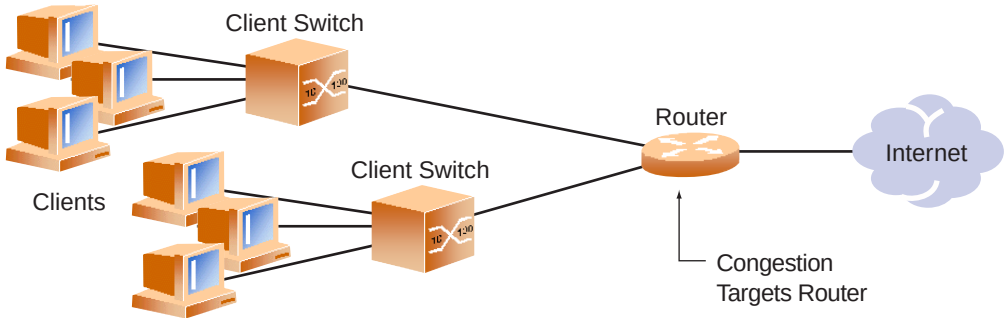


Figure 16-6 Traditional network without Web Cache Redirection

The network needs a solution that addresses the following key concerns:

- The solution must be readily scalable
- The administrator should not have to reconfigure all the clients' browsers to use Proxy Servers.

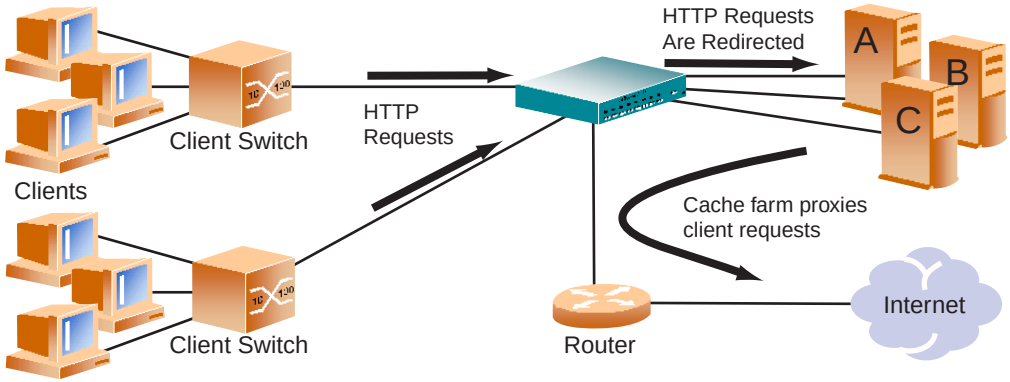


Figure 16-7 Network with Web Cache Redirection

Adding an Alteon WebSystems switch with optional Layer 4 software addresses these issues:

- Web-cache servers can be added or removed dynamically without interrupting services.
- Performance is improved by balancing the cached web request load across multiple servers. More servers can be added at any time to increase processing power.
- The proxy is transparent to the client.
- Frames that are not associated with HTTP requests are passed normally to the router.

Example Configuration for the Web-Cache Solution

The following is required prior to configuration:

- You must be connected to the switch command-line interface as the administrator (see Chapter 2, "The Command-Line Interface").
- Optional Layer 4 software must be enabled (see "Activating Optional Software" on page 8-7).

NOTE – For details about any of the menu commands described in this example, see "Configuring Server Load Balancing" on page 7-36."

In this example, an ACEswitch 180 is placed between the clients and the border gateway to the Internet. The switch will be configured to intercept all Internet bound HTTP requests (on default TCP port 80), and redirect them to the web-cache servers. The switch will distribute HTTP requests equally to the web-cache servers based on the destination IP address of the requests.

Also, filters are not limited to the few protocols and TCP or UDP applications shown in this example. See the tables on page 16-2 for a list of other well-known protocols and services.

1. **Assign an IP address to each of the web-cache servers.**

   Just as with Server Load Balancing, the web-cache real servers will be assigned an IP address and placed into a real server group. The real servers must be in the same VLAN and must have an IP route to the switch that will perform the web-cache redirection. In addition, the path from the switch to the real servers must not contain a router. The router would stop HTTP requests from reaching the web-cache servers, instead directing them back out to the Internet.

   More complex network topologies can be used if configuring IP proxy addresses (see "IP Proxy Addresses for Transparent Proxies or Complex Networks" on page 16-22).

   For this example, the three web-cache real servers have the following IP addresses on the same IP subnet:

   Table 16-4 Web-Cache Example: Real Server IP addresses

Web Cache Server	IP address
Server A	200.200.200.2
Server B	200.200.200.3
Server C	200.200.200.4

2. **Install web-cache software on all three web-cache servers.**

3. **Full Network Address Translation (NAT) is required.**

   Install transparent proxy software with NAT on all three web-cache servers, or define proxy IP addresses on the switch (see "IP Proxy Addresses for Transparent Proxies or Complex Networks" on page 16-22).

4. **Define an IP interface on the switch.**

   The switch must have an IP route to all of the real servers which receive redirection services. The switch uses this path to determine the level of TCP/IP reachability of the real servers.

   To configure an IP interface for this example, enter this command from the CLI:

```
>> Main# /cfg/ip/if 1                          (Select IP interface #1)
>> IP Interface 1# addr 200.200.200.100       (Assign IP address for the interface)
>> IP Interface 1# ena                        (Enable IP interface #1)
```

NOTE – The IP interface and the real servers must belong to the same VLAN. This example assumes that all ports and IP interfaces use default VLAN #1, requiring no special VLAN configuration for the ports or IP interface.

5. **On the switch, define each Real Server**

   For each web-cache real server, you must assign a real server number, specify its actual IP address, and enable the real server. For example:

```
>> ip# /cfg/slb/real 1                         (Server A is real server 1)
>> Real server 1 # rip 200.200.200.2           (Assign Server A IP address)
>> Real server 1 # ena                         (Enable real server 1)
>> Real server 1 # ../real 2                   (Server B is real server 2)
>> Real server 2 # rip 200.200.200.3           (Assign Server B IP address)
>> Real server 2 # ena                         (Enable real server 2)
>> Real server 2 # ../real 3                   (Server C is real server 3)
>> Real server 3 # rip 200.200.200.4           (Assign Server C IP address)
>> Real server 3 # ena                         (Enable real server 3)
```

6. **On the switch, define a Real Server Group.**

   This places the three web-cache real servers into one service group:

```
>> Real server 3 # /cfg/slb/group 1            (Select real server group 1)
>> Real server group 1 # add 1                 (Add real server 1 to group 1)
>> Real server group 1 # add 2                 (Add real server 2 to group 1)
>> Real server group 1 # add 3                 (Add real server 3 to group 1)
```

7. **On the switch, set the Real Server Group metric to `minmisses`.**

   This helps minimize web-cache misses in the event real servers fail or are taken out of service:

```
>> Real server group 1 # metrc minmisses   (Metric for minimum cache misses.)
```

8. **On the switch, verify that server processing is disabled on the ports supporting application redirection.**

NOTE – Do not use the "server" setting on a port with Application Redirection enabled. Server processing is used only with Server Load Balancing. To disable server processing on the port, used the commands on the **`/cfg/slb/port`** menu, as described on page 7-56.

---

9. **On the switch, create a filter that will intercept and redirect all client HTTP requests.**

   The filter must be able to intercept all TCP traffic for the HTTP destination port, and must redirect it to the proper port on the real server group:

```
>> SLB port 6 # /cfg/slb/filt 2          (Select the menu for Filter #2)
>> Filter 2# sip any                     (From any source IP addresses)
>> Filter 2# dip any                     (To any destination IP addresses)
>> Filter 2# proto tcp                   (For TCP protocol traffic)
>> Filter 2# sport any                   (From any source port)
>> Filter 2# dport http                  (To an HTTP destination port)
>> Filter 2# actio redir                 (Set the action for redirection)
>> Filter 2# rport http                  (Set the redirection port)
>> Filter 2# group 1                     (Select real server group 1)
>> Filter 2# ena                         (Enable the filter)
```

   The `rport` parameter must be configured whenever TCP protocol traffic is redirected. The `rport` parameter defines the real server TCP or UDP port to which redirected traffic will be sent. The port defined by the `rport` parameter is used when performing Layer 4 health checks of TCP services.

   Also, if transparent proxies are used for Network Address Translation (NAT) on the switch (see Step 3. on page 16-19), the `rport` parameter must be configured for all Application Redirection filters. Take care to use the proper port designation with `rport`: if the transparent proxy operation resides on the host, the well-known port (80, or "http") is probably required. If the transparent proxy occurs on the switch, make sure to use the service port required by the specific software package.

   See "IP Proxy Addresses for Transparent Proxies or Complex Networks" on page 16-22 for more about IP proxy addresses.

10. On the switch, create a default filter.

In this case, the default filter will allow all non-cached traffic to proceed normally:

```
>> Filter 2# ../filt 224                  (Select the default filter)
>> Filter 224# sip any                    (From any source IP addresses)
>> Filter 224# dip any                    (To any destination IP addresses)
>> Filter 224# proto any                  (For any protocols)
>> Filter 224# actio allow                (Set the action to allow traffic)
>> Filter 224# ena                        (Enable the default filter)
```

NOTE – When the `proto` parameter is not tcp or udp, then `sport` and `dport` are ignored.

11. On the switch, assign the filters to the client ports.

Assuming that the redirected clients are connected to physical switch ports 5 and 6, both ports are configured with our filters as follows:

```
>> Filter 224# ../port 5                  (Select the SLB port 5)
>> SLB Port 5 # add 2                     (Add filter 1 to port 5)
>> SLB Port 5 # add 224                   (Add the default filter to port 5)
>> SLB Port 5 # filt enable               (Enable filtering for port 5)
>> SLB Port 5 # ../port 6                 (Select the SLB port 6)
>> SLB Port 6 # add 2                     (Add filter 1 to port 6)
>> SLB Port 6 # add 224                   (Add the default filter to port 6)
>> SLB Port 6 # filt enable               (Enable filtering for port 6)
```

12. On the switch, enable, apply, and verify the configuration.

```
>> SLB Port 6 # ..                        (Select Server Load Balancing Menu)
>> Server Load Balancing# on              (Activate Layer 4 software services)
>> Server Load Balancing# apply           (Make your changes active)
>> Server Load Balancing# cur             (View current settings)
```

NOTE – Server Load Balancing must be turned on in order for Application Redirection to work properly. The "`on`" command is valid only if the optional Layer 4 software is enabled on your switch (see "Activating Optional Software" on page 8-7).

Examine the resulting information from the "`cur`" command. If any settings are incorrect, make appropriate changes.

13. **On the switch, save your new configuration changes.**

```
>> Server Load Balancing# save                    (Save for restore after reboot)
```

14. **On the switch, check the Server Load Balancing information.**

```
>> Server Load Balancing# /info/slb               (View SLB information)
```

Check that all Server Load Balancing parameters are working according to expectation. If necessary, make any appropriate configuration changes and then check the information again.

NOTE – Changes to filters on a given port do not take effect until the port's session information is updated (every two minutes or so). To make filter changes take effect immediately, clear the session binding table for the port (see the `clear` command under Table 8-3 on page 8-5).

IP Proxy Addresses for Transparent Proxies or Complex Networks

Transparent proxies provide the benefits listed below when used with Application Redirection. Application redirection is automatically enabled when a filter with the `redir` action is applied on a port.

- With proxies IP addresses configured on redirected ports, the switch can redirect client requests to servers located on any subnet, anywhere.
- The switch can perform transparent substitution for all source and destination addresses, including destination port remapping. This provides support for comprehensive, fully-transparent proxies.

1. **On the switch, verify that server processing is disabled on the ports supporting application redirection.**

   Server processing is used only with Server Load Balancing and cannot be enabled on a port supporting a combination of IP Proxies and Application Redirection. To disable server processing on the port, used the `/cfg/slb/port` menu, as described on page 7-56.

