Cajun™ P550/P220™ Switch Operation Guide Version 4.0

Cajun P550/P220 Switch Operation Guide - Version 4.0

Produced in USA, November 1999

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Preface

This guide explains how to configure and operate the Lucent P550, P550R, P220G, and P220FE Cajun switches. The P220 Cajun switch family contains Layer 2 functionality only, while the P550 contains both Layer 2 and Layer 3 functionality. Therefore, all references to Layer 2 functionality apply to both the P220 Cajun switch family, as well as the P550 Layer 2 switches.

This guide also includes information on downloading new operational code to your switch. For detailed information on the command line interface, refer to *Cajun P550/P220 Command Line Interface Reference Guide***.**

Documentation Feedback

If you have comments about the technical accuracy or general quality of this document please contact us at:

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Please cite the document title, part number, and page reference,
if appropriate.

Online Documentation

Lucent Technologies maintains copies of all technical documentation on the corporate web server. To access online documentation, including HTML and PDF documents, use Netscape Navigator version 4.5 or above or Internet Explorer version 3.x or above and enter the URL:

```
http://pubs.lucentctc.com/
```

Installing Online Documentation and Help Files

Certain resources used by the Web Agent are located off the switch to preserve switch memory. Setting up a help server location for the switch allows the switch to access:

❒ Online documentation

❒ Bitmaps used as part of the interface (logo, wallpaper)

❒ Online help files for the Web Agent

There are two ways to provide this information to the switch:

❒ Install the Lucent HTTP documentation server (available on the Lucent user documentation CD, CajunDocs)

❒ Add the files to an existing web server on your network

Installing the Lucent HTTP Documentation Server

Lucent provides HTTP server software that you can install to provide access to documentation and online help directly from the switch. The server must be running a Win32 compatible operating system (for example, Windows 95, Windows 98, or Windows NT).

To install the server, you must perform one of the following:

❒ Run the **Setup** program from the CajunDocs CD-ROM

❒ Click on the latest released version of the CajunDocs CD from the Lucent Publications web site (http://pubs.lucentctc.com/cdrom/cajundocs.html) and double-click **setup.exe**. This extracts the server and the online help system to the server machine and drive.

Starting the Lucent HTTP Web Server

To run the Lucent HTTP server:

1. Click on your Win32/NT Start Menu.
2. Select the **CajunDocs** program group and select document server from that program group.

The Lucent document server will launch. To access this server from a Web browser you need to set a server location on the switch, as specified in the next section.

Entering the Server Location at the Switch

To set the location of the documentation server:

1. Launch your Web browser and connect to your switch.
2. Enter your **user name** and **password** at the respective prompts and click **Login**.
3. In the **System Configuration** section of the Web Agent window, click **Server Location**. The **Online Help Configuration** dialog box opens.
4. In the **HTTP Server Location** field, enter the **host name** or **IP address** of the HTTP server followed by the server name with a port designation of :2010 (for example, for a host named phantom, enter: http://phantom:2010).

   If you decide to install your online help on a Web server other than the Lucent HTTP server bundled on the CajunDocs CD-ROM, then specify the URL without a port number if your Web server runs on port 80 (for example, http://www.abc-company.com). If your Web server does not run on port 80, you need to add the port number (for example, http://host/path:port).

   Note: The default port number for HTTP is port 80. The default port number for telnet is 126.

Adding the Document Files to an Existing Server

If you decide to install your online help on a Web server other than the Lucent HTTP server bundled on the CajunDocs CD-ROM, transfer the help subdirectory to that Web server and enter the URL for that web server in the Server Location field.

For example, if you transfer the CajunDocs help directory to your company server (http://www.abc-company.com) you would need to:

1. Install the online help and documentation from the CajunDocs CD to a Windows95 or NT node in your network.
2. Transfer the entire help subdirectory located in **C:\CajunDocs** to the root directory of your Web server.
3. Launch your browser and connect to your switch.
4. Enter your **user name** and **password** at the respective prompts and click **Login**.
5. In the **System Configuration** section of the Web Agent window, click **Server Location**. The Online Help Configuration dialog box opens.
6. In the **HTTP Server Location** field, enter the **server location** (for example, http://www.abc-company.com).
7. In the **HELP Directory Location** field, enter the **directory name** of your help files. For example, help.

Note: The default for the help directory is help. You do not need to change this unless you changed the name of your help directory prior to transferring it to your Web server.

Downloading an Updated CajunDocs CD from the Internet

The server and help files are available on the Internet. To download update your CajunDocs CD:

1. Launch a web browser and go to the **CajunDocs Installer** Web page at:

   http://pubs.lucentctc.com/cdrom/cajundocs.html
2. Click the latest version CajunDocs CD-ROM installer to download into the directory you previously created.

For more information on this product, refer to the online documentation that comes on your CajunDocs CD-ROM or refer to http://pubs.lucentctc.com to review the online documentation there.

Conventions

This document uses the following conventions:

Convention	Represents	Examples
`User Input`	User entered text.	To create a new password, type `store password owl`
Boldface Text	Menu command, keyword to be acted upon, or button name.	From the **Interface** pull-down menu, select **Default**. Click **Cancel** to cancel the installation.
`System Output`	Text displayed by the system.	If you attempt the find the physical location of port 30, the system displays `Unit 2 Port 2`

Using Note, Caution, and Warning

Note: Provides additional information about a procedure or topic.

CAUTION: Indicates a condition that may damage hardware or software.

WARNING: Indicates a condition that may cause bodily injury or death.

Audience

This guide is intended for:

❐ Network manager or administrator

❐ Hardware installer

Overview of The Contents

This guide contains the following chapters:

Chapter 1, P550 Cajun Switch Overview — Provides an overview of your P550 switch and theory of operation.

Chapter 2, P220 Cajun Switch Family Overview — Provides an overview of your P220G or P220FE switch and theory of operation.

Chapter 3, Configuring the Cajun Switch — Explains how to perform the initial configuration of your switch, create users, and configure ports.

Chapter 4, Configuring IPX Routing — Explains how to configure IPX routing and interpret IPX statistics.

Chapter 5, Configuring IPX RIP Protocol — Explains how to configure IPX RIP.

Chapter 6, Configuring IPX SAP Protocol — Explains how to configure IPX SAP.

Chapter 7, Configuring IP Routing — Explains how to configure your switch for IP routing and interpret IP routing statistics.

Chapter 8, Configuring RIP Routing — Explains how to configure your switch for RIP routing.

Chapter 9, Configuring the OSPF Protocol — Explains how to configure Open Shortest Path First (OSPF) on your Cajun Switch. In addition, this chapter also provides information on OSPF statistical displays.

Chapter 10, Configuring AppleTalk — Explains how to configure AppleTalk parameters and view AppleTalk statistics.

Chapter 11, Monitoring and Configuring the Forwarding Cache (L3 Only) — Explains how to interpret and monitor forwarding operations that occur in the address cache of the multilayer media modules.

Chapter 12, Using VLANs, Spanning Tree, and Hunt Groups — Provides detailed information on how to optimize bandwidth usage on your network.

Chapter 13, Tuning Your Switch Performance — Shows how to use your switch's buffer management features to optimize traffic throughput through the switch fabric.

Chapter 14, Managing Address Forward Tables — Provides information on how to manage the address forwarding tables in your switch.

Chapter 15, Managing Intelligent Multicasting — Provides information on how to configure and manage intelligent multicast sessions on your switch.

Chapter 16, Monitoring the Cajun Switch — Explains how to use the Web Agent to assess your switch's current operational status.

Chapter 17, Analyzing Network Performance Using RMON and Ethernet Statistics — Provides information on how to interpret the statistics counter values displayed in your switch.

Chapter 18, Downloading New Operational Code to the Switch — Provides information on how to update the operational code on your switch.

Appendix A, FCC Notice — Provides the FCC notice statement.

Appendix B, MIB Groups — Provides information on the supported MIB groups.

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Related Documents

This section provides information on supporting documentation, including:

- ❒ Lucent Documents
- ❒ Reference Documents

Lucent Documents

The following documents provide additional information on Lucent products:

P500 Manager User's Guide, which describes the installation and use of Lucent's Java-based, multiswitch element management system.

Reference Documents

The following documents supply related background information:

- ❒ *Internetworking with TCP/IP Volume I* — 3rd Edition, Douglas E. Comer, ISBN 0-13-216987-8.

❒ *Internet Routing Architectures* — Cisco Press, Bassam Halabi

❒ *Routing in the Internet* — Christian Huitema, ISBN 0-13-132192-7

❒ *Interconnections: Bridges and Routers* — Radia Perlman, ISBN 0-201-56332-0

Terminology

Throughout the book, the term Layer 2, often followed by the abbreviation L2, is used to indicate switching capabilities. For example, the name, Layer 2 Supervisor Module, indicates a supervisor module that enables switching.

The terms, Multilayer and Layer 3, often followed by the abbreviation L3, refer to the combined ability to switch and route. For example, the name, Multilayer Supervisor Module, indicates a supervisor module that provides switching and routing capabilities.

Contacting Lucent Technologies

For information about Lucent Data Networking products and services, please consult the Lucent World Wide Web site at **http://www.lucent.com/dns**.

If you have any questions, please call Technical Support at 1-800-237-0016, press 0 at the prompt, then dial ext. 73300. If you are an international customer, please call Technical Support at 1-813-217-2425.

1

Cajun P550 Switch Overview

Switch Description

The Cajun P550 switch is a family member of Gigabit Ethernet switching products from Lucent Technologies Corporation, and supports:

- More bandwidth
- Elimination of bottlenecks
- Better manageability
- Routing
- Dependable multimedia support

Hardware Overview

The P550's hardware features includes:

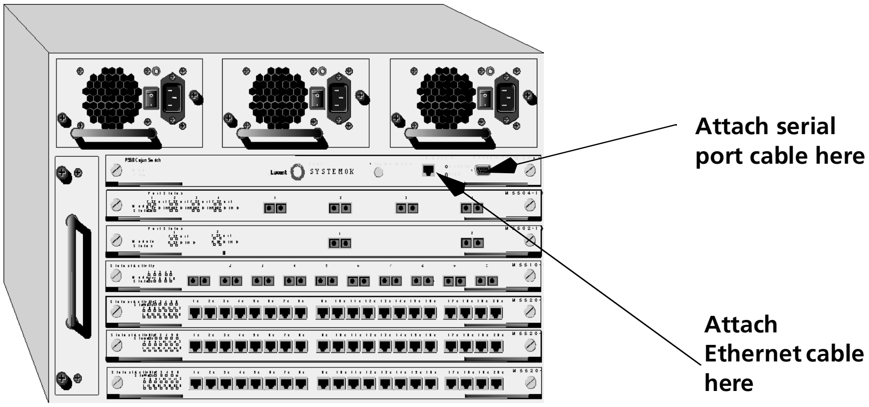
- Chassis
- Modules

Chassis

The switching fabric is non-blocking and provides 22.88 Gbps switching throughput (45.76 Gbps aggregate bandwidth). The chassis features include (Figure 1-1):

- Seven slots (six payload slots)
- Up to 288 10/100Base-TX ports (autosensing)
- Up to 60 100Base-FX ports
- Up to 24 gigabit-speed Ethernet ports

Figure 1-1. *Cajun Switch*



Modules

The chassis modules include:

- ❒ Layer 3 Supervisor Module or Layer 2 Supervisor Module
- ❒ Layer 3 and Layer 2 Fast Ethernet Modules
- ❒ Layer 3 and Layer 2 Gigabit-Speed Modules

Layer 2 Supervisor Module

The Supervisor Module features include:

- ❒ PowerPC 860 Reduced Instruction Set Computer (RISC) processor
- ❒ Memory: 4 MB Flash, 16 MB DRAM, 128 KB NVRAM
- ❒ Real-time clock
- ❒ Out-of-band console: 10Base-T & RS-232
- ❒ RMON support
- ❒ Simple Network Management Protocol (SNMP) management agent
- ❒ Dot matrix display

The supervisor module is responsible for address learning, address cache management, and spanning tree management.

Layer 3 Supervisor Module

The Layer 3 supervisor module features include:

- PowerPC 750 (RISC) processor
- Memory: 4 MB Flash, 64 MB DRAM, 128 KB NVRAM, 512 KB cache, with multiple memory configurations:

Table 1-1. *Multiple Memory Configuration*

DIMM/SIMM	Number of Modules	Total Memory
32 MB	1	32 MB
32 MB	2	64 MB
64 MB	1	64 MB (V3.0 or higher)
64 MB	2	128 MB (V3.0 or higher)

- Real-time clock
- Out-of-band console: 10/100Base-T & RS-232
- RMON support
- Simple Network Management Protocol (SNMP) management agent
- Dot matrix display

The supervisor module is responsible for address learning, address cache management, and spanning tree management.

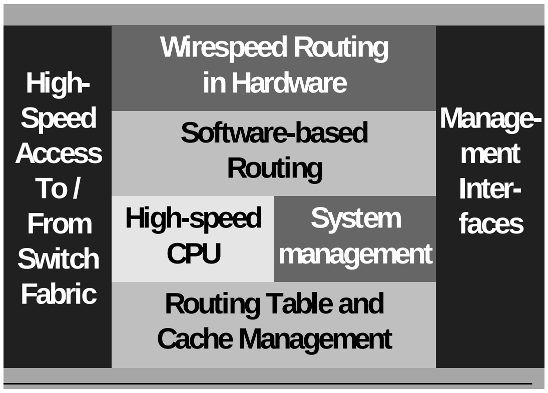
In addition, the Layer 3 supervisor module:

- Implements system management functions and management interfaces.
- Uses standard routing protocols and maintains routing table and caches.
- Provides 1.5 million packets per second of hardware-based routing for packets that arrive on Layer 2-only media modules.
- Supplies software-based routing for packets that are not routed in hardware.
- Supports implementation of AppleTalk, and DECnet, that are not implemented in hardware.

The Layer 3 supervisor module requires a faster CPU and more memory. Also unlike the Layer 2 supervisor, the Layer 3 supervisor is part of the path that some packets take through the system. To accomplish this, the Layer 3 supervisor requires faster data transfer to and from the switching fabric.

Figure 1-2 illustrates a conceptual diagram of the Layer 3 supervisor module's functions.

Figure 1-2. *Layer 3 Supervisor Module Conceptual Operation*


High-Speed Access To / From Switch Fabric
Wirespeed Routing in Hardware
Software-based Routing
High-speed CPU
System management
Routing Table and Cache Management
Manage-ment Inter-faces

Multilayer Supervisor Conceptual Diagram

Media Modules

All Layer 2 and Layer 3 media modules have full non-blocking performance.

Bridging and routing are performed on the input side of each media module.

Each media module features:

- **IEEE 802.3z full-duplex flow control -** This allows the switch ports to send a pause command before input buffers overflow. Half-duplex ports support active backpressure (jamming).
- **VLAN trunking or non-tagged access modes -** This allows the switch ports to interoperate with popular tagged trunking schemes used by large networking vendors.
- **Priority Queuing and Class of Service -** These features allow you to prioritize traffic between particular stations or sets of stations to support jitter-sensitive applications. Supported class of service types: 3Com PACE CoS, IEEE 802.1p CoS.

Layer 3 and Layer 2 Fast Ethernet Modules

The Layer 2 (L2) and Layer 3 (L3) Fast Ethernet modules include:

- 20-Port 10/100Base-TX Ethernet Module (L2 support), with 20 RJ-45 Ports - 10/100, HDX/FDX
- 10-Port 100Base-FX Ethernet Module (L2 support), with 10 Fast Ethernet Ports - Fiber, 1300 nM, HDX/FDX

- ❐ 12-Port 10/100Base-TX Ethernet Module (L2/L3 support), with 12 RJ-45 Ports - 10/100, HDX/FDX
- ❐ 10-Port 100Base-FX Ethernet Module (L2/L3 support), with 10 Fast Ethernet Ports - Fiber, 1300 nM, HDX/FDX
- ❐ 48-Port 10/100Base-TX Ethernet Module (L3 support), with 48 RJ-71 Ports - 10/100, HDX/FDX

Layer 3 and Layer 2 Gigabit-Speed Modules

The Layer 2 (L2) and Layer 3 (L3) Gigabit Ethernet modules include:

- ❐ 2-Port, Full-Duplex 1000Base-SX module (L2 support) 850 nM optics
- ❐ 2-Port, Full-Duplex 1000Base-LX module (L2 support) 1300 nM optics
- ❐ 2-Port, Full-Duplex 1000Base-SLX module (L2 support) 10 Km with 1300nM optics
- ❐ 4-Port, Full-Duplex 1000Base-SX-F module (L2 support) 850 nM optics
- ❐ 2-Port, Full-Duplex 1000Base-SX-F module (L2/L3 support) 850 nM optics
- ❐ 2-Port, Full-Duplex 1000Base-LX-F module (L2/L3 support) 1300 nM optics

Cajun P550 Switch Features

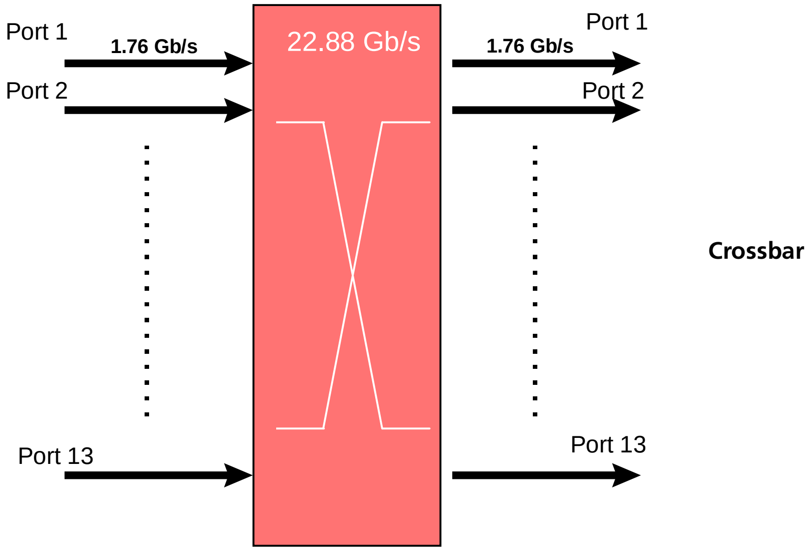
The section includes:

- ❐ Crossbar Switch Fabric
- ❐ Cajun Routing Overview
- ❐ Virtual Bridging Functions
- ❐ VLAN Functions
- ❐ Hunt Groups
- ❐ OpenTrunk Technology
- ❐ Dual Layer Spanning Trees
- ❐ Buffer and Queue Management

Crossbar Switch Fabric

The crossbar switch matrix provides low latency, high throughput packet switching using a crossbar architecture (Figure 1-3).

Figure 1-3. *Crossbar Architecture*



Crossbars are more scalable than shared memory architectures. Architecturally, you can add more capacity simply by adding more switch elements. By comparison, shared memory switches have an inherent maximum upper boundary in throughput that makes high-density, single-backplane gigabit switches impractical. With a crossbar architecture you increase the number of gigabit ports in your network and the architecture scales to meet your needs.

The crossbar supports:

- ❒ 13 fabric ports (two per I/O module slot, plus one for the Supervisor Module).
- ❒ 1.76 Gbps (in and out) on each fabric port.
- ❒ 22.88 Gbps total capacity, 45.76 Gbps total backplane capacity.
- ❒ Under-subscribed switching fabric in most configurations (two connections per I/O module slot, plus one for the supervisor module).
- ❒ Single copy replication - When possible, input frames destined for output multiple switch ports pass through the crossbar only once and are copied by the crossbar to each destination.
- ❒ Hardware-assisted multicast pruning - The switch only forwards to appropriate destination switch ports.

Cajun Routing Overview

The Cajun switch is an IP and IPX router with virtual interfaces. Virtual interfaces are mapped to physical ports or VLANs. Layer 3 IP traffic is routed between the virtual interfaces.

Ports become members of VLANs by assignment or by rules. Multiple VLANs can share a single trunk port. In contrast, multiple physical ports can be associated with a single VLAN. In all cases, traffic that arrives and leaves the same VLAN is bridged, not routed.

This section provides additional information that includes:

❒ Compatibility with the Layer 2 Switch

❒ Routing with Layer 2 and Layer 3 Modules

Compatibility with the Layer 2 Switch

The switch is completely backwards compatible with all of the Layer 2 media modules currently supported in the Cajun switch. Traffic from the Layer 2 media module is routed by sending that traffic to the routing engine on the Layer 3 supervisor module. The supervisor module routes all traffic from Layer 2 media modules in software as described in the section, “Routing with Layer 2 and Layer 3 Modules”.

Note: Layer 2 traffic that does not require routing is bridged independently of the Layer 3 traffic based on the MAC address or VLAN information.

Routing with Layer 2 and Layer 3 Modules

When the Cajun switch is configured with a mix of Layer 2 and Layer 3 modules, IP and IPX routing is performed by the Layer 3 media module or the Layer 3 supervisor module using special ASICs present on those modules. These ASICs contain an address cache (forwarding table) that can hold a maximum of 20,000 address cache entries. The entries consist of packet addressing information and next hop information that enable the switch to effectively route the packets to their destination.

The Layer 3 supervisor also maintains a master routing table. The master routing table contains up to 24,000 entries. This routing table enables the supervisor module to keep track of which entries are in each address cache. As a result, each time a change occurs in the master routing table, the Layer 3 supervisor module updates the appropriate address caches. For example, if a unicast route is removed from the master routing table, then all matching entries in forwarding tables are removed as well.

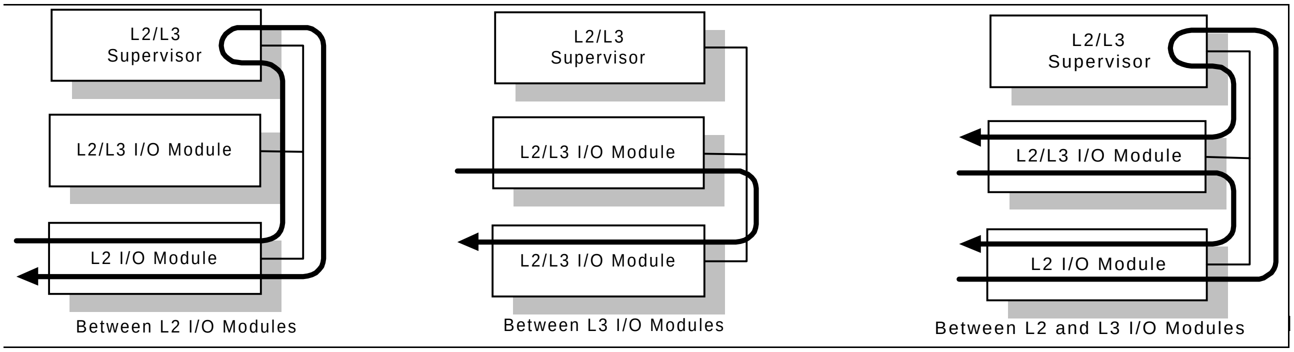
Consequently, when you connect a Cajun switch to the network, it begins to receive frames from the network and builds a master routing table in the supervisor module and forwarding tables in each media module based on those frames.

This process creates three distinct results:

- ❐ All known (learned) traffic from Layer 3 modules that requires routing is routed directly in hardware by the Layer 3 media module without a need to traverse the switching fabric to get to the supervisor module's software routing function.
- ❐ All unknown (not learned) traffic from Layer 3 modules must first be sent to the Layer 3 supervisor module, where information on the frame is added to the supervisor module's master routing table and added to the appropriate address caches of Layer 3 media modules.
- ❐ Since Layer 2 modules have no routing capability, packets that are received by a Layer 2 module and require routing are routed by sending the packet to the Layer 3 supervisor module. The routing engine on the supervisor module then performs the routing operation for the Layer 2 modules and sends the packet back through the switching fabric to the destination port.

Figure 1-4 shows a conceptual example of how traffic is routed in a Cajun switch.

Figure 1-4. *Layer 2/3 Routing with Cajun Switch*



Virtual Bridging Functions

The switch design supports:

- ❐ Up to 24,000 MAC addresses in the switch address forwarding table - This feature allows the switch to store forwarding information for hosts in very large networks.
- ❐ Segmented address tables qualified by address and VLAN membership - This feature allows the same host to appear on different VLANs on different ports.

❒ Optional per-VLAN spanning tree - This isolates loop control to smaller domains, so spanning trees converge faster after a topology change. Otherwise, packets are forwarded to the port's default VLAN.

VLAN Functions

A VLAN (Virtual LAN) is a logical group of hosts on a local area network (LAN) that communicate as if they were on the same wire, even though they are physically on different LAN segments throughout a site.

Virtual LANs provide network managers with two significant capabilities:

❒ The ability to segment traffic in a flat switched network. This helps prevent traffic from being forwarded to stations where it is not needed.

❒ The ability to ignore physical switch locations when creating workgroups. VLANs are logical constructions and can traverse physical switch boundaries.

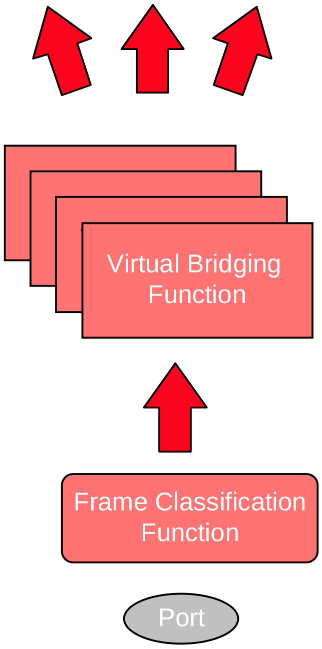
The switch hardware supports Layer 1, Layer 2, and Layer 3 VLANs. The switch-based VLANs have the following characteristics:

❒ Frames classified as they enter the switch using Layer 1 (Port-based).

❒ Explicitly-tagged VLAN packets are forwarded based on the information in the packet.

❒ VLANs define a set of ports in a flooding domain. Packets that need to be flooded are sent only to ports participating in that VLAN (Figure 1-5).

Figure 1-5. *flooding Domain*



Hunt Groups

Hunt groups (also known as link aggregation) aggregate bandwidth from multiple ports so they act as one high-bandwidth switch port. The concept used is borrowed from the world of telephony, where incoming calls to a single phone number are routed to the first available line. Hunt groups allow you to create multi-gigabit pipes to transport traffic through the highest traffic areas of your network.

A hunt group provides:

- ❐ Inter-operation with other vendor's equipment (for example, Cisco's Etherchannel and Sun's Quad Adapter).
- ❐ Shared traffic load.
- ❐ Destination address-based traffic sorting, which keeps packets in the right order.
- ❐ Fault tolerance. If a port in a group fails, the remaining ports in the group pick up the traffic load.
- ❐ Support for any number of same-speed connections in a group.
- ❐ Faster recovery from link failure: If a port in the group fails, the remaining ports can carry the load. Recovery not limited by spanning tree convergence time (convergence time is the time the network takes to resume steady-state forwarding after spanning tree reconfiguration).
- ❐ Up to ten groups per switch.

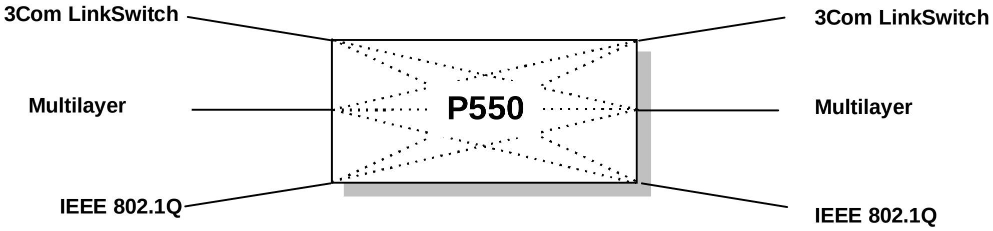
OpenTrunk Technology

OpenTrunk technology translates VLAN-tagged frames from one format to another (including CoS).

The switch is delivered as a plug-and-play IEEE 802.1D standard bridge, but supports several VLAN tagging schemes. This makes the switch highly interoperable in existing networks because:

- ❐ Any port can be a trunk port.
- ❐ Ports have configurable VLAN tagging on a per-port basis.
- ❐ Ports process a number of popular VLAN tagging schemes, including major vendors' proprietary schemes.

Figure 1-6. *Open Trunk Technology*

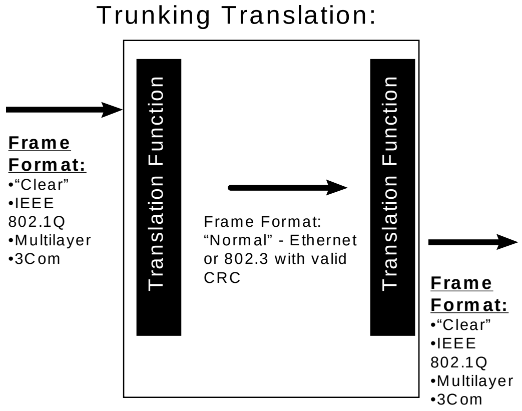


OpenTrunk translates VLAN-tagged frames from one format to another (including CoS)

Open Trunk Technology features include:

- ❐ Switch supports frame encapsulation
  - Identifies frame VLAN via tag
  - Associates frame priority
- ❐ Switch supports multiple tagging formats
  - IEEE 802.1Q standard draft document
  - A major vendor's multi-level tagging scheme
  - 3Com VLAN Tag and PACE priority signalling
- ❐ Switch supports translation to and from any format. A packet can enter the switch with a 3Com SuperStack II VLAN tag and exit the switch as a multi-layer tagged packet.

Figure 1-7. *Trunking Translation*



Spanning Tree Models

Spanning trees are an IEEE 802.1 standard which provides distributed routing over multiple LANs connected by bridges.

There are three spanning tree models:

❒ Single IEEE 802.1D spanning tree

❒ Spanning tree per VLAN

❒ Optimized "per-VLAN" spanning trees using a scalable, two-layer spanning tree approach

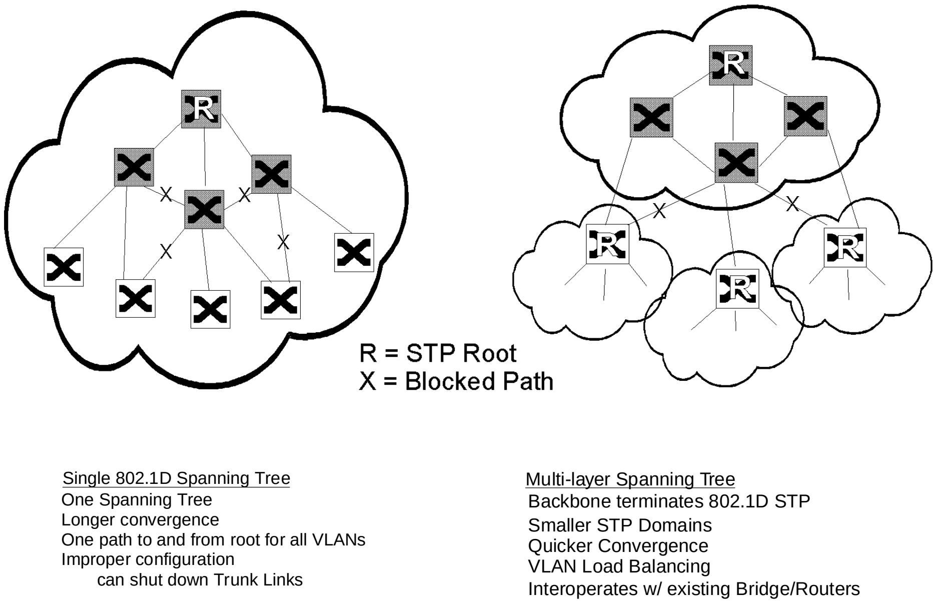
Note: All models interoperate with legacy IEEE 802.1D bridges and switches.

Dual layer spanning trees provide two very important capabilities:

❒ Smaller spanning tree domains means much faster convergence during spanning tree reconfiguration.

❒ Per-VLAN operation enables you to use more of the available bandwidth when you have redundant links. A particular link can be blocked on one VLAN, but still forward packets on another.

Figure 1-8. Spanning Tree



Single 802.1D Spanning Tree
One Spanning Tree
Longer convergence
One path to and from root for all VLANs
Improper configuration
can shut down Trunk Links

Multi-layer Spanning Tree
Backbone terminates 802.1D STP
Smaller STP Domains
Quicker Convergence
VLAN Load Balancing
Interoperates w/ existing Bridge/Routers

Extensive Fault Tolerance

The Cajun P550 switch is designed as a backbone switch. You can install the switch in your network's core without creating a single point of failure.

Extensive fault tolerance features include:

- N+1 power. Power supplies share the power supply load. If a power supply fails, the remaining supply or supplies assume the load automatically and the switch management system warns you of the failure.
- Hot-swappable power supplies, fans, and modules - Each can be changed from the switch front panel, without powering down the switch.
- Redundant switch links (using spanning tree and hunt groups).
- Front-loadable cables, modules, power, supplies and fans.
- Redundant switch matrix and switch controller modules.

Buffer and Queue Management

Adding gigabit speeds to existing networks means that there can be a huge disparity between link speeds. For example, anything more than a 1% load on a gigabit link could easily overwhelm a 10 Mb/s Ethernet link.

Without queue and buffer management, gigabit links might only move congestion in a network, rather than relieving it. The switch employs the following buffer and queue management techniques:

- ❒ Configurable active backpressure:
  - Half-duplex ports use active backpressure to jam input ports when their frame buffers are full.
  - Full-duplex links use IEEE 802.3z pause control frames to pause traffic when buffers are full.
- ❒ Packed frame buffers for optimal memory utilization. The memory management allows virtually 100% utilization of buffer memory.
- ❒ Two Class of Service priority queues that provide flexible queue management algorithms to meet application requirements.
- ❒ Large buffer space:
  - 512 KB per gigabit port.
  - 128 KB additional for outbound 10/100 ports.
- ❒ Configurable queue depth for each of two prioritized packet queues.
- ❒ Configurable priority threshold.

Web-Based Management

Web-based management allows you to manage switches from any station connected to your network.

The switch offers a command line interface and a rich set of web-based management features:

- ❒ Reduced Instruction Set Computing- based (RISC) Supervisor provides high-speed VLAN, RMON, and network management support.
- ❒ Web Agent: Built-in SNMP and HTML-based agent, compatible with popular Web browsers, provides top-to-bottom switch management.

Smart Agent

Smart Agent, the software for the Supervisor Module, has the following features:

- ❒ Built-in support for Simple Network Management Protocol (SNMP) and HTML
- ❒ Out-of-band from 10Base-T or RS-232
- ❒ In-band from a defined VLAN
- ❒ Powerful alarm and event logging subsystem
- ❒ Point and click interface with Netscape Navigator V3.0 or later or Microsoft Internet Explorer V3.0 or later

Cajun P550 Switch Modules

The Layer 2 and Layer 3 supervisor and media modules implement wire speed routing and bridging in Application-Specific Integrated Circuits (ASICs). One set of ASICs supports a gigabit-per-second's worth of traffic (any combination of Layer 2 and Layer 3). The routing and bridging ASICs can process 1.5 million packets per second, which is just slightly more than a gigabit's worth of minimum-sized Ethernet frames.

Note: All Layer 3 modules interoperate with the Layer 2 modules.

2

Overview of the P220 Gigabit Switch Family

The information in this chapter applies to both the P220G and P220FE switches, unless specified otherwise.

Overview

The P220 switch family supports the requirements of the next wave of networking:

- ❒ More bandwidth
- ❒ Elimination of bottlenecks
- ❒ Better manageability
- ❒ Dependable multimedia support

The P220 switch family offers an unrivaled combination of capacity and Class of Service/Quality of Service (CoS/QoS) features. The system satisfies the demanding requirements of the bandwidth-starved campus backbone and high-performance workgroup environments.

The P220G switch has the following features:

- ❒ Seven fixed gigabit-speed Ethernet ports
- ❒ Optional Expander module
  - Four 10/100BaseBase-TX ports (autosensing)
  - Two 100Base-FX ports
  - One 1000Base-SX
  - 1000Base-LX
  - One 1000Base-SLX

The P220FE switch has the following features:

- ❒ 24 10/100Base-TX ports
- ❒ One Gigabit Ethernet port
- ❒ Optional Expansion modules:
  - Four 10/100Base-TX ports (autosensing)
  - Two 100Base-FX ports
  - One 1000Base-SX
  - One 1000Base-LX
  - One 1000Base-SLX

Switch Features

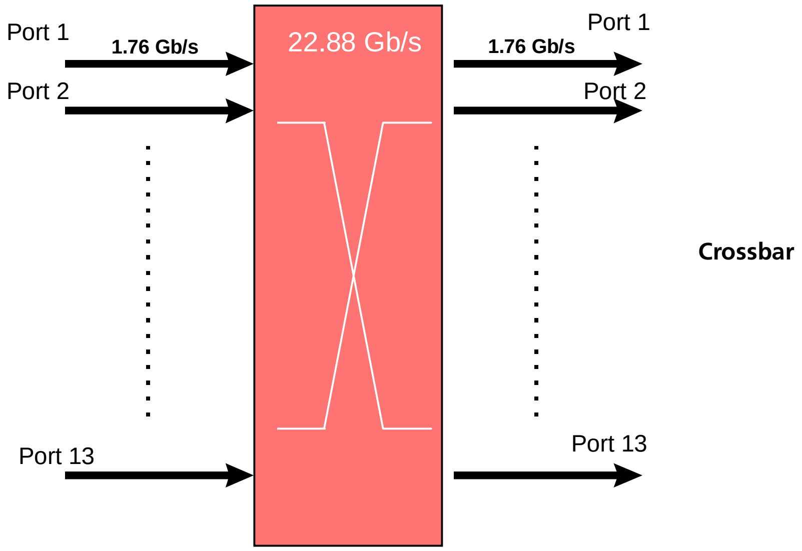
This section describes the following switch features:

- ❒ Crossbar Switch Fabric
- ❒ Virtual Bridging Functions
- ❒ VLAN Functions
- ❒ Hunt Groups
- ❒ OpenTrunk Technology
- ❒ Spanning Tree
- ❒ Buffer and Queue Management
- ❒ Web-Based Management

Crossbar Switch Fabric

The crossbar switch matrix provides low latency, high throughput packet switching using a crossbar architecture (Figure 2-1).

Figure 2-1. *Crossbar Architecture*



Crossbars are more scalable than shared memory architectures. Architecturally, you can add more capacity simply by adding more switch elements. By comparison, shared memory switches have an inherent maximum upper boundary in throughput that makes high-density, single-backplane gigabit switches impractical. With a crossbar architecture you increase the number of gigabit ports in your network and the architecture scales to meet your needs.

The P220G crossbar supports:

- Nine fabric ports running at full line rate.
- 1.76 Gbps (in and out) on each fabric port.
- 31.68 Gbps total capacity.
- Under-subscribed switching fabric.
- Single copy replication. When possible, input frames destined for output on multiple switch ports pass through the crossbar only once and are copied by the crossbar to each destination.
- Hardware-assisted multicast pruning. The switch forwards only to appropriate destination switch ports.

The P220FE crossbar supports:

- Five fabric ports running at full line rate.
- 1.76 Gbps (in and out) on each fabric port.

- ❒ 17.6 Gbps total capacity.
- ❒ Single copy replication. When possible, input frames destined for output on multiple switch ports pass through the crossbar only once and are copied by the crossbar to each destination.
- ❒ Hardware-assisted multicast pruning. The switch forwards only to appropriate destination switch ports.

Virtual Bridging Functions

The switch design supports:

- ❒ Over 24,000 Media Access Control (MAC) addresses in the switch address forwarding table. This feature allows the switch to store forwarding information for hosts in very large networks.
- ❒ Segmented address tables qualified by address and Virtual LAN (VLAN) membership. This feature allows the same host to appear on different VLANs on different ports.
- ❒ Optional per-VLAN spanning tree. This isolates loop control to smaller domains, so spanning trees converge faster during reconfiguration.

VLAN Functions

A VLAN (Virtual LAN) is a software defined group(s) of hosts on a local area network (LAN) that communicate as if they were on the same wire, even though they are physically on different LAN segments throughout a site.

VLANs provide network managers with two significant capabilities:

- ❒ The ability to segment traffic in a “flat” switched network. This helps prevent traffic from being forwarded to stations where it is not needed.
- ❒ The ability to ignore physical switch locations when creating workgroups. VLANs are logical constructions and can traverse physical switch boundaries.

The P220 switch supports Layer 1, port-based VLANs, which have the following characteristics:

- ❒ Frames classified as they enter the switch using Layer 1 (Port-based).
- ❒ Explicitly tagged VLAN packets are forwarded based on the information in the packet. (See OpenTrunk Technology on page 2-5 for more information.)
- ❒ Up to 1000 VLANs. VLANs define a set of ports in a flooding domain. Packets that need to be flooded are sent only to ports participating in that VLAN.

Hunt Groups

Hunt groups (also known as link aggregation) aggregate bandwidth from multiple ports so they act as one high-bandwidth switch port. The concept used is borrowed from the world of telephony, where incoming calls to a single phone number are routed to the first available line. Hunt groups allow you to create multi-gigabit pipes to transport traffic through the highest traffic areas of your network.

A hunt group provides:

- ❒ Shared traffic load.
- ❒ Destination address-based traffic sorting, which keeps packets in the right order.
- ❒ Fault tolerance. If a port in a group fails, the remaining ports in the group pick up the traffic load.
- ❒ Support for any number of same-speed connections in a group.
- ❒ Faster recovery from link failure: If a port in the group fails, the remaining ports can carry the load. Recovery not limited by spanning tree convergence time (convergence time is the time the network takes to resume steady-state forwarding after spanning tree reconfiguration).
- ❒ Up to ten hunt groups per switch.

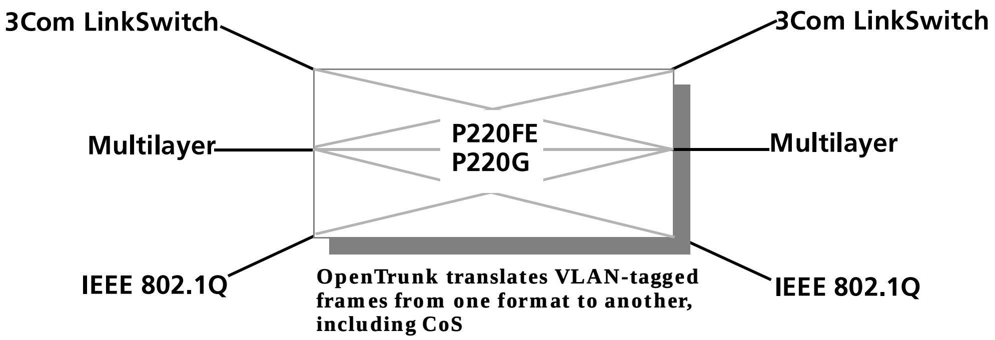
OpenTrunk Technology

OpenTrunk technology translates VLAN-tagged frames from one format to another (including CoS).

The P220 switch is delivered as a plug and play IEEE 802.1D standard bridge, but supports several VLAN tagging schemes. This makes the switch highly interoperable in existing networks because:

- ❒ Any port can be a trunk port.
- ❒ Ports have configurable VLAN tagging on a per-port basis.
- ❒ Ports process a number of popular VLAN tagging schemes, including major vendors’ proprietary schemes (Figure 2-2).

Figure 2-2. *Tagging Schemes*



OpenTrunk technology has the following features:

❒ Switch supports frame encapsulation:

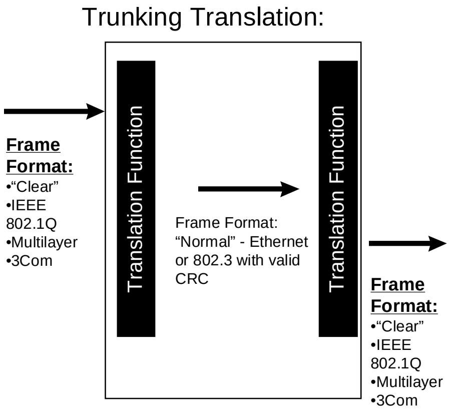
- Identifies frame VLAN via tag
- Associates frame priority

❒ Switch supports multiple tagging formats:

- IEEE pre-standard format based on 802.1Q draft document
- A major vendor's multi-layer tagging scheme
- 3Com® VLAN Tag and PACE priority signalling

❒ Switch supports translation to and from any format. A packet can enter the switch with a 3Com SuperStack II VLAN tag and exit the switch as a multi-layer tagged packet (Figure 2-3).

Figure 2-3. *Trunking Translation*



Dual Layer Spanning Trees

Spanning trees are an IEEE 802.1 standard which provides distributed routing over multiple LANs connected by bridges.

There are three spanning tree models:

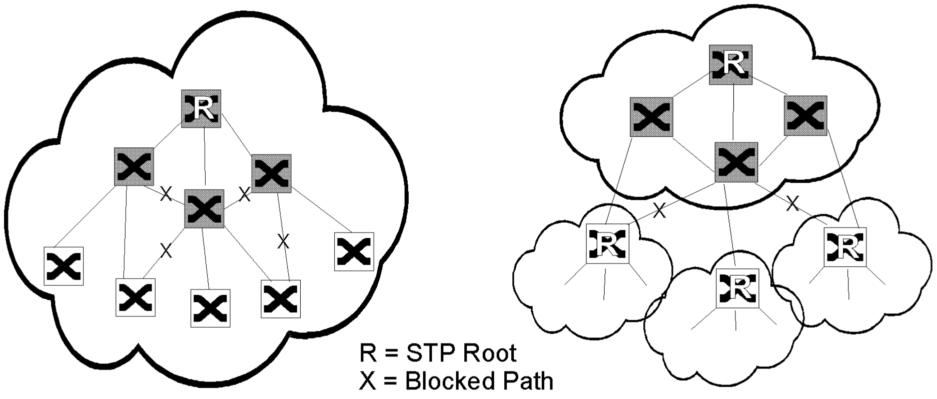
- ❐ Single IEEE 802.1D spanning tree
- ❐ Spanning tree per VLAN
- ❐ Optimized "per-VLAN" spanning trees using a scalable, two-layer spanning tree approach

Note: All models interoperate with legacy IEEE 802.1D bridges and switches.

Dual layer spanning trees provide two very important capabilities:

- ❐ Smaller spanning tree domains means much faster convergence during spanning tree reconfiguration.
- ❐ Per-VLAN operation enables you to use more of the available bandwidth when you have redundant links. A particular link can be blocked on one VLAN, but still forward packets on another.

Figure 2-4. *Spanning Tree*



Single 802.1D Spanning Tree
One Spanning Tree
Longer convergence
One path to and from root for all VLANs
Improper configuration
can shut down Trunk Links

Multi-layer Spanning Tree
Backbone terminates 802.1D STP
Smaller STP Domains
Quicker Convergence
VLAN Load Balancing
Interoperates w/ existing Bridge/Routers

Buffer and Queue Management

Adding gigabit speeds to existing networks means that there can be a huge disparity between link speeds. For example, anything more than a 1% load on a gigabit link could easily overwhelm a 10 Mb/s Ethernet link.

Without queue and buffer management, gigabit links might only move congestion in a network, rather than relieving it. The switch employs the following buffer and queue management techniques:

- Configurable active backpressure:
  - Half-duplex ports use active backpressure to jam input ports when their frame buffers are full.
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- Packed frame buffers for optimal memory utilization. The memory management allows virtually 100% utilization of buffer memory.
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- ❐ Large buffer space:
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- ❐ Configurable queue depth for each of two prioritized packet queues.
- ❐ Configurable priority threshold.

Web-Based Management

Web-based management allows you to manage switches from any station connected to your network.

The switch offers a command line interface to set up connection, and a rich set of web-based management features:

- ❐ Reduced Instruction Set Computing- based (RISC) Supervisor provides high-speed VLAN, RMON, and network management support.
- ❐ Web Agent: Built-in SNMP and HTML-based agent, compatible with popular Web browsers, provides top-to-bottom switch management.

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Smart Agent, the software for the Supervisor Module, has the following features:

- ❐ Built-in support for Simple Network Management Protocol (SNMP) and HTML
- ❐ Out-of-band from 10Base-T or RS-232
- ❐ In-band from a defined VLAN
- ❐ Powerful alarm and event logging subsystem
- ❐ Point and click interface with Netscape Navigator V3.0 or later or Microsoft Internet Explorer V3.0 or later

RMON for Traffic Analysis

RMON (Remote Monitoring) for traffic analysis has the following features:

- ❐ Four groups implemented in hardware
- ❐ Configurable mirror destination per switch fabric port

3

Configuring the Cajun P550 Switch (Layer 2 & Layer 3)

This chapter and its procedures are common to both Layer 2 and Layer 3 configuration.

Included in this chapter:

- ❒ Terminal Settings
- ❒ Configuring the Supervisor Module Using the CLI
- ❒ Configuring the Switch Using the Web Agent
- ❒ Configuring Port Parameters Using the Web Agent
- ❒ Configuring System Information
- ❒ Managing Configuration Files

Terminal Settings

To complete initial switch setup, you need a PC with a serial line connection. It must have the following terminal settings to communicate with the switch (Table 3-1).

Table 3-1. *Terminal Settings*

Baud Rate	Stop Bits	Data Bits	Flow Control	Parity
9,600	1	8	Xon/Xoff	None

Configuring the Supervisor Module Using the CLI

To connect to the Web Agent, you must first use the serial command line interface (CLI) to give the supervisor module an IP address and a subnetwork mask.

To configure the supervisor module using the CLI:

1. Attach a **serial cable** from your PC's serial port to the serial port of the supervisor module front panel (refer to Figure 3-1) using a 9-pin straight-through male-to-female serial cable (refer to "Switch Features," earlier in this guide for pinout information).
2. Run a terminal emulation program (HyperTerminal, for example) on the attached PC. Ensure that the terminal settings match those listed in Table 3-1.
3. Power up the switch by turning on the power supplies. In the terminal emulation program, the switch displays the following startup messages:

```
Booting the operational system, please wait ....

Initializing the file subsystem ... done
Initializing the event subsystem ... done
Initializing the agent subsystem ... done
Initializing the platform ... done
Initializing the switch subsystem ... done


Starting up threads ...
    Periodic Task
    Event
    Network Interface
    Switch Interface
    Telnet Processes
    Ping Process
    Module Manager
    Address Table Aging
    Multicast Pruning
    Front Panel Display
    Download
    Fans Poller
    Power Supplies Poller
    VTP Snooping
    Redundant Controller/Element Poller Task
    Command Line Parser

Powering up modules
Module 1 Powered
    Waiting for power cycle to complete (The 17 second power cycle option)
    Module 2 Powered

Initializing the module subsystem ... done

System initialization complete.

Configuring system from Startup Config file [/nvram/startup.txt] ... done
Boot process complete - system is now operational.(3.0->4.0 conversion)
Creating Startup Config file [/nvram/startup.txt] ... done

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Lucent Technologies Cajun Switch Agent v4.0.0
Press Ctrl-P for previous command, Ctrl-N for next command,? for help.

Login:
```

Note: Information you enter at the Login and Password prompts is case sensitive.

4. At the **Login** prompt, enter **root**. The password prompt displays.

   ```
   Password:
   ```

5. At the **Password** prompt, enter **root** as the default password. The command line interface prompt displays.

6. Enter the command `enable.`

7. Enter the command `configure.` This changes the command mode to configure mode so that you can use the `setup` command.

8. Enter the command `setup.` This initiates a series of queries. Answer each query as follows:

   a. When prompted to change the super user password, press **Enter** to accept the default answer of **Yes**.

   b. Enter your **old password**. The system then prompts you for a new password. The default password is root.

   c. Enter your **new password**, then re-enter the new password to verify your choice.

   d. Enter the **IP address** for the switch manager's Ethernet console.

   e. Enter the **subnet mask** for the network's IP address.

   f. Enter the **default gateway** for the switch.

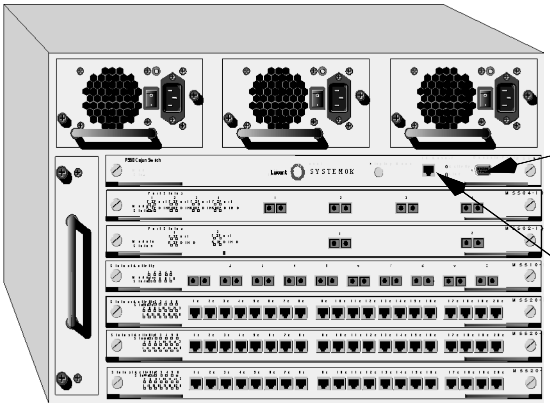
Figure 3-1 illustrates an example setup command session.

Figure 3-1. Layer 2/Layer 3 CLI Setup Command Display

```
Welcome to Switch Setup. The brief series of questions that
follows will help you to configure this switch. After completing
this process, you will be able to manage the switch using:

 - the switch-based HTTP server
 - the Element Management System.

Text in [] is the default answer for each questions. To accept
the default, press ENTER.


Would you like to change the super user password [Yes]? Y

Old Password: xxxx
New Password: xxxx
Re-type New Password: xxxx
User password changed succesfully

What do you want the switch manager's console
Ethernet IP Address to be [0.0.0.0]? 10.0.0.1

What is the subnet mask for your network's
IP address [0.0.0.0]? 255.255.255.0

What is the IP address of the default gateway for this network segment [0.0.0.0]?

You can now connect to the switch using the front-panel
out-of-band 10Base-T connection. This allows you to log in
using either the embedded web agent or the EMS.

See the Installation and Operation guides for instruction on establishing additional IP
network connections.
```

Connect to the system with an out-of-band connection using the 10Base-T port on the supervisor module front panel for Layer 2 or 10/100Base-T port on the supervisor module for Layer 3.

Figure 3-2. Cajun P550 Switch



Attach serial port cable here

Attach Ethernet cable here

Table 3-2. *Pinouts for 10Base-T Crossover Patch Cables*

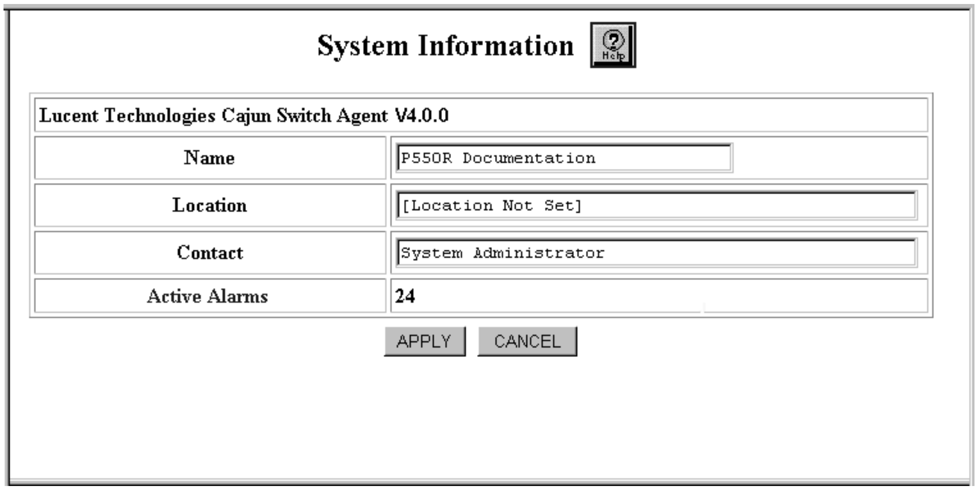
Pin #	Color	Pin #	Color
1	WO	**3**	WG
2	O	**6**	G
3	WG	**1**	WO
4	B	**4**	B
5	WB	**5**	WB
6	G	**2**	O
7	WBr	**7**	WBr
8	Br	**8**	Br

After your switch is connected to the network using an out-of-band connection, log in to the switch using a Web browser, as described in "Logging In to the Web Agent", later in this chapter.

Configuring the Switch Using the Web Agent

The switch includes an embedded HTTP server that allows you to set all the switch's parameters. Use this interface for quick and simple configuration changes. Refer to the *Cajun P550 Manager User Guide* for information on monitoring and configuring the Cajun switch using the Cajun P550 Manager interface.

Figure 3-3. *Cajun P550 Switch Web Agent Application*



System Information

Lucent Technologies Cajun Switch Agent V4.0.0

Name	P550R Documentation
Location	[Location Not Set]
Contact	System Administrator
Active Alarms	24

Logging In to the Web Agent

Although the Web Agent supports any frames-capable browser, the system has been qualified with the following browsers:

❒ Netscape Navigator 4.5 or later

❒ Microsoft Internet Explorer 3.0 or later

To log in to the Web Agent:

1. Start your browser.
2. In the **Location** field, enter the **URL** of the switch you want to manage (for example: http://127.255.255.0). Remember that each interface to the supervisor module (console or inband) has a separate IP address. For Layer 3, this location can be that of any of the router interfaces.
3. Press **Enter**. The login window opens.
4. Click **Login.** The Username/Password dialog box opens.
5. Enter a valid **user name**. The default super user name is **root**.
6. Enter a valid **password**. The default password is **root**. The Web Agent window opens. (Figure 3-3)

   Note: Change the root password for the system as soon as possible to optimize security.

Setting Up User Accounts

User accounts set up in the system allow you to access both the command line interface and the Web Agent.

To add a user to this interface:

1. Log in to the switch from your Web browser, using a user name with administrator privileges. The default login of user **root**, password **root** has this authority. The Web Agent application window opens.
2. In the **System Configuration** section of the Web Agent window, select **User Logins**. The User Account Management dialog box opens.
3. Click **Add User**. The Add User Account dialog box opens.
4. In the **User Name** field, enter a user name for the account.
5. In the **Password** field, enter a password for the account.
6. In the **Re-enter Password** field, re-enter the **same password**.

7. From the **Access Type** pull-down menu, select an access type (Table 3-3).

Table 3-3. *User Account Access Levels*

User Level	Can	Cannot
User (READ_ONLY)	View switch configuration settings and statistics.	View user accounts and community strings. Change switch configurations.
Manager (READ_WRITE)	View and set switch configuration settings, and view statistics.	View user accounts and community strings.
Administrator (ADMINISTRATOR)	View and set all switch parameters.	N/A

8. Click **APPLY** save your changes, or **CANCEL** to restore previous settings.

Configuring Port Parameters Using the Web Agent

The system has two levels of port settings:

- ❐ **Physical port parameters** - Allows you to set up rules that guide the system's physical layer interaction (for example, enable/disable, speed, auto-negotiation).
- ❐ **Switch port parameters** - Allows you to specify how the port participates in switching (for example, VLAN mode, trunking).

The sections that follow explain how to configure these ports.

Configuring Physical Port Parameters on Gigabit Ports

To configure ports on a gigabit module:

1. In the **System Configuration** section of the Web Agent window, select **Modules & Ports**. The Module Information dialog box opens.
2. In the **Ports** column, click the number (2 or 4 for gigabit modules) for the module you want to configure. The Physical Port Configuration dialog box opens.
3. Click **Enable** to enable a port, or if the check box is enabled, click **Enable** if you want to disable the port.
4. Click **APPLY** to save your settings, or **CANCEL** to restore previous settings.
5. In the **Name** field, click the **port name** to set additional parameters. The Detailed Physical Port Configuration dialog box opens.

Refer to Table 3-4 for more information on the Gigabit port parameters.

6. In the **Name** field, enter a **port name**.

7. If this is an end-station port, from the **Category** pull-down menu, select **User Port**. For trunk ports, select **Service Port**.

8. From the **Flow Control Mode** pull-down menu, select **Enable** to use flow control to prevent buffer overflows. Disable this feature only when flow control is causing congestion in other areas of the network.

9. From the **Pace Priority Mode** pull-down menu, select **Enable** to recognize and use 3Com's PACE priority mechanism.

10. From the **Remote Fault Detect** pull-down menu, select **Enable** to detect remote link errors.

Notes:

- The remote fault detection functionality should be enabled (on both ends of a Cajun to Cajun link) in two cases. The first case is when two Cajun gigabit ports are connected that do not support auto-negotiation. The second case is when a Cajun gigabit port that does not support auto-negotiation is connected to a Cajun gigabit port that does support auto-negotiation. If two gigabit ports that support auto-negotiation are connected, you should enable auto-negotiation.

- Auto-negotiation and remote fault detection cannot be enabled concurrently. Auto-negotiation must be disabled in order to enable remote fault detection. When auto-negotiation is enabled, remote fault detection is automatically disabled.

- For GMAC1 gigabit modules, auto-negotiation is always disabled.

11. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings. Table 3-4 describes the gigabit port parameters:

Table 3-4. *Gigabit Port Parameters*

Parameter	Definition
Name	A user-assigned name for this port (possibly a drop name or the name of the station or other device connected to the port).
Category	Allows you to select either User Port or Service Port. The User Port is intended for use with switch connections to end user nodes. The Service Port is intended for use with switch connections to servers or other switches. The primary difference between the User and Service Port designation is that a Service Port allows the switch to generate both log messages and alarm messages (traps). The User Port only generates log messages. This prevents your network management station from being overwhelmed by port up/down messages that result from users turning workstations on and off.

Table 3-4. Gigabit Port Parameters (Continued)

Parameter	Definition
Flow Control Mode	Determines if IEEE 802.3z pause control is used on this port. The pause mechanism allows the port to stop a sending station from sending more packets if the receiving port's buffers are full. This helps prevent lost or dropped packets. This feature is recommended for use primarily on end station connections. Using this feature on trunk ports can cause unnecessary congestion on the network.
Port PACE Priority	Determines if the port detects 3Com's copyrighted PACE format as packets pass through the port. PACE allows a packet's priority (higher priority packets move through the switch faster) to be set at the adapter.
Remote Fault Detect	Proprietary mechanism to detect remote link errors on Cajun gigabit ports. The default value is Disabled. The remote fault detection functionality should be enabled (on both ends of a Cajun to Cajun link) in two cases: • When two Cajun gigabit ports are connected that do not support auto-negotiation. • When a Cajun gigabit port that does not support auto-negotiation is connected to a Cajun gigabit port that does support auto-negotiation.

Configuring Physical Port Parameters on Fast Ethernet Ports

To configure ports on a Fast Ethernet module:

1. In the **System Configuration** section of the Web Agent window, select **Modules & Ports**. The Module Information dialog box opens.
2. In the **Ports** column, click the **number** for the module you want to configure (for example, 12 for 100Base-TX). The Physical Port Configuration dialog box opens.
3. Click the **Enable** check box to enable a port, or if the check box is enabled, click the Enable check box if you want to disable the port.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.
5. In the **Name** field, click the **port name** to set additional parameters. The Detailed Physical Port Configuration dialog box opens.

   Refer to Table 3-5 for more information on the Fast Ethernet (10/100) parameters.
6. In the **Name** field, enter a **port name**.
7. If this is an end-station port, from the **Category** pull-down menu, select **User Port**. For trunk ports, select **Service Port**.

8. From the **Speed Mode** pull-down menu, select a **speed** (10 Mb/s or 100 Mb/s) if you want to set the port speed manually. If you set the port to auto-negotiate, this setting is ignored. (This feature is only available for 10/10 TX).

9. From the **Duplex Mode** pull-down menu, select a **mode** (Half-duplex or Full-duplex) if you want to set the port's duplex mode manually. If you set the port to auto-negotiate, this setting is ignored.

10. From the **Flow Control Mode** pull-down menu, select **Enable** if you want this port to use Flow Control to prevent buffer overflows. Disable this feature only when flow control is causing congestion in other areas of the network.

11. From the **Auto Negotiation Mode** pull-down menu, select **Enable**. (This feature is only available for 10/10 TX).

    Note: This feature works best when the port or device on the other end of the connection auto-negotiates as well. If you are having problems with auto-negotiating connections, try setting the modes manually using the command line interface. For example, `set port auto 7/3 enable`.

12. From the **Auto Negotiation Speed Advertisement** and **Auto Negotiation Duplex Advertisement** pull-down menus, set **Speed** and **Duplex Advertisement**, respectively. The switch sends these values to the device on the other end of the connection at the start of the auto-negotiating process. In general, the defaults are best, but there may be situations when you want to fix one setting, but allow the other setting to auto-negotiate. (This feature is only available for 10/10 TX).

13. From the **Rate Limit Mode** pull-down menu, select **Enable** if you want this port to limit the number of unknown unicast and multicast (flooded) packets it tries to forward.

    a. From the **Rate Limit Rate** pull-down menu, select the **percentage** of a port's traffic that can be unknown unicast and broadcast packets. Lower this value if the port is having overflow problems.

    b. From the **Rate Limit Burst Size** pull-down menu, select a **packet limit** for the number of packets allowed in a single burst. Valid values are 1 to 2048. For Fast Ethernet ports, set this value lower than 1024 (the output buffer's capacity). Set this value lower if the port is experiencing overflow problems.

14. From the **Pace Priority Mode** pull-down menu, select **Enable** if you want this port to recognize and use 3Com's PACE priority mechanism.

15. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Table 3-5 describes the Fast Ethernet port parameters:

Table 3-5. *Fast Ethernet (10/100) Port Parameters*

Parameter	Definition
Name	A user-assigned name for this port (possibly a drop name or the name of the station or other device connected to the port).
Category	Allows you to select either User Port or Service Port. • The User Port is intended for use with switch connections to end user nodes. • The Service Port is intended for use with switch connections to servers or other switches. The Service Port allows the switch to generate both log messages and alarm messages (traps). The User Port only generates log messages, preventing your network management station from being overwhelmed by port up/down messages that result from users turning workstations on and off.
Speed Mode	Allows you to select the speed of the port manually (to either 10 or 100 Mb/s). If auto-negotiation is enabled, this setting is ignored.
Duplex Mode	Allows you set the port duplex mode (half- or full-duplex). If auto-negotiation is enabled, this setting is ignored.
Flow Control Mode	Determines if flow control is used on this port. For half-duplex links, active backpressure jams the sending Ethernet channel until the port's buffers can receive more packets. This prevents lost or dropped packets. For full-duplex links, IEEE 802.3z pause control allows the port to stop a sending station from sending more packets if the receiving port's buffers are full. For TX and FX ports, there is an additional option for Enable with Aggressive Backoff. This option limits the size of the bursts. Flow Control is recommended for use primarily on end-station connections. Using this flow control on trunk ports can cause unnecessary congestion on the network.
Auto Negotiation Mode	Allows you to set the port to auto-negotiate a speed and duplex mode. Auto-negotiate works best when the connection on the other end of the link is set to auto-negotiate as well. If you set a port to auto-negotiate, and the connection is not successful, set the port speed and duplex mode manually.
Auto Negotiation Speed/Duplex Advertisement	Determines what information the port advertises when it starts auto-negotiating. In most cases, 10/100 and Half/Full are the best settings, but there may be cases when you want to auto-negotiate one parameter, while keeping the other fixed.

Table 3-5. Fast Ethernet (10/100) Port Parameters (Continued)

Parameter	Definition
Rate Limit Mode	Prevents the switch from overwhelming the output buffer on lower-speed ports by placing a threshold on the percentage of port traffic that can be flooded packets (unknown unicasts and multicasts). You can optionally include known multicast packets in this percentage to further decrease the possibility of the port's output buffer being overwhelmed.
Rate Limit Rate	Determines the percentage of a port's forwarded traffic that can be unknown unicast and multicast (flooded). Lower this value if the port has overflow problems.
Rate Limit Burst Size	Determines the limit of packets allowed in a single burst. Accepted values are 1 to 2048. For Fast Ethernet ports, set this value lower than 1024 (output buffer capacity). Lower this value if the port has overflow problems.
Port PACE Priority	Determines if the port detects 3Com's proprietary PACE format as packets pass through the port. PACE allows a packet's priority (higher priority packets move through the switch before lower priority packets) to be set at the adapter.

Using the All Ports Configuration Dialog Box

The All Ports Configuration dialog box allows you to apply the same parameter settings to all switch ports for P220 switches and in a module for the P550 using a single command.

To set all ports in a module:

1. In the **System Configuration** section of the Web Agent window, select **Modules & Ports**. The Module Information dialog box opens.
2. In the **Ports** column, click the **number** for the module you want to configure (for example, 10 for 100Base-FX). The Port Configuration dialog box opens.
3. Click **All Module Switch Ports Configuration**. The All Ports Configuration dialog box opens.
4. Set port parameters as described beginning in “Configuring Physical Port Parameters on Gigabit Ports” and/or “Configuring Physical Port Parameters on Fast Ethernet Ports”, earlier in this chapter.
5. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Viewing Switch Port Parameters

To view switch port parameters:

1. In the **System Configuration** section of the Web Agent window, select **Modules & Ports**. The Module Information dialog box opens.
2. In the **Switch Ports** column, click the **number** for switch port information about the desired module. The Switch Ports dialog box opens.
3. Use Table 3-6 for more information on switch port parameters:

Table 3-6. *Switch Port Parameters*

Parameter	Definition
Links	Opens associated dialog boxes.
Port	Displays the port associated with the selected module.
Name	Displays the port name and opens the Switch Port Configuration dialog box for the selected module.
Port VLAN	Displays the port VLAN for the selected module.
VLAN Classification	Displays the port VLAN classification for the selected module.
Trunk Mode	Displays the port's trunk mode for the selected module.
Hunt Group	Displays the hunt group of which the port is a member for the selected module.
STAP Mode	Displays whether the spanning tree algorithm protocol is enabled or disabled for the selected module.
MAC Address	Displays the port's MAC address for the selected module.

4. Click one of the following for more information on switch ports:
   - **Next/Previous Module** - to view the next or previous module's switch port parameters.
   - **Modules** - to return to the Module Information dialog box.
   - **All Module Switch Ports Configuration** - to open the Switch Port Configuration All Ports dialog box and configure all ports for the selected module.

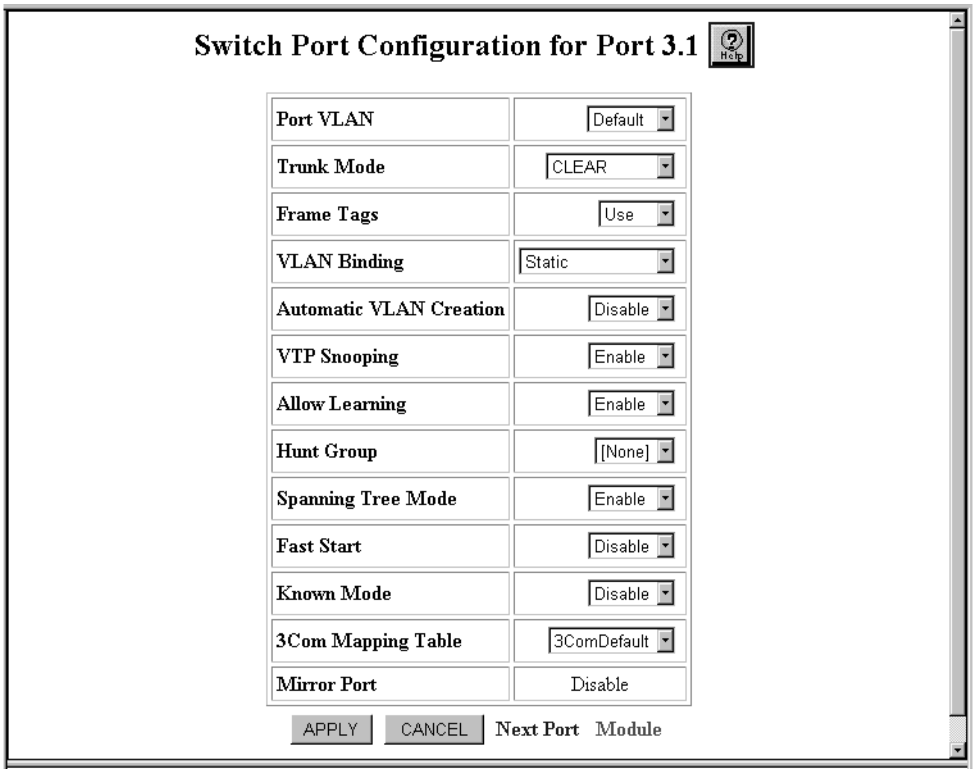
Configuring Switch Port Parameters

Switch port parameters set how each port performs switching functions (for example, VLAN parameters, hunt group assignments, trunk mode, and frame tag scheme). Refer to Table 3-7 for more information on individual switch port configuration parameters.

To configure switch port parameters:

1. In the **System Configuration** section of the Web Agent window, select **Modules & Ports**. The Module Information dialog box opens.
2. From the **Model Number** column, locate the **module** for which you want to configure ports. Click the **Switch Ports** column next to the selected module. The Switch Ports dialog box opens.
3. In the **Name** column, click the name for the port you want to configure. The Switch Port Configuration dialog box opens.