2. **Add proxies.**

   Reexamining the configuration discussed in "Web-Cache Redirection Example" on page 16-16, the port assignments should be as listed in the table on the following page:

Table 16-5 Web Proxy Example: ACEswitch 180 Port Usage

Port	Host	L4 Processing Enabled
1	Server A	None
2	Server B	None
3	Server C	None
4	Internet Router	None
5	Client switch A. This connects the switch to a group of clients where client Internet requests originate.	Redirect filter
6	Client switch B. This connects the switch to a group of clients where client Internet requests originate.	Redirect filter

Only the ports using redirection filters require proxy IP addresses to be configured. Each proxy IP address must be unique on your network. These are configured as follows:

```
>> # /cfg/slb/port 5                    (Select network port #5)
>> SLB port 5# pip 200.200.200.68       (Set proxy IP address for port #5)
>> SLB port 5# ../port 6                (Select network port #6)
>> SLB port 6# pip 200.200.200.69       (Set proxy IP address for port #6)
```

Once proxy IP addresses are established, you need to configure each Application Redirection filter (filter 2 in our example) with the real server TCP or UDP port to which redirected traffic will be sent. In this case, we are mapping the requests to different destination port (8080). You must also enable proxies on the real servers:

```
>> # /cfg/slb/filt 2                    (Select the menu for Filter #2)
>> Filter 2 # rport 8080                (Set proxy redirection port)
>> Filter 2 # real 1/proxy enable       (Enable proxy on real servers)
>> Real server 1 # ../real 2/proxy enable (Enable proxy on real servers)
>> Real server 2 # ../real 3/proxy enable (Enable proxy on real servers)
```

NOTE – This configuration is not limited to HTTP web service. Other TCP/IP services can be configured in a similar fashion. For example, if this had been a DNS redirect, `rport` would be sent to well-known port 80 (or the service port you want to remap to.) For a list of other well-known services and ports, see the command option information on page 7-47.

The Layer 4 proxies are transparent to the user. No additional client configuration is needed.

Excluding Non-Cacheable Sites

Some web sites provide content which isn't well suited for redirection to cache servers. Such sites might provide browser-based games, applications that keep real-time session information or authenticate by client IP address.

To prevent such sites from being redirected to cache-servers, create a filter which allows this specific traffic to pass normally through the switch. This filter must have a higher precedence (a lower filter number) than the Application Redirection filter.

For example, if you wished to prevent a popular web-based game site on subnet 200.10.10.* from being redirected, you could add the following to the previous example configuration:

```
>> # /cfg/slb/filt 1                    (Select the menu for Filter #1)
>> Filter 1# dip 200.10.10.0             (To the site's destination IP address)
>> Filter 1# dmask 255.255.255.0         (For entire subnet range)
>> Filter 1# sip any                     (From any source IP address)
>> Filter 1# proto tcp                   (For TCP traffic)
>> Filter 1# dport http                  (To an HTTP destination port)
>> Filter 1# sport any                   (From any source port)
>> Filter 1# actio allow                 (Allow matching traffic to pass)
>> Filter 1# ena                         (Enable the filter)
>> Filter 1# ../port 5                   (Select SLB port 5)
>> SLB port 5# add 1                     (Add the filter to port 5)
>> SLB port 5# ../port 6                 (Select SLB port 6)
>> SLB port 6# add 1                     (Add the filter to port 6)
>> SLB port 6# apply                     (Apply configuration changes)
>> SLB port 6# save                      (Save configuration changes)
```

Additional Application Redirection Options

Application Redirection can be used in combination with other Layer 4 options such as load balancing metrics, health checks, real server group backups, and more. See "Additional Server Load Balancing Options" on page 15-15 for details.

Network Address Translation Examples

In the following NAT examples, a company has configured its internal network with "private" IP addresses. A private network is one that is isolated from the global Internet, and is therefor free from the usual restrictions requiring the use of registered, globally unique IP addresses. Private networks can use whatever IP addresses they please, including those that are in use elsewhere on the Internet, or reserved for other purposes.

Private networks serve two main purposes. First, because private IP addresses are not valid or visible outside the private network, they can increase network security. Second, since valid, registered IP addresses are a limited resource, many companies use private IP addresses to create internal networks much larger than they could using only their official addresses.

With Network Address Translation (NAT), private networks are not required to remain isolated. NAT capabilities within the switch allow internal, private network IP addresses to be translated to valid, publicly advertised IP addresses and back again.

Internal Client Access to Internet

In this dynamic NAT example, clients on the internal private network require TCP/UDP access to the Internet:

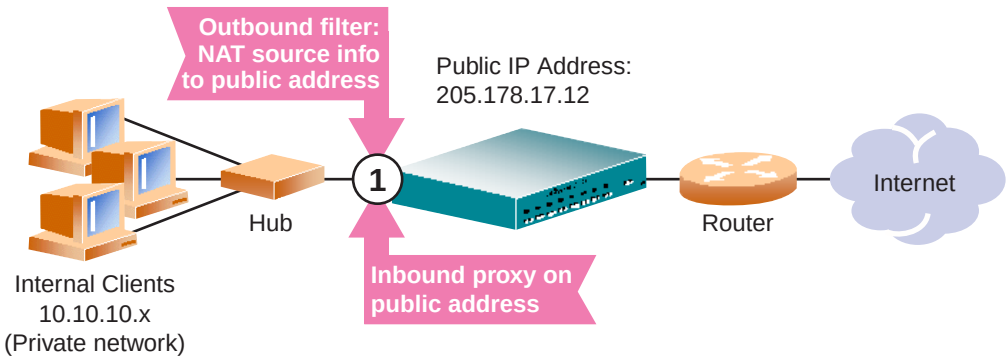


Figure 16-8 Dynamic NAT

This example requires a Network Address Translation (NAT) filter to be configured on the switch port connected to the internal clients. When the NAT filter is triggered by outbound client traffic, the internal private IP address information on the outbound packets is translated to a valid, publicly advertised IP address. In addition, the public IP address must be configured as a proxy IP address on the switch port connected to the internal clients. The proxy performs the reverse translation, restoring the private network addresses on inbound packets.

This is a "many to one" solution: multiple clients on the private subnet take advantage of a single external IP address, thus conserving valid IP addresses.

This example could be configured as follows:

```
>> # /cfg/slb/filt 14                    (Select the menu for client filter)
>> Filter 1# invert ena                   (Invert the filter logic)
>> Filter 1# dip 10.10.10.0               (If the destination is not private)
>> Filter 1# dmask 255.255.255.0          (For the entire private subnet range)
>> Filter 1# sip any                      (From any source IP address)
>> Filter 1# actio nat                    (Perform NAT on matching traffic)
>> Filter 1# nat source                   (Translate source information)
>> Filter 1# proxy enable                 (Allow pip proxy translation)
>> Filter 1# ena                          (Enable the filter)
>> Filter 1# ../port 1                    (Select SLB port 1)
>> SLB port 1# add 14                     (Add the filter to port 1)
>> SLB port 1# pip 205.178.17.12          (Set public IP address proxy)
>> SLB port 1# filt enable                (Enable filtering on port 1)
>> SLB port 1# apply                      (Apply configuration changes)
>> SLB port 1# save                       (Save configuration changes)
```

NOTE – Dynamic NAT solutions apply only to TCP/UDP traffic. Also, filters for dynamic NAT should be placed behind static NAT filters (next example). Dynamic filters should be given higher filter numbers.

External Client Access to Server

In this example, clients on the external Internet require access to a server on the private network:

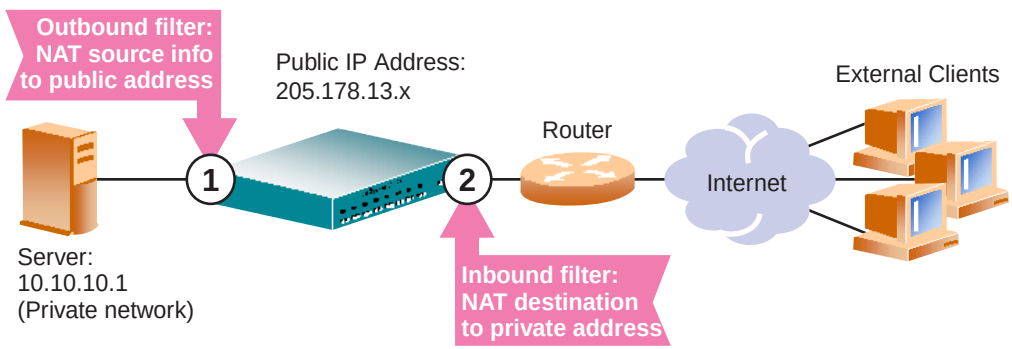


Figure 16-9 Static NAT

This static NAT (non-proxy) example requires two filters: one for the external client-side switch port, and one for the internal, server-side switch port. The client-side filter translates incoming requests for the publicly advertised server IP address to the server's internal private network address. The filter for the server-side switch port reverses the process, translating the server's private address information to a valid public address.

This could be configured as follows:

```
>> # /cfg/slb/filt 10                    (Select the menu for outbound filter)
>> Filter 10# actio nat                  (Perform NAT on matching traffic)
>> Filter 10# nat source                 (Translate source information)
>> Filter 10# sip 10.10.10.0             (From the clients private IP address)
>> Filter 10# smask 255.255.255.0        (For the entire private subnet range)
>> Filter 10# dip 205.178.13.0           (To the public network address)
>> Filter 10# dmask 255.255.255.0        (For the same subnet range)
>> Filter 10# proxy disable              (Override any pip proxy settings)
>> Filter 10# ena                        (Enable the filter)
>> Filter 10# ../filt 11                 (Select the menu for inbound filter)
>> Filter 11# actio nat                  (Use the same settings as outbound)
>> Filter 11# nat dest                   (Reverse the translation direction)
>> Filter 11# sip 10.10.10.0             (Use the same settings as outbound)
>> Filter 11# smask 255.255.255.0        (Use the same settings as outbound)
>> Filter 11# dip 205.178.13.0           (Use the same settings as outbound)
>> Filter 11# dmask 255.255.255.0        (Use the same settings as outbound)
>> Filter 11# proxy disable              (Override any pip proxy settings)
>> Filter 11# ena                        (Enable the filter)
>> Filter 11# ../port 1                  (Select server-side port)
>> SLB port 1# add 10                    (Add the outbound filter)
>> SLB port 1# filt enable               (Enable filtering on port 1)
>> SLB port 1# ../port 2                 (Select the client-side port)
>> SLB port 2# add 11                    (Add the inbound filter)
>> SLB port 2# filt enable               (Enable filtering on port 2)
>> SLB port 2# apply                     (Apply configuration changes)
>> SLB port 2# save                      (Save configuration changes)
```

Note the following important points about this configuration:

- Within each filter, the `smask` and `dmask` values are identical.
- All parameters for both filters are identical except for the NAT direction. For filter #10, `nat source` is used. For filter #11, `nat dest` is used.
- Filters for static (non-proxy) NAT should be placed ahead of dynamic NAT filters (previous example). Static filters should be given lower filter numbers.

CHAPTER 17

Global Server Load Balancing

This chapter describes how to configure and use Global Server Load Balancing. In previous versions of this book, Global Server Load Balancing was referred to as "Distributed Server Load Balancing."

NOTE – Both the optional Server Load Balancing and Global Server Load Balancing software keys must be enabled (see "Activating Optional Software" on page 8-7).

GSLB Overview

Global Server Load Balancing (GSLB), lets you balance server traffic load across multiple physical sites. This allows you to smoothly integrate the resources of a world-wide series of server sites, and to balance web content (or other services) intelligently among them. Alteon WebSystems' GSLB system takes into account individual sites' health, response time, and geographic location for a global performance perspective.