Figure 3-4. Switch Port Configuration Dialog Box



Switch Port Configuration for Port 3.1

Port VLAN	Default
Trunk Mode	CLEAR
Frame Tags	Use
VLAN Binding	Static
Automatic VLAN Creation	Disable
VTP Snooping	Enable
Allow Learning	Enable
Hunt Group	[None]
Spanning Tree Mode	Enable
Fast Start	Disable
Known Mode	Disable
3Com Mapping Table	3ComDefault
Mirror Port	Disable

Refer to “Configuring Port VLAN Parameters” and “Configuring Non-VLAN Switch Port Parameters”, later in this chapter, for your specific configuration needs.

Table 3-7 describes Switch Port configuration parameters:

Table 3-7. Switch Port Configuration Parameters

Parameter	Definition
Port VLAN	Specifies the VLAN assignment for this port.
Trunk Mode	Select the trunk mode.Allows you to define the port as a trunk and allows you to select the appropriate VLAN trunking format if the port is connected to another switch. Refer to Table 3-8 for more information on trunk mode options.
Frame Tags	Select whether to ignore or use received Frame VLAN tags. If you ignore VLAN tags on incoming frames, the frames are bound to the port's default VLAN. The default value is Use.
VLAN Binding	Select the port's outgoing VLAN binding type. Refer to Table 3-9 for more information on VLAN binding options.
Automatic VLAN Creation	Select to enable or disable the ability to automatically create a VLAN each time the port receives a frame from an unknown VLAN. The default value is Disable.
VTP Snooping	Select to enable or disable VTP Snooping on this port. The default value is Disable.
Allow Learning	Select to enable or disable the port's learning of new addresses. The default value is Enable.
Hunt Group	Select a hunt group for which this port will be a member. The default value is None.
Spanning Tree Mode	Select to enable or disable spanning tree protocol on this port. The default value is Enable. **Note:** For the Cajun P220 switch, you will be unable to modify this feature on the CPU switch port.
Fast Start	Select to enable or disable fast start on this port. The default value is Disable. **Note:** For the Cajun P220 switch, you will be unable to modify this feature on the CPU switch port.

Table 3-7. Switch Port Configuration Parameters (Continued)

Parameter	Definition
Known Mode	Select to enable or disable known mode. The default value is Disable.
3Com Mapping Table	Select how incoming tagged frames from 3Com equipment are mapped to Lucent VLANs. The default value is 3ComDefault.
Mirror Port	Displays whether the mirror port is enabled or disabled. This is a Fast Ethernet only option.

Configuring Port VLAN Parameters

Port VLAN parameters determine how a particular port's traffic is flooded to VLANs when tagged and untagged packets are received on the port. See the examples later in this section for recommendations on settings for particular trunk port connections.

Refer to "VLAN Operation", in Chapter 12, for more information on creating VLANs.

Refer to "Viewing Switch Port Parameters", earlier in this chapter, for information on accessing the Switch Port dialog box.

To configure port VLAN parameters:

1. From the **Port VLAN** pull-down menu in the Switch Port Configuration for Port XX dialog box, select a **VLAN** as the VLAN assignment for this port. This causes all untagged frames arriving on this port to be assigned to the specified VLAN. The port will still assign incoming tagged packets to the VLAN indicated by the tag.
2. From the **Trunk Mode** pull-down menu, select the **option (**excluding **Clear)** to indicate that the port is a trunk and to select the appropriate VLAN trunking format if the port is connected to another switch.

   Table 3-8. describes the VLAN Trunking Mode options:

Table 3-8. VLAN Trunking Mode Options

VLAN Mode	Applies the following format to packets entering this port:
Clear	No VLAN tag. This is the default setting.
IEEE-802.1Q	The IEEE 802.1Q Ethernet VLAN tagging scheme.
Multi-layer	A widely available proprietary VLAN tagging scheme.
3Com	3Com's VLAN tagging scheme.

3. From the **Frame Tags** pull-down menu, select whether you want to **Ignore** or **Use** received Frame VLAN tags. If you ignore VLAN tags on incoming frames, the frames are bound to the port's default VLAN.

4. From the **VLAN Binding** pull-down menu, select a **VLAN binding type** for this port.

   Table 3-9 describes the VLAN Binding Options.

Table 3-9. VLAN Binding Options

Option	Definition
Static	Assigns VLAN membership manually, using the VLAN Switch Ports page described in "Creating and Implementing VLANs", in Chapter 12.
Bind to All	Binds this port to all VLANs known to the switch. This is an appropriate mode for switch-to-switch connections. If you use 3Com Mapping Tables, this setting is ignored. **Note:** When a tagged IEEE 802.1Q packet arrives on a port that is sat itot al-19(l)-6 anc th(V)-7LsAN o6(at -25exo6((is)0(at -25on)-18(n-12(th)22(e)25(c)-15wt)21(itc)61(h)-27(,) VL64(AN)-25 f92(o6(rs)07t)-25tthatpno68rs o6(( )-25po68rs)07evt(n-12at)-2 wang nn(w)-9(n)6eVl-13(L-248(AN)25trMa)-7ff(i)-10(c)-14( )25to(th64(e)-7(VL64(AN)-25 otD is T[illegible]

5. From the **Automatic VLAN Creation** pull-down menu, select **Enable** to automatically create a VLAN each time the port receives a frame from an unknown VLAN.

   Note: This feature does not create entries in 3Com Mapping Tables. Refer to "Creating 3Com Mapping Tables", in Chapter 12, for more information on 3Com Mapping Tables.

6. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Configuring VTP Snooping

VTP is a Layer 2 protocol developed by Cisco to maintain VLAN configuration consistency among its switches. this protocol only runs over trunk ports that have enabled either Cisco ISL or IEEE 802.1Q tagging. VTP Snooping allows a Cajun switch to synchronize its VLAN configuration with that of a Cisco switch running VTP in the same network. VLAN additions, deletions, and name changes made on the network's Cisco VTP server will be automatically updated on Cajun switches that have VTP Snooping enabled and have connectivity to the Cisco VTP server. VLAN changes made on a Cajun switch are not automatically updated on any other switch.

Note: VTP Snooping is enabled by default. You would only need to change VTP Snooping port settings if you wanted to disable its ability to learn VLAN changes on the network's Cisco VTP server.

To configure switch port VTP Snooping parameters:

1. In the **System Configuration** section of the Web Agent, click **Modules and Ports**. The Module Information dialog box opens.
2. In the **Switch Ports** column, click on the **Switch Ports link** for the module which you want to enable VTP snooping. The Switch Ports dialog box for that module opens.
3. In the **Name** column, click the **port** on which you want to enable VTP Snooping switch wide. The Switch Port Configuration dialog box opens for that port.
4. From the **Trunk Mode** pull-down menu, select either **IEEE 802.1Q** or **Multi-layer** to match the trunk mode setting of the switch port of the switch port at the other end of the link.
5. From the **VTP Snooping** pull-down menu, select **Enable**. This is disabled by default.
6. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.
7. In the **Switching Parameters** section of the Web Agent window, click **VTP Snooping**. The VTP Snooping Configuration dialog box opens.

8. Use Table 3-10 to configure your switch VTP Snooping parameters.

Table 3-10. *VTP Snooping Parameters*

Parameter	Definition
VTP Snooping State	Select to enable or disable the VTP snooping protocol globally for the switch. The default value is Disabled.
Domain Name	Enter the name associated with the Cisco VTP domain. The default is Null. **Note:** The domain name is automatically learned within approximately five minutes from a Cisco VTP switch provided both the Domain Name is Null and the VTP Snooping State is enabled on the Cajun switch.
Configuration Revision Number	Displays the VTP snooping configuration revision number associated with the last successful VTP configuration update on the Cajun switch.
Updater Identity	Displays the IP address of the Cisco switch that initiated the configuration update.
Update Timestamp	Displays the date and time that the Cisco switch initiated the configuration update.

9. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Configuring Non-VLAN Switch Port Parameters

To configure Non-VLAN switch port parameters:

1. In the **Switch Port Configuration** dialog box, from the **Allow Learning** pull-down menu, select **Disable** to stop the port's learning of new addresses. This feature can be useful for security. Selecting Enable allows the port to learn new addresses.

   For example, you can set this parameter to Disable, then add a static MAC address entry for this port.

2. From the **Hunt Group** pull-down menu, select a **hunt group** for which this port will be a member. Refer to "Using Hunt Groups to Aggregate Bandwidth between Switches", in Chapter 12, for more information on hunt groups.

3. From the **Spanning Tree** pull-down menu, select to **Enable** or **Disable** spanning tree protocol on this port.

4. From the **Fast Start** pull-down menu, select to **Enable** or **Disable**. When enabled, Fast Start mode ports begin forwarding traffic without waiting for the spanning tree negotiation to complete. Fast start eliminates the waiting time of listen and learn states. Ports immediately enter the forward state.

5. From the **Known Mode** pull-down menu, select to **Enable** or **Disable.** Selecting Enable suppresses the packets with unknown unicast destination addresses flooded to this port. For example, if a known end-station or file server is connected to the port, there's no need to flood unknown unicasts to that port. You must manually enter a static MAC address for the station actually attached to the port.

6. From the **3Com Mapping Table** pull-down menu, select an **assignment** to specify how incoming tagged frames from 3Com equipment are mapped to Lucent VLANs. Refer to "Creating 3Com Mapping Tables", in Chapter 12, for more information on 3Com Mapping Tables.

7. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Examples of Switch Ports Settings for Various VLAN Connection Types

Use Table 3-11 through Table 3-13 for recommended switch port settings for each connection type.

Note: Automatic VLAN Creation and VTP Snooping must not be enabled at the same time.

Table 3-11. *Example 1. Trunk to Cisco Catalyst 5000^{TM}*

Parameter	Recommended Setting
Port VLAN	**Default** - causes untagged packets to be assigned to the default VLAN.
Trunk Mode	**Multi-layer** - causes the port to send frames using the multi-layer format.
VLAN Binding	**Bind to All** - binds the port to all VLANs known to the switch.
Automatic VLAN Creation	**Enable (Disable if using VTP Snooping)** - causes the switch to learn new VLAN IDs that arrive at the port, and then bind the port to these VLANs.
VTP Snooping	**Enable** - cause the switch to update its VLANs as they are created, deleted, or changed on the Catalyst.

Table 3-12. Example 2. Trunk to 3Com SuperStack^{TM}

Parameter	Recommended Setting
Port VLAN	**Default** - This parameter is ignored when using 3Com VLANs.
Trunk Mode	**3Com** - Allows the switch to read the incoming VLAN tags.
VLAN Binding	**Static** - This parameter is ignored when using 3Com VLANs.
Automatic VLAN Creation	**Disable** - This parameter is ignored when using 3Com VLANs.

Table 3-13. Example 3. Trunk to Bay Networks System 5000^{TM}

Parameter	Recommended Setting
Port VLAN	**Default** - Causes untagged packets to be assigned to the default VLAN.
Trunk Mode	**IEEE-802.1Q** - Causes the port to send frames using the IEEE-802.1Q format. This assumes that you have configured the Bay Networks switch to use IEEE-802.1Q VLAN tagging as well.
VLAN Binding	**Bind to All** - Binds the port to all VLANs known to the switch.
Automatic VLAN Creation	**Enable** - Causes the switch to learn new VLAN IDs that arrive at the port, and then bind the port to these VLANs.

Configuring Fast Start Mode

Fast Start mode causes ports to begin forwarding traffic without waiting for the spanning tree negotiation to complete.

Examples of situations where you may want to set a port to Fast Start mode are:

- ❒ End-station ports that do not need to participate in the full spanning tree negotiation
- ❒ Loop-free topologies that do not need spanning tree protocol to resolve redundant connections

To enable Fast Start for ports on a module associated with a selected bridge:

1. In the **System Configuration** section of the Web Agent window, click **Modules & Ports**. The Module Information dialog box opens.
2. In the **Switch Ports** column, click on the **switch port number** listed for the selected module. The Switch Ports dialog box opens.

3. To set Fast Start mode on individual ports, in the **Name** column, click the **port name** for the selected module. The Switch Port Configuration dialog box opens.

   Or

   To set Fast Start mode on all ports in a module, click **All Module Switch Port Configuration**. The Switch Port Configuration on All Ports dialog box opens.
4. From the **Fast Start** pull-down menu, select **Enable** to enable Fast Start mode on the selected module ports.
5. Click **APPLY** to save your changes, or **CANCEL** to clear your selection.

Using the All Ports Configuration Dialog Box

The All Ports Configuration dialog box allows you to apply the same parameter settings to all switch ports in a module using a single command.

To set all switch ports in a module using a single command:

1. In the **System Configuration** section of the Web Agent window, select **Modules & Ports**. The Module Information dialog box opens.
2. In the **Ports** column, click the **number** of ports listed for the module you want to configure (for example, 10 for 100Base-FX). The Physical Port Configuration dialog box opens.
3. Click **All Module Ports Configuration** at the bottom of the dialog box. The All Ports Configuration dialog box opens.
4. Select the port on which you want your changes to occur.
5. Set port parameters for the selected ports, as described in “Viewing Switch Port Parameters”, earlier in this chapter.
6. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Setting Up SNMP Communities

SNMP communities are the SNMP values that an SNMP manager uses to manage the switch. SNMP Version 2c is supported.

Table 3-14. *SNMP Communities Parameters*

Parameter	Definition
Community String	This string serves as a password that you enter at the network management station. It provides the level of access to the switch that you specify on this page.
IP Address	Allows you to send SNMP responses only to a station with any or a particular IP address.
Access	Helps provide security when you use SNMP to manage the network from a single workstation. Refer to Table 3-15 for more information on Access options. The default value is Read-Write.
Security Level	Allows you to select the security level for this community string. Refer to Table 3-16 for more information on security level options. The default value is Normal.
Trap Receiver	Allows you to enable or disable the transmission of traps to the selected IP address. The default value is Disable.

To set SNMP communities:

1. In the **System Configuration** section of the Web Agent window, select **SNMP Administration**. The SNMP Community Management dialog box opens.
2. Click **CREATE**. The Create SNMP Community dialog box opens.
3. In the **Community String** field, enter a **community name**.
4. From the **IP Address** pull-down menu, select **Any** for any IP address or **Specific** and enter an **IP Address** in the appropriate fields.

5. From the **Access** pull-down menu, select a **level** for this community (Table 3-15).

Table 3-15. *Access Levels*

Access Level	Manager Can...	Manager Cannot...
Read-Only	View switch configuration settings and statistics.	View community strings. Change switch configurations.
Read-Write	View and set switch configuration settings, and view statistics.	View community strings.
Read-Write with Security Level Set to admin	View and set all switch parameters, including community table.	N/A
None	Do nothing. This selection allows you to disable a string without deleting it.	Access any switch features.

6. From the **Security Level** pull-down menu, select a **security level** for this community string (Table 3-16).

Table 3-16. *SNMP Security Levels*

Option	Allows Access to...
normal	All switch configuration and reporting functions.
admin	All switch configuration and reporting functions, including access to community configuration.

7. From the **Trap Receiver** pull-down menu, select **Enable**.

8. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Changing the Console Serial Port Settings

You can use the Web Agent to change the communications settings for the serial port connection on the front panel of the Layer 3 supervisor module.

Initially, the switch’s console port is configured as a TTY Console to support a TTY connection. The Layer 2 and Layer 3 supervisor modules allow you to reconfigure the console serial port as a PPP Console to support a dial-in PPP connection using a modem.

Note: As a PPP console, you can change only the switch’s baud rate and flow control parameters. The flow control parameters are limited to None or Xon/Xoff.

Configuring the Serial Console Port as a TTY Console

To configure the console serial port as a TTY Console:

1. In the **System Configuration** section of the Web Agent window, select **Console Configuration**. The Console Configuration dialog box opens.
2. Click **TTY** for your console type and click **SELECT**. The Console Port Configuration dialog box opens.
3. Use Table 3-17 to set your console serial port settings:

Table 3-17. *Console Serial Port Options*

Option	Default	Available Settings
Baud Rate	9600	300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
Flow Control	Xon/Xoff (TTY)	None, Xon/Xoff (TTY)
Data Bits	8	7 or 8
Parity	None	Odd, Even, or None
Stop Bits	1	1 or 2

4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Connecting a Modem

In order to use the serial console port as a PPP console, you must connect a modem to the switch. When you use the specified serial cable and connectors, the switch will convert the normal DCE interface to a DTE interface that is used by modems.

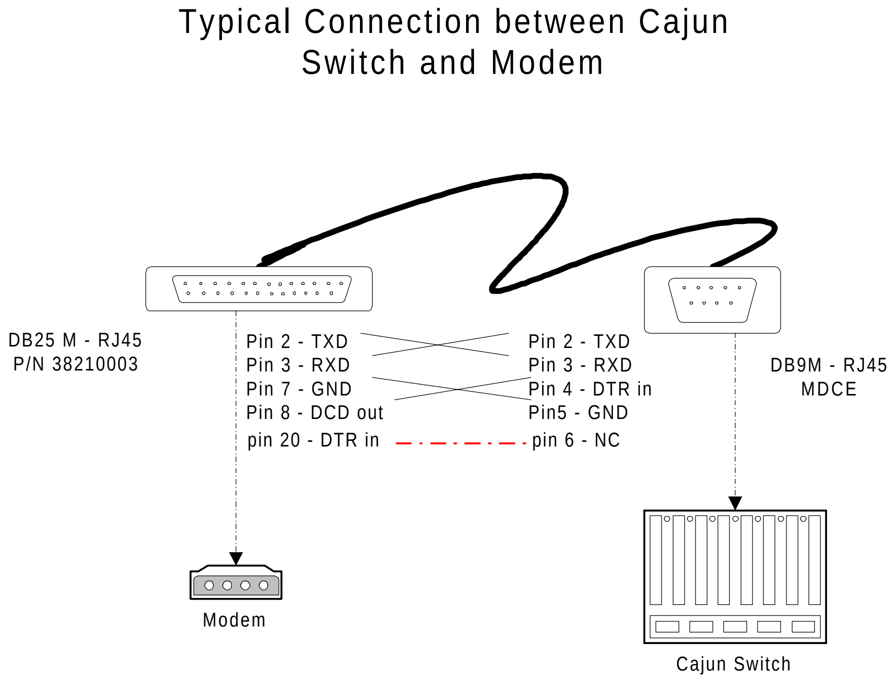
When the switch is configured for PPP mode, it will periodically send the modem config string from the serial console port. This will synchronize the baud rates between the modem and the console port and configure the modem to operate with the switch's DTE interface.

The switch does not use any output signals except for TXD. It uses the DTR (converted to DSR by the specified cable and connectors) input connected to the modem DCD output, to detect that the modem is connected. It supports XON/XOFF flow control (or none).

To connect a modem:

1. Attach a DB25M-RJ45 (P/N 38210003)connector to the modem.
2. Attach the DB9M-RJ45 MDCE connector to the switch's serial console port on the front panel of the switch.

Figure 3-5. *Typical Connection Between the Switch and a Modem*



Configuring the Serial Console Port as a PPP Console

You can reconfigure the console serial port as a PPP Console to support a dial-in PPP connection using a modem.

Note: The lack of an IP address for the PPP serial interface causes the switch to immediately return to sending the modem configuration string. Typing TTY will re-access the CLI login prompt.

To configure the console serial port as a PPP console:

1. In the **System Configuration** section of the Web Agent window, select **Console Configuration**. The Console Configuration dialog box opens.
2. Click **PPP** for your console type and click **Select**. The Console Port Configuration dialog box opens.
3. Use Table 3-17 to change your console port settings.

   Note: The only parameters you can change as a PPP console is baud rate and flow control. The flow control settings are limited to None or Xon/Xoff.

4. In the **Modem Init Cmd** field, enter your **modem initialization command**. The default modem configuration string is **AT&D0S0=1**.

Table 3-18. Modem Configuration String Parameters

Parameter	Definition
&D0	Disable DTR
S0=1	Auto-answer mode (one ring)
CD follows carrier	Depends on modem
E0	Disable local echo
Software Flow Control (Receive and Transmit)	Depends on modem

5. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Note: If you misconfigure your PPP serial console port, you can regain CLI access to correct the configuration parameters. For more information, refer to "Regaining Configuration Access to the PPP Serial Port Console".

Safety Tip: To successfully dial-in with PPP to the switch, you must also configure an IP address and interface for the PPP Serial Interface (Serial-Console). Refer to "Configuring the IP Interface for the PPP Console", later in this chapter for more information.

Regaining Configuration Access to the PPP Serial Port Console

If the PPP serial port console is configured incorrectly, the command line interface (CLI) becomes temporarily unavailable for reconfiguration.

To regain access to the CLI when the console port is in PPP mode:

1. In the console window, enter **TTY**. The CLI login prompt displays. It may be necessary to press **Enter** several times to see the login prompt. You may see the modem init command string.
2. At the **Login** prompt, enter your **user name**. The password prompt displays.
3. At the **Password** prompt, enter your **password**. The Cajun CLI prompt displays.
4. Enter the PPP configuration commands necessary to start PPP. Refer to "Configuring the Serial Console Port as a PPP Console", earlier in this chapter, and "Creating an IP Interface", in Chapter 7, for more information on PPP configuration commands.

5. After you complete your configuration settings, enter **exit** at the CLI prompt to reinvoke the modem control software and exit CLI mode.

   Note: You do not need to exit from CLI if the serial port console has been configured as a TTY console, or if you do not intend to re-attempt connecting using PPP.

Configuring Dial-Up Networking

To configure your PC for dial-up networking with a PPP serial port console:

1. From **My Computer**, double-click **Dial-Up Networking**. The Dial-Up Networking dialog box opens.

   Note: You must have dial-up networking installed on your PC.

2. Double-click **Make New Connection** to configure your modem. The Make New Connection wizard opens.
3. In the **Type a name for the computer you are dialing** field, enter a **connection name** for the computer you are dialing.
4. From the **Select a Modem** pull-down menu, select your **modem** and click **Configure**. The Modem Properties dialog box opens.
5. Click the **Connection** tab. The Connection tab opens.
6. In **Connection preferences**, select the following:
   - From the **Data bits** pull-down menu, select **8**.
   - From the **Parity** pull-down menu, select **None**.
   - From the **Stop bits** pull-down menu, select **1**.
7. Click Advanced. The Advanced Connection Settings dialog box opens.
8. In **Use flow control**, click **Software** (XON/XOFF).
9. Click **OK** to close the dialog box. The Modem Properties dialog box re-opens.
10. Click the **Options** tab. The Option tab opens.
11. In **Connection control**, click **Bring up terminal window after dialing** and click **OK**. The Modem Properties dialog box closes and the wizard continues.
12. In the wizard dialog box, click **Next** and enter the **telephone number** you are calling.
13. Click **Next**. The wizard reports that you have successfully configured a modem.

14. Click **Finish**. The wizard closes and the newly configured connection displays in your Dial-Up networking program group.

15. Right-mouse click on your new connection and select **Properties**. The Properties dialog box opens.

16. Click the **Server Types** tab and **de-select** all advanced options except TCP/IP.

17. Click **TCP/IP Settings**. The TCP/IP settings dialog box opens.

18. Click **Specify an IP Address** and enter the **IP address** of the serial port interface.

19. Click **Server assigned name server addresses**.

20. De-select **Use IP header compression** and **Use default gateway on remote network**.

21. Click **OK** to close the TCP/IP dialog box.

22. Click **OK** to close the new connections properties dialog box.

Using Dial-Up Networking with a PPP Serial Port Console

To use TCP/IP applications (Telnet, HTTP, and SNMP) over your PPP serial port interface:

1. From **My Computer**, double-click **Dial-Up Networking**. The Dial-Up Networking program group opens.
2. Double-click on the **PPP modem** previously created. The Connect To dialog box opens.
3. Enter your **password** and click **Connect**. A Pre-Dial Terminal Screen opens.

   When the modem has successfully connected, a Post-Dial Terminal Screen opens.
4. In the **Post-Dial Terminal screen**, **login** using your **CLI user name** and **password**. It may be necessary to enter several carriage returns to view the Login prompt.
5. At the CLI prompt, go to configuration mode and enter **`set console transfer`** **PPP**. ASCII characters display below the CLI prompt. This is typical while the switch attempts to connect via PPP.
6. In the **Post-Dial Terminal screen**, click **Continue (F7)**. PPP verification completes and the Connected To dialog box displays a message that the modem connection has been successfully established.

Configuring the IP Interface for the PPP Console

To configure the PPP console with an IP address and mask:

1. Configure your console serial port as a PPP Console. See “Connecting a Modem”, earlier in this chapter.
2. Connect your modem cable to the Cajun’s serial port.
3. From the **IP Configuration** section of the Web Agent, click **Interfaces**. The IP Interfaces dialog box opens.
4. Click **CREATE**. The Add IP Interface dialog box opens.
5. From the **VLAN** pull-down menu, select **Serial-Console**. This specifies the interface for the PPP console.
6. In the **Network Address** field, enter the **IP address** to be associated with the PPP console port.

   Note: If you do not enter a name for this interface, the IP address is used as the interface name.

7. In the **Mask** field, enter the **network mask IP address** (for example, 255.255.255.0).
8. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Configuring a Static Route for the PPP Console

To configure a PPP Console static route:

1. Configure your console serial port as a PPP Console. Refer to “Connecting a Modem”, earlier in this chapter.
2. From the **IP Configuration** section of the Web Agent window, click **Static Routes**. The IP Static Routes dialog box opens.
3. Click **CREATE**. The Add IP Static Routes dialog box opens. This allows you to define a static route for the PPP console.
4. In the **Network Address** field, enter the **IP address** to be associated with the PPP console port.
5. In the **Mask** field, enter the **network mask IP address**.
6. In the **Next-Hop Address** field, enter the **IP address** of the gateway associated with this static route.
7. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Hardware Requirements for Routing

To configure your switch as an IP/IPX router, you must first configure your Cajun switch with the following hardware:

- ❒ Layer 3 supervisor module (mandatory)
- ❒ Layer 3 media modules (optional) including:
  - 2-Port Gigabit Ethernet module
  - 10-Port 100-Base-F module
  - 12-Port 10/100-Base-T module

Configuring IP Routing on the Switch

The Cajun P550 Switch with Integrated Routing combines scalable wire speed IP Layer 3 switching (routing) with 10/100/1000 Ethernet Layer 2 switching (bridging) in a high-capacity chassis-based system. The product emphasizes traditional, standards-compliant IP operation and ample capacity to avoid bottlenecks.

For more detailed information on Cajun P550 Switch routing operations, refer to "Routing with Layer 2 and Layer 3 Modules", in Chapter 1.

Minimum IP Routing Configuration Requirements

The configuration process for the Cajun P550 Switch with integrated routing has the following minimum requirements for using IP routing:

- ❒ IP routing must be globally enabled.
- ❒ At least one routing protocol must be enabled (RIP, OSPF) if communication between routers is necessary.
- ❒ Determine which interfaces need to have IP routing enabled.
- ❒ If you plan to expand your current network, create VLANs (subnets) to address your network configuration.
- ❒ Assign an IP address, subnet mask, routing protocol, and multicast routing protocol to each IP interface you configure.

Routing Configuration Quickstart

This section provides an overview of the LAN router configuration operation. For more information on these configuration steps, see the sections referenced after each step.

To configure the switch as a LAN router:

1. Create a **IP interface** for each subnet. Refer to "Creating and Implementing VLANs", in Chapter 12.
2. Create or assign a **VLAN** to the IP interface. Refer to "Assigning IP Interfaces to the VLAN", in Chapter 7.
3. **Bind ports** to the VLANs assigned to the IP interfaces. Refer to "Viewing Switch Port Parameters", earlier in this chapter.
4. Assign an **IP address** and **subnet mask** to the VLAN. Refer to "Assigning IP Interfaces to the VLAN", in Chapter 7.
5. Specify how the router will communicate with other routers. Refer to "Assigning IP Interfaces to the VLAN", in Chapter 7, to configure OSPF and RIP parameters.

Configuring System Information

The System Information section of the Web Agent allows you to configure general system information and settings, such as:

- ❒ Entering General System Information
- ❒ Enabling SNTP
- ❒ Setting Summer Time Hours
- ❒ Displaying the Power System Statistics
- ❒ Displaying Cooling System Statistics
- ❒ Configuring Redundant Hardware
- ❒ Performing a System Reset
- ❒ Viewing Your Running Configuration
- ❒ Viewing Your Startup Configuration
- ❒ Viewing Your Script Execution Log File
- ❒ Copying Configuration Files
- ❒ Copying Files

Entering General System Information

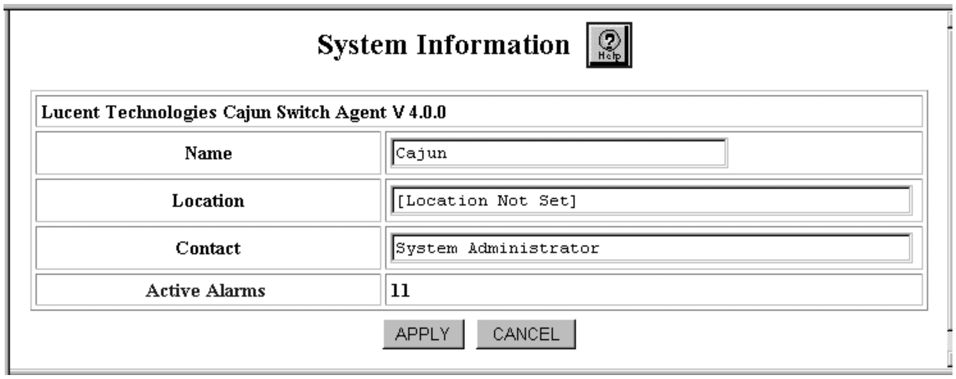
The system allows you to enter general system identification information from the Web Agent. Use these fields to uniquely identify each switch:

- Switch name
- Device location
- Device contact

To change these values:

1. In the **System Information** section of the Web Agent window, click **General**. The System Information dialog box opens (Figure 3-6).

Figure 3-6. General System Information Dialog Box



System Information

Lucent Technologies Cajun Switch Agent V 4.0.0	
Name	Cajun
Location	[Location Not Set]
Contact	System Administrator
Active Alarms	11

2. In the **Name** field, enter a **name** for the switch.
3. In the **Location** field, enter the **location** for the switch (for example, floor and closet location).
4. In the **Contact** field, enter **information** about the person who should be contacted in the event of a problem.
5. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Enabling SNTP

The Simple Network Time Protocol (SNTP) ensures that you can automatically synchronize time on all computers, switches, and other devices connected to your Cajun P550 Switch. By enabling SNTP, you ensure that all devices connected to your switch reflect the same time.

When you enable SNTP, you are required to set your time zone and the rule or dates of Summer Time Hours followed by your location. For information about setting your time zone, refer to "Setting One-Time Summer Time Hours". For information about setting Summer Time Hours, refer to "Setting Summer Time Hours".

To enable SNTP:

1. In the **System Information** section of the Web Agent window, click **System Clock**. The System Clock dialog box opens.
2. In the **Clock Options** section, click **Simple Network Time Protocol (SNTP)**. The SNTP Client Configuration dialog box opens.
3. From the **Enable State** pull-down menu, select **Enable**.
4. In the **Server IP Address** field, enter the **IP address** of the switch for which you enable SNTP.
5. Click **Apply**. SNTP is enabled for the switch.

Setting Summer Time Hours

Summer Time Hours, also referred to as Daylight Savings Time (DST), is the strategy of moving clocks ahead to provide greater amounts of daylight in the afternoon and to standardize time with other parts of the world. In many parts of the world, the Summer Time Hours algorithm is based on a standardized rule. For example, in the Western hemisphere, the rule used by most locations in Canada, Mexico, and the United States is to set clocks forward by one hour at 2:00 a.m. on the first Sunday in April and back an hour at 2:00 a.m. on the first Sunday in October annually. Many countries in Europe and Asia follow similar rules. The offset, or amount of time by which the clock is set forward or backward, varies from country to country.

Many parts of the world follow a one-time change of Summer Time Hours. When you configure the switch for these locations, you reset the clock by specifying a scheduled time and date.

Note: If you upgrade the Cajun P550 or P220 switch from a previous version, your local time settings are saved as Greenwich Mean Time values. Ensure that you change the Summer Time Hours Algorithm before you set the clock.

Setting Recurring Summer Time Hours

To set recurring Summer Time Hours:

1. In the **System Information** section of the Web Agent window, click **System Clock**. The System Clock dialog box opens.

2. In **Clock Options**, click **Summer Time Hours Algorithm**. The Summer Time Hours Configuration box opens.
3. From the **Enable State** pull-down menu, select **Enable**.
4. In the **Offset** cell of the **Value** column, enter the **reset value** for the clock in minutes.

   For example, if you intend to reset the clock forward or backward by one hour, retain the default value of 60 minutes.
5. Click **Recurring**.

Note: The Web Agent enables you to select the boxes next to both Recurring and One-time Summer Time Hours. However, the option to set both Recurring and One-time hours is not provided.

6. Use Table 3-19 for information about configuring Summer Time Hours.

Table 3-19. Recurring Summer Time Hours Configuration

Parameter	Definition
Recurring	Select if Summer Time Hours is defined by a rule such as Daylight Savings Time (DST). All Start and End fields associated with Recurring Summer Time Hours provide the default values for Daylight Savings Time. When you select recurring Summer Time Hours, you indicate the time, in hours and minutes, on a specified day, week, and month that Summer Time Hours begin and end.
Start	Specifies the start of Summer Time Hours.
End	Specifies the end of Summer Time Hours.
Week	Select the week during which you want recurring Summer Time Hours to start or end. The selected week should reflect the day on which Summer Time Hours start. For example, if Summer Time Hours start on the first Sunday in April, select the First week. Options include: • **First -** First week of the month, the default Start value, when Daylight Savings Time starts in the Western hemisphere. • **Second -** Second week of the month. • **Third -** Third week of the month. • **Fourth -** Fourth week of the month. • **Last -** Remaining days of the month that form the last week of the month. Last is specified as the default End value, denoting when Daylight Savings Time ends in the Western hemisphere.

Table 3-19. Recurring Summer Time Hours Configuration

Parameter	Definition
Day	Select the day of the week when you want recurring Summer Time Hours to start or end. Options are based on a seven-day week and include: • **Sunday -** the default Start and End values. In the Western hemisphere, DST starts on the first Sunday in April and ends on the last Sunday in October. • **Monday** • **Tuesday** • **Wednesday** • **Thursday** • **Friday** • **Saturday**
Month	Select the month when recurring Summer Time Hours start or end. The twelve months of the Gregorian calendar are provided. For recurring Summer Time Hours, the default Start value is April, the month during which DST starts in the Western hemisphere. The default End value is October, the month during which DST ends in the Western hemisphere.
Hour	Enter a value to represent the hour when Summer Time Hours start or end for Recurring settings. For Recurring Summer Time Hours, the default value is 02, meaning 2:00 a.m., for both Start and End hours.
Minutes	Enter a value to represent the number of minutes into the hour when Summer Time Hours start or end for Recurring Summer Time Hours. The default value is 00 for both Start and End minutes.

7. To set Summer Time Hours that recur annually, according to a rule:

   a. Select **Recurring**.

   b. Select values for the Week, Day, and Month when Summer Time Hours start and end.

   c. Enter values for the Hour and Minutes when Summer Time Hours start and end.

8. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Setting One-Time Summer Time Hours

To set Summer Time Hours that are not based on a standard rule:

1. In the **System Information** section of the Web Agent window, click **System Clock**. The System Clock dialog box opens.
2. In **Clock Options**, click **Summer Time Hours Algorithm**. The Summer Time Hours Configuration box opens.
3. From the **Enable State** pull-down menu, select **Enable**.
4. In the **Offset** cell of the **Value** column, enter the **reset value** for the clock in minutes.

   For example, if you intend to reset the clock forward or backward by one hour, retain the default value of 60 minutes.
5. Click **One-Time**.

Note: The Web Agent enables you to select the boxes next to both Recurring and One-time Summer Time Hours. However, the option to set both Recurring and One-time hours is not provided.

6. Use Table 3-20 to configure Summer Time Hours on a one-time basis.

Table 3-20. *One-Time Summer Time Hours Configuration*

Parameter	Definition
One-time	Select if Summer Time Hours change one time, such as on a specified date. When you select one-time Summer Time Hours, you indicate the time and date on which Summer Time Hours begin and end.
Start	Specifies the start of Summer Time Hours.
End	Specifies the end of Summer Time Hours.