Benefits

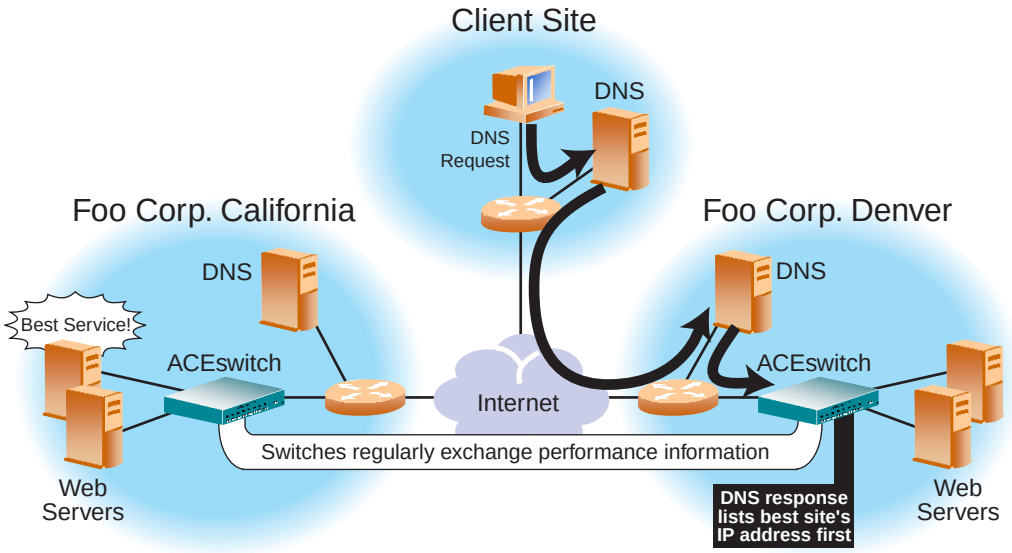
GSLB meets the following demands for distributed network services:

- High content availability through distributed content and distributed decision making. If one site becomes disabled, the others become aware of it and take up the load.
- No latency during client connection set up. Instant site hand-off decisions can be made by any distributed switch.
- The best performing sites get a majority of traffic over a given period of time, but are not overwhelmed.
- Switches at different sites regularly exchange information through DSSP (Distributed Site State Protocol), and can trigger exchanges when any site's health status changes. This ensures that each active site has valid state knowledge and statistics.

- Takes geography into account, as well as network topology.
- Gives creative control to the administrator or web-master to build and control content by user, location, target application, and more.
- Easy to deploy, manage, and scale. Switch configuration is straight-forward. There are no complex system topologies involving routers, protocols, etcetera.
- Provides flexible design options.
- Supports all IP protocols.

How GSLB Works

Consider the following sample network:



1. Browser requests www.foocorp.com IP address from local DNS.

2. Client's DNS asks its upstream DNS, which in turn asks the next, and so on, until the address is resolved.

3. The Foo Corp. Denver DNS knows that the local ACEswitch is an authoritative name server for www.foocorp.com.

4. The switch DSLB software knows that Foo Corp. California currently provides better service, and responds with Foo Corp. California's virtual IP address listed first.

5. The client connects to Foo Corp. California for the best service.

Figure 17-1 DNS Resolution with Global Server Load Balancing

In this example, a client is using their web-browser to view the web-site for the Foo Corporation at www.foocorp.com. The Foo Corporation has two sites: one in California, and one in Denver, each with identical content and services available. Both sites have an Alteon WebSystems' Web switch configured for Global Server Load Balancing. These switches are also configured as the Authoritative Name Servers for www.foocorp.com.

When a client loads their web-browsing software and enters the URL for a website such as www.foocorp.com, a query is sent to the client's local DNS server, asking for the IP address that represents the domain name entered. If the local DNS server does not have this information cached, it will in turn ask a DNS server further upstream. Eventually, the request will reach an upstream DNS server that has this information on hand, or it will reach one of the Foo Corporation's DNS servers. The Foo Corporation's DNS server has been configured to know that the local Alteon WebSystems' Web switch with Global Server Load Balancing software is the authoritative name server for www.foocorp.com.

Each switch with GSLB software is capable of responding to the client's name resolution request. Since each switch regularly checks and communicates health and performance information with its peers, either switch can determine which site (or sites) are best able to serve the client's web-cruising needs, and can respond with a list of IP addresses for the Foo Corporation's distributed sites, prioritized by performance, geography, and other criteria.

The client's web browser will use the IP address information to open a connection to the best available site. The IP addresses can represent real servers at any site, or they can represent virtual servers at any site, which are in turn locally load balanced according to regular Server Load Balancing configuration.

If the site serving the client HTTP content suddenly experiences a failure (no healthy real servers) or becomes overloaded with traffic (all real servers reach their maximum connection limit), the switch will issue an HTTP Redirect and transparently cause the client to connect to another peer site.

The end result is that the client gets quick, reliable service with no latency and no special client-side configuration.

GSLB Configuration Example

Summary

Configuring Global Server Load Balancing is merely an extension of the Server Load Balancing configuration. The process is summarized as follows:

- Use the administrator login to connect to the switch you are configuring.
- Activate Server Load Balancing and Global Server Load Balancing software keys.
- Configure the switch at each site with basic attributes
  - Configure the switch IP interface
  - Configure the default gateways
- Configure the switch at each site to act as Domain Name System (DNS) server for each service hosted on its virtual servers. Also, configure the local DNS server to recognize the switch as the authoritative DNS server for the hosted services.
- Configure the switch at each site as usual for local Server Load Balancing.
  - Define each local real server
  - Group local real servers into real server groups
  - Define the local virtual server with its IP address, services, and real server groups
  - Define the switch port states
  - Enable Server Load Balancing
- Finally, make each switch recognize its remote peers.
  - On each switch, configure a remote real server entry for each remote service.
  - Add the remote real server entry to an appropriate real server group.
  - Enable Global Server Load Balancing

Example GSLB Configuration Procedure

Consider the following example network:

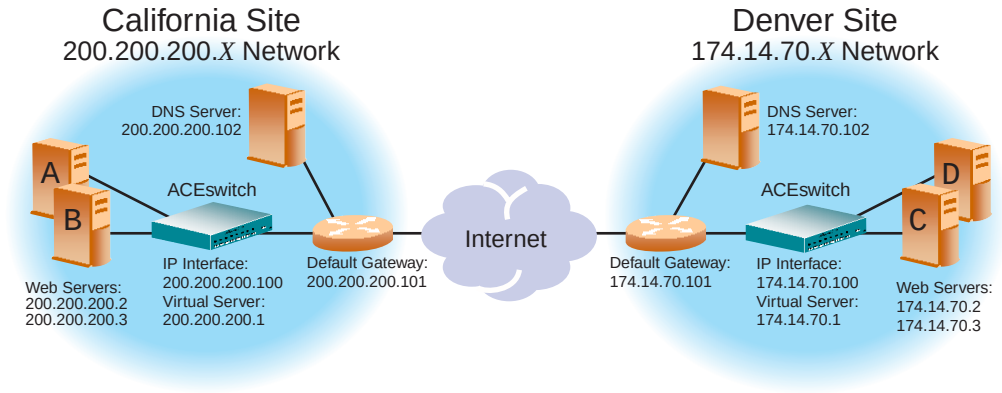


Figure 17-2 Global Server Load Balancing Example Topology

In the following examples, many of the options are left to their default values. See "Additional Server Load Balancing Options" on page 15-15 for more options.

The following is required prior to configuration:

- You must be connected to the switch command-line interface as the administrator (see Chapter 2, "The Command-Line Interface").
- Both of the following optional software keys must be activated (see "Activating Optional Software" on page 8-7):
  - Server Load Balancing
  - Global Server Load Balancing

NOTE – For details about any of the menu commands described in this example, see Chapter 7, "The Configuration Menu."

Part One: Configure the California Site with Basic System Items

1. **If the web-based interface is to be used for managing the California switch, change its service port.**

   Global Server Load Balancing uses service port 80 on the IP interface for DSSP updates. By default, the WebOS web-based interface also uses port 80. Both services cannot use the same port. If the web-based interface is enabled (see the `http` command on page 7-7), configure it to use a different port.

   For example, to change the web-based interface port to 8080, enter the following command:

```
>> Main# /cfg/sys                    (Select the System Menu)
>> System# wport 8080                (Set service port 8080 for web UI)
```

2. **On the California switch, define an IP interface.**

   The switch IP interface is the entity that responds when the asked to resolve client DNS requests. The IP interface must have an IP route to the local real servers. The switch uses this path to determine the level of TCP/IP reachability of the real servers.

   To configure an IP interface for this example, enter these commands from the CLI:

```
>> System# /cfg/ip/if 1                    (Select IP interface #1)
>> IP Interface 1# addr 200.200.200.100    (Assign IP address for the interface)
>> IP Interface 1# ena                     (Enable IP interface #1)
```

NOTE – This example assumes that all ports and IP interfaces use default VLAN #1, requiring no special VLAN configuration for the ports or IP interface.

3. **On the California switch, define the default gateway.**

   In this example, a router at the edge of the site acts as the default gateway to the Internet. To configure the default gateway for this example, enter these commands from the CLI:

```
>> IP Interface 1# ../gw 1                    (Select default gateway #1)
>> Default gateway 1# addr 200.200.200.101    (Assign IP address for the gateway)
>> Default gateway 1# ena                     (Enable default gateway #1)
```

4. **Configure the local DNS server to recognize the local GSLB switch as the authoritative name server for the hosted services.**

   Determine the domain name which will be distributed to both sites, and the hostname for each distributed service. In this example, the California DNS server is configured to recognize 200.200.200.100 (the IP interface of the California GSLB switch) as the authoritative name server for www.foocorp.com.

Part Two: Configure the California Switch for Standard SLB

1. **Assign an IP address to each of the real servers in the local California server pool.**

   The real servers in any real server group must have an IP route to the switch that will perform the Server Load Balancing functions. This is most easily accomplished by placing the switches and servers on the same IP subnet, although advanced routing techniques can be used as long as they do not violate the topology rules outlined in "Network Topology Considerations" on page 15-4.

   For this example, the web-host real servers have IP addresses on the same IP subnet:

   Table 17-1 GSLB Example: California Real Server IP Addresses

Real Server	IP address
Server A	200.200.200.2
Server B	200.200.200.3

2. **On the California switch, define each local Real Server.**

   For each local real server, you must assign a real server number, specify its actual IP address, and enable the real server. For example:

```
>> Default gateway 1# /cfg/slb/real 1          (Server A is real server 1)
>> Real server 1 # rip 200.200.200.2           (Assign Server A IP address)
>> Real server 1 # ena                         (Enable real server 1)
>> Real server 1 # ../real 2                   (Server B is real server 2)
>> Real server 2 # rip 200.200.200.3           (Assign Server B IP address)
>> Real server 2 # ena                         (Enable real server 2)
```

3. **On the California switch, define a Real Server Group.**

   This combines the real servers into one service group, and sets the necessary health checking parameters. In this example, HTTP health checking is used to ensure that web content is being served. If the index.html file is not accessible on a real server during health checks, the real server will be marked as down.

   The following commands are entered:

```
>> Real server 2 # /cfg/slb/group 1            (Select real server group 1)
>> Real server group 1# add 1                  (Add real server 1 to group 1)
>> Real server group 1# add 2                  (Add real server 2 to group 1)
>> Real server group 1# healt http             (Use HTTP for health checks)
>> Real server group 1# cntnt index.html       (Set URL content for health checks)
```

4. **On the California switch, define a Virtual Server.**

   All client requests will be addressed to a virtual IP on a virtual server defined on the switch. Clients acquire the virtual IP through normal DNS resolution. HTTP uses well-known TCP port 80. In this example, HTTP is configured as the only service running on this virtual IP, and is associated with our real server group. For example:

```
>> Real server group 1 # /cfg/slb/virt 1      (Select virtual server 1)
>> Virtual server 1# vip 200.200.200.1       (Assign a virtual server IP address)
>> Virtual server 1# add http 1              (Associate virtual port to real group)
>> Virtual server 1# ena                     (Enable the virtual server)
```

NOTE – This configuration is not limited to HTTP web service. Other TCP/IP services can be configured in a similar fashion. For a list of other well-known services and ports, see the command option information on page 7-47.

5. **On the California switch, define the type of L4 traffic processing each port must support.**

   In this example, the following ports are being used on the ACEswitch 180:

Table 17-2 GSLB Example: California ACEswitch 180 Port Usage

Port	Host	Type of L4 Processing Enabled
1	Server A	Server
2	Server B	Server
6	Default Gateway Router. This connects the switch to the Internet where all client requests originate.	Client

   The ports are configured as follows:

```
>> Virtual server 1# /cfg/slb/port 1         (Select physical switch port 1)
>> SLB port 1# servr ena                     (Enable server processing on port 1)
>> SLB port 1# ../port 2                     (Select physical switch port 2)
>> SLB port 2# servr ena                     (Enable server processing on port 2)
>> SLB port 2# ../port 6                     (Select physical switch port 6)
>> SLB port 6# clien ena                     (Enable client processing on port 6)
```

6. **On the California switch, enable Server Load Balancing.**

```
>> SLB port 6# ..                            (Select the SLB Menu)
>> Server Load Balancing# on                 (Turn Server Load Balancing on)
```

Part Three: Configure the California Site for GSLB

1. **On the California switch, define each remote site.**

   Add and enable the IP address for the IP interface of up to eight remote sites. In this example, there is only one remote site: Denver, with an IP interface address of 174.14.70.100. The following commands are used:

```
>> Server Load Balancing# /cfg/dist/site 1     (Select Remote Site #1)
>> Remote site 1# prima 174.14.70.100         (Define remote IP interface address)
>> Remote site 1# ena                         (Enable remote site #1)
```

   Each additional remote site would be configured in the same manner.