Table 3-20. *One-Time Summer Time Hours Configuration (Continued)*

Parameter	Definition
Week	Select the week of the month during which you want recurring Summer Time Hours to start or end. Options include: • **First** - First week of the month, the default Start value, when Daylight Savings Time starts in the Western hemisphere. • **Second** - Second week of the month. • **Third** - Third week of the month. • **Fourth** - Fourth week of the month. • **Last** - The final days of a month, such as the 29th, 30th, and 31st days of a month. Last is specified as the default End value, denoting when Daylight Savings Time ends in the Western hemisphere.
Day	Select the day of the week when you want recurring Summer Time Hours to start or end. Options are based on a seven-day week and include: • **Sunday** - The default Start and End values. In the Western hemisphere, DST starts on the first Sunday in April and ends on the last Sunday in October. • **Monday** • **Tuesday** • **Wednesday** • **Thursday** • **Friday** • **Saturday**
Month	Select the month when one-time Summer Time Hours start or end. The twelve months of the Gregorian calendar are provided. For a one-time setting of Summer Time Hours, the default value for start and end months is January.
Hour	Enter a value to represent the hour when Summer Time Hours start or end for One-time settings. The default value is 00.
Minutes	Enter a value to represent the number of minutes into the hour when Summer Time Hours start or end for One-time Summer Time Hours. The default value is 00 for both Start and End minutes.

7. To set Summer Time Hours on a one-time basis:

   a. Select **One-Time**.

b. Set the **date** on which Summer Time Hours start and end by selecting the Month, Day, and Year on which Summer Time Hours start and end.

c. Enter **values** for the Hour and Minutes when Summer Time Hours start and end.

8. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Setting the System Clock

The system clock is used for setting traps, alarms, and other events of the switch. Set SNTP and Summer Time Hours before you set the system clock.

To set the system clock:

1. In the **System Information** section of the Web Agent window, click **System Clock**. The System Clock dialog box opens.
2. In the **Current Time Setting** fields, enter the time using 24-hour time format (for example, 10 p.m. is 22 00 00).
3. From the **Time Zone** pull-down menu, select your **time zone**.
4. In the **Current Date Setting** fields, enter the current **month**, **date**, and **year**.
5. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Note: The system clock does not automatically change with Daylight Savings Time.

Setting the Temperature System

You can set the upper and lower temperature warning systems for your switch's backplane and slot 1.

To configure the temperature warning systems:

1. In the **System Information** section of the Web Agent window, click **Temperature**. The Temperature System dialog box opens.
2. Enter the desired temperature **warnings** for the **switch backplane** and **slot 1 sensors**. For Layer 3 switches, also enter the desired temperature **warning** for the **CPU sensor**.
3. Click on **APPLY** to save your changes, or **Defaults** to restore the temperature defaults.

Note: The supervisor modules shut down the switching modules if the temperature reaches the Shutdown temperature. The modules are restarted if the temperature goes below the Upper Warning Temperature. The default Shutdown temperatures are conservative for the slot 1 sensor (50° C) and backplane sensor (50° C). They can be safely set to 60° C, but settings higher than 60° C are not recommended. You can set the shutdown temperature to a value lower than 50° C to ensure prompt notification if a fan fails.

Displaying the Power System Statistics

To display the power system statistics:

1. In the **System Information** section of the Web Agent window, click **Power System**. The Power System dialog box opens.
2. Use Table 3-21 to review your power system statistics:

Table 3-21. Power System Statistical Parameters

Parameter	Definition
Power Supply	Identifies the power supply.
Status	Identifies whether the power supply is detected.
Type	Describes the type of power supply detected.
Total System Power	Displays the total system power in Watts.
Current Power Available	Displays the current power available.

Note: The power system settings will only display 600W of available power with three power supplies installed. This is because the switch uses a maximum of two power supplies. The third power supply is held in reserve for redundancy in the event one of the other power supplies fails.

Displaying Cooling System Statistics

To display the switch's cooling system status:

1. In the **System Information** section of the Web Agent window, click **Cooling System**. The Cooling System dialog box opens.
2. Ensure that all the individual components are operational by checking the status column for each component.
3. If a component's status is non-operational, power down the switch and contact a service representative to diagnose the failing unit.

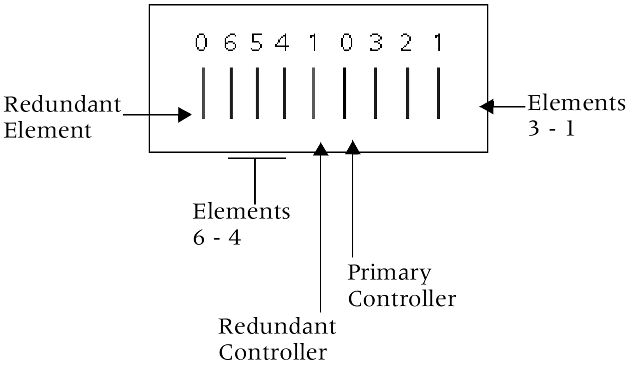
Configuring Redundant Hardware

In both Layer 2 and Layer 3 models, the Cajun P550 switch provides a redundant backplane to ensure that if a controller or an element fails, the switch will continue to route data properly. The redundant components are available as separate options.

When the redundant controller and element are installed, the backplane consists of the following parts:

- ❒ One main controller
- ❒ One redundant controller
- ❒ Six switch elements
- ❒ One redundant element

Figure 3-7. *Layout of Redundant Backplane*



The Cajun P550 switch is equipped with diagnostics to monitor the status of switch controllers and elements. When an element fails, diagnostics run automatically and test the hardware. In the Web Agent, information about a failed controller or element displays in the Switch Fabric Status dialog box.

If the primary controller fails, the redundant controller takes over switch operation until you replace the primary controller. If an element fails, the redundant element takes over the function of the failed element until you replace the element.

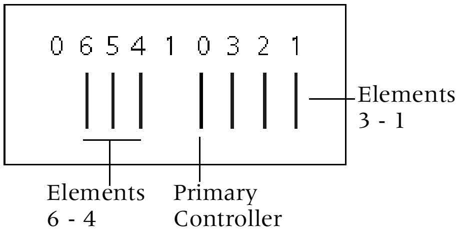
The following sections explain how to:

- ❒ Install Redundant Hardware
- ❒ Replace the Primary Controller
- ❒ Replace an Element

Installing Redundant Hardware

By default, the switch is configured without the redundant controller or element, as shown in Figure 3-8.

***Figure 3-8.** Default Hardware Configuration*



To install the redundant modules and enable module redundancy:

1. Shut down the switch.

WARNING: Before replacing switch controllers or elements, turn off the switch.

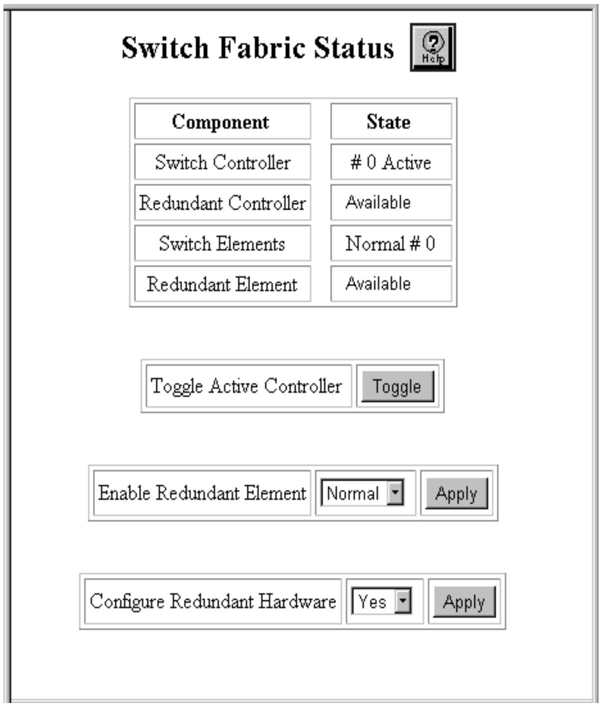
2. Install the redundant controller in the slot to the left of the primary controller. (Slot 1 in Figure 3-8).

Note: Controllers and elements are equipped with keys to ensure that a controller cannot be inserted into an element slot and an element cannot be inserted into a controller slot.

3. Install the redundant element in the slot to the left of the sixth element. (Slot 0 in Figure 3-8).
4. Restart the switch and login.
5. In the **System Information** section of the Web Agent window, click **Switch Fabric**. The Switch Fabric Status dialog box opens.

   If the redundant controller and element installed properly, settings display as in Figure 3-9.

***Figure 3-9.** Properly-Installed Redundant Hardware Settings*



Switch Fabric Status

Component	State
Switch Controller	# 0 Active
Redundant Controller	Available
Switch Elements	Normal # 0
Redundant Element	Available

Toggle Active Controller [Toggle]

Enable Redundant Element [Normal] [Apply]

Configure Redundant Hardware [Yes] [Apply]

6. From the **Configure Redundant Hardware** pull-down menu, select **Yes**.
7. Click **APPLY** to save your changes.

   The redundant hardware is enabled. If the primary controller fails, the redundant controller takes over in its place. If an element fails, the redundant element takes over in its place.

Replacing the Primary Controller

If the primary controller fails, you are notified by a console message and an event log message. In the Web Agent, the **Switch Controller** field displays **# 0 Failed**. If the switch is installed with a redundant controller, the redundant controller automatically takes over the operation of the failed primary controller.

To replace the primary controller:

1. In the **System Information** section of the Web Agent window, click **Switch Fabric**. The Switch Fabric Status dialog box displays.
2. From the **Configure Redundant Hardware** pull-down menu, select **No**.
3. Click **APPLY** to disable the primary controller.

4. Shut down the switch.

WARNING: Before replacing switch controllers or elements, you must turn off the switch.

5. Replace the failed primary controller by inserting it in the slot to the right of the redundant controller and to the left of element three. (See Figure 3-7)
6. Restart the switch and login.
7. In the **System Information** section of the Web Agent, click **Switch Fabric**. The Switch Fabric Status dialog box displays.
8. From the **Configure Redundant Hardware** pull-down menu, select **Yes.**
9. Click **APPLY** to enable the redundant controller.

   The Switch Controller field displays # 1 Active to show that the redundant controller is now enabled.
10. In the **Toggle Active Controller** field, click **Toggle** to restore control to the primary controller.

    The Switch Controller field displays # 0 Active to show that the primary controller is now enabled.

Replacing an Element

If an element fails, you are notified by a console message and an event log message. In the Web Agent, the Switch Elements field displays # Failed <number>, where `<number>` is the number that indicates the failed element.

To configure the redundant element:

1. In the **System Information** section of the Web Agent window, click **Switch Fabric**. The Switch Fabric Status dialog box displays.
2. From the **Configure Redundant Hardware** pull-down menu, select **No**.
3. Click **Apply** to disable the failed element.
4. Shut down the switch.

WARNING: Before replacing switch controllers or elements, you must turn off the switch.

5. Replace the failed element by inserting it into the appropriate slot. (See Figure 3-7.)
6. Restart the switch and **login**.

7. In the **System Information** section of the Web Agent window, click **Switch Fabric**. The Switch Fabric Status dialog box displays.

8. From the **Configure Redundant Hardware** pull-down menu, select **Yes** and click **APPLY** to enable the redundant element.

   The Switch Elements field displays Normal # 0 to show that the redundant element is now enabled.

9. From the **Enable Redundant Element** pull-down menu, select **Normal** and click **APPLY**.

   The Switch Element field displays Normal # 0 to show that the replaced element is now enabled.

Performing a System Reset

To perform a system reset:

1. In the **System Information** section of the Web Agent window, click **System Reset**. The System Reset Page dialog box opens.
2. Click **Save** to save your running configuration to the startup configuration before performing a system reset.

3. Click **Yes** to reset the switch, or **No** to cancel the operation.

Managing Configuration Files

You can manage the system files that contain the configuration data for your Cajun P550 switch. When you first install the switch, or upgrade from a previous installation, your configuration parameters are stored in a *startup.txt* file located in the switch's Non-Volatile Random Access Memory (NVRAM). When the switch is restarted, the startup.txt file runs and stores configuration parameters in volatile RAM as a running configuration.

Changes you make to the switch configuration are automatically recorded in RAM, but not in NVRAM. When you want to retain your current configuration, you must manually save it to NVRAM through the Web Agent or the Command Line Interface (CLI). For information about how to save your running configuration file to your startup configuration, refer to "Copying Running Configuration to Startup Configuration", later in this section. To determine changes you have made to your running configuration, you can view and compare your running and startup configuration files.

Viewing Your Running Configuration

To view your running configuration:

❒ In the **CLI Configuration** section of the Web Agent window, click **Running Configuration**.

Or

❒ In **priv.mode** in the Command Line Interface, enter `show running_config`.

Viewing Your Startup Configuration

To view your startup configuration:

❒ In the **CLI Configuration** section of the Web Agent window, click **Startup Configuration**.

Or

❒ In **priv.mode** in the Command Line Interface, enter `show startup_config`.

Viewing Your Script Execution Log File

Each time the startup.txt file or other script runs, a log file is generated. Log files contain the data that scripts return.

To view your script execution log file:

❒ In the **CLI Configuration** section of the Web Agent window, click **Script Log File**.

The Script Execution Log File dialog box opens showing the contents of the script execution log file.

Or

❒ In **priv.mode** in the Command Line Interface, enter `show file logfile.txt`.

Copying Configuration Files

If you modify your running configuration through the Command Line Interface (CLI) or the Web Agent, and you want your changes to replace your startup configuration, copy your running configuration to your startup configuration. Before you copy a running configuration over your startup configuration, copy your startup configuration to a file on the switch or on a TFTP server using the Web Agent or the Command Line Interface. On the switch, configuration files are automatically saved as text files using the *.txt extension. On a TFTP server, you can edit the startup.txt file using a text editor of your choice and save copies of it with or without a file extension.

Copying Running Configuration to Startup Configuration

To save your running configuration as your startup configuration in NVRAM:

1. In the **CLI Configuration** section of the Web Agent window, click **Config File Management**.
2. Click **Save** to save your running configuration as your startup configuration.

   Or

   In priv.mode in the CLI, enter:

   ```
   copy running-config startup-config
   ```

Copying Files

Using the Configuration File Management dialog box, you can copy files to and from multiple locations. For example, if you modify your running configuration and you want to reinstate your startup configuration parameters, you can copy your startup configuration to your running configuration in volatile RAM. Also, you can upload configuration and other ASCII files from the switch to a TFTP server. Likewise, you can download files by copying files from a TFTP server directory to the switch or to a startup or running configuration file.

To copy files:

1. In the **CLI Configuration** section of the Web Agent, click **Config File Management**. The Configuration File Management dialog box opens.

2. Use Table 3-22 for information about copying a source file to a TFTP server destination:

Table 3-22. Configuration File Management Parameters

Parameter	Description	Options
Save Running-Config to Startup-Config	Saves the running configuration to the startup configuration	N/A
Copy Source	Specifies the source file to be copied	• **Unspecified** - Specifies an initialized value. • **File** - Specifies a source file located on the switch in NVRAM. • **Running-Config** - Specifies a running configuration. • **Startup-Config** - Specifies a startup configuration. • **TFTP Server** - Specifies a source file located in a directory on a TFTP server.
Source Filename	Specifies the path and name of the source file	Source files can be ASCII files in NVRAM available for upload or files located on a TFTP server available for download
Copy Destination	Specifies the destination of the file to be copied	• **Unspecified**- Specifies an initialized value. • **File** - Specifies that a source is copied or downloaded to NVRAM. • **Running-Config** - Specifies that a source is copied to the running configuration. • **Startup-Config** - Specifies that a source is copied to the startup configuration. • **TFTP Server** - Specifies that a source is copied to a TFTP server location.
Destination Filename	Specifies the location of the destination	Configuration files and other files can be copied to NVRAM on the switch or to a TFTP server as a destination location.
TFTP Server IP Address	Specifies the IP address of a source or destination TFTP server	Copy (download) source files, located on a TFTP server, to your running configuration, your startup configuration, or a location on the switch. Or, copy (upload) your configuration files, or a file located on the switch, to a TFTP server.

3. From the **Copy Source** pull-down menu, select one of the following:

   - **Running-Config -** To copy your running configuration to your startup configuration, to a file located on the switch, or to a file located on a TFTP server.
   - **Startup-Config -** To copy your startup configuration to your running configuration, to a file located on the switch, or to a file located on a TFTP server.
   - **File -** To copy a file stored on the switch to your running or startup configuration, to a location on the switch, or to a location on a TFTP server.
   - **TFTP Server -** To copy a file stored on a TFTP server to your running or startup configuration or to a file on the switch.

   If you select **File** or **TFTP Server**, also provide the path and filename of the source file in the **Source Filename** field.

4. From the **Copy Destination** pull-down menu, select one of the following:

   - **Running-Config -** If you are copying your startup configuration, or other file located on the switch or on a TFTP server, to your running configuration.
   - **Startup-Config -** If you are copying your running configuration, or other file located on the switch or on a TFTP server, to your startup configuration.
   - **File -** If you are copying your startup or running configuration, another file located on the switch, or a file located on a TFTP server to a file on the switch.
   - **TFTP Server -** If you are copying your startup or running configuration, or another file located on the switch, to a location on a TFTP server.

   If you select **File** or **TFTP Server**, also provide the path and filename of the destination file in the **Source Destination** field.

5. In **TFTP Server IP Address**, enter the IP address of the source or destination TFTP server, if applicable.

6. Click **Copy**. Your source configuration or file is copied to your specified destination.

Note: The Web Agent returns an `Invalid operation!` error message if you attempt to copy:

- The current running configuration to the running configuration.
- The startup configuration to the same startup configuration.
- The specified TFTP server to a TFTP server.

Viewing the Status of a TFTP Transfer

After you have copied the startup configuration or other files to a TFTP server, you can check the status of the TFTP transfer to ensure that files copied correctly.

To view the status of a TFTP transfer:

1. In the **CLI Configuration** section of the Web Agent, click **Config File Management**. The **Configuration File Management** dialog box opens.
2. In the **Get Status of Most Recent TFTP Copy** field, click **Status**.

4

Configuring IPX Routing (Layer 3)

Overview

This chapter and its procedures are specific to Layer 3 configuration.

Included in this chapter:

- IPX Overview
- Configuring the Cajun Switch as an IPX Router

IPX Overview

The Internetwork Packet Exchange (IPX) protocol is a connectionless protocol that performs datagram delivery and routing in Novell NetWare networks. Each IPX address consists of three parts:

- **Network Number** — A 32-bit (8 characters) number that is normally assigned by the network administrator.
- **Node Number** — A 48-bit (12 characters) number that is normally the MAC layer address of the physical interface.
- **Socket Number** — A number used to route packets to different processes within the same node.

The syntax of the IPX address is:

```
network node socket
```

For example:

```
000000AAh 00e03b124213h 4003h
```

where `000000AAh` is the network number, `00e03b124213h` is the node number, and `4003h` is the socket number associated with a running process on the end node (for example, RIP, NetWare Link State Protocol (NLSP)).

IPX Datagram Structure

The IPX datagram contains an IPX header and any data to be transferred on the network. The IPX header is a 30 byte header that contains 10 fields. Figure 4-1. illustrates a conceptual view of an IPX datagram:

Figure 4-1. *IPX Datagram in Detail*

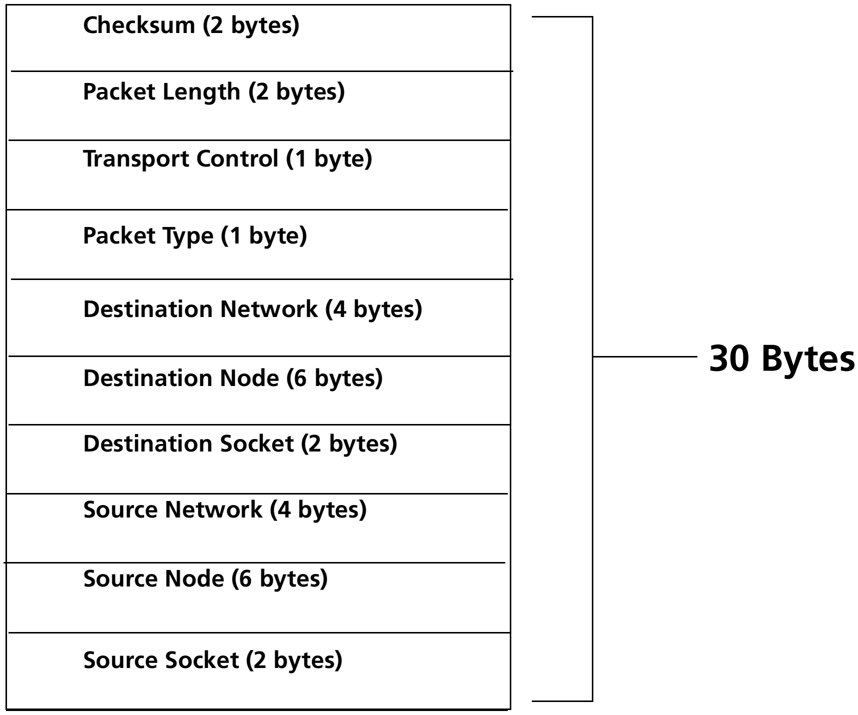


Table 4-1 describes each field in the IPX datagram:

Table 4-1. *IPX Datagram Fields*

Field	Definition
Checksum	Provides integrity checking. **Note:** Checksum is normally *not enabled* in IPX networks and is usually set to 0xFFFF.
Packet Length	Length (in bytes) of the packet.
Transport Control	Number of routers a packet has traversed. This is used to discard a packet if the packet traverses a maximum number of routers (16).

Table 4-1. IPX Datagram Fields (Continued)

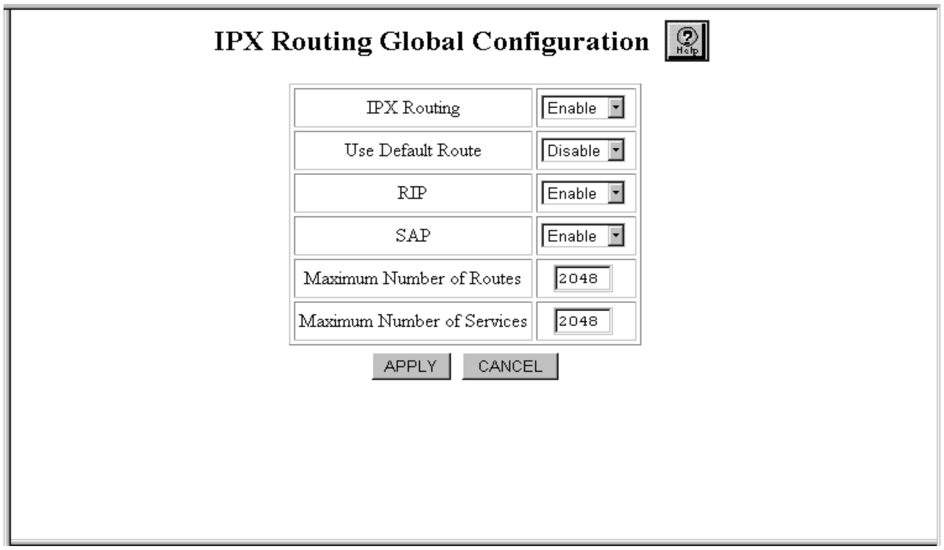
Field	Definition
Packet Type	Indicates the type of service required or offered by the packet. Types include: • **Sequenced Packet Exchange** (SPX packet) • **NetWare Core Protocol** (NCP packet) • **NetBIOS** (propagated packet)
Destination Network	The IPX network address of the destination network.
Destination Node	The MAC address of the destination node.
Destination Socket	Address of the process running in the destination node. Sockets route packets to different processes within the same node.
Source Network	The network address of the source network.
Source Node	The MAC address of the source node.
Source Socket	Address of the process running in the source node.

Configuring the Cajun Switch as an IPX Router

To configure IPX routing globally on your switch:

1. From the **IPX Configuration** section of the Web Agent window, click **Global Configuration**. The IPX Routing Global Configuration dialog box opens.

Figure 4-2. IPX Routing Global Configuration Dialog Box



IPX Routing Global Configuration

IPX Routing	Enable
Use Default Route	Disable
RIP	Enable
SAP	Enable
Maximum Number of Routes	2048
Maximum Number of Services	2048

2. Use Table 4-2 to configure your global setup:

Table 4-2. *IPX Global Parameters*

Parameter	Allows you to...
IPX Routing	Enable or disable IPX routing on a global basis. The default value is Enable.
Use Default Route	Enable or disable the default route, if known. The default value is Disable.
RIP	Enable or disable IPX RIP on a global basis. This affects all IPX interfaces set up to use the IPX RIP routing protocol. The default value is Enable.
SAP	Enable or disable IPX SAP on a global basis. This affects all IPX interfaces set up to use the IPX SAP routing protocol. The default value is Enable.
Maximum Number of Routes	Specify the maximum number of routes that can be added to the routing table. The system rounds up your entry to the nearest power of 2. For example, if you enter 1000, the system rounds this number up to 1024 routes. The default value is 2048.
Maximum Number of Services	Specify the maximum number of services that can be added. The system rounds up your entry to the nearest power of 2. For example, if you enter 1000, the system rounds this number up to 1024 services. The default value is 2048.

3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings and close the dialog box.

Configuring IPX Interfaces

You can create new IPX interfaces and associate up to four interfaces of different encapsulation types to a VLAN. The concept of more than one IPX interface on a VLAN is referred to as multinetting.

To create a new IPX interface:

1. From the **IPX Configuration** section of the Web Agent window, click **Interfaces**. The IPX Interfaces dialog box opens.
2. Click **CREATE**. The Add IPX Interface dialog box opens.
3. From the **VLAN** pull-down menu, select the **VLAN** to which you want to assign an IPX network address.

   Note: If you need to create a new VLAN, refer to “Creating and Implementing VLANs” in Chapter 10.

4. Use Table 4-3 to complete the configuration of your IPX interface:

Table 4-3. IPX Interface Parameters

Parameter	Allows you to...
Select	Select the interface to be configured. **Note:** This parameter is displayed in the IPX Interface dialog box, not in the Add IPX Interface dialog box.
State	Display the current state of the interface. Options include: • **Up** • **Down** **Note:** This parameter is displayed in the IPX Interface dialog box, not in the Add IPX Interface dialog box.
Interface	Enter the name of the IPX interface.
Admin. State	Select the administration state of the interface. Options include: • **Up** • **Down**
VLAN	Select the VLAN that corresponds to the IPX interface.
Network Address	Enter the number of the IPX network you want to assign to the IPX interface. This number is a hexadecimal number.
Node Address	Displays the node address on which the IPX interface resides. **Note:** This parameter is displayed in the IPX Interface dialog box, not in the Add IPX Interface dialog box.
Frame Type	Select the format of the MAC header on the IPX packets sent by the router on the interface. Formats include: • **Ethernet II** (Maximum Transmission Unit (MTU) = 1500) • **Ethernet 802.2** (MTU = 1497) • **Ethernet SNAP** (MTU = 1492) • **Ethernet 802.3** (MTU = 1500)
Ticks	Specify the amount of time (in ticks) that the packet takes to reach the network number you specified. A tick is approximately 1/18th of a second.
RIP	Enable or disable IPX RIP on a selected interface.

Table 4-3. IPX Interface Parameters (Continued)

Parameter	Allows you to...
SAP	Enable or disable IPX SAP on a selected interface.
Type 20 Packet Propagation	Specify whether or not Type 20 packets can be sent, received, disabled, or sent and received on a given interface. Options include: • **Disable** - Type 20 packets are neither sent nor received. • **Inbound** - Type 20 packets are received. • **Outbound** - Type 20 packets are sent. • **Both** - Type 20 packets are sent and received.

5. Click **CREATE** to save your changes or **CANCEL** to restore previous settings.

Creating IPX Static Routes

To create IPX static routes:

1. From the **IPX Configuration** section of the Web Agent window, click **Static Routes**. The IPX Static Routes dialog box opens.
2. Click **CREATE**. The Add IPX Static Route dialog box opens.
3. Use Table 4-4 to complete your configuration:

Table 4-4. IPX Static Route Parameters

Parameter	Allows you to specify the...
Network	Number of the IPX network (in hex) you want to assign to the IPX static route.
Next-Hop Node	MAC address of the next destination to which the packet is routed. Format of the value to enter is **aa:bb:cc:dd:ee:ff**.
Interface	IPX Interface associated with the next hop.
Ticks	Amount of time (in ticks) that the packet takes to reach the network number you specified. A tick is approximately 1/18th of a second.
Hops	Number of routers (hops) that the packet must pass through before reaching the network number associated with the IPX network.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Deleting IPX Static Routes

To delete an IPX static route:

1. From the **IPX Configuration** section of the Web Agent window, click **Static Routes**. The IPX Static Routes dialog box opens.
2. Select the IPX static route to be removed.
3. Click **DELETE** to remove the static route, or **CANCEL** to restore previous settings.

Modifying IPX Static Routes

To modify an IPX static route:

1. From the I**PX Configuration** section of the Web Agent window, click **Static Routes**. The IPX Static Routes dialog box opens.
2. Select the IPX static route to be modified.
3. Use Table 4-4 to complete your configuration changes.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Creating IPX Static Services

To create IPX static services:

1. From the **IPX Configuration** section of the Web Agent window, click **Static Services**. The IPX Static Services dialog box opens.
2. Click **CREATE** to create a new static service. The Add IPX Static Service dialog box opens.

3. Use Table 4-5 to complete your configuration:

Table 4-5. *IPX Static Service Parameters*

Parameter	Allows you to specify the...
Service Name	Name of the IPX static service. For example, FS_ENG01. Use SLIST (NetWare 3.x) or NLIST (NetWare 4.x) to list your current server names and types from your NetWare server.
Type	Service type (in hex) that identifies the type of IPX static service the server provides. Well-known service types include: • **Unknown (0)** • **Print Queue (3)** • **File Server (4)** • **Job Server (5)** • **Print Server (7)** • **Archive Server (9)** • **Remote Bridge Server (24)** • **Advertising Print Server (47)**
Network	Network number (in hex) of the IPX static service.
Node	Node address (in hex) of the IPX static service. The format of the node value is **aa:bb:cc:dd:ee:ff**.
Socket	Number (in hex) associated with a running process on the end node (for example, RIP, NLSP).
Next-Hop Node	MAC address of the next destination through which the service is reached. The format of the node value is **aa:bb:cc:dd:ee:ff**.
Interface	Interface that corresponds to the next-hop node.
Hops	Number of routers (hops) that the packet must pass through before reaching the network number associated with the service.

Deleting IPX Static Service

To delete an IPX static service:

1. From the **IPX Configuration** section of the Web Agent window, click **Static Services**. The IPX Static Services dialog box opens.
2. Select the IPX static service to be removed.
3. Click **DELETE** to remove the static service, or **CANCEL** to restore previous settings.

Modifying IPX Static Services

To modify an IPX static service:

1. From the **IPX Configuration** section of the Web Agent window, click **Static Services**. The IPX Static Services dialog box opens.
2. Select the IPX static service to be modified.
3. Use Table 4-5 to complete your configuration changes.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Monitoring Switch Performance Using IPX

This section provides detailed statistical information on IPX and the use of IPX on your switch:

- ❒ Examining IPX Global Statistics
- ❒ Searching the IPX Route Table
- ❒ Examining the IPX Route Table
- ❒ Examining IPX Route Table Statistics
- ❒ Searching the IPX Service Table
- ❒ Examining the IPX Service Table
- ❒ Examining IPX Service Table Statistics

Examining IPX Global Statistics

All statistics only count IPX packets which are received by or sent from the Supervisor module, not those packets routed in hardware.

To display the global IPX routing statistics:

1. In the **IPX Display** section of the Web Agent window, click **Global Statistics**. The IPX Routing Global Statistics dialog box opens.
2. To view or remove statistics, perform one of the following steps:
    - If you want to see the latest statistics available, click **REFRESH** to update all statistics.
    - If you want to reset all statistics currently displayed, click **CLEAR** to reset all statistics to zero.

3. Use Table 4-6 to review the definition of each statistic:

Table 4-6. *IPX Global Parameters*

Parameter	Defines the...
IPX In Receives	Total number of IPX packets received (including errors).
IPX In Delivers	Total number of IPX packets delivered locally, including packets from local applications.
IPX Forward Datagrams	Number of IPX packets forwarded.
IPX Netbios Receives	Number of NetBIOS packets received.
IPX In Discards	Number of IPX packets received but discarded.
IPX In Header Errors	Number of IPX packets discarded because of errors in the packet header. This includes packets that are less than the minimum 30 byte length.
IPX In Unknown Sockets	Number of IPX packets discarded because the destination socket was not open.
IPX In Max Hops Exceeds	Number of IPX packets discarded because the Transport Control field is greater than or equal to 16.
IPX In Checksum Errors	Number of IPX packets received with bad checksums.
IPX Out Requests	Number of IPX packets supplied locally for transmission, not including any packets counted in IPX Forward Datagrams.
IPX Out Packets	Total number of IPX packets transmitted.
IPX Out Discards	Number of outgoing IPX packets discarded.
IPX Out No Routes	Number of IPX packets which can not be transmitted because no routes are available.
IPX In Ping Request	Number of received ping requests.
IPX In Ping Replies	Number of received replies made to ping requests.
IPX Out Ping Requests	Number of transmitted ping requests.
IPX Out Ping Replies	Number of transmitted replies made to ping requests.

Searching the IPX Route Table

To search the IPX routing table:

1. In the **IPX Display** section of the Web Agent window, click **Route Table Search**. The IPX Route Table Search dialog box opens.
2. Select the **Search Criteria** you want to use to find information on specific routes. For example, if you want to find all static routes that are presently configured on your switch, search by **source** and specify **static** as your search value.

3. Use Table 4-7 to determine the search parameters:

Table 4-7. *IPX Routing Table Search Parameters*

Parameter	Allows you to perform a search...
Source	In your IPX routing table, use one of the following parameters: • **RIP** - RIP routing updates • **Static** - User configuration • **Local** - Directly connected routes Once you select one of these parameters, the search attempts to find routes associated with the parameter you chose.
Interface	Based on the interface associated with the next-hop to the IPX network.
Network Number	Based on an IPX Network address (hexadecimal number) you specify.

4. Click **Search** to start the search. If available routes are found they are displayed in the IPX Route Table dialog box. If no routes are available, a message is displayed in the IPX Route Table dialog box.

Examining the IPX Route Table

To examine your IPX route table:

1. Perform an IPX Route Table search as described in "Searching the IPX Route Table", earlier in this chapter. If available routes are found they are displayed in the IPX Route Table dialog box.
2. Use Table 4-8 to review your configuration:

Table 4-8. *IPX Route Table Parameters*

Parameter	Defines the...
Select	Parameter selected.
Network	Network number (in hex) of the IPX network in question.
Interface	Interface associated with the IPX network.
Source	Method by which the network was learned. For example, RIP, local, or static.
TTL	Number of seconds before the route expires.

Table 4-8. IPX Route Table Parameters (Continued)

Parameter	Defines the...
Ticks	Amount of time (in ticks) that the packet takes to reach the network number you specified. A tick is approximately 1/18th of a second.
Hops	Number of routers (hops) that the packet must pass through before reaching the network number associated with the IPX network.
Next-Hop MAC Address	MAC address of the next destination through which the network is reached.

Examining IPX Route Table Statistics

To examine your IPX route table statistics:

1. In the **IPX Display** section of the Web Agent window, click **Route Table Statistics**. The IPX Routing Table Statistics dialog box opens.
2. Use Table 4-9 to review each statistic:

Table 4-9. IPX Route Table Statistics

Statistic	Definition
Current Number of Routes	Indicates the current number of IPX routes.
Peak Number of Routes	Lists the peak number of routes.
Route Add Failures	Indicates the number of failed attempts to add a route to the routing table.

Searching the IPX Service Table

To search the IPX service table:

1. In the **IPX Display** section of the Web Agent window, click **Service Table Search**. The IPX Service Table Search dialog box opens.
2. Select the **search criteria** you want to use to find information on specific services. For example, if you want to find all static services that are presently configured on your switch, search by **source** and specify **static** as your search value.