2. **On the California switch, assign each remote distributed service to a local virtual server.**

NOTE – This step can result in improper configuration if not clearly understood. Please take care to note where each configured value originates.

   In this step, we are configuring the local California site to recognize the services offered at the remote Denver site. To do this, configure one real server entry on the California switch for each virtual server located at each remote site. Since there's only one remote site (Denver) with only one virtual server, only one more local real server entry is needed at the California site.

   The new real server entry will be configured with the IP address of the remote virtual server, rather than the usual IP address of a local physical server.

   Also, the "remote" property will be enabled, and the real server entry will be added to the real server group under the local virtual server for the intended service. Finally, since the real server health checks will be headed across the Internet, the health checking interval should be increased to 30 or 60 seconds to avoid generating excess traffic. For example:

```
>> Remote site 1# /cfg/slb/real 3          (Create an entry for real server #3)
>> Real server 3# rip 174.14.70.1          (Set remote virtual server IP address)
>> Real server 3# remote enable            (Define the real server as remote)
>> Real server 3# intr 60                  (Set a high health check interval)
>> Real server 3# ena                      (Enable the real server entry)
>> Real server 3# ../group 1               (Select appropriate real server group)
>> Real server group 1# add 3              (Add real server 3 to the group 1)
```

NOTE – The IP address of the real server being added is taken from the virtual server IP address on the remote switch. Do not confuse this value with the IP interface address on the remote switch.

---

3. **On the California switch, define the domain name and hostname for each service hosted on each virtual server.**

   In this example, the domain name for the Foo Corporation is "foocorp.com," and the hostname for the only service (HTTP) is "www." These values are configured as follows:

```
>> Real server group 1# /cfg/slb/virt 1      (Select virtual server #1)
>> Virtual server 1# dname foocorp.com       (Define domain name)
>> Virtual server 1# hname http www          (Define HTTP hostname)
```

   If other services were defined (such as FTP), additional hostname entries would be made.

4. **On the California switch, turn Global Server Load Balancing on.**

```
>> Virtual server 1# ../dist                 (Select the GSLB Menu)
>> Global SLB menu# on                       (Activate GSLB for the switch)
```

5. **Apply and verify the configuration.**

```
>> Global SLB menu# apply                    (Make your changes active)
>> Global SLB menu# cur                      (View current GSLB settings)
>> Global SLB menu# ../cur                   (View current SLB settings)
```

   Examine the resulting information. If any settings are incorrect, make and apply any appropriate changes, and then check again.

6. **Save your new configuration changes.**

```
>> Server Load Balancing# save               (Save for restore after reboot)
```

Part Four: Configure the Denver Site with Basic System Items

Following the same procedures as above, configuration the Denver site as follows.

1. **If the WebOS web-based interface (WBI) is to be used for managing the Denver switch, change its service port.**

```
>> Main# /cfg/sys                            (Select the System Menu)
>> System# wport 8080                        (Set service port 8080 for WBI)
```

2. **On the Denver switch, define an IP interface.**

```
>> Main# /cfg/ip/if 1                    (Select IP interface #1)
>> IP Interface 1# addr 174.14.70.100    (Assign IP address for the interface)
>> IP Interface 1# ena                   (Enable IP interface #1)
```

3. **On the Denver switch, define the default gateway.**

```
>> IP Interface 1# ../gw 1                    (Select default gateway #1)
>> Default gateway 1# addr 174.14.70.101      (Assign IP address for the gateway)
>> Default gateway 1# ena                     (Enable default gateway #1)
```

4. **Configure the local DNS server to recognize the local GSLB switch as the authoritative name server for the hosted services.**

   The Denver DNS server is configured to recognize 174.14.70.100 (the IP interface of the Denver GSLB switch) as the authoritative name server for www.foocorp.com).

Part Five: Configure the Denver Switch for Standard SLB

1. **Assign an IP address to each of the real servers in the local Denver server pool.**

Table 17-3 Denver Real Server IP Addresses

Real Server	IP address
Server C	179.14.70.2
Server D	179.14.70.2

2. **On the Denver switch, define each local Real Server.**

```
>> Default gateway 1# /cfg/slb/real 1     (Server C is real server 1)
>> Real server 1 # rip 179.14.70.2        (Assign Server C IP address)
>> Real server 1 # ena                    (Enable real server 1)
>> Real server 1 # ../real 2              (Server D is real server 2)
>> Real server 2 # rip 179.14.70.3        (Assign Server D IP address)
>> Real server 2 # ena                    (Enable real server 2)
```

3. **On the Denver switch, define a Real Server Group.**

```
>> Real server 2 # /cfg/slb/group 1          (Select real server group 1)
>> Real server group 1# add 1                (Add real server 1 to group 1)
>> Real server group 1# add 2                (Add real server 2 to group 1)
>> Real server group 1# healt http           (Use HTTP for health checks)
>> Real server group 1# cntnt index.html     (Set URL content for health checks)
```

4. **On the Denver switch, define a Virtual Server.**

```
>> Real server group 1 # /cfg/slb/virt 1     (Select virtual server 1)
>> Virtual server 1# vip 179.14.70.1         (Assign a virtual server IP address)
>> Virtual server 1# add http 1              (Associate virtual port to real group)
>> Virtual server 1# ena                     (Enable the virtual server)
```

5. **On the Denver switch, define the type of L4 traffic processing each port must support.**

In this example, the following ports are being used on the ACEswitch 180:

Table 17-4 Web Host Example: ACEswitch 180 Port Usage

Port	Host	Type of L4 Processing Enabled
3	Server C	Server
4	Server D	Server
5	Default Gateway Router. This connects the switch to the Internet where all client requests originate.	Client

The ports are configured as follows:

```
>> Virtual server 1# /cfg/slb/port 3         (Select physical switch port 3)
>> SLB port 3# servr ena                     (Enable server processing on port 3)
>> SLB port 3# ../port 4                     (Select physical switch port 4)
>> SLB port 4# servr ena                     (Enable server processing on port 4)
>> SLB port 4# ../port 5                     (Select physical switch port 5)
>> SLB port 5# clien ena                     (Enable client processing on port 5)
```

6. **On the Denver switch, enable Server Load Balancing.**

```
>> SLB port 5# ..                            (Select the SLB Menu)
>> Server Load Balancing# on                 (Turn Server Load Balancing on)
```

Part Six: Configure the Denver Site for GSLB

Following the same procedures as above, here is a summary of the configuration steps for the Denver site.

1. **On the Denver switch, define each remote site.**

   Since we are now configuring the Denver site, Denver is local and California is remote. Add and enable the IP address for the IP interface of up to eight remote sites. In this example, there is only one remote site: California, with an IP interface address of 200.200.200.100. The following commands are used:

```
>> Server Load Balancing# /cfg/dist/site 1      (Select Remote Site #1)
>> Remote site 1# prima 200.200.200.100        (Define remote IP interface address)
>> Remote site 1# ena                          (Enable remote site #1)
```

2. **On the Denver switch, assign each remote distributed service to a local virtual server.**

NOTE – This step can result in improper configuration if not clearly understood. Please take care to note where each configured value originates.

In this step, we are configuring the local Denver site to recognize the services offered at the remote California site. As before, configure one real server entry on the Denver switch for each virtual server located at each remote site. Since there's only one remote site (California) with only one virtual server, only one more local real server entry is needed at the Denver site.

The new real server entry will be configured with the IP address of the remote virtual server, rather than the usual IP address of a local physical server.

Also, the "remote" property will be enabled, and the real server entry will be added the real server group under the local virtual server for the intended service. Finally, since the real server health checks will be headed across the Internet, the health checking interval should be increased to 30 or 60 seconds to avoid generating excess traffic. For example:

```
>> Remote site 1# /cfg/slb/real 3          (Create an entry for real server #3)
>> Real server 3# rip 200.200.200.1        (Set remote virtual server IP address)
>> Real server 3# remote enable            (Define the real server as remote)
>> Real server 3# intr 60                  (Set a high health check interval)
>> Real server 3# ena                      (Enable the real server entry)
>> Real server 3# ../group 1               (Select the approp. real server group)
>> Real server group 1# add 3              (Add real server 3 to the group 1)
```

NOTE – The IP address of the real server being added is taken from the virtual server IP address on the remote switch. Do not confuse this value with the IP interface address on the remote switch.

---

3. **On the Denver switch, define the domain name and hostname for each service hosted on each virtual server.**

   These will be the same as for the California switch: the domain name is "foocorp.com," and the hostname for the HTTP service is "www." These values are configured as follows:

```
>> Real server group 1# /cfg/slb/virt 1      (Select virtual server #1)
>> Virtual server 1# dname foocorp.com       (Define domain name)
>> Virtual server 1# hname http www          (Define HTTP hostname)
```

4. **On the Denver switch, turn Global Server Load Balancing on.**

```
>> Virtual server 1# /cfg/dist/on            (Activate GSLB for the switch)
```

5. **Apply and verify the configuration.**

```
>> Global SLB menu# apply                    (Make your changes active)
>> Global SLB menu# cur                      (View current GSLB settings)
>> Global SLB menu# ../cur                   (View current SLB settings)
```

   Examine the resulting information. If any settings are incorrect, make and apply any appropriate changes, and then check again.

6. **Save your new configuration changes.**

```
>> Server Load Balancing# save               (Save for restore after reboot)
```

IP Proxy Addresses for Non-HTTP Application Redirects

Prior to Release 5.2, non-HTTP applications such as FTP or SNMP had no method to redirect users away from sites that do not have the resources to handle their requests. Alteon WebSystems switches that have the latest WebOS software installed can now configure GSLB Remote Servers to have any user request sent to them using a load balancing mechanism called IP Proxy.

NOTE – This feature should be used as a method of last resort for GSLB implementations, in topologies where the remote servers are usually VIPs in other Alteon WebSystems switches.

How IP Proxy Works

Example: The figure below shows two GSLB sites, each with one local virtual server (VIP 1) serviced by two real servers in Real Server Group 1. The applications being load balanced are HTTP and POP3. The network administrator wants to have any request that cannot be serviced locally to be sent to the peer site. HTTP requests will be sent to the peer site using HTTP Redirect. Any other application request will be sent to the peer site using the IP Proxy feature.

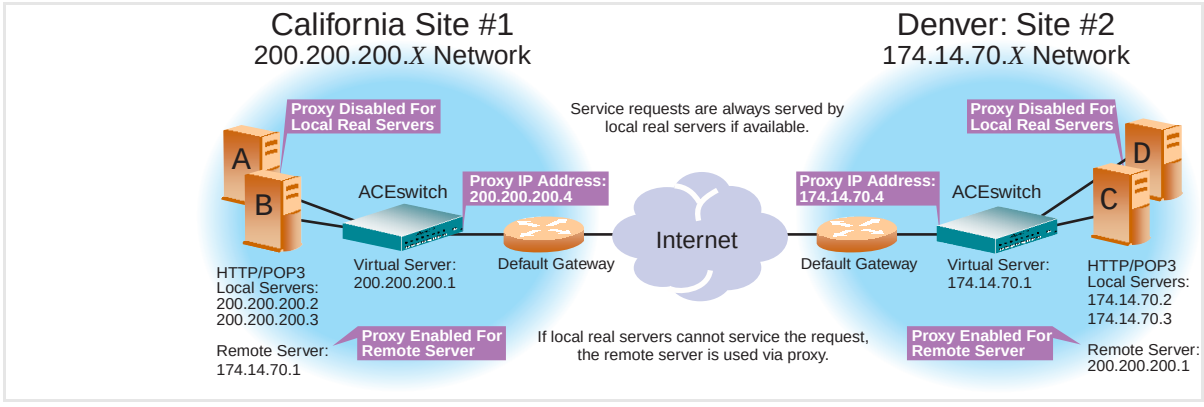


Figure 17-3 POP3 Request fulfilled via IP Proxy

When the POP3 processes at Site #1 terminate due to operator error, the following events occur to allow users' POP3 requests to be fulfilled:

1. **A user POP3 TCP SYN request is received by the virtual server at Site #1. The switch at that site determines that there are no local resources to handle the request.**
2. **The switch rewrites the request, such that it now contains a proxy IP address as the IP source address (IPSA), and the virtual server IP address at Site #2 as the IP destination address (IPDA).**
3. **The switch at Site #2 receives the TCP SYN (POP3) request to its virtual server that looks like a normal SYN frame, and thus, performs normal local load balancing mechanisms.**
4. **The TCP SYN ACK coming from Site #2's local real server IP address is sent back toward the IP address specified by the proxy IP address.**
5. **The switch at Site #2 sends the TCP SYN ACK frame towards Site #1, with Site #2's virtual server IP address as the IP source address and the proxy IP address as the IP destination address.**
6. **The switch at Site #1 receives the frame and translates it, using Site #1's virtual server IP address as the IP source address and the client's IP address as the IP destination address.**

This cycle continues for the remaining frames that are necessary to transmit the client's mail, until a FIN frame is received.

Configuring IP Proxy

In keeping with the previous example starting on page 17-1, the switch at Site #1 in California is configured with switch port 6 connecting to the default gateway, and real server 3 representing the remote server in Denver. The following commands are used to configure the IP Proxy on Site #1 in California:

```
>> # /cfg/slb/port 6                          (Select port to default gateway)
>> SLB port 6# pip 200.200.200.4              (Set unique Proxy IP address)
>> SLB port 6# ../real 1/proxy disable        (Disable proxy for local real server)
>> Real server 1 # ../real 2/proxy disable    (Disable proxy for local real server)
>> Real server 2 # ../real 3/proxy enable     (Enable proxy for remote server)
>> Real server 3 # apply                      (Apply configuration changes)
>> Real server 3 # save                       (Save configuration changes)
```

If you want to configure IP Proxy on Site #2, the following commands are issued on the Denver switch:

```
>> # /cfg/slb/port 5                          (Select port to default gateway)
>> SLB port 5# pip 174.14.17.4                (Set unique Proxy IP address)
>> SLB port 5# ../real 1/proxy disable        (Disable proxy for local real server)
>> Real server 1 # ../real 2/proxy disable    (Disable proxy for local real server)
>> Real server 2 # ../real 3/proxy enable     (Enable proxy for remote server)
>> Real server 3 # apply                      (Apply configuration changes)
>> Real server 3 # save                       (Save configuration changes)
```

Basic Tests for GSLB Operation

- Execute a browser request to the configured service (www.foocorp.com in the previous example).
- On each switch, examine the `/info/slb` information.
- Check that all Server Load Balancing parameters are working according to expectation. If necessary, make any appropriate configuration changes and then check the information again.
- On each switch, examine the following statistics:
  - `/stats/slb/gslb/virt` *virtual-server-number*
  - `/stats/slb/gslb/group` *real-server-group-number*
  - `/stats/slb/maint`

CHAPTER 18

Troubleshooting

This chapter describes the most common problems that might occur with the switch, lists the probable causes for the problems, and defines possible solutions.

Definitions

- **Management Processor (MP)**

  The processor that handles management of the switch. It processes the CLI, Telnet, SNMP operation, and Spanning-Tree.

- **Switch Processor (SP)**

  The switch processor that processes both switched user frames and switched management frames.

- **Forwarding Database (FDB)**

  This is the database of learned and being-learned MAC addresses.

- **Spanning-Tree Protocol (STP)**

  The IEEE 802.1d specified loop prevention protocol widely used in Ethernet bridge networks.

- **Bridge Protocol Data Unit (BPDU)**

  Frames used to convey Spanning-Tree information to form a loop-free network topology.

System Problems

Switch Management Problems

Cannot `ping` a switch IP interface. Cannot Telnet to a switch IP interface. MIB Browser cannot discover the switch. The switch does not send SNMP traps.

Possible Causes

- Incorrect switch IP interface configuration
- Link state of the port the `ping`ing station is connected to is the in the "down" state
- Spanning-Tree port state is not in "forwarding" state
- Incorrect SNMP community strings
- Trap server is not configured
- Switch IP interface address is used by some other device in the network

Actions

- Check `/cfg/ip/cur` to be sure the switch IP interface addresses, subnet masks, and default gateways are correctly configured, and that the IP interfaces are enabled.
- Check `/info/link` to be sure the management port link is in the "up" state.
- Check `/info/stp` to be sure port Spanning-Tree is in "forwarding" state.
- Check `/cfg/snmp/cur` to be sure SNMP community strings are correct.
- Check `/cfg/snmp/cur` to be sure the Trap server is specified.
- Check for duplicate IP address and correct if necessary.

Link Problems

Green link LED does not come on. Link state is in "down" state from the CLI (`/info/link`).

Potential Causes

- Port Configuration mismatch between the switch and the other device
- Different version of Link Negotiation used between the switch and the other device
- Bad or incorrect cable

Actions

- If ports are configured with specific values such as 100Mbs speed, then make sure the other device is configured the same way.
- Port Configuration: Make sure both the switch port and the other device are configured with the same negotiation mode. If the switch port is configured with either Speed or Duplex mode in "auto," the other device must have the same configuration.
- Check the cabling between the switch and the other device. If the other device is a workstation, straight through cable should be used. However, if it is either another switch or a hub, a cross-over cable should be used unless there is an "uplink" enable/disable switch used instead on the switch or hub.

Table 18-1 Pin-outs for Crossover cable

pin 1 ---------- pin 3
pin 2 ---------- pin 6
pin 3 ---------- pin 1
pin 6 ---------- pin 2

NOTE – These pin-outs are for the 10/100 Mbps physical ports only.

- Check link status in `/info/link`. If link state is "up", then the problem is a bad LED.

SNAP Traces

If a console is hooked up to the switch, a message will indicate that the switch had taken a "snap trace."

Possible Causes

- Watchdog Timer: If the MP fails to refresh the on-board timer, this will reset the processor, initiating a snap trace and reset of the switch.
- Different software resets: When encountering certain error conditions or anomalies, the software will trigger a panic which in turn will generate a snap trace, coredump, and reset the switch.

Actions

- Messages: Any message(s) on the console should be recorded and sent to Alteon WebSystems Customer Support.
- Coredump: Retrieve the coredump (if available) by accessing the Maintenance menu and invoking the `uudmp` option. Alternately, you can enter **`/maint/uudmp`** to retrieve the coredump. Any coredump should be sent to Alteon WebSystems Customer Support.

Switch Boot Failure

The switch will not boot.

Possible Causes

- Corrupted firmware
- Firmware and configuration was corrupted when rebooting with an older firmware image. This can occur when replacing Release 4 software with Release 3.0.20 or earlier software without first resetting the switch to factory default configuration.

Actions

Replace the corrupted firmware by performing a serial download of a new binary firmware image.

NOTE – The procedure for serial download is different from the procedure for TFTP download.

This procedure requires the following:

- A computer running terminal emulation software
- A standard serial cable with a male DB9 connector (see your switch hardware installation guide for specifics)
- A *binary* switch firmware image (*not* the `tftp` file used for TFTP download)

Procedure

1. **Using the serial cable, connect the computer to the switch Console port (Serial Port on some models).**
2. **Make sure that the new binary firmware file is available on the computer.**

3. **Start your terminal emulation software and set the communication parameters:**

   Table 18-2 Console Configuration Parameters

Parameter	Value
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1

4. **Turn on the switch power and press <Shift-F> while the switch is first attempting to boot.**

   When performed correctly, the following message appears:

```
Xmodem flash download 1.0.5
To download to flash use xmodem at 57600 baud
Power cycle to end xmodem.
```

5. **Reconfigure your terminal emulation software for the following parameters:**

Parameter	Value
Baud Rate	57,800
Data Bits	8
Parity	None
Stop Bits	1

6. **Set the file transfer mode to Xmodem.**

7. **Transfer the binary firmware image file to the switch.**

   This process can take three or four minutes to complete. When finished, the message "done" will appear on your terminal.

8. **Disconnect the terminal emulation session and reconfigure your terminal emulation software for normal switch connection parameters:**

Parameter	Value
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1

9. **Reconnect the terminal session to the switch.**

10. **Turn the switch power off, and then back on again.**

    The switch should now boot normally.

Switching Problems

This section lists the most common switching problems, their causes, and solutions.

Connectivity Problems

Client "A" on port 1 cannot connect to server "B" on port 2.

Potential Causes

- Incorrect configuration of client/server machines: the IP address is wrong.
- Ports 1 or 2 may be down (link down).
- Spanning-Tree Port State is not in "forwarding" state.
- Frames from either "A" or "B" are received with errors or not transmitted due to error conditions on outgoing port.
- MAC Address of either "A" or "B" is learned incorrectly from ports other than 1 and 2.

Actions

- Check `/info/link` to be sure link state is up.
- Check `/info/stp` to be sure Spanning-Tree Port is in "forwarding" state.
- Check port interface statistics (`/stats/port` *port-number*`/if`) to see whether `ifInErrors`, `ifInDiscards`, `ifOutErrors`, or `ifOutDiscards` are incrementing.
  - `ifInErrors`: MAC errors
  - `ifInDiscards`: STP blocking state, filtering, frame errors, PCI busy
  - `ifOutErrors`: not used
  - `ifOutDiscards`: due to backup on link
- Check port `dot3` statistics (`/stats/port 1/ether`) for Ethernet specific errors.
- Search MAC addresses for "A" and "B" from the FDB. For example, if A's MAC address is 00:00:00:00:00:01 and B's is 00:00:00:00:00:02, search for A's MAC address by typing the following from the CLI: **`/info/fdb/find 00:00:00:00:00:01`**

  Output similar to the following example should be displayed.

```
MAC Address Port State Referenced from Ports...
00:00:00:00:00:01 1 FWD
```

Spanning-Tree Protocol Problems

The topology in the following figure is used to illustrate the STP problems in this section.

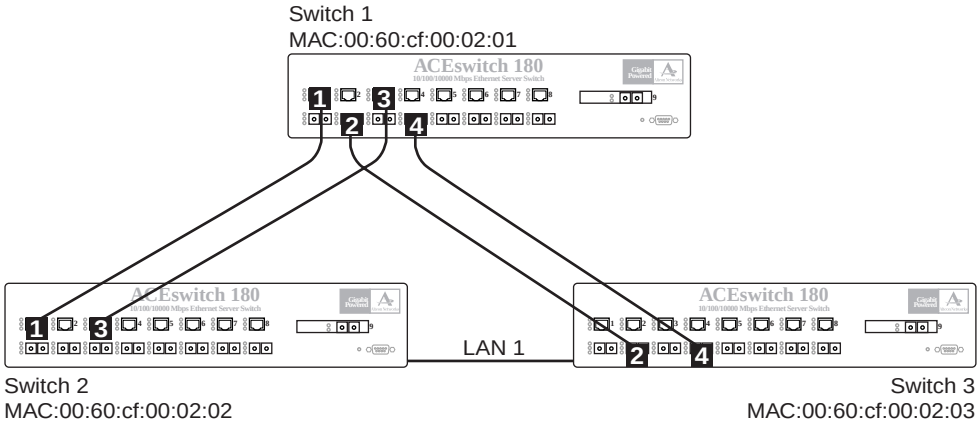


Figure 18-1 Spanning-Tree Topology

All switches have the default STP parameters except the following:

- Switch 1 MAC: 00:60:cf:00:02:01
- Switch 2 MAC: 00:60:cf:00:02:02, Path cost for port 1 (to Switch 1) is 10. Path cost for port 3 (to Switch 1) is 5.
- Switch 3 MAC: 00:60:cf:00:02:03, Path cost for port 2 and port 4 (to Switch 1) is 1.

Switch Receives its own Spanning-Tree BPDU Message

If the switch software receives its own bridge protocol data unit (BPDU) message, the switch port will be disabled. As an example, this could occur when the switch transmits the BPDU message out switch port 1 to a hub that has two hub ports connected together in a loop.