3. Use Table 4-10 to determine the search parameters:

Table 4-10. *IPX Service Table Search Parameters*

Parameter	Allows you to perform a search...
Source	In your IPX service table, use one of the following parameters: • **SAP** - Services learned via the SAP protocol • **Static** - User configuration • **Local** - Local services Once you select one of these parameters, the search will attempt to find services associated with the parameter you chose.
Interface	Based on the interface associated with the next-hop to the service.
Service Name	Based on a service name you specify. Note that you can specify a single asterisk (*) to indicate a wildcard character that will match all characters entered before the wildcard. For example, entering FS_ENG* will find all service names that start with FS_ENG.
Service Type	Based on the service type you specify. For example, to specify a print queue type, you would enter 3 (0003h) in the space provided.

4. Click **Search** to start the search. If available services are found they are displayed in IPX Service Table dialog box. In services are not available, a message displays in the IPX Service Table dialog box.

Examining the IPX Service Table

To examine the IPX service table:

1. Perform an IPX Service table search as described in "Searching the IPX Service Table", earlier in this chapter. If available services are found they are displayed in the IPX Service Table dialog box.

2. Use Table 4-11 to review each field in the IPX Services table:

Table 4-11. IPX Service Table Parameters

Parameter	Defines the...
Select	Parameter selected.
Name	Name of the service in question. For example, FS_ENG01. (Use SLIST (NetWare 3.x™) or NLIST (NetWare 4.x™) to list your current server names and types from your NetWare server.)
Type	Service type that identifies the type of service the server provides. Well known service types include: • **Unknown (0)** • **Print Queue (3)** • **File Server (4)** • **Job Server (5)** • **Print Server (7)** • **Archive Server (9)** • **Remote Bridge Server (24)** • **Advertising Print Server (47)**
Network	Network number of the IPX service in question.
Node	Node address of the service in question.
Socket	Number associated with a running process on the end node (for example, RIP, NLSP).
Interface	Interface associated with the next hop to the service.
Source	Method by which the service was learned. For example, SAP or static.
TTL	Number of seconds before the service expires.
Hops	Number of routers (hops) that the packet must pass through before reaching the network number associated with the service.
Next-Hop MAC Address	MAC address of the next destination through which the service is reached.

Examining IPX Service Table Statistics

To examine the IPX service table statistics:

1. In the **IPX Display** section of the Web Agent window, click **Service Table Statistics**. The IPX Service Table Statistics dialog box opens.

2. Use Table 4-12 to review each statistic:

Table 4-12. *IPX Service Table Statistics*

Statistic	Defines the...
Current Number of Services	Indicates the current number of IPX services.
Peak Number of Services	Lists the peak number of services.
Service Add Failures	Indicates the number of failed attempts to add a service to the routing table.

5

Configuring IPX RIP Protocol (Layer 3)

Overview

This chapter and its procedures are specific to Layer 3 configuration.

Included in this chapter:

❐ Configuring IPX RIP Interfaces

❐ Creating and Modifying IPX RIP Filters

❐ IInterpreting IPX RIP Interface Statistics

Configuring IPX RIP Interfaces

To configure the IPX RIP interfaces:

1. In the **IPX RIP Configuration** section of the Web Agent window, click **Interfaces**. The IPX RIP Interfaces dialog box opens.
2. Use Table 5-1 to configure the IPX RIP interfaces:

Table 5-1. *IPX RIP Interface Parameters*

Parameter	Allows you to...
Select	Select a RIP interface to modify. **Note:** This field is displayed in the IPX RIP Interface dialog box, not the Add IPX RIP Interface dialog box.
Interface	Identify the IPX interface associated with the RIP interface.
Network Number	Identify the number of the IPX network associated with the VLAN.
Use Interpacket Gap	Select to enable or disable whether RIP updates sent out over an interface have an interpacket transmission delay. • **If enabled**, IPX RIP provides update packets. • **If disabled**, IPX RIP periodic update packets have no interpacket gap.

Table 5-1. IPX RIP Interface Parameters (Continued)

Parameter	Allows you to...
Use Max Packet Size	Select to enable or disable whether the RIP packets sent out an interface are set to the maximum transmission size. • **If enabled**, RIP packets can contain the maximum allowed by the MTU of the RIP interface. • **If disabled**, RIP packets are limited to 50 network entries.
Periodic Update Interval (sec)	Specify (in seconds) the interval at which periodic RIP updates are sent out an interface.
Aging Interval Multiplier	Specify the length of time that information from received RIP updates are kept as a multiplier of the Periodic Update Interval.
Triggered Updates	Select to enable or disable RIP updates to be immediately transmitted to the network in response to changes in the network topology.
Advertise Default Route Only	Select to enable or disable the advertising of the default network exclusively (subject to a route to the default network being known to the switch).
Mode	Select the mode for the RIP interface. Options include: • **Talk/Listen** - Send and receive advertisements. • **Talk Only** - Send advertisements. • **Listen Only** - Receive advertisements.

3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Creating and Modifying IPX RIP Filters

To create IPX RIP filters:

1. In the **IPX RIP Configuration** section of the Web Agent window, click **Filters**. The IPX RIP Filters dialog box opens.
2. Click **CREATE** to create a new filter. The Add IPX RIP Filter dialog box opens.

3. Use Table 5-2 to complete your configuration:

Table 5-2. Add IPX RIP Filter Parameters

Parameter	Allows you to...
Interface	Select the interface to which this filter will be applied to RIP packets sent and/or received on the interface.
Precedence	Specify the filter precedence (in order of importance) with 0 equal to most important. **Note:** All filters on the same VLAN, must be assigned a unique filter precedence.
Start Network	Specify the first IPX network number in the range.
End Network	Specify the last IPX network number in the range.
Direction	Select the direction of the filter. Filter options include: • **Inbound** - Apply the filter only to RIP packets received on the interface. • **Outbound** - Apply the filter only to RIP packets sent on the interface. • **Both** - Apply the filter to RIP packets both sent and received on the interface.
Filter/Suppress	Select whether to enable or disable the IPX networks (within the specified range in the filter) to be filtered (inbound) or suppressed (outbound). • **Filtered** - Apply the filter only to RIP packets received (inbound direction) on the interface. • **Suppressed** - Apply the filter only to RIP packets sent (outbound direction) on the interface. Select **Enable** to filter/suppress traffic. Select **Disable** to disable the filtering and suppression of traffic.
Ticks	Specify the time (in ticks) that the packet takes to reach the network number you specified. A tick is approximately 1/18th of a second. This entry is used to override the value in the RIP packet. Entering **0** ensures that there is no override in the transmission of data on the network.
Hops	Specify the number of routers (hops) that the packet must pass through before reaching the network number associated with the IPX interface. This entry is used to override the value in the RIP packet. Entering **0** ensures that there is no override in the transmission of data on the network.

4. Click **CREATE** to save changes, or **CANCEL** to restore previous settings.

Example: Suppress Advertising of Network 10

To configure your switch to suppress the advertising of network 10 on the IPX interface named Backbone:

1. In the **IPX RIP Configuration** section of the Web Agent, click **Filters**.
2. Click **Create** to create a new filter. The Add IPX RIP Filter dialog box opens.
3. Configure the following parameters:
   - **a.** From the **Interface** pull-down menu, select the **Backbone**.
   - **b.** In the **Precedence** field, enter **0**.
   - **c.** In the **Start Network** field, enter **10**.
   - **d.** In the **End Network** field, enter **10**.
   - **e.** From the **Direction** pull-down menu, select **Outbound**.
   - **f.** From the **Filter/Suppress** pull-down menu, select **Enable**.
   - **g.** In the **Ticks** and **Hops** fields, enter **0**.
4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

This filter ensures that all advertising of network 10 from the interface Backbone is suppressed.

Example: Suppress Advertising of all Networks Except 10

To configure your switch to suppress the advertising of all networks except network 10 on the IPX interface named Backbone, you must create two filters.

To create these filters:

Filter 1

1. In the **IPX RIP Configuration** section of the Web Agent window, click **Filters**.
2. Click **Create** to create a new filter. The Add IPX RIP Filter dialog box opens.
3. Configure the following parameters:
   - **a.** From the **Interface** pull-down menu, select the **Backbone**.
   - **b.** In the **Precedence** field, enter **0**.
   - **c.** In the **Start Network** field, enter **10**.
   - **d.** In the **End Network** field, enter **10**.
   - **e.** From the **Direction** pull-down menu, select **Outbound**.
   - **f.** From the **Filter/Suppress** pull-down menu, select **Disable**.

- **g.** In the **Ticks** and **Hops** fields, enter **0**, respectively.

This filter ensures that the advertising of network 10 on the interface Backbone will not be suppressed. To suppress all other networks, proceed with the creation of Filter 2.

Filter 2

1. In the **IPX RIP Configuration** section of the Web Agent window, click **Filters**.
2. Click **Create** to create a new filter. The Add IPX RIP Filter dialog box opens.
3. Configure the following parameters:
   - **a.** From the **Interface** pull-down menu, select the **Backbone**.
   - **b.** In the **Precedence** field, enter **1**.
   - **c.** In the **Start Network** field, enter **0**.
   - **d.** In the **End Network** field, enter **ffffffff**.
   - **e.** From the **Direction** pull-down menu, select **Outbound**.
   - **f.** From the **Filter/Suppress** pull-down menu, select **Enable**.
   - **g.** In the **Ticks** and **Hops** fields, enter **0**, respectively.
4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

This filter ensures that the advertising of all networks on the interface Backbone will be suppressed.

Together, Filter 1 and Filter 2 will act to suppress all network advertising with the exception of network 10. It is important to note that Filter 2 had the Precedence field set to 1 and Filter 1 had the Precedence field set to 0. Any filter with a Precedence of 0 will always override a filter with a precedence of 1 or higher.

Interpreting IPX RIP Interface Statistics

To interpret IPX RIP interface statistics:

1. In the **IPX RIP Display** section of the Web Agent window, click **Interface Statistics**. The IPX RIP Interface Statistics dialog box opens.

2. Use Table 5-3 to interpret your IPX RIP statistics:

Table 5-3. *IPX RIP Interface Statistical Parameters*

Parameter	Definition
Interface	The interface associated with this RIP interface.
State	The current state of the RIP interface.
Network Number	The network number of the IPX network associated with the interface.
Triggered Updates Sent	The number of triggered updates sent from the RIP interface.
Non-triggered Updates Sent	The number of non-triggered updates sent from the RIP interface.
Updates Received	The number of updates received by the RIP interface. Updates may be received periodically even if no changes have occurred.
Requests Received	The number of requests for updates received by the RIP interface.
Bad Packets Received	The number of bad packets received by the RIP interface.

3. Click **Clear** to remove the statistics, or **Refresh** to access current interface statistics.

6

Configuring IPX SAP Protocol (Layer 3)

Overview

This chapter and its procedures are specific to Layer 3 configuration.

Included in this chapter:

- ❒ Configuring IPX SAP Interfaces
- ❒ Creating IPX SAP Filters
- ❒ Interpreting IPX SAP Interface Statistics

Configuring IPX SAP Interfaces

To configure the IPX SAP interfaces:

1. In the **IPX SAP Configuration** section of the Web Agent window, click **Interfaces**. The IPX SAP Interfaces dialog box opens.
2. Use Table 6-1 to configure the IPX SAP interfaces:

Table 6-1. *IPX SAP Interface Parameters*

Parameter	Allows you to...
Select	Select a SAp interface to modify.
Interface	Identify the IPX interface associated with the SAP interface.
Network Number	Identify the number of the IPX network associated with the interface.
Use Interpacket Gap	Select whether or not SAP updates sent out over an interface have an interpacket transmission delay. • **If enabled**, IPX SAP provides update packets. • **If disabled**, IPX SAP periodic update packets have no interpacket gap.

***Table 6-1.** IPX SAP Interface Parameters (Continued)*

Parameter	Allows you to...
Use Max Packet Size	Select to enable or disable whether the SAP packets sent out an interface are set to the maximum transmission unit size. • **If disabled**, SAP packets are limited to 7 service entries. • **If enabled**, SAP packets can contain the maximum number of service entries allowed by the MTU of the SAP interface.
Periodic Update Interval (sec)	Specify (in seconds) the interval at which periodic SAP updates are sent out an interface.
Aging Interval Multiplier	Specify the length of time that information from received SAP updates are kept as a multiplier of the Periodic Update Interval.
Triggered Updates	Select to enable or disable whether SAP updates are immediately transmitted to the network in response to changes in the network topology.
Get Nearest Server Reply	Select to enable or disable whether the router responds to Get Nearest Server requests received on the interface.
Get Nearest Server Reply Delay	Specify the delay (in msecs) to wait before responding to a Get Nearest Service request received on the interface.
Mode	Select the mode for the SAP interface. Options include: • **Talk/Listen** - Send and receive advertisements. • **Talk Only** - Send advertisements. • **Listen Only** - Receive advertisements.

3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Creating IPX SAP Filters

This section describes:

❒ Creating IPX SAP Name Filters

❒ Creating IPX SAP Network Filters

Creating IPX SAP Name Filters

To create IPX SAP Name filters:

1. In the **IPX SAP Configuration** section of the Web Agent window, click **Name Filters**. The IPX SAP Name Filters dialog box opens.

2. Click **CREATE** to create a new filter. The Add IPX SAP Name Filter dialog box opens.

3. Use Table 6-2 to complete your configuration:

Table 6-2. *IPX SAP Name Filter Parameters*

Parameter	Allows you to...
Interface	Select the interface to which this filter will be applied to SAP packets sent and/or received on the interface.
Precedence	Specify the filter precedence (in order of importance) with 0 equal to most important. **Note:** All SAP filters on the same interface must be assigned a unique precedence value.
Name	Specify a service name. For example, FS_ENG001. A single asterisk may be present as the last character, which will match all remaining characters of a service name.
Type	Specify the service type that identifies the type of service the server provides. Well-known service types include: • **Unknown (0)** • **Print Queue (3)** • **File Server (4)** • **Job Server (5)** • **Print Server (7)** • **Archive Server (9)** • **Remote Bridge Server (24)** • **Advertising Print Server (47)** • **NetWare Directory Services [NDS] (278)** A value of ffff matches all service type values.
Direction	Select the direction of the filter in question. Filter choices include: • **Inbound** - Applies the filter only to SAP packets received on the interface. • **Outbound** - Applies the filter only to SAP packets sent on the interface. • **Both** - Applies the filter to SAP packets both sent and received on the interface.

Table 6-2. IPX SAP Name Filter Parameters (Continued)

Parameter	Allows you to...
Filter/Suppress	Select to enable or disable whether the services matching Name and Type are filtered (inbound) or suppressed (outbound). • **Filtered** - Applies the filter only to SAP packets received (inbound direction) on the interface. • **Suppressed** - Applies the filter only to SAP packets sent (outbound direction) on the interface. Select **Enable** to filter/suppress traffic. Select **Disable** to disable the filtering and suppression of traffic.
Hops	Specify the number of routers (hops) that the packet must pass through before reaching the service(s) matched by the filter. This entry is used to override the value in the SAP packet. Entering 0 ensures that there is no override in the transmission of data on the network.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Example: Suppress Advertising of all Print Servers on Interface Remote

To configure your switch to suppress the advertising of all Print Servers (for example, type 7) on Interface Remote:

1. In the **IPX SAP Configuration** section of the Web Agent window, click **Name Filters**.
2. Click **CREATE** to create a new filter. The Add IPX SAP Name Filter dialog box opens.
3. Configure the following parameters:
   a. From the **Interface** pull-down menu, select **Remote**.
   b. In the **Precedence** field, enter **0**.
   c. In the **Name** field, enter *****. The asterisk represents a wildcard that applies to all server names.
   d. In the **Type** field, enter **7**.
   e. From the **Direction** pull-down menu, select **Outbound**.
   f. From the **Filter/Suppress** pull-down menu, select **Enable**.
   g. In the **Hops** field, enter **0**. Entering 0 ensures that there is no override in the transmission of data on the network.
4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

This filter ensures that all advertising of any known print server on Interface Remote will be suppressed.

Creating IPX SAP Network Filters

To create IPX SAP Network filters:

1. In the **IPX SAP Configuration** section of the Web Agent window, click **Net Filters**.
2. Click **CREATE**. The Add IPX SAP Net Filter dialog box opens.
3. Use Table 6-3 to complete your configuration:

Table 6-3. IPX SAP Network Filter Parameters

Parameter	Allows you to...
Select	Select the IPX interface. **Note:** This field is displayed in the IPX SAP Net Filter dialog box, not in the Add IPX SAP Net Filter dialog box.
Interface	Select the interface to which this filter will be applied to SAP packets sent and/or received on the interface.
Precedence	Specify the filter precedence (in order of importance) with 0equal to most important. **Note:** All SAP filters on the same interface must be assigned a unique filter precedence.
Net	Specify the network on which the server resides. A network number of ffffffff represents all networks.
Type	Specify the service type (in hex) that identifies the type of service the server provides. Well-known service types include: • **Unknown (0)** • **Print Queue (3)** • **File Server (4)** • **Job Server (5)** • **Print Server (7)** • **Archive Server (9)** • **Remote Bridge Server (24)** • **Advertising Print Server (47)** • **NetWare Directory Services (278)** A value of ffff matches all service type values.

Table 6-3. IPX SAP Network Filter Parameters (Continued)

Parameter	Allows you to...
Direction	Select the direction of the filter in question. Filter choices include: • **Inbound** - Applies the filter only to SAP packets received on the interface. • **Outbound** - Applies the filter only to SAP packets sent on the interface. • **Both** - Applies the filter to SAP packets both sent and received on the interface
Filter/Suppress	Select to enable or disable whether the services matching Net and Type are filtered (inbound) or suppressed (outbound). • **Filtered** - Applies the filter only to SAP packets received (inbound direction) on the interface. • **Suppressed** - Applies the filter only to SAP packets sent (outbound direction) on the interface. Select **Enable** to filter/suppress traffic. Select **Disable** to disable the filtering and suppression of traffic.
Hops	Specify the number of routers (hops) that the packet must pass through before reaching the service(s) matched by the filter. This entry is used to override the value in the SAP packet. Entering 0 ensures that there is no override in the transmission of data on the network.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Example: Filtering all Services Except Netware Directory Services (NDS)

To configure your switch to filter all services except NDS on Interface Remote, you must create two filters.

To create these filters:

Filter 1

1. In the **IPX SAP Configuration** section of the Web Agent window, click **Net Filters**.
2. Click **CREATE** to create a new filter. The Add IPX SAP Net Filter dialog box opens.
3. Configure the following parameters:
   a. From the **Interface** pull-down menu, select **Remote**.
   b. In the **Precedence** field, enter **0**.
   c. In the **Net** field, enter **fffffff** (which represents all networks).
   d. In the **Type** field, enter **278** (which represents the type for NDS).

e. From the **Direction** pull-down menu, select **Inbound**.

f. From the **Filter/Suppress** pull-down menu, select **Disable**. (This ensures that NDS advertisements are not filtered.)

g. In the **Hops** field, enter **0**. Entering 0 ensures that there is no override in the transmission of data on the network.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

This filter ensures that all NDS packets received are not filtered on Interface Remote.

Filter 2

1. In the **IPX SAP Configuration** section of the Web Agent window, click **Net Filters**.
2. Click **Create** to create a new filter. The Add IPX SAP Net Filter dialog box opens.
3. Configure the following parameters:

   a. From the **Interface** pull-down menu, select **Remote**.

   b. In the **Precedence** field, enter **1**.

   c. In the **Net** field, enter **fffffff** (which represents all networks).

   d. In the **Type** field, enter **ffff** (which represents all services/types).

   e. From the **Direction** pull-down menu, select **Inbound**.

   f. From the **Filter/Suppress** pull-down menu, select **Enable**.

   g. In the **Hops** field, enter **0**. Entering 0 ensures that there is no override in the transmission of data on the network.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

This filter ensures that all networks and service types are filtered in Interface Remote.

Together, Filter 1 and Filter 2 filter services learned on Interface Remote except for NDS advertisements. It is important to note that Filter 2 had the Precedence field set to 1 and Filter 1 had the Precedence field set to 0. Any filter with a Precedence of 0 will always override a filter with a precedence of 1 or higher.

Interpreting IPX SAP Interface Statistics

To interpret IPX SAP interface statistics:

1. In the **IPX SAP Display** section of the Web Agent window, click **Interface Statistics**. The IPX SAP Interface Statistics dialog box opens.

2. Use Table 6-4 to interpret your IPX SAP interface statistics:

Table 6-4. *IPX SAP Interface Statistical Parameters*

Parameter	Definition
Interface	The IPX interface associated with this SAP interface.
State	The current state of the SAP interface.
Network Number	The network number of the IPX network associated with the interface.
Triggered Updates Sent	The number of triggered updates sent from the SAP interface.
Non-triggered Updates Sent	The number of non-triggered updates sent from the SAP interface.
GNS Responses Sent	The number of GNS responses sent from the SAP interface.
Updates Received	The number of updates received. Updates may be received periodically even if no changes have occurred.
Requests Received	The number of requests received on the SAP interface.
GNS Requests Received	The number of GNS requests received on the SAP interface.
Bad Packets Received	The number of bad packets received on the SAP interface.

3. Click on **CLEAR** to remove the statistics, or **REFRESH** to access current interface statistics.

7

Configuring IP Routing (Layer 3)

Overview

This chapter and its procedures are specific to Layer 3 configuration. This chapter describes how to configure IP on your switch.

Configuring IP Global Routing

In the Cajun P550 Switch, capabilities that once were provided by additional hardware, such as bridges, switches, and hubs, are now provided as virtual configurations inside the router. You can emulate bridging capabilities inside the chassis of the Cajun P550 Switch through Virtual Local Area Networks (VLANs). The ability to emulate bridging hardware through a virtual means is referred to as IP Routing. High-level tasks involved in creating and setting up IP Routing include:

❒ Creating an IP Interface

❒ Enabling IP Routing

❒ Assigning IP Interfaces to the VLAN

❒ Configuring Access Lists

❒ Activating Access Lists

❒ Creating IP Static Routes

❒ Creating Static ARP Entries

❒ Creating a BOOTP/DHCP Server Entry

❒ Configuring IGMP

❒ Configuring DVMRP

For information about creating and assigning physical ports to a VLAN, refer to "Creating a VLAN", in Chapter 12. For information about enabling IP routing and assigning subnets, refer to the following sections.

Creating an IP Interface

By creating an IP interface, you activate a location in the switch that communicates between the Internet Protocol (IP) and the embedded software of the switch.

To create an IP interface:

1. In the **IP Configuration** section of the Web Agent window, click **Interfaces**. The IP Interfaces dialog box opens.
2. Click **CREATE**. The Add IP Interface dialog box opens.
3. Use Table 7-1 to configure the IP interface:

Table 7-1. *Add IP Interface Parameters*

Parameter	Allows you to...
Interface	Enter a unique, alphanumeric name for the interface.
Admin. State	Specify the administrative state of the interface. Options include: • **UP** - The interface is active. • **DOWN** - The interface is inactive.
VLAN	Specify the type of VLAN. Options include: • **Default** - Selects the default VLAN. • **Discard** - Selects the VLAN to be discarded. • **Ethernet-Console** - Selects the Ethernet Console port as the VLAN. • **Serial Console** - Selects the Serial Console port as the VLAN. **Note:** The way that you configure a VLAN to a port determines the IP Routing option that you select for the interface. Use the following options to configure the appropriate interface: • If you select to create an IP interface for an Ethernet-Console VLAN, select **Mgmt Only** from the IP Routing pull-down menu. • If you select to create an IP interface for a serial-console VLAN, select **Mgmt Only** from the IP Routing pull-down menu. • If you create an IP interface for an inbound VLAN, select **Routing Mgmt** from the IP Routing pull-down menu.
Network Address	Enter the network IP address for the selected interface.
Mask	Enter the subnet mask for the interface.

Table 7-1. Add IP Interface Parameters

Parameter	Allows you to...
MAC Format	Select the MAC address format for the interface. Options include: • **Ethernet V2** • **Simple Network Access Protocol (SNAP)**
IP Routing	Select to enable or disable IP routing on the interface. Options include: • **Routing/Mgmt** - Enables you to manage the switch, from the Command Line Interface (CLI) or the Web Agent, and configure IP routing for the switch. • **Mgmt Only** - Enables you to manage the switch, however, IP routing is disabled. • **Default** - Enables you to configure IP routing for the switch, however, you cannot manage the switch. **Note:** When you set up IP routing for an interface, the Default selection is automatically chosen. The IP interface is created with the default IP routing option on the VLAN associated with the interface.
RIP	Enable or disable RIP. The default value is Disable.
OSPF	Enable or disable OSPF. The default value is Disable.
Multicast Protocol	Specify the multicast protocol for the interface. Options include: • **None** • **DVMRP** • **IGMP**
Proxy ARP	Enable or disable Proxy ARP. The default value is Disable.
ICMP Redirect	Enable or disable ICMP Redirect (IDRP). The default value is Enable.
NetBIOS UDP Rebroadcast	Enable or disable NetBIOS UDP Rebroadcasts. The default value is Disable.
VRRP	Enable or disable Virtual Redundancy Router Protocol. The default value is Disable.

4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Enabling IP Routing

To enable IP routing for an IP interface:

1. In the **IP Configuration** section of the Web Agent window, click **Global Configuration**. The IP Global Configuration dialog box opens.

Note: IP routing is disabled by default.

2. Use Table 7-2 to configure your global configuration setup:

Table 7-2. IP Global Configuration Parameters

Parameter	Allows you to...
IP Unicast Forwarding	Enable or disable IP unicast on a global basis.
IP Multicast Forwarding	Enable or disable IP multicast on a global basis. This affects all IP RIP interfaces set up to use multicast protocols.
IP Source Routing	Enable or disable strict source routing and loose source routing globally.
VRRP	Enable or disable VRRP globally.
BOOTP/DHCP Relay Agent	Accepts client requests for an IP address and forwards them to a server. This agent also relays responses from the server to the client.
Limit Proxy ARP to Same Network	Enable or disable Proxy ARP on the same network. When enabled, the router only responds to ARP requests when the source and target IP address are in the same IP network and different IP subnets. When disabled, the router only responds to ARP requests when the source and target IP address are in different networks.
Use Default Route for Proxy ARPs	Enable or disable the use of the default route on your Cajun switch as the route for Proxy ARPs. For example, if you have a default route configured to reach the 0.0.0.0 IP address, then any ARP request that does not match any of the other routes in your IP routing table will automatically go to this default route.
Maximum Number of Routes	Specify the maximum number of routes that can be added to the routing table. The default number of routes is 16384. **Note:** These routes refer only to IP Unicast entries.
Maximum Number of ARP Cache Entries	Specify the maximum number of ARP cache entries. Refers to the space available for the IP address table. When you increase the number of entries, it may cause the table to be relearned more frequently. Consequently, it will make address space usage more efficient. The default maximum number of entries is 16384.

Table 7-2. *IP Global Configuration Parameters (Continued)*

Parameter	Allows you to...
Route Preference by Protocol	Describe the routing preferences set up according to the network administrator's preferences. These preferences are normally set up using a system based on the most to least trust. For example, local routes are normally considered to have more trust or a higher preference, while OSPF external routes are considered to have less trust or a lower preference. These preferences can be overridden, but careful consideration must be given to how the preferences are set up.
Local Routes	Specify a preference value for local routes.
High-Preference Static Routes	Specify a preference value for high-level static routes.
OSPF Intra-area Routes	Specify an OSPF intra-area route. A lower number indicates a lower preference for the path.
OSPF Inter-area Routes	Specify inter-area paths to destinations in other OSPF areas. These are discovered through the examination of received summary Link State Advertisements (LSA). Enter a number to specify your path cost. A lower number indicates a lower preference for the path.
OSPF External Routes	Specify AS external paths to destinations external to the Autonomous System. These are detected through the examination of received AS external LSAs. Enter a number to specify your path cost (preference). A lower number indicates a lower preference for the path.
RIP Routes	Specify RIP to use the hop count as a metric. Hence, to specify a preference for a RIP route, you need to enter a lower number (path cost).
Low-Preference Static Routes	Specify a preference value for low-level static routes.

3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Assigning IP Interfaces to the VLAN

After you have set up a VLAN and enabled IP Routing, create the IP interface that your VLAN and your subnet use to communicate with each other. After creating the IP interface, you assign it to the VLAN. If you need to create a new VLAN, refer to “Creating and Implementing VLANs” in Chapter 11.

To create a new IP interface and assign it to a VLAN:

1. In the **IP Configuration** section of the Web Agent window, click **Interfaces**. The IP Interfaces dialog box opens.
2. Click **CREATE**. The Add IP Interface dialog box opens.
3. In the **Interface** field, enter the **Interface** name.

4. Use Table 7-3 to complete the configuration of your IP interface:

Table 7-3. IP Interfaces

Parameter	Allows you to...
Select	Select the interface to configure.
State	Shows the current running condition of the switch. Options include: • **UP** - The interface is active. • **DOWN** - The interface is inactive.
Interface	Enter an interface name from the interfaces you have previously configured.
Admin State	Shows the administration state of the interface. The default setting is UP. Options include: • **UP** - Indicates an active state. • **DOWN** - Indicates an inactive state.
VLAN	Select a VLAN associated with the selected interface from the VLANs you have previously configured.
Network Address	Assign an IP address to the VLAN you previously selected.
Mask	Assign a subnet mask for the interface.
MAC Format	Specify the MAC format (Ethernet V2 or SNAP).
IP Routing	Enable or disable IP Routing on the interface. When set to Routing/Mgmt, you can both manage the switch (from the CLI or Web Agent), and configure IP Routing for the switch. When set to Mgmt Only, you can manage the switch, however, IP routing is disabled. **Note:** When the interface has a VLAN identified as Serial-Console, the only valid IP routing option is Mgmt Only.
RIP	Enable or disable RIP for a given interface.
OSPF	Enable or disable OSPF for a given interface.
Multicast Protocol	Select a multicast protocol to associate with your interface. Selections include: DVMRP, IGMP, and None. IGMP is enabled automatically when DVMRP is selected.
Proxy ARP	Enable or disable Proxy ARP on a given interface.
ICMP Redirect	Enable or disable ICMP Redirect on a given interface.

Table 7-3. IP Interfaces (Continued)

Parameter	Allows you to...
NetBIOS UDP Rebroadcast	Configure your switch for InterVLAN forwarding of NetBIOS broadcasts. NetBIOS parameters include: • **Inbound** - Allow the receipt of NetBIOS replies. • **Outbound** - Allow the transmission of NetBIOS broadcasts. • **Both** - Allow the interface to both receive NetBIOS replies and send NetBIOS broadcasts. • **Disable** - Disallow both the receipt of NetBIOS replies and the transmission of NetBIOS broadcasts.
VRRP	Enable or disable VRRP on a given interface. The default value is Disable.

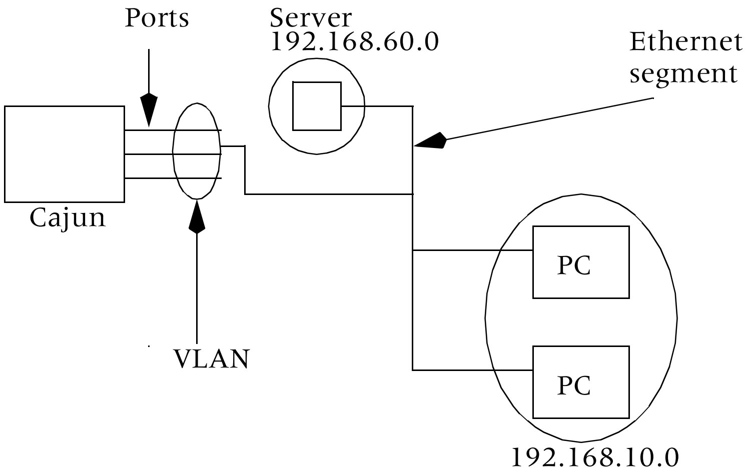
5. Click **CREATE** to save changes, or **CANCEL** to restore previous settings.

Note: Routing is not supported on the serial interface. Do not configure Routing/Mgmt on serial IP interfaces.

IP Multinetting

Using the Cajun P550 switch, you set up IP multinetting—a configuration of multiple subnets on a single VLAN. A network is said to be multinetted (Figure 7-1) when multiple logical groups of computers are brought together within a single broadcast domain. To create a multinetted network, you assign multiple subnets to a VLAN.

Figure 7-1. Multinet Diagram



Example: Creating a Multinet Interface

To create a multinet interface:

1. In the **IP Configuration** section of the Web Agent window, click **Interfaces**. The IP Interfaces dialog box opens.
2. Click **CREATE** to create a multinetting interface. The Add IP Interface dialog box opens.
3. In the **Interface** field, enter the **name** of the new interface.
4. From the **VLAN** pull-down menu, select the **VLAN** for this multinet configuration.
5. In the **Network Address** field, enter the **network address** associated with this interface.
6. Click **CREATE**. The IP Interfaces dialog box opens with the new interface listed.
7. Repeat steps 2 through 6 for all the interfaces you want associated with the same VLAN.

Note: You must have a different network address for each new multinetting interface that you create for the same VLAN.

Configuring Access Lists

Access control lists (ACLs), also referred to as access lists, contain rules that forward or deny data to and through the switch. By configuring access lists, you can:

- ❒ Prioritize the transmission of frames within the Cajun P550R switch.
- ❒ Filter out specific or general network transmissions (for example, all traffic from a particular subnet to the switch).

When you create an access list, you create a series of rules that describe how data is forwarded or filtered within the switch. You can assign up to eight levels of priority to routed data.

Standard access lists support the conversion to the Web Agent of Cisco scripts that contain access lists. Extended access lists enable the switch to filter or deny information between two specified subnets via specific protocols, such as the Transmission Control Protocol (TCP) and the User Datagram Protocol (UDP), and specified ranges of ports.

Note: Access rules are searched in order of priority from first to last. During this search, the first rule that matches the frame is applied. If no rule is matched to a frame, then the frame is forwarded with normal priority. You can not use access lists to filter traffic destined to the switch’s CPU.

There is an implied implicit permit all at the end of the list. Also, you can only have one list active at a time.

Creating Standard Access Rules

To create standard access rules:

1. In the **IP Configuration** section of the Web Agent window, click **Access Lists**. The IP Access List dialog box opens.

   Note: The IP Access List dialog box displays all standard and extended access rules that have been created. If no rules have been created, the following statement displays: `No IP Access Rules are currently configured`.

2. Click **Create Standard**. Valid numeric values are 1-99.

3. Use Table 7-4 to configure your IP access rules to either filter or prioritize traffic:

Table 7-4. IP Access List Setup Parameters

Parameter	Allows you to specify...
Access List Name	The alphanumeric name assigned to the newly-created access list.
Access Rule Index	The sequence number for each new rule you create. Note that rules may override each other, so review your current configuration prior to creating new rules for an access list.
Access Type	The method of handling incoming datagrams based on the IP access type. Priority levels include: • **Deny/Filter** - Allows you to filter out traffic based on the specified configuration. • **Permit/Fwd pri8 (high) to pri1 (low)** - Allows you to prioritize traffic based on the specified configuration. • **Permit/Fwd with no change in priority** - Allows you to forward traffic with no change in priority.
Source Subnet	• **Source Address** - The IP address of a subnet that is denied or granted access to the switch. • **Source Address Wildcard** - A range of IP addresses that are denied or granted access to the switch. Place the number one (1) in the bit positions you want to ignore.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Creating Extended Access Rules

To create extended access rules:

1. In the **IP Configuration** section of the Web Agent window, click **Access Lists**. The IP Access List dialog box opens.

   Note: The IP Access List dialog box displays all standard and extended access rules that have been created. If no rules have been created, the following statement displays: `No IP Access Rules are currently configured`.

2. Click **Create Extended**. The IP Extended Access Rule Creation dialog box opens.

3. Use Table 7-5 to configure your IP access rules to either filter or prioritize traffic:

Table 7-5. IP Extended Access Rule Creation Parameters

Parameter	Allows you to specify...
Access List Name	An alphanumeric name assigned to the newly-created access list.
Access Rule Index	The sequence number for each new rule you create. Note that rules may override each other, so review your current configuration prior to creating new rules for an access list.
Access Type	The method of handling incoming datagrams based on the IP access type you set. Priority levels include: • **Deny/Filter** - Allows you to filter out traffic based on the specified configuration. • **Permit/Fwd pri8 (high) to pri1 (low)** - Allows you to prioritize traffic based on the specified configuration. • **Permit/Fwd with no change in priority** - Allows you to forward traffic with no change in priority.
Source Subnet	• **Source Address** - The IP address of a subnet that is denied or granted access to the switch. • **Source Wildcard** - A range of IP addresses that are denied or granted access to the switch. Place the number one (1) in the bit positions you want to ignore.
Destination Subnet	• **Dest Address** - The IP address of a subnet that is denied or granted access to data from the switch. • **Dest Address Wildcard** - A range of IP addresses of subnets that are denied or granted access to the switch. Place the number one (1) in the bit positions you want to ignore.
Protocol ID	A protocol ID to be filtered. (For example, ICMP=1, IGMP=2). A single asterisk (*) indicates all protocols.