You must remove the loop from the port and manually re-enable the switch port. To manually re-enable the switch port, enter the following command:

```
Main# /oper/port port-number/enable
```

Spanning-Tree Recalculation

The IEEE 802.1d Spanning-Tree algorithm can take up to 45 seconds from the time it detects a topology change to the time it transitions from "spanning-tree port" state to "forwarding" state. During Spanning-Tree recalculation, frame forwarding from the port will stop and interrupt normal network traffic flow. Unlike shared media environments, in a switched network environment when the end station directly connected to a switch port is rebooted, it causes the switch port link state to change, resulting in recalculation of the "spanning-tree port" state. This is seen by loss of connection upon end station reboot.

Server Load Balancing Configurations

General

The following checklist will help you resolve the most common difficulties configuring Server Load Balancing.

- Check the Server Load Balancing maintenance statistics (page 6-17) and the Server Load Balancing information (page 5-9) for anything unexpected.
- On the switch, check that the real servers, real server groups, virtual servers, etc. have been *enabled*.
- Check that the real servers are physically functioning.
- Check that all the services which the switch is expecting to find on each real server are installed, configured, and running properly.
- On the switch, make sure that you used `apply` and `save` to activate your configuration changes (see "Viewing, Applying, and Saving Changes" on page 7-4).
- On the switch, make sure that the real servers were added to the proper real server groups and that the real server groups are associated with a virtual server.
- Make sure that you are not violating any of the network topology restrictions, such as by connecting clients and servers to the same switch port (see "Network Topology Considerations" on page 15-4).
- Make sure that the port state for each switch port is properly configured as `client`, `server`, or `none` (see "The SLB Port Menu" on page 7-56).
- Make sure that the switch is configured to accept the TCP/UDP port numbers on which each particular service is expected to run.
- If a service on a real server runs on a different port number than typical (such as using TCP port 8000 for HTTP, instead of TCP port 80), make sure that the virtual port and real port are properly mapped ("Mapping Virtual Ports to Real Ports" on page 7-51).

Service Problems

Periodic loss of a configured TCP service (such as HTTP). Real server does not come into service, or comes into service and fails periodically.

Possible Causes

- Invalid topology or port state: the real server is connected to the switch through a port configured in the "client" or "application redirection" state.
- There may be a health-check failure between the switch and the real server.
- One of the real servers of the real server group does not respond to the service request.

Actions

- Monitor the health checks. At Layer 4, there should be a 3-way TCP handshake for opening a TCP connection, followed by a 4-way TCP handshake to close a TCP connection.
- Verify that the real server has a default gateway or a route back to the client.
- Verify that the requested HTTP object is present on every real server in the real server group.

Miscellaneous

LED Patterns on Gigabit Ethernet Ports

LED patterns on Gigabit Ethernet Ports 9 and 10 are different upon switch reset. Both LEDs on Port 10 (in the switch I/O Module slot) come up OFF, and all LEDs on Port 9 come up ON.

Lost Character Output on Console Port

Characters written to the console are sometimes lost. This problem occurs rarely, but it can be seen as misaligned output or missing prompts. A missing prompt might appear to be a switch hang, but pressing Return or Control-C (^C) will cause the prompt to be repeated, returning the switch to normal operation.

Index

Symbols

/ 4-4
? (help) 4-4
[ ] xvii

Numerics

32-bit vs. 64-bit counters 1-5
80 (port) 17-6
802.1d Spanning-Tree Protocol 1-1, 18-8
802.1Q VLAN tagging 1-2, 11-2, 11-3
802.3z Link-Negotiation 1-1

A

abbreviating commands (CLI) 4-6
ACEnic adapters
    Dual Homing 1-5
    jumbo frames 1-2, 12-1
    supporting multiple VLANs 11-3
    supporting VLANs 11-3
ack (SLB filtering option) 7-54
actio (SLB filtering option) 7-54
activating optional software 8-7
active configuration block 7-5, 9-4
active switch, saving and loading configuration ... 7-33
active-active redundancy 1-4
add
    ARP entry 10-8
    SLB port option 7-57
    SLB virtual server option 7-47
addr
    IP route info 5-16
address list
    ARP entries 10-9
Address Resolution Protocol (ARP)
    add, delete entries 10-8
    address list 10-9
    interval 7-23
    statistics 6-4
administrator account 2-4, 3-1
admpw (system option) 7-7
aging
    STP bridge option 7-28
    STP information 5-6
allow (filtering) 1-3, 16-1, 16-4
Alteon WebSystems Enterprise MIB 1-5
application health checking 7-43, 15-11
application ports 16-3
application redirection . 1-6, 7-38, 7-54, 16-2, 16-23
    client IP address authentication 16-24
    example with NAT 16-19, 16-20
    filter states 5-9
    filters 7-37
    games and real-time applications 16-24
    non-HTTP redirects for GSLB 17-15
    proxies ..... 16-17, 16-20 to 16-23
    rport 16-20, 16-23
    topologies 16-18
    web-cache redirection example ... 16-16 to 16-24
    within real server groups 7-42
application servers 1-6
apply (global command) 7-4
applying configuration changes 7-4
ARP Cache Manipulation Menu 10-8
ARP Information Menu 5-16
ARP. *See* Address Resolution Protocol.
ASCII terminal 2-2
authentication, application health checking 7-37
authoritative name servers 17-3

autoconfiguration
duplex mode 3-6
link 3-7
port speed 3-6
auto-negotiation 3-6
configuring flow control 7-12
enable/disable on port 7-12
setup 3-7

B

backup
SLB real server group option 7-43
SLB real server option 7-40
backup configuration block 7-5, 9-4
backup connector (back), Port Menu option 7-10
backup server activations (SLB statistics) 6-18
backup servers 15-16
banner (system option) 7-7
baud rate
console connection 2-2, 18-5
serial download 18-5
binary firmware image 18-4
binding failure 6-17
binding table 7-48
BLOCKING (port state) 5-6
Boot Options Menu 9-1
BOOTP 2-3
setup (enable/disable) 3-5
system option 7-7
BPDU. *See* Bridge Protocol Data Unit.
Bridge MIB (RFC 1493) 1-2
bridge parameter menu, for STP 7-26
bridge priority 5-6
Bridge Protocol Data Unit (BPDU) ... 5-6, 11-5, 18-1
STP transmission frequency 7-28
Bridge Spanning Tree Menu 7-27
Bridge Spanning-Tree parameters 7-28
bridging (dot1) 6-3
broadcast
IP route tag 5-16
IP route type 5-15
broadcast domains 1-2, 11-1, 11-3, 11-5, 13-6
broadcast IP address 3-10

C

cache filter 7-55
cache servers 1-6
capture dump information to a file 10-2
CGI-bin scripts 15-4, 15-16
Cisco EtherChannel 7-61
clear
ARP entries 10-9
dump information 10-3
FDB entry 10-5
routing table 10-10
client traffic processing 7-56, 15-5
SLB web balancing example 15-10
Command-Line Interface (CLI) ..2-1 to 2-6, 3-1, 4-1
commands
abbreviations 4-6
conventions used in this manual xvii
shortcuts 4-6
stacking 4-6
tab completion 4-6
community string, trap host (SNMP option) 7-31

configuration
administrator password 7-7
apply changes 7-4
default gateway interval, for health checks 7-15
default gateway IP address 7-15
dump command 7-32
effect on Spanning-Tree Protocol 7-4
Fast Ethernet 7-10
flow control 7-12
Gigabit Ethernet 7-10
imask 7-38
IP broadcast address 7-14
IP parameters 7-12
IP static route 7-16
Layer 4 administrator password 7-7
local route address mask 7-17
local route IP address 7-17
Main Menu 7-3
operating mode 7-11
port link speed 7-11
port mirroring 7-34
port parameters 7-9
port trunking 7-61
real servers 7-38
route cache 7-17
save changes 7-5
scripts 7-32
Server Load Balancing 7-36
setup command 7-32
SNMP 7-30
Spanning-Tree Protocol 7-26
switch IP address 7-14
system parameters 7-6
user password 7-7
view changes 7-4
VLAN default (PVID) 7-10
VLAN IP interface 7-14
VLAN tagging 7-10
VLANs 7-24
VRRP 7-62
configuration block
active 9-4
backup 9-4
factory 9-4
selection 9-4
connecting
via console 2-2
via Telnet 2-3
connection timeout (Real Server Menu option) 7-48
console port
communication settings 2-2, 18-5
connecting 2-2
lost character output 18-9
serial download settings 18-5
contacting Alteon WebSystems xviii
coredump 18-4
cost
STP information 5-6
STP port option 7-29
counters
32-bit vs. 64-bit 1-5
frame 1-5
MIB-II 1-5
No Server Available (dropped frames) 6-18
octet 1-5
crossover cable 18-3
cur (system option) 7-7
current bindings 6-17
customer support xviii

D

date
setup 3-4
system option 7-7
debugging 10-1
default gateway 13-3
configuration example 13-5, 17-6
information 5-13
interval, for health checks 7-15
metrics 7-23
round robin, load balancing for 7-23
Default Gateway Menu 7-14
default password 2-4
delete
ARP entry 10-8
FDB entry 10-5
deny (filtering) 1-3, 6-18, 16-1, 16-4
diff (global) command, viewing changes 7-4
dip (destination IP address for filtering) 7-55
dir (port mirroring option) 8-4
direct (IP route type) 5-15
direct access mode 7-38
direct real server access 7-49
DISABLED (port state) 5-6
disconnect idle timeout 2-6
Distributed Site State Protocol (DSSP) 17-1, 17-6
setting update interval 7-59

dmask
destination mask for filtering 7-55
SLB filtering option 7-53
DNS. *See* Domain Name System.
domain name 17-10
domain name server 17-3
Domain Name System (DNS)
filtering 16-6, 16-9
Global SLB (diagram) 17-2
health checks 7-43
Menu 7-21
peer site handoffs 7-58
round robin 15-2
domain name, virtual server 7-47
downloading software 9-2
dport (filtering option) 16-7, 16-21
dropped frames (No Server Available) counter 6-18
DSSP. *See* Distributed Site State Protocol.
Dual Homing with STP 1-5
dump
configuration command 7-32
maintenance 10-1
state information 10-4
duplex mode 3-6
jumbo frames 12-1
link status 5-4
setup 3-6
dynamic NAT 16-25
dynamic routes 10-10

E

enabled software keys 5-19
EtherChannel 1-4, 14-1
as used with port trunking 7-61
Ethernet frame size 1-2

F

factory configuration block 9-4
factory default configuration 2-5, 3-1, 3-2, 3-3, 18-4
failed server protection, SLB 15-2
Fast (Ethernet) Link Menu 7-11
Fast Ethernet, configuring ports for 7-10
fault tolerance
Dual Homing 1-5
hot-standby 1-5
port trunking 1-4, 14-2
Server Load Balancing 15-7
FDB. *See* forwarding database.
Filter Menu 7-52
filter statistics 6-10
filtered (denied) frames 6-18
filtering
allow 1-3, 16-4
application redirection 1-6
configuration example 16-7
default filter 16-4, 16-7
deny 1-3, 16-4
description 1-3
inserting 16-5
NAT configuration example ..... 16-25 to 16-27
numbering 16-5
order of precedence 16-3, 16-4
proto (option) 16-7, 16-21
security example 16-6
tutorial ..... 16-1 to 16-27
filters
caching session information 7-55
IP address ranges 7-55
SLB options 7-53
firewalls 16-6
firmware image 18-4
first-time configuration ..... 2-5, 3-1 to 3-16
fixed (IP route tag) 5-16
flag field 5-17
flow control 5-4
configuring 7-12
setup 3-6, 3-7
forwarding database (FDB) 1-1, 10-1
delete entry 10-5
description 18-1
Forwarding Database Information Menu 5-11
Forwarding Database Menu 10-5
forwarding state (FWD) 5-6, 5-12, 5-19
fragmenting jumbo frames 13-1, 13-3
frame counter 1-5
frame processing 12-1
frame size, Ethernet 1-2
frame tagging. *See* VLANs tagging.
FTP server health checks 7-43
full-duplex 3-6
fwd (STP bridge option) 7-28
FwdDel (forward delay), bridge port 5-6