TCP/UDP Source Port Specify a range of source ports that pass between two hosts or switches using the Transmission Control Protocol (TCP) or the User Datagram Protocol (UDP). Options include:

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Example: Filtering Web Traffic Using an Access Rule

To configure your switch to filter Web traffic to or from a particular Web server:

1. In the **IP Configuration** section of the Web Agent window, click **Access Lists**. The IP Access List dialog box displays.
2. Click **Create Extended**. The IP Extended Access Rule Creation dialog box displays.

3. In the **Access List Name** field, enter a number between 100 and 199 to identify your new access control list.

4. In the **Access Rule Index** field, enter a number to identify the access rule.

5. From the **Access Type** pull-down menu, select **Filter**.

6. In the **Source Address** field, enter an * (asterisk) for the source address.

7. In the **Dest Address** field, enter an IP address that represents the destination address of the Web server.

8. In the **TCP/UDP Destination Port** field:

   - Enter a **Min**. of **0** (HTTP).
   - Enter a **Max.** of **80** (HTTP).

9. In the **TCP/UDP Source Port** field:

   - Enter a **Min**. of **0** (HTTP).
   - Enter a **Max.** of **80** (HTTP).

10. Select **TCP Established**. A check mark displays in the check box.

11. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Each time an end user attempts to access the corporate Web server specified by the source and destination TCP/UDP ports, all Web requests are filtered.

Example: Filtering Traffic Between Subnets

It is possible to filter traffic to either a specific address or to an entire subnet. In this example, all traffic between the two subnets is filtered:

❒ 10.1.1.0

❒ 10.1.2.0

This example also assumes that the network is a Class C network (255.255.255.0).

To filter traffic between both subnets, you must create two access rules.

To create the access rules:

1. In the **IP Configuration** section of the Web Agent window, click **Access Lists**. The IP Access List dialog box opens.

2. Click **Create Extended**. The IP Extended Access Rule Creation dialog box opens.

3. In the **Access List Name** field, enter a number between 100 and 199 to identify your new access control list.

4. In the **Access Rule Index** field, enter a number to identify the access rule.

5. From the **Access Type** pull-down menu, select **Filter**.

6. In the **Source Address** field, enter the **source address** (**10.1.2.0**) and the **source address wildcard** (**0.0.0.255**), respectively.

7. In the **Dest Address** field, enter the **destination address** (**10.1.1.0**) and the **destination address wildcard** (**0.0.0.255**), respectively.

8. In the **TCP/UDP Destination Port** field:

   - Enter a **Min.** of **80**(HTTP).
   - Enter a **Max.** of **80** (HTTP).

9. In the **TCP/UDP Source Port** field:

   - Enter a **Min.** of **80**(HTTP).
   - Enter a **Max.** of **80** (HTTP).

10. Select **TCP Established**. A check mark displays in the check box.

11. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Once you complete the creation of both access rules, all traffic between subnet 10.1.1.0 and 10.1.2.0 is filtered. Note that traffic between subnet 10.1.1.0 and 10.1.3.0, and 10.1.2.0 and 10.1.3.0 is not filtered. This is because your access rules only filter traffic between 10.1.1.0 and 10.1.2.0.

Note: To filter traffic to a specific address and not to an entire subnet, you must specify the destination address of the network node, and use a subnet wildcard of 255.255.255.255.

To filter all traffic, you must specify a destination address of 0.0.0.0 and a subnet wildcard of 0.0.0.0. This filters out all traffic. This is useful if you want to filter all traffic except traffic that matches a previous rule. Ensure that you do not make this your first rule, since that overrides all subsequent rules.a

Activating Access Lists

You can specify which access lists to activate on the switch by selecting Access Control in the IP Configuration section of the Web Agent.

Note: Before you specify access lists to activate, you must first configure access lists. For information about configuring access lists, refer to “Configuring Access Lists” earlier in this chapter.

To activate an access list:

1. In the **IP Configuration** section of the Web Agent window, click **Access Control**. The IP Access Control dialog box opens.
2. From the **Enable** pull-down menu, select **Enable** to filter inbound traffic.
3. From the **IP Access List** pull-down menu, select the name of the access list to be used for filtering when IP access control is enabled.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Creating IP Static Routes

To create IP static routes:

1. In the **IP Configuration** section of the Web Agent window, click **Static Routes**. The IP Static Routes dialog box opens.
2. Use Table 7-6 to complete your static route configuration:

Table 7-6. IP Static Route Parameters

Parameter	Allows you to...
Network Address	Assign an IP network address for your IP static route.
Mask	Assign an IP subnet mask for your IP static route.
Next-Hop Address	Assign an IP address for the gateway associated with the IP static route.
Next-Hop Interface	Select an interface that is associated with the IP static route.
Cost	Specify the metric between this router and the destination. Note that this overrides routing protocol metrics.
Preference	Specify a low or high routing preference.

3. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Creating Static ARP Entries

To create a static ARP entry in your switch's ARP cache:

1. In the **IP Configuration** section of the Web Agent window, click **Static ARP**. The IP Static ARP Entries dialog box opens.
2. Click **CREATE**. The Add IP Static ARP Entry dialog box opens.

3. Use Table 7-7 to configure IP Static ARP:

Table 7-7. IP Static ARP Parameters

Parameter	Allows you to...
IP Address	Configure an IP address to associate with the Static ARP entry.
MAC Address	Enter the MAC address of a node to which you want to create a static ARP entry.
Interface	Select an interface to associate with the Static ARP entry.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Creating a BOOTP/DHCP Server Entry

The BOOTP/DHCP Server Entry allows you to configure a Cajun Router as a BOOTP/DHCP Relay Agent between a BOOTP/DHCP server and the source client. Only the locally attached clients will be able to find the BOOTP/DHCP server if the BOOTP/DHCP server entry is configured on your switch. If you have a network with multiple switches, and you want at least one client that is attached to each switch to be able to access the BOOTP/DHCP server, then you must configure each of those switches with a BOOTP/DHCP server entry.

To create a BOOTP/DHCP entry:

1. In the **IP Configuration** section of the Web Agent window, click **BOOTP/DHCP Servers**. The IP BOOTP/DHCP Servers dialog box opens.
2. Click **CREATE**. The Add BOOTP/DHCP Server Entry dialog box opens.
3. In the **IP Address** field, enter the **IP address** of the BOOTP/DHCP server on your network.
4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Note: It is possible to create multiple BOOTP/DHCP Server Entries if necessary.

IP Multicast

IP Multicast enables a single host to distribute information to multiple recipients. To do this, multicast protocols use class D IP addresses to specify specific multicast groups to which information is sent. The class D IP address used by multicast routing protocol ranges from 224.0.0.1 to 224.0.0.255. The class D IP addresses available for general use are 224.0.1.0 to 239.255.255.255.

In addition, IP multicasting distributes information to multicast groups in two specific ways:

- ❒ **Multicast Forwarding -** allows a switch to forward multicast traffic from the local router to group members on directly attached subnetworks. If a multicast packet is forwarded to multiple interfaces on one VLAN, only one Forwarding Entry is added on the VLAN for the packet. One copy of the packet is sent to the VLAN.
- ❒ **Multicast Routing -** allows a switch to deliver multicast traffic between neighboring routers and across the network.

For example, the switch could use Internet Group Membership Protocol (IGMP) Only to forward multicast traffic to locally attached subnetworks. However, if the multicast traffic in question is needed to be sent to a neighboring router, the switch could use DVMRP to send the information between routers. Since IGMP is a required protocol for any multicast routing protocol (for example, DVMRP), it is automatically enabled when you enable DVMRP.

Note: You must globally enable IP multicast routing in order to successfully configure IGMP or DVMRP. Refer to "Configuring IP Global Routing", earlier in this chapter, for instructions on enabling IP multicast routing.

Configuring IGMP

IGMP enables hosts to inform routers when they join or leave groups. Routers periodically query hosts (query interval) for the groups in which the hosts are members. When there is more than one router in a broadcast domain (subnet), one of the routers becomes the designated querier. Only the designated router queries the hosts.

Both IGMP Version 1.0 and IGMP Version 2.0 are supported. After selecting the specific IGMP version for an interface, you can manually configure the Version 1.0 querier. The selection of the querier for Version 2.0 is dynamic but can be overridden.

Enabling the IGMP Global Configuration

To enable IGMP global configuration:

1. In the **IP Configuration** section of the Web Agent window, click **Global Configuration**. The IP Global Configuration dialog box opens.
2. From the **IP Multicast Forwarding** pull-down menu, select **Enable**. This enables IP multicast globally.
3. In the **IGMP Configuration** section of the Web Agent window, click **Global Configuration**. The IGMP Global Configuration dialog box opens.
4. From the **IGMP** pull-down menu, select **Enable**.

5. To enable MTRACE processing, from the **MTRACE** pull-down menu, select **Enable**.

6. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Modifying IGMP Interfaces

To modify IGMP interfaces:

1. In the **IGMP Configuration** section of the Web Agent window, click **Interfaces**. The IGMP Interfaces dialog box opens.

   Note: If no IGMP interfaces are enabled for your existing IP interfaces, you must first enable a multicast protocol before you can configure IGMP. Refer to "Creating an IP Interface" earlier in this chapter for more information on how to select a multicast protocol.

2. Use Table 7-8 to complete your configuration:

Table 7-8. *IGMP Interface Parameters*

Parameter	Allows you to...
Select	Select the interface to be modified.
Interface	Display the IP interface that is configured with IGMP.
IP Address	Identify an IP address associated with this interface. This parameter is not configurable from the IGMP configuration dialog box.
IP Address Mask	Identify a subnet mask associated with this interface. This parameter is not configurable from the IGMP configuration dialog box.
IGMP Version	Specify the IGMP Version (1.0 or 2.0) to associate with the IGMP interface.
Maximum Groups	Specify the number of IGMP Groups that can be active on this interface. The default value is 32.
Always be Group Membership Querier	**Version 1.0:** Enable or disable this interface to be the designated querier. **Version 2.0:** • Enable to force this interface to send queries. • Disable to obey the designated querier election. Only the designated router will query hosts on your network. This is disabled by default.
Process Leave Packets	Enable to terminate group memberships quickly. (IGMP Version 2.0 only). The default value is Enabled.
Query Request Interval in (sec)	Configure the time period between queries. The default value is 125 seconds.

Table 7-8. IGMP Interface Parameters (Continued)

Parameter	Allows you to...
Query Response Interval in (sec)	Configure the amount of time to wait for a response from a host after sending a query. If no response is received within this time, the host is removed from the group table. The default value is 10 seconds.
Neighbor Querier Timeout Interval in (sec)	Enter the amount of time (in seconds) this interface should wait after hearing a neighbor's query before assuming the role of querier, if not already the querier. If no query is received from a neighbor with a lower IP address in the allotted time, this interface becomes the querier. (IGMP Version 2.0 only). The default value is 255 seconds.
Robustness Variable	Perform tuning for the expected packet loss on a subnet. If a subnet is expected to have more packet loss, the Robustness Variable should be increased. The Robustness Variable must not be set to 0 and should not be set to 1. The default value is 2.

3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Configuring DVMRP

Distance Vector Multicast Routing Protocol (DVMRP) is a distance vector routing protocol that uses IP packets with protocol type 2 (IGMP) to exchange routing datagrams. DVMRP enables multicast routers to exchange distance vector updates that contain lists of multicast flows and their cost metrics. DVMRP uses tunneling between pairs of DVMRP routers when traffic must pass through one or more intermediary routers or gateways that do not implement DVMRP.

Configuring the DVMRP Global Configuration

To configure the DVMRP global configuration:

1. In the **IP Configuration** section of the Web Agent window, click **Global Configuration**. The IP Global Configuration dialog box opens.
2. From the **IP Multicast Forwarding** pull-down menu, select **Enable**. This enables IP multicast globally.
3. In the **DVMRP Configuration** section of the Web Agent window, click **Global Configuration**. The DVMRP Global Configuration dialog box opens.
4. From the **DVMRP Version 3/xF**F pull down menu, select **Enable**.

5. Use Table 7-9 to set up your global configuration:

Table 7-9. DVMRP Global Parameters

Parameter	Allows you to...
DVMRP Version 3/xFF	Globally enable or disable DVMRP.
Neighbor Router Probe Interval	Set the value (in seconds) that the switch probes the network for available neighbor routers.
Neighbor Router Timeout Interval	Set the timeout (in seconds) that a neighbor stays up without confirmation. This is an important method used to timeout old routes.
Minimum Flash Update Interval	Set the period (in seconds) between flash updates. This represents the minimum time between advertisements of the same route.
Maximum Number of Routes	Enter the maximum number of routes for this interface.
Route Report Interval	Set the time (in seconds) that elapses between delivery of DVMRP routing table updates.
Route Replace Time	Specify the amount of time (in seconds) before which a route entry will be removed if it is not refreshed.
Route Hold Down Time	Set the time (in seconds) that the switch reports unavailable routes with a metric of infinity.
Prune Message Lifetime	Set the time (in seconds) that a transmitted upstream prune message persists.
Prune Message Retransmit Interval	Specify the time (in seconds) between the transmittal of generated upstream prune messages on your network.
Graft Message Retransmit Interval	Set the time (in seconds) between the transmittal of generated upstream graft messages.

6. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Modifying DVMRP Interface Information

To modify DMVRP interface parameters:

1. In the **DVMRP Configuration** section of the Web Agent window, click **Interfaces**. The DVMRP Interfaces dialog box opens.

Note: If no DVMRP interfaces are enabled for your existing IP interfaces (VLANs), you must first enable a multicast protocol before you can configure DVMRP. Refer to “Creating an IP Interface”, earlier in this chapter, for more information on how to select a multicast protocol.

2. Use Table 7-10 to complete your DVMRP configuration:

Table 7-10. *DVMRP Interface Parameters*

Parameter	Defines the...
Select	DVMRP interface to be configured.
Interface	Interface that is configured with the DVMRP multicast protocol.
IP Address	IP address of each interface. Not configurable.
IP Address Mask	Subnet mask of each interface. Not configurable
Interface Type	Interface type for each interface. You can configure the interface type as: • **Broadcast** - All traffic is forwarded through the routers. This is not a tunnel and does not require encapsulation. • **Non-Encapsulated Tunnel** - All multicast data traffic is IPIP encapsulated, but the protocol messages are simply unicast. • **IPIP Tunnel** - All multicast traffic (data and protocol messages) on this interface is encapsulated in IP unicast packets with the protocol set to IPIP (IP in IP).
Tunnel Endpoint Address	Tunnel endpoint IP address of a router. Configure this setting to represent the IP address of the end router to which you want to send datagrams through a tunnel. Typically, the origin and endpoint routers are separated by a gateway(s) or a router(s) that do not support DVMRP.
Interface Metric	Cost metric for the interface.
Src Host Addr in Prune Msg	Transmission of prunes. • **Enable** - Send prunes with the full source host address. • **Disable** - Send prunes with only the subnet portion of the source address.
Interface Scope	Minimum TTL (time-to-live) required for a packet to leave this interface (None, 127, 255).

3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Monitoring Switch Performance Using IP Statistics

This section provides detailed information on the analysis and use of IP and IP multicast statistics.

IP routing statistic options include:

- ❒ Displaying Global IP Routing Statistics
- ❒ Searching the IP Routing Table
- ❒ Examining the IP Routing Table Statistics
- ❒ Searching the IP ARP Cache

Displaying Global IP Routing Statistics

Note: IP routing global statistics only represent traffic processed by the supervisor module software.

To display the global IP routing statistics:

1. In the **IP Display** section of the Web Agent window, click **Global Statistics**. The IP Routing Global Statistics dialog box opens.
2. Click **Refresh** to update all statistics.

   Or

   Click **Clear** to set all statistics to zero.
3. Use Table 7-11 to review the definition of each statistic:

Table 7-11. *IP Routing Global Statistics*

Statistic	Defines the...
IP In Receives	Total number of input datagrams received from interfaces, including those received in error.
IP In Header Errors	Number of input datagrams discarded due to errors in their IP headers, including bad checksums, version number mismatch, other format errors, time-to-live exceeded, errors discovered in processing their IP options.

Table 7-11. IP Routing Global Statistics (Continued)

Statistic	Defines the...
IP In Address Errors	Number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received at this entity. This count includes invalid addresses (for example, 0.0.0.0) and addresses of unsupported Classes (for example, Class E). For entities that are not IP Gateways and therefore do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.
IP Forward Datagrams	Number of input datagrams for which this entity was not their final IP destination, as a result of which an attempt was made to find a route to forward them to that final destination. In entities which do not act as IP Gateways, this counter will include only those packets which were Source-Routed via this entity, and the Source-Route option processing was successful. **Note:** This is routed by the supervisor in the software.
IP In Unknown Protocols	Number of input datagrams discarded due to errors in their IP headers. Such errors may include bad checksums, version number mismatches, other format errors, time-to-live exceeded, errors discovered in processing their IP options.
IP In Discards	Number of input IP datagrams for which no problems were encountered to prevent their continued processing, but which were discarded (for example, for lack of buffer space). **Note:** This counter does not include any datagrams discarded while awaiting re-assembly.
IP In Delivers	Total number of input datagrams successfully delivered to IP user-protocols (including Internet Control Message Protocol (ICMP)).
IP Out Requests	Total number of IP datagrams that local IP user-protocols (including ICMP) supplied to IP in requests for transmission. **Note:** This counter does not include any datagrams counted in ipForwDatagrams.
IP Out Discards	Number of output IP datagrams for which no problem was encountered to prevent their transmission to their destination, but were discarded (for example, for lack of buffer space). Note that this counter includes datagrams counted in ipForwDatagrams if any such packets met this (discretionary) discard criterion.
IP Out No Routes	Number of IP datagrams discarded because no route could be found to transmit them to their destination. Note that this counter includes any packets counted in ipForwDatagrams which meet this `no-route' criterion. Note that this includes any Datagrams which a host cannot route because all of its default gateways are down.
IP Reassembly Timeout	Maximum number of seconds that received fragments are held while they are awaiting reassembly at this entity.
IP Reassembly Required	Number of IP fragments received that need to be reassembled.

Table 7-11. IP Routing Global Statistics (Continued)

Statistic	Defines the...
IP Reassembly OKs	Number of IP datagrams successfully reassembled.
IP Reassembly Failures	Number of failures detected by the IP re-assembly algorithm (timeout errors). Note that this is not necessarily a count of discarded IP fragments since some algorithms can lose track of the number of fragments by combining them as they are received.
IP Fragmentation OKs	Number of IP datagrams that have been successfully fragmented at this entity.
IP Fragmentation Failures	Number of IP datagrams that have been discarded because they needed to be fragmented at this entity but could not be.
IP Fragmentation Creates	Number of IP datagram fragments that have been generated as a result of fragmentation at this entity.
IP Routing Discards	Number of routing entries that were chosen to be discarded even though they are valid. One possible reason for discarding such an entry could be to free-up buffer space for other routing entries.
ICMP In Messages	Total number of ICMP messages that the entity received. Note that this counter includes all those counted by icmpInErrors.
ICMP In Errors	Number of ICMP messages that the entity received but determined as having ICMP-specific errors (bad ICMP checksums, bad length).
ICMP In Destination Unreachables	Number of ICMP Destination Unreachable messages received.
ICMP In Time Exceeds	Number of ICMP Time Exceeded messages received.
ICMP In Parameter Problems	Number of ICMP Parameter Problem messages received.
ICMP In Source Quenchs	Number of ICMP Source Quench messages received.
ICMP In Redirects	Number of ICMP Redirect messages received.
ICMP In Echo Requests	Number of ICMP Echo (request) messages received.
ICMP In Echo Replies	Number of ICMP Echo Reply messages received.
ICMP In Timestamp Requests	Number of ICMP Timestamp (request) messages received.
ICMP In Timestamp Replies	Number of ICMP Timestamp Reply messages received.
ICMP In Address Mask Requests	Number of ICMP Address Mask Request messages received.
ICMP In Address Mask Replies	Number of ICMP Address Mask Reply messages received.
ICMP Out Messages	Total number of ICMP messages that this entity attempted to send. Note that this counter includes all those counted by icmpOutErrors.
ICMP Out Errors	Number of ICMP messages that this entity did not send due to problems discovered within ICMPd such as a lack of buffers. This value should not include errors discovered outside the ICMP layer such as the inability of IP to route the resultant datagram. In some implementations, there may be no types of error which contribute to this counter's value.

Table 7-11. IP Routing Global Statistics (Continued)

Statistic	Defines the...
ICMP Out Destination Unreachables	Number of ICMP Destination Unreachable messages sent.
ICMP Out Time Exceeds	Number of ICMP Time Exceeded messages sent.
ICMP Out Parameter Problems	Number of ICMP Parameter Problem messages sent.
ICMP Out Source Quenchs	Number of ICMP Source Quench messages sent.
ICMP Out Redirects	Number of ICMP Redirect messages sent. For a host, this object will always be zero, since hosts do not send redirects.
ICMP Out Echo Requests	Number of ICMP Echo (request) messages sent.
ICMP Out Echo Replies	Number of ICMP Echo Reply messages sent.
ICMP Out Timestamp Requests	Number of ICMP Timestamp (request) messages sent.
ICMP Out Timestamp Replies	Number of ICMP Timestamp Reply messages sent.
ICMP Out Address Mask Requests	Number of ICMP Address Mask Request messages sent.
ICMP Out Address Mask Replies	Number of ICMP Address Mask Reply messages sent.
UDP In Datagrams	Total number of UDP datagrams delivered to User Datagram Protocol (UDP) users.
UDP In No Ports	Total number of received UDP datagrams for which there was no application at the destination port.
UDP In Errors	Number of received UDP datagrams that could not be delivered for reasons other than the lack of an application at the destination port.
UDP Out Datagrams	Total number of UDP datagrams sent from this entity.
IP Multicast Forward Datagrams	Number of input multicast datagrams for which this entity was not their final IP destination, as a result of which an attempt was made to find a route to forward them to that final destination.
IP Multicast In Discard	Number of input IP multicast datagrams for which no problems were encountered to prevent their continued processing, but were discarded (for example, for lack of buffer space). **Note:** This counter does not include any datagrams discarded while awaiting re-assembly.
IP Multicast In Receives	Total number of input multicast datagrams received from interfaces, including those received in error.
BOOTP/DHCP In Requests	Number of requests received by the BOOTP/DHCP Relay Agent.
BOOTP/DHCP In Responses	Total number of BOOTP/DHCP response datagrams received by the BOOTP/DHCP Relay Agent.
BOOTP/DHCP In Discards	Number of BOOTP/DHCP requests discarded.
BOOTP/DHCP In Hops Exceeds	Number of BOOTP/DHCP requests not forwarded due to number of hops exceeds.

Table 7-11. IP Routing Global Statistics (Continued)

Statistic	Defines the...
BOOTP/DHCP Out Requests	Total number of BOOTP/DHCP requests forwarded by the BOOTP/DHCP Relay Agent.
BOOTP/DHCP Out Responses	Total number of BOOTP/DHCP responses forwarded by the BOOTP/DHCP Relay Agent.

Searching the IP Routing Table

To use the IP routing table:

1. In the **IP Display** section of the Web Agent window, click **Route Table Search**. The Route Table Search dialog box opens.
2. Select the search criteria you want to use to find more specific information on available routes. For example, if you want to find all static routes that are presently configured on your switch, search by source and specify static as your search value.
3. Use Table 7-12 to determine your search parameters:

Table 7-12. IP Route Table Search Parameters

Parameter	Allows you to perform a search...
Source	Of your IP routing table using one of the following parameters: • **RIP** • **OSPF** • **Static** • **Local** Once you select one of these parameters, the search attempts to find routes associated the parameter you chose.
Interface	Based on the interface you select. System default entries include: • **Default** • **Discard** • **Ethernet Console** • **Configured Interface**
IP Address	Based on an IP address you specify.

4. Click **SEARCH** to start the search. If routes are available, they are displayed in the IP Routing Table dialog box.

Note: To delete a local entry from your IP routing table, you must delete the local IP interface associated with that entry.

Examining the IP Routing Table Statistics

To examine the IP Routing Table Statistics:

1. In the **IP Display** section of the Web Agent window, click **Route Table Statistics**. The IP Routing Table Statistics dialog box opens.
2. Use Table 7-13 to review each statistic:

Table 7-13. IP Routing Table Statistical Parameters

Parameter	Definition
Current Number of Routes	Displays the total number of active routes.
Peak Number of Routes	Displays the peak number of routes.
Total Routes Added	Displays the total number of routes added.
Total Routes Deleted	Displays the total number of routes deleted.
RIP Route Changes	Indicates the number of changes to the IP route database made by RIP.
RIP Queries	Indicates the number of RIP queries sent to the network.

Searching the IP ARP Cache

To search the IP ARP Cache entries:

1. In the **IP Display** section of the Web Agent window, click **ARP Cache Search**. The ARP Cache Entry Search dialog box opens.
2. Select the search criteria you want to use to find more specific information on your switch’s current ARP cache. For example, if you want to find all of the IP ARP cache entries associated with your out-of-band connection on your switch, search by VLAN and specify Ethernet Console as your search value.

3. Use Table 7-14 to determine your search parameters:

Table 7-14. ARP Cache Search Parameters

Parameter	Allows you to perform a search based on...
IP Address	An IP address you specify.
I/F	The interface you select. System entries include all interfaces that you previously configured.

4. Click **SEARCH** to start the search. If matching entries are found they are displayed in IP ARP Cache dialog box.

IP Multicast Statistics

IP multicast statistics include:

- ❒ Examining IGMP Interface Statistics
- ❒ Displaying the Multicast Group Table
- ❒ Displaying the IGMP Local Multicast Forwarding Cache
- ❒ Displaying DVMRP Global Statistics
- ❒ Examining DVMRP Interface Statistics
- ❒ Displaying DVMRP Neighbor Router(s)
- ❒ Displaying DVMRP Routing Table Statistics
- ❒ Displaying the DVMRP Route Table
- ❒ Displaying the DVMRP Upstream Routers
- ❒ Displaying the DVMRP Designated Forwarder(s) Table
- ❒ Displaying the DVMRP Downstream Dependent Router(s)
- ❒ Displaying the DVMRP Multicast Forwarding Cache

Note: It is possible to use access rules to filter and prioritize multicast traffic.

Displaying IGMP Global Statistics

The IGMP global statistics provides users with statistics on membership reports, membership queries transmitted and received, and unknown messages.

To display IGMP global statistics:

1. In the **IGMP Display** section of the Web Agent window, click **Global Statistics**. The IGMP Global Statistics dialog box opens.
2. To modify your global statistics, perform one of the following:
   - Click **REFRESH** to view the latest statistics.
   - Click **CLEAR ALL** to reset all statistics to zero.
   - Select one or more interfaces and click **CLEAR** to reset statistics on those interfaces to zero.
3. Use Table 7-15 to review each IGMP statistic:

Table 7-15. IGMP Global Statistics Parameters

Parameter	Defines the...
Group Membership Reports Received	Number of reports received in response to a group membership query. Hosts respond to a Query by generating Host Membership Reports reporting each host group to which they belong on the network interface from which the Query was received.
Group Membership Queries Transmitted	Number of query messages sent by all local IGMP interfaces. These messages are sent to discover which host groups have members on their attached local networks. Queries are addressed to the all-hosts group (address 224.0.0.1), and carry an IP time-to-live of 1.
Group Membership Queries Received	Number of query messages received by all local IGMP interfaces. All hosts that receive this query transmit a group membership report reporting each host group to which they belong.
Unknown Messages Received	IGMP message of a type other than Group Membership Query, Group Membership Report, or Leave group.

Examining IGMP Interface Statistics

The IGMP interface statistics allow you to view IGMP statistics for each configured IP interface with multicast enabled.

To view IGMP interface statistics:

1. In the **IGMP Display** section of the Web Agent window, click **Interface Statistics**. The IGMP Interface Statistics dialog box opens.

2. Click **REFRESH** to view the latest interface statistics.

Or

Click **CLEAR** to reset all statistics to zero.

3. Use Table 7-16 to review the IGMP interface statistics:

Table 7-16. *IGMP Interface Statistical Parameters*

Parameter	Defines the...
IGMP Interface	IP interface for these statistics.
IP Address	IP address associated with the interface.
IP Address Mask	Subnet mask associated with each listed interface.
State	Current state of the interface. For example, if the interface was enabled and operating properly, you should see a state of UP listed in this field.
IGMP Version	Version of IGMP enabled on each interface.
This Router is Group Membership Querier	Router that was configured or elected to be the designated group membership querier. The switch queries hosts on each interface only when it is acting as the designated querier on that interface.
Robustness Variable	Tuning for the expected packet loss on a subnet. If a subnet is expected to have more packet loss, the Robustness Variable should be increased. The Robustness Variable must not be set to 0 and should not be set to 1.
Next Query Request in (sec)	Remaining amount of time (in seconds) before the next group membership query is transmitted.
Neighbor Querier Timeout in (sec)	Amount of time (in seconds) remaining before this interface assumes the role of designated querier. This timer is reset to the value entered for the Neighbor Querier Timeout Interval each time an IGMP query is received from a neighbor with a lower IP address. If no response is received in the allotted time, the query will timeout and the Version 2.0 querier will begin.
Group Join Requests Received	Number of new groups that have been joined on this interface.
Group Leave Requests Received	Number of leave requests received on this interface.
Group Reports Received	Number of reports received on this interface in response to a group membership query. Hosts respond to a Query by generating Host Membership Reports reporting each host group to which they belong on the network interface from which the Query was received.
Query Messages Received	Number of query messages received from other multicast routers.

Table 7-16. IGMP Interface Statistical Parameters (Continued)

Parameter	Defines the...
Query Messages Transmitted	Number of query messages sent by a multicast router. These messages are sent to discover which host groups have members on their attached local networks. Queries are addressed to the all-hosts group (address 224.0.0.1), and carry an IP time-to-live of 1.
Unknown Messages Received	IGMP messages received with an unsupported type.
Number of Current Groups	Number of groups on each interface for which there are entries in the Group Membership Table.

Displaying the Multicast Group Table

The multicast group table provides information on interfaces that are members of an IGMP group and contains an expiry time for the entry, IP address of the group, and the group reporter address.

To display the IGMP group table:

1. In the **IGMP Display** section of the Web Agent window, click **Group Membership Table**. The IGMP Group Membership Table dialog box opens.
2. To modify your IGMP group membership table, perform one of the following:
   - Select the entry and click **Delete Entry** to delete one or more entries.
   - Click **Flush Table** to clear the entire table.
   - Click **REFRESH** to receive the most up-to-date information on the entries in the table.
3. Use Table 7-17 to review the IGMP Group Membership information:

Table 7-17. IGMP Group Membership Table Parameters

Parameter	Defines the...
Group Member Interface	Interface that is connected to a member of IGMP group.
Group Address	Group address that has members on this interface.
Group Created On	Time at which the group was created on the router.
Group Multicast Protocol	Routing protocol being used for the group. If no routing protocol is being used on the interface a group is on, this column displays IGMP.

Table 7-17. IGMP Group Membership Table Parameters (Continued)

Parameter	Defines the...
Group Reporter Address	IP address of the host that sent the most recent host membership report for this group.
Entry Expiration Period in (sec)	Expiration time (in seconds) of the group that is being displayed.

Displaying the IGMP Local Multicast Forwarding Cache

To display the multicast forwarding cache information (IGMP only interfaces):

1. In the **IGMP Display** section of the Web Agent window, click **Local Multicast Forwarding Cache**. The Local Multicast Forwarding Cache dialog box opens.
2. To modify your Local Multicast Forwarding Cache, perform one of the following:
   - Select the entry and click **Delete Entry** to delete one or more entries.
   - Click **Flush Table** to clear the entire table.
   - Click **REFRESH** to receive the most up-to-date information on the entries in the table.
3. Use Table 7-18 to review the IGMP Multicast Forwarding Cache information:

Table 7-18. IGMP Local Multicast Forwarding Cache Parameters

Parameters	Defines the...
Destination Group Address	Destination group address of the multicast transmission.
Source SubNetwork	Subnet on which the IGMP interface(s) exist.
Source Address Mask	Subnet mask associated with the IGMP source subnetwork.
Upstream Interface	IP interface configured on the upstream interface.
Invalid Flows From Upstream	Number of invalid flows received from the upstream neighbor.
Packets Forwarded Through Cache Entry	Number of packets successfully forwarded in the CPU (supervisor module).
Downstream Interface(s)	Number of downstream interfaces and provides a link to the IGMP Downstream Interfaces dialog box.
Upstream Source(s)	Number of upstream interfaces and provides a link to the IGMP Upstream Interfaces dialog box.

Displaying DVMRP Global Statistics

To display the DVMRP global statistics:

1. In the **DVMRP Display** section of the Web Agent window, click **Global Statistics**. The DVMRP Global Statistics dialog box opens.
2. Click **REFRESH** to view the latest statistics.

   Or

   Click **CLEAR** to reset all statistics to zero.
3. Use Table 7-19 to review the DVMRP global statistics:

Table 7-19. *DVMRP Global Statistical Parameters*

Statistic	Defines the number of...
Probe Messages Received	Probe messages received on this switch. DVMRP routers exchange probes and routing updates so they each have a picture of their neighbors' capabilities and the DVMRP network topology.
Report Messages Received	Report messages received on this switch.
Prune Messages Received	Prune messages received on this switch. This indicates the number of old branches removed from the multicast distribution tree.
Graft Messages Received	Graft messages received. This indicates the number of attempts at adding a new branch to the multicast distribution tree.
Graft Acknowledgments Received	Graft acknowledgments received.
Unknown Message Codes Encountered	Messages received that are not graft, report, or probe messages.
Probe Messages Transmitted	Probe messages transmitted to the network.
Report Messages Transmitted	Report messages transmitted on this switch.
Prune Messages Transmitted	Prune messages transmitted upstream on this switch. This indicates the number of old branches removed from the multicast distribution tree.
Graft Messages Transmitted	Graft messages transmitted upstream from this switch. This indicates the number of new upstream branches added to the multicast distribution tree.
Graft Acknowledgments Transmitted	Graft acknowledgments sent downstream from this switch. This indicates the number of new downstream branches added to the multicast distribution tree.

Examining DVMRP Interface Statistics

DVMRP interface statistics list active DVMRP interfaces and provide specific information on each interface.

To examine DVMRP statistics:

1. In the **DVMRP Display** section of the Web Agent window, click **Interface Statistics**. The DVMRP Interface Statistics dialog box opens.
2. Perform one of the following...

   Click **REFRESH** to view the latest interface statistics.

   Click **CLEAR All** to reset all statistics to zero.

   Select one interface, and click **CLEAR** to reset the selected interface.
3. Use Table 7-20 to review the interface statistics:

Table 7-20. DVMRP Interface Statistical Parameters

Parameter	Defines the...
DVMRP Interface	IP interface configured with the DVMRP multicast routing protocol.
Network Address	IP address of the interface configured with the DVMRP multicast.
Address Mask	IP subnet mask associated with the interface.
State	Current status of the interface. Possible status indications include: • **UP** - The interface is active. • **DOWN** - The interface is inactive.
Type	Type of interface configured. Possible values include: • **Broadcast** - All traffic is forwarded through the routers. This is not a tunnel and does not require encapsulation. • **IPIP Tunnel** - All multicast traffic (data and protocol messages) on this interface is encapsulated in IP unicast packets with the protocol set to IPIP (IP in IP). • **Non-Encapsulated Tunnel** - All multicast data traffic on this interface is IPIP encapsulated, but the protocol messages are simple unicast.
Metric	Interface cost.
IGMP Querier on Interface	Router is the IGMP querier. The purpose of the IGMP querier is to periodically poll hosts on your network to trigger group membership reports.
Next Probe Message in (sec)	Time (in seconds) remaining until the next probe message is sent.