G

gateway. *See* default gateway.
gig (Port Menu option) 7-10
Gigabit (Ethernet) Link Menu 7-11
Gigabit Ethernet
  configuration 7-10
Global SLB
  configuration tutorial ..... 17-5 to 17-14
  Distributed Site State Protocol 17-1, 17-6
  DNS resolution (diagram) 17-2
  domain name configuration 17-10
  health check interval 17-9
  hostname configuration 17-10
  HTTP redirect 17-3
  overview 1-6
  port states 17-8
  real server groups 17-7
  real servers 17-7
  remote site configuration 17-9
  tests 17-17
Global SLB Menu 7-57
gtcfg (TFTP load command) 7-33

H

half-duplex 3-6
  jumbo frames 12-1
hash metric 7-45
health checking (SLB real server group option) ... 7-43
health checks 7-41, 16-20
  default gateway interval, retries 7-15
  Global SLB interval 17-9
  IMAP server parameters 15-14
  layer information 5-9
  parameters for most protocols 7-43
  RADIUS server parameters 15-13
  real server parameters 15-11
  redirection (rport) 7-54
  services supported 1-6
hello
  STP information 5-6
help 4-4
hostname, for HTTP health checks 15-11, 17-10
Hot Standby Router Protocol (HSRP)
  priority increment value for L4 client ports 7-69
  use with VRRP 7-67
  VRRP priority increment value 7-69
hot-standby 1-5
  See Also fault tolerance.
HP-OpenView 1-5, 2-1
HSRP. *See* Hot Standby Router Protocol.
HTTP
  application health checks 7-43, 15-11
  redirects (Global SLB option) 7-58, 17-3
  system option 7-7

I

ICMP 6-4, 16-2
  IP route tag 5-16
  Layer 3 health checks 7-43
idle timeout
  overview 2-6
  system option 7-7
IEEE standards
  802.1d Spanning-Tree Protocol 1-1, 5-5, 7-26, 18-8
  802.1Q VLAN tagging 1-2, 11-2, 11-3
  802.3z Link-Negotiation 1-1
IF Extensions MIB 1-2, 1-5
IF. *See* IP interfaces.
ifInDiscards 18-6
ifInErrors 18-6
ifOutDiscards 18-6
IGMP 16-2
image
  downloading 9-2
  software, selecting 9-3
IMAP server health checks 7-43, 15-14
imask (IP address mask) 7-37
in (port mirroring option) 8-4
incorrect VIPs (statistic) 6-17
incorrect Vports (dropped frames counter) 6-18
indirect (IP route type) 5-15
Information Menu 5-1
inserting filters 16-5
Interface (if), port traffic statistics MIB 6-3
Interface Extensions MIB 1-2, 1-5
Internet Protocol (IP) 6-3
Internet Service Provider (ISP), SLB example 15-6
intr (SLB real server option) 7-41

IP address 3-9
ARP information 5-17
BOOTP 2-3
configuring default gateway 7-15
conservation 16-25
filter ranges 7-55
IP interface 3-9
local route cache ranges 7-18
private 16-25
proxies ..... 15-4, 15-17, 16-17, 16-20 to 16-23
real server groups 15-9, 17-7
real servers 15-3, 15-8, 17-7
routing example 13-4
SLB real servers 15-9
syslog host 7-22
Telnet 2-3
virtual servers 15-3, 15-4, 15-9, 17-8
IP address mask (mmask) 7-7
IP address mask for SLB 7-37
IP configuration via setup 3-9
IP forwarding 7-20
IP forwarding information 5-13
IP Forwarding Menu 7-17
IP Information Menu 5-13
IP interface
broadcast address (broad) 7-14
configuring address 7-14
configuring VLANs 7-14
example configuration 15-8
subnet address maskconfiguration
IP subnet address 7-14
IP Interface Menu 7-13
IP interfaces 3-9, 5-15
configuration example 17-6
example configuration 13-4, 13-7
information 5-13
IP route tag 5-16
priority increment value (ifs) for VRRP 7-69
routing 13-1
VLAN #1 (default) 11-2
VLANs 11-2
IP Menu 7-12
IP parameters
configuring 7-12
IP Port Menu 7-20
IP proxies
for application redirection 16-22
for Global Server Load Balancing 17-15
for Server Load Balancing 15-17
See also proxies, proxy IP address (PIP).
IP Route Manipulation Menu 10-10
IP routing 3-9, 15-5
cross-subnet example 13-1
default gateway configuration 13-5
IP interface configuration 13-4, 13-7
IP interfaces 13-1
IP subnets 13-2
network diagram 13-2
overview 1-3
routing between VLANs 12-2
subnet configuration example 13-4
subnets 1-3
switch-based topology 13-3
tag parameters 5-16
tutorial ..... 13-1 to 13-7
IP Routing Information Menu 5-14
IP Static Route Menu 7-16
IP subnet mask 3-9
IP subnets 13-1, 13-3
routing 13-1, 13-2, 13-3
VLANs 11-1, 11-3
IP, switch processor statistics for 6-4
ISL Trunking 14-1

J

jumbo frames 1-2
ACEnic adapters 1-2, 12-1
fragmenting to normal size 13-1, 13-3
frame size 12-1
isolating with VLANs 12-1
routing 13-1, 13-3
setup 3-8
supported duplex modes 12-1
tutorial ..... 12-1 to 12-2
VLAN configuration 7-24
VLAN diagram 12-2
VLANs 1-2, 12-1

L

l4apw (L4 administrator system option) 7-7
Layer 3 (SLB virtual server option) 7-47
Layer 4
  administrator account 2-4
  optional software 15-1
LEARNING (port state) 5-6
least connections (SLB Real Server metric) 7-45
LED patterns 18-9
licence certificate 8-7
license password 8-7
lines (display option) 4-4
link 6-3
  speed, configuring 7-11
  troubleshooting 18-2
link status
  command 5-4
  duplex mode 5-4
  port speed 5-4
linkt (SNMP option) 7-31
LISTENING (port state) 5-6
lmask (local route address mask) 7-17
lmask (local route cache parameter) 7-18
lmask (routing option) 5-13
lnet (local route cache parameter) 7-18
lnet (local route IP address) 7-17
lnet (routing option) 5-13
local (IP route type) 5-15
local route cache 7-17
  IP address ranges for 7-18
local route cache parameters
  lmask 7-18
  lnet 7-18
log
  filtering 1-3
  filtering option 16-1, 16-6
  SLB filtering option 7-55
log command
  syslog host 7-22
logical segment. *See* IP subnets.
lost character output 18-9

M

MAC (media access control) address 5-3, 5-11, 5-17, 8-7, 10-5
  switch location 2-3
Main Menu 4-2
  Command-Line Interface (CLI) 2-5
  map 4-3
  summary 4-2
Maintenance Menu 10-1
Management Processor (MP) 10-6, 11-2, 18-1
  display MAC address 5-3
  use in switch security 7-8
manual style conventions xvii
map (SLB virtual server option) 7-48
mapping ports 16-23
mapping virtual ports to real ports 7-51
martian
  IP route tag (filtered out) 5-16
  IP route type (filtered out) 5-15
mask
  IP interface subnet address 7-14
Master Forwarding Database 1-1
MaxAge (STP information) 5-6
maximum connections 15-16
mcon (maximum connections) 6-18, 7-43, 15-16
  SLB real server option 7-40
mcons limit 15-16
media access control. *See* MAC address.
metrc (SLB real server group option) 7-42
metrics, SLB 7-44
MIBs
  proprietary 1-2, 1-5
  RFC 1213 MIB-II 1-2, 1-5
  RFC 1493 Bridge MIB 1-2
  RFC 1573 Interface Extension MIB 1-5
  RFC 1573 Interface Extensions MIB 1-2
  RFC 1643 Ethernet-like MIB 1-2
  SNMP support for 1-2
minimum misses (SLB real server metric) 7-44
Miscellaneous Debug Menu 10-6
mmask
  IP address mask for SLB 7-37
  system option 7-7
mnet
  management traffic IP address for SLB 7-37
  system option 7-7
monitor port 1-4, 7-34, 8-3
MP (Management Processor) 11-2

MP Snap, display trace buffer 10-7
MP. *See* Management Processor.
multicast
IP route tag 5-16
IP route type 5-15
multi-links between switches
using port trunking 14-1
using VLANs 11-5

N

name servers, Global SLB configuration example 17-3
NAT. *See* Network Address Translation.
Network Address Translation (NAT) 16-2, 16-19, 16-20
configuration example ..... 16-25 to 16-27
filter action 7-54
filter example 16-26
proxy 16-26
static example 16-27
network analyzer 8-3
network management 2-1
network performance 8-3
collecting information 1-4
statistics, with use of proxy addresses 15-17
NFS server 15-6
non TPC/IP frames 6-17
non-cacheable sites
application redirection
non-cacheable sites 16-24
none (port processing mode) 16-23
SLB web balancing example 15-10
non-HTTP redirects for GSLB 17-15

O

octet counters 1-5
online help 4-4
operating mode, configuring 7-11
Operations Menu 8-1
Operations-Level Port Mirroring Options Menu 8-3
Operations-Level Port Options 8-2
operations-level SLB options 8-5
operations-level VRRP options 8-6
optional software 1-6, 5-19, 16-1, 17-1
activating 8-7
Layer 4 SLB support 15-1
removing 8-8
OSPF 16-2
out (port mirroring option) 8-4
overflow server activations 6-18
overflow servers 7-40, 15-16

P

panic
command 10-4
software reset 10-6
switch (and Maintenance Menu option) 10-1
parallel links 11-5
parameters
tag 5-16
type 5-15
password
administrator account 2-4
default 2-4
L4 administrator account 2-4
user account 2-4
VRRP authentication 7-68
passwords 2-4
pbind (SLB virtual server option) 7-48, 15-4
PDUs 11-5
persistent bindings 15-4
real server 7-48
ping 4-4, 7-39
troubleshooting 18-2
PIP. *See* proxies, proxy IP address.
poisoned reverse, as used with split horizon 7-19
POP3
filtering example 16-6
server health checks 7-43
port 80 17-6
port flow control. *See* flow control.
port mapping 16-23
Port Menu 7-9
configuration options 7-10
configuring Fast Ethernet 7-10
configuring Gigabit Ethernet (gig) 7-10
port mirroring
configuration and topology limitations 7-34
description 1-4
menu options 7-35
Port Mirroring Menu 8-3
port parameters
configuring 7-9

port processing mode
client 15-10
none 15-10
server 15-5, 15-10
port speed 5-4
auto-sense 3-6
setup 3-6
port states 16-23, 17-8
none 16-23
redir 16-23
UNK (unknown) 5-12
Port Statistics Menu 6-3
port trunking 1-4, 14-2
configuration 7-61
configuration example 14-3
description 7-61
EtherChannel 1-4, 14-1
fault tolerance 14-2
menu options 7-61
tutorial ..... 14-1 to 14-4
ports
adding, removing VLAN ports 7-24
configuration 3-6
defining VLAN membership 7-25
disabling (temporarily) 7-12
for services 16-3
information 5-8
IP status 5-13
mapping 7-50
membership of the VLAN 5-7
physical. *See* switch ports.
priority 5-6
SLB configuration example 15-10
SLB state information 5-9
STP port priority 7-29
VLAN ID 5-8
preemption
assuming VRRP master routing authority 7-65
virtual router 7-65
preferred connector (pref), Port Menu option 7-10
priority (STP port option) 7-29
private IP address 16-25
private network 16-25
proprietary MIB 1-2, 1-5
protocol
statistics 6-4
types 16-2
proxies ..... 15-4, 15-17, 16-17 to 16-23
configuration example 16-26
IP address translation 7-41
NAT 16-25
proxy IP address (PIP) ... 5-9, 7-50, 15-4, 15-17, 16-22, 16-23
proxy servers 16-17
ptcfg (TFTP save command) 7-33
PVID (port VLAN ID) 5-8, 11-1
pwd 4-4