***Table 7-20.** DVMRP Interface Statistical Parameters (Continued)*

Parameter	Defines the...
Unrecognized Packets Received	Number of unknown DVMRP messages.
Invalid Routes Received	Number of invalid routes received on this interface.
Neighbor DVMRP Router(s)	Number of (neighbor) routers that are also running DVMRP. **Note:** This number is a hypertext link that provides additional information on the DVMRP neighbor router(s).

Displaying DVMRP Neighbor Router(s)

To view the DVMRP neighbor routers:

1. In the **DVMRP Display** section of the Web Agent window, click **Interface Statistics**. The DVMRP Interface Statistics dialog box opens.
2. In the **DVMRP Neighbor Router(s)** column, click on the **number** (where the number is 1 or more) to view DVMRP neighbor routers.
3. Use Table 7-21 to view more information on DVMRP neighbor routers.

Table 7-21. DVMRP Neighbor Routers

Parameter	Displays...
Neighbor Network Address	The neighbor router's network address.
Found on Interface	The neighbor routers found on this interface.
DVMRP Supported Major/Minor Version	The DVMRP version supported by the neighbor router.
Expiration period in (sec)	The time (in seconds) before the neighbor router times out.
Neighbor Received Probe From This Router	Whether the neighbor router received this router's probe message.
Neighbor Supports Prune Function	Whether the neighbor router supports prune functionality.
Neighbor Supports Generation ID Function	Whether the neighbor router supports generation of IDs.
Neighbor Supports MTRACE Requests	Whether the neighbor router supports MTRACE requests.
Neighbor is SNMP Manageable	Whether the neighbor router can be managed by SNMP.

Displaying DVMRP Routing Table Statistics

DVMRP routing table statistics provides information on the current number of valid routes, the number of total routes present (both valid and invalid), and the number of triggered routes.

To view the DVMRP routing table statistics:

1. In the **DVMRP Display** section of the Web Agent window, click **Route Table Statistics**. The DVMRP Routing Table Statistics dialog box opens.

2. Use Table 7-22 to review the DVMRP Routing Statistics information:

***Table 7-22.** DVMRP Routing Statistical Parameters*

Parameter	Defines the...
Current Number of Routes	Total number of routes present in the routing database. This number includes both valid and invalid routes.
Number of Triggered Routes	Total number of routes added to the routing table that were triggered by a topology change in the network.
Number of Valid Routes	Total number of valid routes present in the routing database.

Displaying the DVMRP Route Table

The DVMRP route table contains information on valid DVMRP routes, the expiry for those routes, and additional next-hop information.

To view the DVMRP route table:

1. In the **DVMRP Display** section of the Web Agent window, click **Route Table**. The DVMRP Route Table dialog box opens.
2. Complete one of the following to modify your DVMRP table:
   - Select the entry and click **Delete Entry** to delete one or more entries.
   - Click **Flush Table** to clear the entire table.
   - Click **REFRESH** to receive the most up-to-date information on the entries in the table.
3. Use Table 7-23 to review the DVMRP route table parameters:

***Table 7-23.** DVMRP Route Table Parameters*

Parameter	Defines the...
Source Network	Network from which a multicast flow may originate.
Source Network Mask	Source network mask.
Reporting Router	IP address of the router reporting this route to its neighbors.
Reporting Router Interface	IP interface configured, which leads to th0.01 u13(ip-17(r)11(t)4r)11(e)1(a)2(4m

Table 7-23. DVMRP Route Table Parameters (Continued)

Parameter	Defines the...
Upstream Router(s)	IP address of the DVMRP router that is the upstream neighbor to the local router. The local DVMRP router must know which DVMRP router is its upstream neighbor to determine how packets from a given source will be transmitted to a given multicast group. Opens DVMRP Upstream Router(s) dialog box.
Designated Forwarder(s)	Network router(s) responsible for forwarding from the source network onto the upstream interface. Opens the Designated Forwarders dialog box.
Downstream Dependent Router(s)	Number of downstream DVMRP routers that are dependent on this router for this particular route. Opens the DVMRP Downstream Dependent Router(s) dialog box.

Displaying the DVMRP Upstream Routers

To view the DVMRP upstream routers:

1. In the **DVMRP Display** section of the Web Agent window, click **Route Table**. The DVMRP Route Table dialog box opens.
2. In the **Upstream Router(s)** column, for the appropriate source network, click the **number** to view information on the upstream routers. The Upstream Router(s) dialog box opens.
3. Use Table 7-24 for more information on Upstream Router(s).

Table 7-24. DVMRP Upstream Router(s)

Parameter	Definition
Router Network Address	Displays the router network address.
Router Cost to Source Network	Displays the cost metric.
Found on Interface	Displays the interface on which the upstream router was found.

Displaying the DVMRP Designated Forwarder(s) Table

To view the DVMRP Designated Forwarder table:

1. In the **DVMRP Display** section of the Web Agent window, click **Route Table**. The DVMRP Route Table dialog box opens.

2. In the **Designated Forwarder** column, for the appropriate source network, click the **number** to view information on the designated forwarder. The Designated Forwarder(s) table opens.

3. Use Table 7-25 for more information on Designated Forwarder(s) parameters:

Table 7-25. Designated Forwarder(s) Table Parameters

Parameter	Defines the...
Forwarding Interface	Local interface which leads to the network where the Designated Forwarder resides.
Forwarder Network Address	Designated Forwarder for the given source network on the indicated Forwarding Interface.
Forwarder Cost to Source Network	Cost reported by the Designated Forwarder for the given source network.

Displaying the DVMRP Downstream Dependent Router(s)

To view the DVMRP downstream dependent routers:

1. In the **DVMRP Display** section of the Web Agent window, click **Route Table**. The DVMRP Route Table dialog box opens.
2. In the **Downstream Dependent Router(s)** column, for the appropriate source network, click the **number** to view information on the downstream dependent routers. The Downstream Dependent Router(s) dialog box opens.

3. Use Table 7-26 for more information on Downstream Dependent Router(s).

Table 7-26. *DVMRP Downstream Dependent Router(s)*

Parameter	**Definition**
Router Network Address	Displays the router network address of the downstream dependent router.
Found on Interface	Displays the name of the interface on which the downstream router was found.
DVMRP Supported Major/Minor Version	Displays the DVMRP version supported.
Router Received Probe from This Router	Displays whether the router received a probe from this router.
Router Supports Prune Function	Displays whether this router supports prune functionality.
Router Supports Generation ID Function	Displays whether the router supports generation ID function.
Router is SNMP Manageable	Displays whether the router can be managed by SNMP.

Displaying the DVMRP Multicast Forwarding Cache

The DVMRP Multicast Forwarding Cache screen provides detailed information on the multicast forwarding attributes including information on downstream interfaces and upstream sources. DVMRP allows the switch to construct paths from the hosts that are sending to a multicast group to the hosts that are receiving it.

To display the multicast forwarding cache information:

1. In the **DVMRP Display** section of the Web Agent window, click **Multicast Forwarding Cache**. The Multicast Forwarding Cache dialog box opens.
2. Complete one of the following to modify your Multicast Forwarding Table:
   - Select the entry and click **Delete Entry** to delete one or more entries.
   - Click **Flush Table** to clear the entire table.
   - Click **REFRESH** to receive the most up-to-date information on the entries in the table.

3. Use Table 7-27 to review the DVMRP Multicast Forwarding Cache information:

Table 7-27. DVMRP Multicast Forwarding Cache Parameters

Parameter	Defines the...
Select	Selection of the multicast forwarding cache.
Destination Group Address	Destination group address of the multicast transmission.
Source SubNetwork	Subnet from which the flow is coming.
Source Address Mask	Subnet mask associated with the DVMRP source subnetwork.
Upstream Interface	Local interface which is receiving this flow.
Upstream Neighbor (Router) Address	IP address of the upstream neighbor (router).
Invalid Flows From Upstream	Number of invalid flows received from the upstream neighbor.
Packets Forwarded Through Cache Entry	Number of packets successfully forwarded in the CPU (supervisor module) for this flow.
Upstream Interface is Pruned	Router that is sending prunes to the upstream neighbor. Allows you to open the DVMRP Upstream Prune Information dialog box.
Next Pruned Downstream Interface to Timeout	Next interface that is currently pruned which will be grafted back.
Downstream Interface(s)	Number of downstream interfaces. Allows you to open the DVMRP Downstream Links dialog box.
Upstream Source(s)	Number of upstream interfaces. Allows you to open the Upstream Sources dialog box.

4. In the **Upstream Interface is Pruned** field, click on the **number** to view information on the upstream prune information. The Upstream Prune Information dialog box opens.

5. Use Table 7-28 for more information on upstream prunes.

Table 7-28. Upstream Prune Information

Parameter	Displays the...
Destination Group Address	Destination group address of the multicast session.
Source SubNetwork	Subnet on which the DVMRP interface exists.
DVMRP Upstream Interface	Name of the upstream interface.
Interface Type	The interface type. Types include: • **Broadcast** - All traffic is forwarded through the routers. This is not a tunnel and does not require encapsulation. • **IPIP Tunnel** - All multicast traffic (data and protocol messages) on this interface is encapsulated in IP unicast packets with the protocol set to IPIP (IP in IP). • **Non-Encapsulated Tunnel** - All multicast data traffic on this interface is IPIP encapsulated, but the protocol messages are simple unicast.
Interface is Pruned	Status of whether the interface has been pruned.
Prune Expiration Time in sec	Time (in seconds) that the interface times out waiting for the prune message to expire.

6. In the **Downstream Interface(s)** field, click the **number** to view information on the downstream interface. The DVMRP Downstream Link(s) dialog box opens.

7. Use Table 7-29 to view the DVMRP Downstream Links information.

Table 7-29. DVMRP Downstream Links Parameters

Parameter	Displays the...
Destination Group Address	Destination group address.
Source SubNetwork	Source subnetwork.
DVMRP Downstream Interface	DVMRP Downstream interface.
Interface Type	Interface type. Types include: • **Broadcast** - All traffic is forwarded through the routers. This is not a tunnel and does not require encapsulation. • **IPIP Tunnel** - All multicast traffic (data and protocol messages) on this interface is encapsulated in IP unicast packets with the protocol set to IPIP (IP in IP). • **Non-Encapsulated Tunnel** - All multicast data traffic on this interface is IPIP encapsulated, but the protocol messages are simple unicast.

Table 7-29. *DVMRP Downstream Links Parameters (Continued)*

Parameter	Displays the...
Interface is Pruned	Status of whether the interface has been pruned.
Prune Expiration in (sec)	Time (in seconds) that the interface times out waiting for the prune message to expire.

8. In the **Upstream Source(s)** field, click on the **number** to view information on the upstream source. The DVMRP Upstream Source(s) dialog box opens.

9. Use Table 7-30 to view the DVMRP Upstream Source(s) information.

Table 7-30. *DVMRP Upstream Sources Parameters*

Parameter	Displays the...
Destination Group Address	Destination group address for the upstream interface.
Flow Source Address	Host source address for the upstream flow.
Flow Upstream Interface	Name of the flow source interface.
Payload Protocol Type	Protocol type for the payload.
Source Port Number	Source port number.
Destination Port Number	Destination port number.

Configuring VRRP

When multiple routers are available to forward traffic, the Virtual Router Redundancy Protocol (VRRP) is used to provide fast automatic fail-over for hosts when the default gateway fails. This eliminates the single point of failure inherent in the static default routed environment. A Master VRRP router controls the IP addresses associated with the virtual router and forwards packets sent to these IP addresses. The backup router is always on standby. If the Master router fails, the backup router takes over. Multiple virtual routers can be created per interface. VRRP can be enabled or disabled globally or on an interface basis.

Enabling VRRP

To enable a VRRP virtual router:

1. In the **IP Configuration** section of the Web Agent window, click Global Configuration. The IP Global Configuration dialog box opens.
2. From the **VRRP** pull-down menu, select **Enable**.
3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Enabling VRRP on an Interface

To enable an VRRP virtual router on an interface:

1. In the **IP Configuration** section of the Web Agent window, click **Interfaces**. The IP Interfaces dialog box opens.
2. Select the interface to be enabled.
3. From the **VRRP** pull-down menu for your interface, select **Enable**.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Note: You must enable VRRP globally from the IP Configuration/Global Configuration dialog box.

Creating a VRRP Virtual Router

To create a VRRP router:

1. In the **IP Configuration** section of the Web Agent window, click **VRRP Configuration**. The VRRP Configuration dialog box opens.
2. Click **CREATE**. The Add VRRP Virtual Router dialog box opens.
3. Use Table 7-31 to configure your VRRP parameters:

Table 7-31. *VRRP Configuration Parameters*

Parameter	Defines...
Interface	The name associated with the selected interface to configure.
VR ID	The reporting virtual router's identification. The ID range is 1-255 (decimal).
IP Address	The virtual router's IP address.

Table 7-31. VRRP Configuration Parameters (Continued)

Parameter	Defines...
Priority	The sending VRRP router's priority. Higher values equal higher priority. Possible values: • **255** - The value that must be assigned to the Master. • **1** to **254** - Values that must be used for routers backing up a virtual router. • **0** - the current Master is disabled. Allows Backup routers to trigger without waiting for the current Master to timeout.
Advertisement Timer	The number of seconds a Master virtual router advertises itself.
Auth Type	The VRRP authentication method. The default is None.
Auth Key	The VRRP authentication key for the interface. The default is LUCENT.
Addr Owner Override	The address owner override.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Configuring VRRP Authentication

To configure VRRP authentication:

1. In the **IP Configuration** section of the Web Agent window, click **Interfaces**. The IP Interfaces dialog box opens.
2. Select the interface on which to enable VRRP authentication.
3. From the **VRRP Auth Type** pull-down menu, select **Simple**.
4. In the **VRRP Auth Key** field, enter your authentication password. The default is LUCENT.
5. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Displaying VRRP Statistics

To view VRRP virtual router statistics:

1. In the **IP Display** section of the Web Agent window, click **VRRP Statistics**. The VRRP Statistics dialog box opens.

2. Complete one of the following to modify your VRRP statistics:
   - Click **CLEAR** to reset all the entries.
   - Click **REFRESH** to receive the most up-to-date information on the entries.
3. Use Table 7-32 to review your VRRP statistics:

Table 7-32. VRRP Statistical Parameters

Parameter	Defines the...
Interface	IP interface name corresponding to the selected VRRP virtual router.
VR ID	Reporting virtual router's identification.
IP Address	IP address that corresponds with the selected VRRP virtual router.
State	State of the virtual router. Values include: • **Inactive** - Disables the VRRP virtual router. • **Initialize** - Initializes the VRRP Virtual Router. • **Backup** - Defines the VRRP Virtual Router as a backup router to the master. • **Master** - The VRRP Virtual Router functions as the forwarding router.
Time of State Change	Last state of transition. This value is reported in an HH:MM:SS format.
Times this VR became master	Number of instances that the virtual router became the Master.
Advertisements Received	Number of advertisements received, matching the VRRP Virtual Router configuration.
Advertisements Sent	Number of advertisements sent by the VRRP Virtual Router.
Bad Advertisements Received	Number of advertisements received by the VRRP Virtual Router with invalid parameters.

Configuring IRDP

ICMP Router Discovery Protocol (IRDP) is an alternative router discovery protocol using ICMP messages on multicast links.

ICMP uses router discovery messages, known as **router advertisements** and **router solicitations**. Each router periodically multicasts a router advertisement from each of its multicast interfaces, announcing the IP address of that interface, and other router IP addresses. Hosts discover the addresses of their neighbor routers by listening for the advertisements. When a host attached to a multicast link starts up, it may multicast a router solicitation to ask for immediate advertisements, rather than waiting for the next periodic one to arrive.

If no advertisements arrive, the host may re-transmit the solicitation a small number of times, but then must stop sending more solicitations. Routers that subsequently start up, or were not discovered because of packet loss or temporary link partitioning, are eventually discovered by reception of their periodic (unsolicited) advertisements.

Enabling IRDP on an Interface

To enable IRDP on an interface:

1. In the **IP Configuration** section of the Web Agent window, click **IRDP**. The ICMP Router Discovery Protocol dialog box opens.
2. In the **Select** column, choose the interface on which to enable IRDP.
3. Use Table 7-33 to enable parameters and enter necessary Internet addresses in the IRDP Interfaces dialog box.

Table 7-33. ICMP Router Discovery Protocol Parameters

Parameter	Definition
Select	Selects the interface to be configured.
Interface	Displays the IRDP interface.
Network Address	Displays the network IP address of the IRDP interface.
IRDP State	Select to enable or disable IRDP on the selected interface. The default is **Enable**.
Preferences	Enter the preference of the address as a default router address, relative to other router addresses on the same subnet. The minimum value (80000000 hex) is used to indicate that the address should not be used by neighboring hosts as a default router address, even though it may be advertised. The default is 0.
Adv. Address	Select an IP destination address used for multicast router advertisements sent from the interface. Options include: • **Multicast** - Used on any link where listening hosts support IP multicast. The default is 224.0.0.1. • **Broadcast** - Used on any link where listening hosts support IP unicast. The default is 255.255.255.255.

Table 7-33. ICMP Router Discovery Protocol Parameters

Parameter	Definition
Min. Advertisement Interval (sec)	The minimum time (in seconds) allowed between sending unsolicited multicast router advertisements from the interface. This value must be no less than three seconds and no greater than the Max. Advertisement Interval. The default is 0.75 times the maximum interval.
Max. Advertisement Interval (sec)	Enter the maximum time (in seconds) allowed between sending multicast router advertisements sent from the interface. This value must be no less than four seconds and no greater than 1800 seconds. The default value is 1800 seconds.
Advertisement Life Time (sec.)	The time (in seconds) of the lifetime of the router advertisements sent from the interface. This value must be no less than the maximum advertisement interval and no greater than 9000 seconds. The default value is three times the maximum advertisement interval.

4. From the **IRDP State** pull-down menu for the selected interface, select **Enable**.

5. From the **Adv. Address** pull-down menu for the selected interface, select **Multicast**.

6. In the **Min. Advertisement Interval (sec.)** field for the selected interface, delete the default value and enter the minimum time interval that passes before the host contacts the switch.

7. In the **Max. Advertisement Interval (sec.)** field for the selected interface, delete the default value and enter the maximum time interval that passes before the host contacts the switch.

8. In the **Advertisement Life Time (sec.)** field, delete the default value and enter the duration, in seconds, of the IRDP advertisement.

9. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

10. In the **IP Configuration** section of the Web Agent window, click **Global Configuration**. The IP Global Configuration dialog box opens.

11. From the **IP Multicast Forwarding** pull-down menu, select **Enable**.

12. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Adding an IRDP Interface

To add an IRDP interface:

1. In the **IP Configuration** section of the Web Agent window, click **IRDP**. The ICMP Router Discovery Protocol dialog box opens.
2. Click **Add**. The Add IRDP dialog box opens.
3. From the **Interface** pull-down menu, select the **interface**.
4. In the **Router Address** field, enter the IP address of the router for which you create an IRDP interface.
5. In the **Preference** field, enter a value that indicates the preference of the address as a default router address. The default is 0.
6. Click **CREATE** to create the new IRDP interface, or **CANCEL** to restore previous settings.

Deleting an IRDP Interface

To delete an IRDP interface:

1. In the **IP Configuration** section of the Web Agent window, click **IRDP**. The ICMP Router Discovery Protocol dialog box opens.
2. Select the IRDP interface you want to delete and click **DELETE**. The IRDP interface is deleted and no longer displays in the interface list.

Configuring LDAP

In the Web console, you can configure Lightweight Directory Access Protocol (LDAP) settings and view LDAP statistics. On the Cajun P550 switch, LDAP allows access control lists to be retrieved from a database on an LDAP server and applied to the Cajun P550 switch. You can also view LDAP statistics for the switch.

You can configure a primary and secondary LDAP server as well as the search base for the switch to contact in response to an LDAP request. Configuring a secondary server ensures that LDAP requests can be fulfilled if a primary server fails.

Configuring LDAP Settings

To configure LDAP settings:

1. In the **IP Configuration** section of the Web Agent, click **LDAP Configuration**. The LDAP Configuration dialog box opens.

2. Use the following table to enter necessary information in the LDAP Configuration dialog box.

Table 7-34. LDAP Configuration Parameters

Parameter	Definition
Primary Server IP Address	Enter the IP address of your primary LDAP server for the access control list domain. This address is used first when connecting to and downloading access lists from an LDAP server. The default value of 0.0.0.0 indicates to the client that there is no primary LDAP server.
Primary Server Port	Enter the **port number** of the primary LDAP server for the access control list domain. The port number is used in conjunction with the primary server IP address. There are no special overload values. The default port is 389.
Secondary Server IP Address	Enter the backup LDAP server IP address for the access control list domain. This address is used as a backup when connecting to and downloading access lists from an LDAP server. If the LDAP client is unsuccessful in connecting to or downloading access lists from the primary server, the secondary server IP address is used. If the primary server IP address has a value of 0.0.0.0, the secondary server IP address is used. The default value is 0.0.0.0. **Note:** Setting the IP address of the secondary server to 0.0.0.0 indicates to the LDAP client that there is no secondary server.
Secondary Server Port	Enter the backup LDAP server port number for the access control list domain. The port number is used in conjunction with the secondary server IP address. There are no special overload values. The default port number is 389.
Search Base	Enter the search criteria that will be sent to the LDAP server. The default value is “ou=Devices, ou=CajunRules, o=Lucent”.

3. Click **APPLY** to save changes, or **CANCEL** to restore previous settings.

The LDAP client sends a search for access control lists to the primary server if the client finds the primary server. The primary server retrieves the access lists from the LDAP database and returns them to the switch’s LDAP client. If the client does not find the primary server and if the primary server does not respond after five retries, the client tries to connect to the secondary server. If the secondary server fails after five retries, the client times out. The LDAP client applies the access lists to manage the way traffic is forwarded.

Viewing LDAP Statistics

To view LDAP statistics:

1. In the **IP Display** section of the Web console, click **LDAP Statistics**. The LDAP Statistics dialog box opens.
2. Click **Refresh** to dynamically update LDAP Statistics data. LDAP Statistics include:

Table 7-35. *LDAP Statistics*

Parameter	Definition
Last Change	Displays the sysUpTime in the device that this Policy Capability was last modified. Providing this allows a remote manager to detect a change in the Policy Capabilities by polling a single object. On seeing this value change, an interested manager should relearn this device's Policy Capabilities. For more detailed information about SysUpTime and Policy Capabilities, refer to lucentDevicePolicyCapabilityLastChange in the Lucent MIB.
Producer Signal	The sequence number that, when modified, triggers the LDAP client to download the latest policy from the LDAP server. Typically, RealNet Rules will set this value whenever there is a new policy to download. If this value is a non-zero value, the LDAP client will compare it to the producer signal on the LDAP server. No comparison is made if the value is zero.
Consumer Signal	Used to indicate the success of the LDAP client downloading a policy. If the consumer signal matches the producer signal, then the last time the LDAP client attempted to download a policy, the download was successful. If the consumer signal is -1, then either the LDAP client had a problem processing the access lists or the consumer signal set on the LDAP client did not match the signal configured on the LDAP server. If the consumer signal is not -1 and does not match the producer signal, then the LDAP client was unable to connect to the LDAP server(s).

Configuring an IP Helper Address

When you configure an IP Helper Address, you enable a server to receive broadcasts from the switch and forward them to a server or computer on a particular VLAN. The receiving server is referred to as the helper because once it receives the request from the switch, it obtains the requested information and forwards it to the requesting server or computer.

Creating an IP Helper Address

To create an IP helper address:

1. In the **IP Configuration** section of the Web Agent window, click **IP Helper Address**. The IP Helper Address dialog box opens.
2. Click **CREATE**.
3. From the **Interface** pull-down menu, select the interface of the PC or server on which you want to create an IP helper address.
4. In the **Helper Address** field, type the **IP Address** of the server that will receive and pass along the broadcast from the switch.
5. Use Table 7-36 to determine the fields to enable:

Table 7-36. *IP Helper Address Parameters*

Parameter	Definition
Interface	Provides a list of interfaces associated with the switch configuration.
Helper Address	Enables you to specify the IP Address of the server that receives and passes along broadcasts from the switch.
TFTP	Enables the helper to route files via Trivial File Transfer Protocol (TFTP). The default value is Enabled.
DNS	Enables the helper to route the domain names via Dynamic Naming Service. The default value is Enabled.
TIME	Enables the helper to route the system time of specified computers on the VLAN. The default value is Enabled.
NETBIOS Name Service	Enables the helper to route the name of a user or a computer on a VLAN via NETBIOS. The default value is Enabled.
NETBIOS Date Service	Enables the helper to route the current system date of a computer on a VLAN via NETBIOS. The default value is Enabled.
BOOTP Server	Enables the helper to route IP addresses assigned by a Bootstrap Protocol (BOOTP) to a receiving computer. The default value is Enabled.
BOOTP Client	Enables the helper to route the IP address of a BOOTP client. The default value is Enabled.
TACACS	Enables the helper to route passwords forwarded by the Terminal Access Controller Access Control System (TACACS). The default value is Enabled.

6. Click **CREATE** to create the helper address, or **CANCEL** to restore previous settings.

Deleting an IP Helper Address

To delete an IP helper address:

1. In the **IP Configuration** section of the Web Agent, click **IP Helper Address**. The IP Helper Address dialog box opens.
2. Select the IP helper address you want to delete, and click **Delete**.

Modifying an IP Helper Address

To modify an IP helper address:

1. In the **IP Configuration** section of the Web Agent, click **IP Helper Address**. The IP Helper Address dialog box opens.
2. Select the IP helper address you want to modify.
3. Use Table 7-36 to modify the IP helper address parameters.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

8

Configuring the RIP Routing Protocol (Layer 3)

Overview

This chapter and its procedures are specific to Layer 3 configuration.

Configuring the Switch Using the RIP Routing Protocol

This section describes:

- ❒ Configuring RIP for the Switch
- ❒ Modifying RIP Interfaces
- ❒ Creating Trusted RIP Neighbors
- ❒ Interpreting RIP Statistics

Configuring RIP for the Switch

To configure the RIP routing protocol globally on your switch:

Note: You must enable RIP globally. To enable RIP, refer to "Configuring IP Interfaces", and "Configuring VRRP", in Chapter 7.

1. In the **RIP Configuration** section of the Web Agent window, click **Global Configuration**. The RIP Global Configuration dialog box opens.
2. Use Table 8-1 to configure the global setup:

Table 8-1. *RIP Global Configuration Parameters*

Parameter	Allows you to...
Global RIP	Enable or disable the RIP protocol. The default is Enable.
Update Timer	Specify the value (in seconds) that represents the time between RIP updates on all interfaces. The default value is 30 seconds.

Table 8-1. RIP Global Configuration Parameters (Continued)

Parameter	Allows you to...
Purge TTL	Specify the global Time To Live (TTL) in seconds that the RIP update persists. The default value is 120 seconds.
Triggered Updates	Enable or disable route updates that were triggered by a topology change in the network to be added to the routing table. The default is Enable.
Update Pkt Delay	Specify the value (in seconds) that represents the time delay between successive RIP update packets to the neighbor, when the update requires multiple packets. The default value is 0 seconds (no delay).

3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Modifying RIP Interfaces

To modify the RIP interfaces:

1. In the **RIP Configuration** section of the Web Agent window, click **Interfaces**. The RIP Interfaces dialog box opens.
2. Use Table 8-2 to modify RIP interfaces:

Table 8-2. RIP Interface Parameters

Parameter	Allows you to...
Select	Select the RIP interface to be modified.
Interface	Displays an interface from a list of interfaces that you previously configured.
Network Address	Displays an IP address to be associated with the displayed interface.
Mode	Specify the RIP State. Different states include: • **talk only** (send RIP information to the network) • **listen only** (receive RIP information from the network) • **talk/listen** (both send and receive RIP information from the network)
Send Version	Specify the version of RIP you want to use to send packets across your interface. Selections include: • **V1** • **V2** • **V1/V2**

Table 8-2. RIP Interface Parameters (Continued)

Parameter	Allows you to...
Receive Version	Specify the version of RIP you want to use to receive packets. Selections include: • **V1** • **V2** • **V1/V2**
Split Horizon	Specify that IP routes learned from an immediate neighbor are not advertised back to the neighbor from which the routes were learned. • **Split Horizon** - Routes are not advertised. • **Split Horizon with Poison Reverse** - Routes are advertised with an infinite metric (16).
Default Route	Specify the mode for the default route. Different states include: • **Disable** - Disables the default route. • **Talk Only** - Send RIP information to the network. • **Listen Only** - Receive RIP information from the network. • **Talk/Listen** - Both send and receive RIP information from the network.
Auth Type	Specify the type of authentication available for use on a given RIP interface. Authentication types include: • **None** - No authentication available. • **Simple** - Uses a clear-text password for validation. • **MD5** - Uses a stronger encryption technique for passwords.
Auth Key	Enter the authorization key value.

3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Creating Trusted RIP Neighbors

Trusted RIP neighbors enable you to enhance a Cajun switch's security by enabling one or more neighbors to relay RIP information.

CAUTION: Adding one or more trusted RIP neighbors ensures that your router accepts only information from these neighbors. Consequently, all other information is filtered. Do not create trusted RIP neighbor(s) if you do not wish to filter RIP information from the network.

To create a trusted RIP neighbor:

1. In the **RIP Configuration** section of the Web Agent window, click **Trusted RIP Neighbors**. The Trusted RIP Neighbors dialog box opens.
2. Click **CREATE**. The Add Trusted RIP Neighbor dialog box opens.
3. Enter the **Network Address** of the node that acts as the trusted RIP neighbor.
4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Interpreting RIP Statistics

To display RIP statistics:

1. In the **RIP Display** section of the Web Agent window, click **Interface Statistics**. The Interface Statistics dialog box opens.
2. Use Table 8-3 to interpret the RIP statistics:

Table 8-3. *RIP Statistical Parameters*

Parameter	Defines the...
Interface	Interface associated with the IP address specified.
State	Current status of the RIP route. UP indicates that the interface is up and RIP can transmit and receive updates.
IP Address	IP address associated with the interface.
Triggered Updates Sent	Number of RIP triggered updates sent.
Non-Triggered Updates Sent	Number of RIP non-triggered updates sent.
Updates Received	Number of RIP updates received based on route changes in the IP routing table.
Bad Packets Received	Number of bad packets received on this interface.
Bad Routes Received	Number of bad routes received on this interface.

9

Configuring the OSPF Routing Protocol (Layer 3)

Overview

This chapter and its procedures are specific to Layer 3 configuration. Included in this chapter:

- ❐ Configuring OSPF
- ❐ Monitoring Switch Performance Using OSPF Statistics

Configuring OSPF

Configuring OSPF includes:

- ❐ Configuring the OSPF Global Configuration
- ❐ Creating OSPF Areas
- ❐ Deleting OSPF Areas
- ❐ Modifying OSPF Areas
- ❐ Deleting OSPF Areas
- ❐ Creating OSPF Virtual Links
- ❐ Deleting OSPF Virtual Links
- ❐ Modifying OSPF Virtual Links
- ❐ Creating OSPF Summaries
- ❐ Deleting OSPF Summaries
- ❐ Modifying OSPF Summaries

Configuring the OSPF Global Configuration

The OSPF global configuration allows you to globally configure OSPF on your switch. It also allows you to specify your router ID and whether or not you want the switch to be the Autonomous System (AS) border router.

To globally configure OSPF:

1. In the **OSPF Configuration** section of the Web Agent window, click **Global Configuration**. The OSPF Global Configuration dialog box opens.
2. Use Table 9-1 to configure your global setup:

Table 9-1. OSPF Global Configuration Parameters

Parameter	Allows you to...
OSPF	Select to enable or disable OSPF globally on your switch.
Router ID	Specify the Router ID on the switch. The router ID is a 32-bit number assigned to each router running the OSPF protocol. This number uniquely identifies the router within an Autonomous System. If 0.0.0.0 is used, the router uses the IP address of an interface.
AS Border Router	Enable or disable the switch to be an Autonomous System Border Router (ASBR).
SPF Hold Time	Specify the minimum number of seconds between SPF runs.
SPF Suspend	Specify the number of nodes to process SPF runs before suspending.
Auto-Creation of Virtual Links	Enable or disable the function of automating the creation of virtual circuits based on network topology.
Maximum Number of Paths	Configure the maximum number of paths used when running SPF.
Local Ext Type	Specify whether imported local routes will be advertised in OSPF with type 1 (internal) or type 2 (external) metrics.
RIP Ext Type	Specify whether imported RIP routes will be advertised in OSPF with type 1 (internal) or type 2 (external) metrics.
Static Ext Type	Specify whether imported high preference routes will be advertised in OSPF with type 1 (internal) or type 2 (external) metrics.
Static Low Ext Type	Specify whether imported low preference routes will be advertised in OSPF with type 1 (internal) or type 2 (external) metrics.

3. Click **APPLY** to save changes, or **CANCEL** to restore previous settings.

Creating OSPF Areas

To create OSPF areas:

1. In the **OSPF Configuration** section of the Web Agent window, click **Areas**. The OSPF Areas dialog box opens.

Note: The Area ID 0.0.0.0 is a backbone area and always exists in an OSPF configuration.

2. Click **CREATE.** The Add OSPF Area dialog box opens.
3. Use Table 9-2 to configure your new OSPF area:

Table 9-2. *OSPF Area Parameters*

Parameter	Allows you to...
Select	Select the OSPF area to be configured. **Note:** This parameter is displayed in the OSPF Area dialog box, not in the Add OSPF Area dialog box.
Area ID	Specify the Area ID (32-bit character) for the new area. This must be a unique ID within AS. **Note:** Do not use 0.0.0.0 as an area ID.
Area Type	Select the type of area. Types include: • **Non-Stub** - Non-edge device/router. • **Stub** - An edge device/router that does not leak external advertisements. • **Not-so-stubby** - This is still a stub area, however, this device/router can leak some external advertisements.
Translate 7 into 5	Select to enable or disable the translation of the NSSA ASE Type 7 into an AS External LSA Type 5.
Stub Metric	Specify the stub area default summary cost metric. (Default is 1).
Type 3 ASE Filter	Select to enable or disable the Type 3 summary LSA filter for Stub and NSSA only.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Deleting OSPF Areas

To delete an OSPF area:

1. In the **OSFP Configuration** section of the Web Agent window, click **Areas**. The OSPF Areas dialog box opens.

2. Select the **OSPF area** to be removed.
3. Click **DELETE**. The OSPF area is removed.

Modifying OSPF Areas

To modify an OSPF area:

1. In the **OSFP Configuration** section of the Web Agent window, click **Areas**. The OSPF Areas dialog box opens.
2. Select the **OSPF area** to be modified.
3. Use Table 9-2 to modify your configuration.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Modifying OSPF Interfaces

To modify an OSPF interface:

1. In the **OSPF Configuration** section of the Web Agent window, click **Interfaces**. The OSPF Interfaces dialog box opens.

   Note: If OSPF is not enabled for your existing IP interfaces (VLANs) you must first enable OSPF before you can modify OSPF interfaces. Refer to "Configuring IP Interfaces" in Chapter 7 for more information on how to enable OSPF on IP interfaces.

2. Use Table 9-3 to determine how to modify your OSPF interfaces:

Table 9-3. OSPF Interface Parameters

Parameter	Definition
Select	Select the OSPF interface to be modified.
Interface	Displays IP interface (VLAN) that has OSPF enabled. **Note:** This is a read-only field.
IP Address	Displays IP address associated with the OSPF interface. **Note:** This is a read-only field.
Area	Enter the area ID configured for this interface.
DR Priority	Enter the decimal value for this interface for DR priority functionality.
Transit Delay	Enter the estimated number of seconds it takes to transmit a link state update packet over this interface.

Table 9-3. OSPF Interface Parameters (Continued)

Parameter	Definition
Retransmit Interval	Enter the number of seconds between link-state advertisement retransmissions, for adjacencies belonging to this interface. This value is also used when retransmitting database description and link-state request packets.
Hello Interval	Enter the length of time, in seconds, between the Hello packets that the router sends on the interface. This value must be the same for all routers attached to a common network.
Dead Interval	Enter the number of seconds that a router's Hello packets have not been seen before it's neighbors declare the router down. This should be some multiple of the Hello interval. This value must be the same for all routers attached to a common network.
Poll Interval	Enter the larger time interval, in seconds, between the Hello packets sent to an inactive non-broadcast multiaccess neighbor.
Cost	Enter the cost metric associated with this interface.
Authentication	Select the type of authentication available for use on a given OSPF interface. Authentication types include: • **None** • **Simple Password** • **MD5 Authentication**
Key	Enter the area's authorization key value.
MD5 Key ID	Enter the MD5 authentication key ID as a decimal value.