Q

quiet (screen display option) 4-5

R

RADIUS
server authentication 7-37, 7-43
server parameters 15-13
read community string (SNMP option) 7-31
real server
configuration 7-38
menu options 7-39
statistics 6-7
Real Server Group Menu 7-42
real server groups
backup/overflow servers 15-16
combining servers into 7-42
configuration example 15-9, 17-7
metrics 15-15
statistics 6-9
real servers 15-4
backup 7-43
backup/overflow servers 15-16
configuration example 17-7
connection timeouts 15-15
health checks 15-11
maximum connections 15-16
priority increment value (reals) for VRRP 7-69
SLB configuration example 15-9
SLB state information 5-9
weights 15-15
reboot 10-1, 10-4
receive flow control 3-6, 3-7, 7-12
redir (SLB filtering option) 7-54
redir port state 16-23
redirect (HTTP) 17-3
redirection. *See* application redirection

reference ports 5-12
rem (SLB virtual server option) 7-48
remote (Global SLB real server property) 17-9
Remote Site Menu (Global SLB) 7-59
remote site servers 7-41
removing optional software 8-8
reset 10-6
reset key combination 10-1
restarting switch setup 3-3
restr (SLB real server UDP option) 7-41
retry
    health checks for default gateway 7-15
    SLB real server option 7-41
RFCs
    1213 MIB-II 1-2
    1493 Bridge MIB 1-2
    1573 Interface Extension MIB 1-5
    1573 Interface Extensions MIB 1-2
    1643 Ethernet-like MIB 1-2
rip (IP routing tag) 5-16
RIP. *See* Routing Information Protocol.
RIP1 information 5-13
rmkey 8-8
round robin
    as used in gateway load balancing 7-23
roundrobin
    SLB Real Server metric 7-45
route
    cache configuration 7-17
    switch statistics for Route protocol 6-4
routers 13-2, 13-5
    port trunking 14-1
    switch-based routing topology 13-3
    using redirection to reduce Internet congestion 16-16
    web-cache redirection example 16-17
Routing Information Protocol (RIP) 5-16
    options 7-19
    poisoned reverse 7-19
    split horizon 7-19
    version 1 parameters 7-18
Routing Information Protocol Menu 7-18
routing. *See* IP routing.
rport
    filtering 16-20, 16-23
    SLB filtering option, redirected traffic port 7-54
rx flow control 3-6, 3-7

S

save (global command) 7-5
    noback option 7-5
save command 9-4
scalability, service 15-2
security
    filtering 1-6, 16-1, 16-6
    firewalls 16-6
    private networks 16-25
    switch management 7-8
    traffic 7-55
    VLANs 11-1
segmentation. *See* IP subnets.
segments. *See* IP subnets.
serial cable 2-2
serial download 18-4
server (port processing mode)
    SLB web balancing example 15-10

Server Load Balancing
- across subnets....13-1
- backup servers....15-16
- client traffic processing....7-56
- complex network topologies....15-17
- configuration examples....15-6 to 15-18
- direct access mode....7-38
- direct real server access....7-49
- distributed sites....17-1
- failed server protection....15-2
- fault tolerance....15-7
- filter options....7-53
- health checks....15-11
- information....5-9
- maximum connections....15-16
- menu options....7-37
- metrics....7-44, 15-15
- operations-level options....8-5
- overflow servers....15-16
- overview....1-6, 15-2
- persistent bindings....15-4
- port options....7-57
- port processing modes....15-5, 15-10
- proxies....15-4, 15-17
- proxy IP addresses....7-50
- real server group....15-9
- real server group options....7-42
- real server IP address (RIP)....15-3
- real server weights....7-40
- real servers....15-4
- remote sites....17-1
- server traffic processing....7-56
- topology considerations....15-4
- troubleshooting....18-8
- tutorial....15-1 to 15-18
- virtual IP address (VIP)....15-3, 15-4
- virtual servers....15-3, 15-9
- weights....15-15

Server Load Balancing Configuration Menu....7-36
Server Load Balancing Maintenance Statistics Menu 6-17
Server Load Balancing Metrics....7-44
Server Load Balancing Port Menu....7-56
Server Load Balancing Statistics Menu....6-7
Server Load Balancing Switch Port Statistics Menu. 6-11
server pool....15-1
server port mapping....5-9
server port processing....15-5
server traffic processing....7-56
- Global SLB configuration example....17-8

service ports....16-3
Session Binding Table....7-40
session identifier....7-47
setup command, configuration....7-32
setup facility....2-5, 3-1
- BOOTP....3-5
- duplex mode....3-6
- IP configuration....3-9
- IP subnet mask....3-9
- jumbo frames....3-8
- port auto-negotiation mode....3-7
- port configuration....3-6
- port flow control....3-6, 3-7
- port speed....3-6
- restarting....3-3
- Spanning-Tree Protocol....3-5
- starting....3-2
- stopping....3-3
- system date....3-4
- system time....3-4
- VLAN name....3-8
- VLAN port numbers....3-8
- VLAN tagging....3-7
- VLANs....3-8

shared services....15-1
shortcuts (CLI)....4-6
SIP (source IP address for filtering)....7-55
SLB. *See* Server Load Balancing.
smask
- SLB filtering option....7-53
- source mask for filtering....7-55

SMTP server health checks....7-43
snap traces....18-3
- buffer....10-6
- overview....10-6

SNMP....2-1, 6-3, 6-4
- configuration....7-30
- HP-OpenView....1-5, 2-1
- IP route tag....5-16
- menu options....7-31
- MIBs....1-2, 1-5
- proprietary MIB....1-5
- set and get access....7-31
- troubleshooting....18-2

software
image ... 9-2
image file and version ... 5-3
license ... 8-7
Spanning-Tree Port Menu ... 7-29
Spanning-Tree Protocol ... 5-19, 7-4, 18-1, 18-8
bridge aging option ... 7-28
bridge parameters ... 7-28
bridge priority ... 5-6
configuring parameters ... 7-26
Dual Homing ... 1-5
forwarding state ... 18-8
port cost option ... 7-29
port priority option ... 7-29
recalculation ... 18-8
root bridge ... 5-6, 7-28
setup (on/off) ... 3-5
spanning-tree port state ... 18-8
switch reset effect ... 9-4
troubleshooting ... 18-7
VLANs ... 11-2, 11-5
split horizon ... 7-19
spoofing, prevention of ... 7-8
sport (filtering option) ... 16-7, 16-21
stacking commands (CLI) ... 4-6
starting switch setup ... 3-2
state (STP information) ... 5-6
state information, client system ... 7-48
static (IP route tag) ... 5-16
static NAT ... 16-27
statistical load distribution ... 1-4, 14-2
statistics
ARP ... 6-4
Statistics Menu ... 6-1
stopping switch setup ... 3-3
STP bridge PDUs ... 11-5
STP. *See* Spanning-Tree Protocol.
subnet mask ... 3-9
subnets ... 3-9
IP interface ... 7-13
IP routing ... 1-3
switch
name and location ... 5-3
resetting ... 9-4
switch management
security ... 7-8
via IP interface ... 11-2
web-based interface for ... 1-4
switch ports
VLANs membership ... 11-1
Switch Processor (SP) ... 1-1, 10-6, 18-1
display trace buffer ... 10-7
swkey ... 5-19, 8-7
syslog
messages ... 16-1
preventing high volume of messages in ... 7-55
syslog host ... 7-22
system
contact (SNMP option) ... 7-31
date and time ... 5-3
information ... 5-3
location (SNMP option) ... 7-31
System Maintenance Menu ... 10-4
System Menu ... 7-6
system options
admpw (administrator password) ... 7-7
BOOTP ... 7-7
cur (current system parameters) ... 7-7
date ... 7-7
HTTP access ... 7-7
idle timeout ... 7-7
l4apw (Layer 4 administrator password) ... 7-7
login banner ... 7-7
mmask ... 7-7
mnet ... 7-7
Telnet access ... 7-7
time ... 7-7
usrpw (user password) ... 7-7
web-based management interface access ... 7-7
wport ... 7-7
system parameters, current ... 7-7

T

t1comm (SNMP option) ... 7-31
tab completion (CLI) ... 4-6
tagging. *See* VLANs tagging.
TCP ... 6-4, 16-2, 16-9, 16-10
ACK flag ... 7-54
fragments ... 6-17, 7-47
health checking using ... 7-41
health checks ... 7-43
port 80 ... 7-50
source and destination ports ... 7-53
TCP/UDP
port numbers ... 7-51
ports ... 7-47

Telnet 2-3, 16-6
BOOTP 2-3
configuring switches using 7-32
system option 7-7
troubleshooting 18-2
terminal emulation 2-2
text conventions xvii
TFTP 9-2
PUT and GET commands 7-33
time
setup 3-4
system option 7-7
timeouts
idle connection 2-6
port mirroring option 8-4
real server connnections 15-15
time-to-live, DNS response (Global SLB option) . 7-58
trace buffer 10-6
MP Snap 10-7
Switch Processor 10-7
traceroute 4-4
transmit flow control 3-6, 3-7, 7-12
transparent proxies .... 15-17, 16-17, 16-20 to 16-23
transparent proxies, when used for NAT 7-54
trap host (SNMP options) 7-31
troubleshooting ..... 18-1 to 18-9
Trunk Group Information Menu 5-19
Trunk Group Menu 7-61
trunking. *See* port trunking.
tx flow control 3-6, 3-7
type parameters 5-15
typographic conventions, manual xvii

U

UDP 6-4, 16-2, 16-9, 16-10
datagrams 6-17, 12-2
jumbo frame traffic fragmentation 13-3
server status using 7-41
SLB virtual server option 7-48
source and destination ports 7-53
unknown (UNK) port state 5-12
Unscheduled System Dump 10-4
upgrade, switch software 9-2
URL for health checks 5-9
user account 2-4
usrpw (system option) 7-7
uudmp 10-6
Uuencode Flash Dump 10-2

V

verbose 4-5
virtual IP address (VIP) 5-9, 15-3, 15-4
SLB virtual server option 7-46
Virtual Local Area Networks. *See* VLANs.
virtual port state, SLB information about 5-9
Virtual Router Redundancy Protocol (VRRP)
authentication parameters for IP interfaces 7-67
configuration 7-62
configuration menu options 7-62
operations-level options 8-6
overview 1-4
password, authentication 7-68
Priority Tracking Menu 7-65
priority tracking options 7-66
Tracking Menu 7-68
virtual router options 7-64
VRRP Interface Menu 7-67
virtual routers
description 7-63
HSRP failover 7-67
HSRP priority increment value 7-69
increasing priority level of 7-65
master preemption (prio) 7-65
menu options 7-63
priority increment values (vrs) for VRRP 7-69
Virtual Server Menu 7-46
virtual servers 7-44, 15-3
configuration example 15-9
IP address 15-9, 17-8
SLB state information 5-9
statistics 6-9
VLAN tagging
port configuration 7-10
port restrictions 7-25
See Also VLANs tagging.
setup 3-7

VLANs 3-9, 16-18
ACEnic adapter support for..... 11-3
adding and removing ports..... 7-24
ARP entry information 5-17
broadcast domains .. 1-2, 11-1, 11-3, 11-5, 13-6
configuration options 7-24
default..... 11-1
defining port membership 7-25
example showing multiple VLANs 11-3
ID numbers..... 11-1
information 5-7
interface 3-10
IP interface configuration 13-7
IP interfaces..... 11-2
isolating jumbo frames 12-1
jumbo frames 1-2, 7-24, 12-1
Management Processor..... 11-2
multiple links 11-5
multiple VLANs.....11-2, 11-3
name 5-7
name setup..... 3-8
overview 1-2
parallel links example..... 11-5
port configuration 13-6
port members 11-1
port membership..... 5-7
port numbers 3-8
PVID 11-1
routing 13-6
security 11-1
setting default number (PVID) 7-10
setup 3-8
Spanning-Tree Protocol.....11-2, 11-5
tagging..... 1-2, 3-7, 5-8, 7-25, 11-1 to 11-4
topologies..... 11-3
tutorial .....11-1 to 11-5
VLAN #1 (default) .. 11-1 to 11-3, 15-8, 16-19, 17-6
VRID (virtual router ID) 7-64
VRRP. *See* Virtual Router Redundancy Protocol.

W

watchdog timer..... 10-1, 10-6, 18-3
web hosting.....15-6
web-based management interface.....2-1
access.....7-7
overview.....1-4
web-cache redirection. *See* application redirection
web-cache servers..... 16-16 to 16-18
weights.....15-15
for SLB real servers 7-40, 7-45
setting virtual router priority values 7-68
World Wide Web, client security for browsing....16-6
wport.....7-7
write community string (SNMP option) 7-31

X

Xmodem.....18-5