Creating OSPF Virtual Links

To create an OSPF virtual link:

1. In the **OSPF Configuration** section of the Web Agent window, click **Virtual Links**. The OSPF Virtual Links dialog box opens.

Note: This dialog box only appears with configured OSPF virtual links if you have previously configured one or more OSPF virtual links.

2. Click **CREATE.** The Add OSPF Virtual Link dialog box opens.

3. Use Table 9-4 to complete your OSPF virtual link configuration:

Table 9-4. OSPF Virtual Link Parameters

Parameter	Defines the...
Router ID	Router ID for the far end of the virtual link.
Area	Area ID of the area through which the virtual link travels.
Transit Delay	Estimated number of seconds it takes to transmit a link state update packet over this virtual link.
Retransmit Interval	Number of seconds between link-state advertisement retransmissions on this virtual link, for adjacencies belonging to this virtual link. This value is also used when retransmitting database description and link-state request packets.
Hello Interval	Length of time, in seconds, between the Hello packets that the router sends on the virtual link. This value must be the same for all routers attached to a common network.
Dead Interval	Number of seconds that a router's Hello packets have not been seen before it's neighbors declare the router down. This should be some multiple of the Hello interval. This value must be the same for all routers attached to a common network.
Authentication	Type of authentication available for use on a given OSPF interface. Authentication types include: • **None** • **Simple Password** • **MD5 Authentication**
Authentication Key	Area's authentication key.
MD5 Key ID	MD5 authentication key ID as a decimal value.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Deleting OSPF Virtual Links

To delete an OSPF virtual link:

1. In the **OSPF Configuration** section of the Web Agent window, click **Virtual Links**. The OSPF Virtual Links dialog box opens.
2. Select the virtual link to be removed.
3. Click **DELETE**. The virtual link is removed.

Modifying OSPF Virtual Links

To modify an OSPF virtual link:

1. In the **OSPF Configuration** section of the Web Agent window, click **Virtual Links**. The OSPF Virtual Links dialog box opens.
2. Select the virtual link to be removed.
3. Use Table 9-4 to modify your configuration.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Creating OSPF Summaries

The primary purpose of the OSPF summary is route aggregation. Route aggregation is a group range of IP addresses that are linked to a single address.

To create a new OSPF summary:

1. In the **OSPF Configuration** section of the Web Agent window, click **Summaries**. The OSPF Summaries dialog box opens.
2. Click **CREATE** to create a new OSPF summary.

Note: This window will only appear with configured OSPF summaries if you have previously configured one or more OSPF summaries.

3. Use Table 9-5 to configure your OSPF summaries:

Table 9-5. OSPF Summaries Parameters

Parameter	Definition
Area	Select the area ID of the area from which the routes are aggregated (summary IP address).
Network Address	Enter the IP address of the network to be advertised.
Mask	Enter the subnet mask of the network to be advertised.
Advertisement	Select the ability to suppress (disable) or enable advertisements of this summary. When suppressing, advertisements of IP routes in this range are also suppressed.

4. Click **CREATE** to save your changes, or **CANCEL** to restore previous settings.

Deleting OSPF Summaries

To delete an OSPF summary:

1. In the **OSPF Configuration** section of the Web Agent window, click **Summaries**. The OSPF Summaries dialog box opens.
2. Select the OSPF summary to be removed.
3. Click **DELETE**. The OSPF summary is removed.

Modifying OSPF Summaries

To modify an OSPF summary:

1. In the **OSPF Configuration** section of the Web Agent window, click **Summaries**. The OSPF Summaries dialog box opens.
2. Select the OSPF summary to be modified.
3. Use Table 9-5 to configure your parameters.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Monitoring Switch Performance Using OSPF Statistics

Monitoring switch performance using OSPF statistics includes:

❒ Displaying OSPF Statistics

❒ Displaying OSPF Links

❒ Displaying OSPF Neighbors

❒ Searching the OSPF Link State Database

Displaying OSPF Statistics

To display the OSPF global statistics:

1. In the **OSPF Display** section of the Web Agent window, click **Statistics**. The OSPF Statistics dialog box opens.

2. Use Table 9-6 to review the OSPF statistics:

Table 9-6. *OSPF Statistical Parameters*

Parameter	Displays the...
OSPF State	Current state of OSPF.
Router ID	Router ID for OSPF.
OSPF Version	Current version of OSPF. The P550 with Integrated Routing supports OSPFv2.
External LSA Count	Number of external (LS type 5) link-state advertisements in the link-state database.
Originate LSA Count	Number of LSAs originated by this router.
Receive New LSA Count	Number of new LSAs received by this router.
LSA Checksum Sum (global OSPF system)	32-bit unsigned sum of the LS checksums of the external link-state advertisements contained in the link-state database. This sum can be used to determine if there has been a change in a router's link state database, and to compare the link-state database of two routers.
Area ID	Area ID of the area in question. It has the function of defining a summarization point for Link State Advertisements.
SPF Runs	Number of times that the intra-area route table has been calculated using this area's link-state database.
Border Rtrs	Total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF Pass.
AS Border Rtrs	Total number of Autonomous System border routers reachable within this area. This is initially zero, and is calculated in each SPF Pass.
LSAs	Total number of link-state advertisements in this area's link-state database, excluding AS External LSAs.
LSA Chksum Sum (per area, not globally)	32-bit unsigned sum of the LS checksums of the external link-state advertisements contained in the link-state database. This sum can be used to determine if there has been a change in a router's link state database, and to compare the link-state database of two routers.

3. Click **Refresh** to reset the counters with the latest information.

Displaying OSPF Links

The OSPF link display provides information on the currently active OSPF links.

To display OSPF links:

1. In the **OSPF Display** section of the Web Agent window, click **Links**. The OSPF Links dialog box opens.
2. Use Table 9-7 review the OSPF link parameters:

Displaying OSPF Neighbors

The OSPF neighbors table summarizes the list of current OSPF interfaces and their associated neighbors.

To display the OSPF neighbors:

1. In the **OSPF Display** section of the Web Agent window, click

2. Use Table 9-8 to review the OSPF neighbors parameters:

Table 9-8. *OSPF Neighbors Parameters*

Parameter	Definition
IP Address	The IP address associated with the OSPF neighbor.
State	The functional level of an interface. States include: • **Down** - This is the initial state of a neighbor conversation. It indicates that there has been no recent information received from the neighbor. • **Attempt** - Indicates that no recent information has been received from the neighbor, but that a more concerted effort should be made to contact the neighbor • **INIT** - Indicates that the Hello packet has recently been seen from the neighbor. However, bidirectional communication has not yet been established with the neighbor. • **2-Way** - Communication between the two routers is bidirectional. • **ExStart** - This is the first step in creating an adjacency between the two neighboring routers. The goal of this step is to decide which router is the master, and to decide upon the initial DD sequence number. Neighbor conversations in this state or greater are called adjacencies. • **Exchange** - Router is describing its entire link state database by sending Database Description packets to the neighbor. • **Loading** - Link State Request packets are sent to the neighbor asking for the more recent LSAs that have been discovered (but not yet received) in the Exchange state. • **Full** - The neighboring routers are fully adjacent. These adjacencies will now appear in router-LSAs and network-LSAs.
Router ID	The router ID of the neighbor.
Master	The state of the neighbor: master or slave.
DD Number	The hexadecimal number used to sequence the collection of Database Description Packets. The initial value (indicated by the Init bit being set) should be unique. The DD sequence number then increments until the complete database description has been sent.
DR Priority	Displays the DR Priority of the neighboring router. This is used to determine whether this neighbor is eligible to become the Backup Designated Router. If 0, the router is ineligible to become the Backup Designated Router.
E-Option	The method used to flood AS-external-LSAs.
T-Option	Specifies whether this neighbor is an ASBR.
MC-Option	Specifies whether this neighbor supports MOSPF.

Table 9-8. OSPF Neighbors Parameters (Continued)

Parameter	Definition
N-Option	Specifies whether this neighbor supports the handling of Type-7 LSAs.
OPQ-Option	Specifies whether this neighbor supports opaque LSAs (Link State Advertisements).
DR Choice	Interface IP address of the designated router.
BDR Choice	Interface IP address of the backup designated router.

Searching the OSPF Link State Database

To perform a search of your OSPF link state database:

1. In the **OSPF Display** section of the Web Agent window, click **Link State Database Search**. The Link State Database Search dialog box opens.

   Note: It is possible to select more than one item in the Search By column to help narrow your search results.

2. To search by Area ID: click the **Area ID checkbox** and specify the **IP address** of the Area ID that you want to find in the database, and click **SEARCH**.

   To search by Type: click the **Type** checkbox and from the **Type** pull-down menu, select the type of search you want to perform, and click **SEARCH**.

   To search by Router ID: click the **Router ID checkbox** and specify the **router IP address**, and click **SEARCH.**

3. Use Table 9-9 to determine the search parameters:

Table 9-9. OSPF Link State Database Search Parameters

Parameter	Allows you to perform a search...
Area ID	For the 32-bit identifier of the area from which a LSA was received.
Type	For all entries in the database that match one of the following types: • **Router Links** - These packets describe the states of the router's links to the area and are only flooded within a particular area. • **Network Links** - These packets are generated by Designated Routers and describe the set of routers attached to a particular network. • **Summary Network** - These summaries are generated by Area Border Routers and describe inter-area routes to various networks. Then can also be used for aggregating routes. • **Summary AS border** - This describes links to Autonomous System Border Routers and are generated by Area Border Routers. • **AS external** - These packets are generated by Autonomous System Border Routers and describe routes to destination external to the Autonomous system. They are flooded everywhere except stub areas. • **Multicast group** - These packets are generated by multicast groups. • **NSSA external** - These packets are generated by Area Border Routers and describe routes within the NSSA (Not-So-Stubby-Area).
Router ID	Of the link state database for entries originated by this router.

Note: If your search produces results, the detailed information displays in the OSPF Link State Database dialog box.

4. Click **MORE** to display more OSPF link state database search results.

Note: If there are no other OSPF link state database search results to display, the MORE button is not available.

5. Use Table 9-10 for a description of the OSPF Link State Database Search results.

Table 9-10. *OSPF Link State Database Parameters*

Parameter	Definition
Detail Link	Displays a link to the LSA Detail dialog box.
Area ID	Displays the 32-bit identifier of the area from which the LSA was received.
Type	Displays the format and function of the LSA. Types include: • **Router Links** - These packets describe the states of the router's links to the area and are only flooded within a particular area. • **Network Links** - These packets are generated by Designated Routers and describe the set of routers attached to a particular network. • **Summary Network** - These summaries are generated by Area Border Routers and describe inter-area routes to various networks. Then can also be used for aggregating routes. • **Summary AS Border** - This describes links to Autonomous System Border Routers and are generated by Area Border Routers. • **AS External** - These packets are generated by Autonomous System Border Routers and describe routes to destination external to the Autonomous system. They are flooded everywhere except stub areas. • **Multicast Group** - These packets are generated by multicast groups. • **NSSA External** - These packets are generated by Area Border Routers and describe routes within the NSSA (Not-So-Stubby-Area).
LS ID	Displays the piece of routing domain that is being described by the advertisement. Depending on the advertisements LS type, the LS ID displays different values.
Router ID	Displays the 32-bit number that uniquely identifies the originating router in the Autonomous System.
Sequence	Displays the sequence number.
Age	Displays the age (in seconds) of the LSA.
Checksum	Displays the checksum of the complete contents of the advertisement, except the age field.

Viewing LSA Details

To view link state advertisement details:

1. In the **OSPF Display** section of the Web Agent window, click **Link State Database Search**. The Link State Database Search dialog box opens.

   Note: It is possible to select more than one item in the Search By column to help narrow your search results.

2. To search by Area ID: click the **Area ID checkbox** and specify the **IP address** of the Area ID that you want to find in the database, and click **SEARCH**.

   If your search produces results, the detailed information displays in the OSPF Link State Database dialog box.

   To search by Type: click the **Type** checkbox and from the **Type** pull-down menu, select the type of search you want to perform, and click **SEARCH**.

   To search by Router ID: click the **Router ID** checkbox and specify the **router IP address**, and click **SEARCH.**

3. In the **Detail Link** column, click **Details**. The LSA Detail dialog box opens.

4. Use Table 9-11 for more information on LSA Details.

Table 9-11. *LSA Detail Parameters*

Parameter	Definition
Area	Displays the 32-bit identifier of the area from which the LSA was received.
Type	Displays the link state type. Types include: • **Router Links** • **Network Links** • **Summary Network** • **Summary AS Border** • **AS External** • **Multicast Group** • **NSSA External**
LS ID	Displays the link-state ID. The link-state ID is an LS type specific field containing either a router ID or an IP address that identifies the piece of the routing domain that is being described by the advertisement.
Router ID	Displays the router ID of the originator of the link state advertisement.

Table 9-11. *LSA Detail Parameters (Continued)*

Parameter	Definition
Sequence	Displays the link-state sequence number. The sequence number is a 32-bit signed integer.
Checksum	Displays the checksum of the complete contents of the advertisement, except the age field.
Age	Displays the time (in seconds) of the LSA.
Link ID	Displays the neighboring router's interface ID.
Link Data	Displays the interface ID of the associated router interface.
Type	Displays the link type of Router Network LSAs. Types include: • **Point-to-point Link (1)** • **Transit Network (2)** • **Stub Network (3)** • **Virtual Link (4)**
TOS Count	Displays the type-of-service count.
TOS 0 Metric	Displays the type-of-service cost of the interface.
Network Mask	Displays the network mask for the LSA.
External	Displays whether the route is connected to an external network. This parameter is associated with AS External LSAs.
TOS	Displays the type-of-service of the route. This parameter is associated with AS External, Summary Network, and Summary AS Border LSAs.
Metric	Displays the cost of the link. This parameter is associated with AS External, Summary Network, and Summary AS Border LSAs.
Forward Address	Displays the forward address. This indicates that packets for the external destination should be forwarded to the advertising OSPF router. This parameter is associated with AS External LSAs.
Tag	Displays the tag associated with the LSA. This parameter is associated with AS External LSAs.
Attached Router ID 1 &2	Displays the router ID for the attached router(s).

10

Configuring AppleTalk Routing (Layer 3)

Overview

This chapter and its procedures are specific to Layer 3 configuration.

Included in this chapter:

- ❐ AppleTalk Routing Overview
- ❐ Configuring AppleTalk Routing
- ❐ Viewing AppleTalk Statistics

AppleTalk Routing Overview

AppleTalk Phase I was originally designed for local work groups. AppleTalk Phase II extends the number of nodes in an internetwork to over 16 million and the number of zones per port to 254. The Cajun switch supports both AppleTalk Phase I and Phase II. However, the translation from AppleTalk Phase I to Phase II is not supported.

The Cajun switch version 4.0 software supports AppleTalk routing for packets destined across VLANs (inter-VLAN) using Layer 3 but for intra-VLAN traffic, Layer 2 switching is supported. The Cajun switch supports AppleTalk over Ethernet only.

Ethernet versions supported:

- ❐ Ethernet SNAP
- ❐ Ethernet II

The switch supports the following AppleTalk protocols:

- ❐ AppleTalk Address Resolution Protocol (AARP)
- ❐ Routing Table Maintenance Protocol (RTMP)
- ❐ Name-Binding Protocol (NBP)
- ❐ AppleTalk Echo Protocol (AEP)

- Datagram Delivery Protocol (DDP)
- Zone Information Protocol (ZIP)

Configuring AppleTalk Routing

This section includes:

- Enabling AppleTalk Global Routing
- Creating an AppleTalk Routing Interface
- Editing AppleTalk Interfaces
- Deleting an AppleTalk Interface
- Creating an AppleTalk Static Route
- Editing AppleTalk Static Routes
- Deleting an AppleTalk Static Route
- Creating an AppleTalk NBP Filter
- Editing an AppleTalk NBP Filter
- Adding or Deleting Interfaces to NBP Filter
- Creating an AppleTalk Zone Filter
- Editing an AppleTalk Zone Filter
- Adding or Deleting Interfaces to a Zone Filter

Enabling AppleTalk Global Routing

To enable AppleTalk routing globally:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **Global Configuration**. The AppleTalk Routing Global Configuration dialog box opens.
2. From the **AppleTalk Routing** pull-down menu, select **Enable**.
3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Creating an AppleTalk Routing Interface

To create an AppleTalk interface:

1. Enable AppleTalk routing globally. Refer to “Enabling AppleTalk Global Routing”, earlier in this section.
2. In the **AppleTalk Configuration** section of the Web Agent window, click **Interfaces**. The AppleTalk Interfaces dialog box opens.
3. Click **CREATE**. The Add AppleTalk Interfaces dialog box opens.
4. Use Table 10-1 to configure your AppleTalk interface.

Table 10-1. *AppleTalk Interface Parameters*

Parameter	Definition
Interface	Enter the name of the AppleTalk interface to be created.
VLAN	Select the VLAN to be associated with the AppleTalk interface. Options include: • **Default** • **Discard** • **All created VLANs**
Metric	Enter the metric associated with the AppleTalk interface.
Encapsulation Type	Select the encapsulation type to be associated with the AppleTalk interface. Options include: • **Ethernet II** - MTU = 1500 • **Ethernet SNAP** - MTU =1492
Network Range Start	Enter the starting network number. The network number specifies the range of AppleTalk network numbers for extended networks. Each number in the range must be an integer between 0 and 65279. **Note:** The Network Range Start value must be less than or equal to the Network Range End value.
Network Range End	Enter the ending network number. The network number specifies the range of AppleTalk network numbers for extended networks. Each number in the range must be an integer between 0 and 65279. **Note:** If the Network Range Start value equals 0, Network Range End value must also equal 0.

Table 10-1. AppleTalk Interface Parameters (Continued)

Parameter	Definition
Network Number	Enter the interface network number. This number specifies the network number the interface is using. **Note:** This value must be within the Network Range or be equal to 0.
Node	Enter the interface node identification number. This number must be between 1 and 253. **Note:** Only if the Network Number is equal to 0, can the Node also be equal to 0.
Admin. State	Select whether to enable or disable the administrator state. The administrator state determines if the interface is operational from a management point of view.
Default Zone	Select the default AppleTalk zone to be used by this interface. Zone names may be up to 32 characters in length.

5. Click **CREATE** to add the new AppleTalk interface, or **CANCEL** to restore previous settings.

Editing AppleTalk Interfaces

To edit an AppleTalk interface:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **Interfaces**. The AppleTalk Interfaces dialog box opens.

   Note: You must enable AppleTalk globally and create an AppleTalk interface before you can edit an interface. See “Enabling AppleTalk Routing Globally” and “Creating an AppleTalk Interface”, earlier in this section.

2. From the **VLAN** pull-down menu, select the **VLAN** to be associated with the interface.

3. In the **Metric** field, enter the **new port metric** to be associated with the interface.

4. From the **Frame Type** pull-down menu, select the **new frame type** to be associated with the interface.

5. In the **Network Range Start** field, enter the **new network range start number**.

6. In the **Network Range End** field, enter the **new network range end number**.

7. In the **Network Number** field, enter the **new network number** to be associated with the interface.

8. In the **Node** field, enter the **new node number** to be associated with the interface.

9. From the **Admin. State** pull-down menu, select to **enable** or **disable** the administration state associated with the interface.

10. From the **Default Zone** pull-down menu, select the **new default zone** associated with the interface.

    Note: If there is no zone to select or if you want to edit the zones available, proceed with steps 11 through 14. Otherwise, proceed to step 15.

11. Click **Edit Zone** to edit the AppleTalk zone for this interface. The Edit AppleTalk Zone dialog box opens.

12. In the **Add** text field, enter the **new AppleTalk** z**one** and click **Add**.

13. In the **AppleTalk Configuration** section of the Web Agent window, click **Interfaces**. The AppleTalk Interfaces dialog box opens.

14. From the **Default Zone** pull-down menu, select the new zone that you just created.

15. Select the **AppleTalk interface** to be updated by clicking the **Select** check box.

16. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

    Note: You may select and change as many interfaces simultaneously with one APPLY operation.

Deleting an AppleTalk Interface

To delete an AppleTalk interface:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **Interfaces Configuration**. The AppleTalk Interfaces dialog box opens.
2. Select the **AppleTalk interface** to be deleted by clicking the **Select** check box.
3. Click **DELETE** to remove the AppleTalk interface.

Creating an AppleTalk Static Route

To create an AppleTalk static route:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **Static Route**. The AppleTalk Static Route dialog box opens.
2. Click **CREATE** to add a new static route. The Add AppleTalk Static Route dialog box opens.
3. Use Table 10-2 to configure your static route.

Table 10-2. AppleTalk Static Route Parameters

Parameter	Definition
Network Range Start	Enter the starting network number. The network number specifies the range of AppleTalk network numbers for extended networks. Each number in the range must be an integer between 1 and 65279. **Note:** Network Range Start must be less than or equal to Network Range End.
Network Range End	Enter the ending network number. The network number specifies the range of AppleTalk network numbers for extended networks. Each number in the range must be an integer between 1 and 65279.
Network Number	Enter the next hop network number. This number specifies the network number of the next hop router for the network range.
Node	Enter the next hop node identification number. This number must be between 1 and 253.
Type	Select the type of static route. Options include: • **High** - The static route is not superseded by a route update. • **Low** - The static route can be superseded by a route update.
Zone	Enter an AppleTalk zone name assigned to this route. Zone names may be up to 32 characters in length.

4. Click **CREATE** to add the static route, or **CANCEL** to restore previous settings.

Editing AppleTalk Static Routes

To edit an AppleTalk static route:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **Static Route**. The AppleTalk Static Route dialog box opens. For more information on static route parameters, refer to Table 10-2.
2. Select the **AppleTalk Static Route** to be edited by clicking the **Select** check box.
3. In the **Network Range Start** field, enter the **new network range start number**.
4. In the **Network Range End** field, enter the **new network range end number**.
5. In the **Network Number** field, enter the **new network number** of the next hop for the static route.
6. In the **Node** field, enter the **new node number** of the next hop for the static route.
7. In the **Type** field, enter the type to be associated with the static route.
8. Click **Edit Zone** to edit the AppleTalk zone for this static route. The Edit AppleTalk Zone dialog box opens.
9. In the **Add** text field, enter the **new AppleTalk** z**one network range** and click **Add**.
10. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Deleting an AppleTalk Static Route

To delete an AppleTalk static route:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **Static Route**. The AppleTalk Interfaces dialog box opens.
2. Select the **AppleTalk static route** to be deleted.
3. Click **DELETE** to remove the AppleTalk static route.

Creating an AppleTalk NBP Filter

The Name-Binding Protocol (NBP) performs a conversion from named AppleTalk entities to their AppleTalk protocol addresses. Multiple names can exist for the same entity (alias). NBP also performs:

❒ Name registration

- ❒ Name deletion
- ❒ Name lookup
- ❒ Name confirmation

NBP allows you to bind a name to the internal storage address for your entity and register this mapping so that other entities can look it up. You can display NBP names to users and use addresses internally to locate entities. When you register your entity's name and address pair, NBP validates its uniqueness.

To create an NBP filter:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **NBP Filter**. The AppleTalk NBP Filter dialog box opens.
2. Click **CREATE** to add a new NBP filter. The Add AppleTalk NBP Filter dialog box opens.
3. Use Table 10-3 to configure the NBP filter.

Table 10-3. AppleTalk NBP Filter Parameters

Parameter	Definition
Access List	Enter the access list number to be associated with the NBP filter. Valid values are 600-631.
Name	Enter the name of the NPB name object to be filtered.
Type	Select the type of filtering. Options include: • **Deny** • **Permit** **Note:** You can also leave this field blank for wildcarding.
Interface	Select the interface(s) to apply this filter to.

4. Click **CREATE** to add your new static route, or **CANCEL** to restore previous settings.

Editing an AppleTalk NBP Filter

To edit an AppleTalk NBP filter:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **NBP Filter**. The AppleTalk NBP Filter dialog box opens.
2. Use Table 10-3 to edit your AppleTalk NBP filter.

3. Click...

   CREATE to add a new filter. The Add AppleTalk NBP Filter dialog box opens. See "Creating an AppleTalk NBP Filter", earlier in this section, for more information.

   DELETE to remove the selected NBP filter.

   CANCEL to restore previous settings.

   Edit If to add or delete this NBP filter to/from an interface. The Add/Delete Interface to NBP Filter dialog box opens. See "Adding or Deleting Interfaces to NBP Filter", later in this section, for more information.

Adding or Deleting Interfaces to NBP Filter

To add or delete interfaces to an NBP filter:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **NBP Filter**. The AppleTalk NBP Filter dialog box opens.
2. Click **Edit If**. The Add/Delete Interface to NBP Filter dialog box opens.
3. In the **Add** pull-down menu, select the interface to be added.

   Or

   Click the **Select** for the interface to be removed.
4. Click...

   Add to add this NBP filter to the selected interface.

   DELETE to remove this NBP filter from the selected interface.

   CANCEL to restore previous settings.

Creating an AppleTalk Zone Filter

To create an AppleTalk zone filter:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **Zone Filter**. The AppleTalk Zone Filter dialog box opens.
2. Click **CREATE**. The Add AppleTalk Zone Filter dialog box opens.

3. Use Table 10-4 to configure your zone filter.

Table 10-4. AppleTalk Zone Filter Parameters

Parameter	Definition
Access List	Enter the access list number to be associated with the zone filter. Valid values are 632-663.
Name	Enter the name of the zone to be filtered. You can also leave this field blank for wildcarding.
Type	Select the type of filtering. Options include: • **Deny** • **Permit**
Interface	Select the interface to apply this filter to.

4. Click **CREATE** to add the new zone filter, or **CANCEL** to restore previous settings.

Editing an AppleTalk Zone Filter

To edit an AppleTalk zone filter:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **Zone Filter**. The AppleTalk Zone Filter dialog box opens.
2. Click the **Select** for the AppleTalk zone filter to be edited.
3. Use Table 10-4 to edit your zone filter.
4. Click...

   CREATE to add a new zone filter. The Add AppleTalk Zone Filter dialog box opens. See “Creating an AppleTalk Zone Filter”, earlier in this section, for more information.

   DELETE to remove the selected zone filter.

   CANCEL to restore previous settings.

   Edit If to add or delete this zone filter to/from an interface. The Add/Delete Interface to Zone Filter dialog box opens. See “Adding or Deleting Interfaces to Zone Filter”, later in this section, for more information.

Adding or Deleting Interfaces to a Zone Filter

To add or delete interfaces to a zone filter:

1. In the **AppleTalk Configuration** section of the Web Agent window, click **Zone Filter**. The AppleTalk Zone Filter dialog box opens.
2. Click **Edit If**. The Add/Delete Interface to Zone Filter dialog box opens.
3. In the **Add** pull-down menu, select the interface to be added.

   Or

   Click the **Select** for the interface to be removed.
4. Click...

   Add to add this zone filter to the selected interface.

   DELETE to remove this zone filter from the selected interface.

   CANCEL to restore previous settings.

Viewing AppleTalk Statistics

This section includes:

- ❐ Viewing AppleTalk Global Statistics
- ❐ Viewing the AppleTalk Interface Statistics Table
- ❐ Viewing the AppleTalk Route Table
- ❐ Viewing AppleTalk Route Table Statistics
- ❐ Viewing the AppleTalk ARP Cache Table
- ❐ Viewing the AppleTalk Zone Table
- ❐ View AppleTalk Zone Table Statistics
- ❐ Viewing the AppleTalk NBP Table

Viewing AppleTalk Global Statistics

To view AppleTalk global statistics:

1. In the **AppleTalk Display** section of the Web Agent window, click **Global Statistics**. The AppleTalk Global Statistics dialog box opens.

2. Use Table 10-5 for more information on AppleTalk global statistics.

Table 10-5. AppleTalk Global Statistical Parameters

Parameter	Number of...
Echo Req Tx	Echo requests transmitted.
Echo Req Rx	Echo requests received.
DDP Output Counter	DDP packets sent from this node.
DDP Output Long	DDP packets sent using the long format.
DDP Forward Counter	DDP packets forwarded through this node.
No Client	Packets received for which the destination socket was not known.
Too Short	Packets received that were smaller than the minimum size allowed for an AppleTalk packet.
Bcast Error	Broadcast errors detected.
TTL Expired	Packets dropped because they timed out.
AARP Req Rx	AppleTalk ARP requests received.
AARP Invalid PDU	AppleTalk ARP requests received which were invalid.
AARP Req Tx	AppleTalk ARP requests transmitted.
Config Addr Error	Configuration address errors detected.
Echo Reply Rx	Echo replies received.
DDP Output Short	DDP packets sent using the short format.
DDP Input Counter	DDP packets received.
DDP Local Counter	DDP packets received destined for this node.
No Route	DDP packets for which no route existed to the destination.
Too Long	Packets received that were larger than the maximum size allowed.
Short PDU in Error	Packets received that had a short PDU in error.
Checksum Error	Packets which had checksum in error.
AARP Reply Rx	AppleTalk ARP replies received.
AARP Reply Tx	AppleTalk ARP replies transmitted.
Config Zone Error	Zone configuration errors detected.
RTMP Rq Rx	RTMP requests received.
RTMP Rq Tx	RTMP requests transmitted.
RTMP Rsp Rx	RTMP responses received.
RTMP Rsp Tx	RTMP responses transmitted.
RTMP RDR Rx	RTMP route data requests received.

Table 10-5. AppleTalk Global Statistical Parameters (Continued)

Parameter	Number of...
RTMP RDR Tx	RTMP route data requests transmitted.
Zip Query Rx	ZIP queries received.
Zip Query Tx	ZIP queries transmitted.
Zip Reply Rx	ZIP replies received.
Zip Reply Tx	ZIP replies transmitted.
Zip Ext Reply Rx	ZIP extended replies received.
Zip Ext Reply Tx	ZIP extended replies transmitted.
Zip GNI Rq Rx	ZIP get net info request received.
Zip GNI Rq Tx	ZIP get net info request transmitted.
Zip GNI Rsp Rx	ZIP get net info response received.
Zip GNI Rsp Tx	ZIP get net info response transmitted.

3. Click **REFRESH** to update all statistics.

   Or

   Click **CLEAR** to reset all statistics to zero.

Viewing the AppleTalk Interface Statistics Table

To view the AppleTalk Interface statistics table:

1. In the **AppleTalk Display** section of the Web Agent window, click **Interface Statistics**. The AppleTalk Interface Statistics Table opens.
2. Use Table 10-6 for more information on the statistics table.

Table 10-6. AppleTalk Interface Statistics Table Parameters

Parameter	Definition
Interface	Displays the name of the AppleTalk interface.
Network Range	Displays the network range associated with the AppleTalk interface.
Network Number	Displays the network number of this node.
Node	Displays the node number of this node.

Table 10-6. AppleTalk Interface Statistics Table Parameters (Continued)

Parameter	Definition
Seed	Displays whether the AppleTalk interface seeded the network.
State	Displays the state of the AppleTalk interface. Options include: • **Up** - indicates that the AppleTalk interface is active. • **Down** - indicates that the AppleTalk interface is inactive.

Viewing the AppleTalk Route Table

To view the AppleTalk route table:

1. In the **AppleTalk Display** section of the Web Agent window, click **Route Table**. The AppleTalk Route Table opens.
2. Use Table 10-7 for more information on route table statistics.

Table 10-7. AppleTalk Route Table Parameters

Parameter	Definition
Select	Select the entry to be acted upon.
Network Range	Displays the network range.
Metric	Displays the AppleTalk metric for the network range.
State	Displays the state of the entry. Options include: • **Good** • **Suspect** • **Going Bad** • **Bad**
Owner	Displays the AppleTalk component responsible for the addition of the route. Options include: • **Local** • **Static** • **RTMP**
Next Hop	Displays the next hop address where forwarded packets are routed.

Table 10-7. AppleTalk Route Table Parameters (Continued)

Parameter	Definition
Interface	Displays the Appletalk interface associated with the route table entry.
Zones	Displays the zones associated with the selected AppleTalk route.

3. Click **Delete Entries** to remove selected route table entries.

   Or

   Click **Flush Route Table** to empty the route table of all dynamic entries. Static and Local entries are not flushed.

Viewing AppleTalk Route Table Statistics

To view AppleTalk route table statistics:

1. In the **AppleTalk Display** section of the Web Agent window, click **Route Table Statistics**. The AppleTalk Route Table Statistics dialog box opens.
2. Use Table 10-8 for more information on AppleTalk route table statistics.

Table 10-8. AppleTalk Route Table Statistical Parameters

Parameter	Definition
Current Number of Routes	Displays the current number of AppleTalk routes.
Peak Number of Routes	Displays the peak number of AppleTalk routes.

Viewing the AppleTalk ARP Cache Table

To view the AppleTalk ARP cache table:

1. In the **AppleTalk Display** section of the Web Agent window, click **ARP Table**. The AppleTalk ARP Cache Table dialog box opens.
2. Use Table 10-9 for more information on AppleTalk ARP cache table statistics.

Table 10-9. AppleTalk ARP Cache Table Statistical Parameters

Parameter	Definition
Select	Select the table entry to be acted upon.
Network Range	Displays the network range.

Table 10-9. AppleTalk ARP Cache Table Statistical Parameters (Continued)

Parameter	Definition
Node	Displays the node number for the entry.
MAC Address	Displays the MAC address associated with the AppleTalk ARP cache table entry of the node.
Interface	Displays the Appletalk interface associated with the AppleTalk ARP cache table entry.
Type	Displays the type of cache entries. Values include: • **Local** • **Broadcast** • **Dynamic** • **Router Neighbor**
TTL	Displays the time-to-live value for the selected AppleTalk ARP cache table entry. Local and Broadcast entries do not time out.

3. Click **Delete Entries** to remove selected ARP cache table entries.

   Or

   Click **Flush Route Table** to reset the ARP cache table entries. Only Dynamic and Router Neighbor entries are flushed.

Viewing the AppleTalk Zone Table

To view the AppleTalk zone table:

1. In the **AppleTalk Display** section of the Web Agent window, click **Zone Table**. The AppleTalk Zone Table opens.
2. Use Table 10-10 for more information on AppleTalk zone table parameters.

Table 10-10. AppleTalk Zone Table Parameters

Parameter	Definition
Index	Displays the zone index.
Name	Displays the zone name.
Network Range	Displays the network range associated with the zone.

View AppleTalk Zone Table Statistics

To view AppleTalk zone table statistics:

1. In the **AppleTalk Display** section of the Web Agent window, click **Zone Table Statistics**. The AppleTalk Zone Table Statistics dialog box opens.
2. Use Table 10-11 for more information on AppleTalk zone table statistics.

Table 10-11. AppleTalk Zone Table Statistical Parameters

Parameter	Definition
Current Number of Zones	Displays the current number of AppleTalk zones.
Peak Number of Zones	Displays the peak number of AppleTalk zones.

Viewing the AppleTalk NBP Table

To view the AppleTalk NBP table:

1. In the **AppleTalk Display** section of the Web Agent window, click **Zone Table**. The AppleTalk Zone Table opens.
2. Use Table 10-12 for more information on AppleTalk NBP table statistics.

Table 10-12. AppleTalk NBP Table Statistical Parameters

Parameter	Definition
Index	Displays the index of the name binding protocol entry.
Name	Displays the name of the NBP entry.
Type	Displays the type of object named.
Interface	Displays the Appletalk interface associated with the AppleTalk NBP table entry.
Zone	Displays the zone field associated with the NBP table entry.

11

Monitoring and Configuring the Forwarding Cache (Layer 3)

Overview

This chapter and its procedures are common to Layer 3 configuration. Included in this chapter:

- ❐ Configuring the Fowarding Cache
- ❐ Displaying Frame Fowarding Statistics
- ❐ Searching the Routing Cache for an Entry

Configuring the Fowarding Cache

The forwarding cache enables you to configure the multilayer media module's forwarding tables. To configure the forwarding cache:

1. In the **L3 Forwarding Cache** section of the Web Agent window, click **Cache Configuration**. The Layer 3 Forwarding Cache Configuration dialog box opens.

2. Use Table 11-1 to complete your fowarding cache configuration:

Table 11-1. Layer 3 Cache Configuration - Tree Configuration

Tree Configuration		
Field...	**For the protocol...**	**Allows you to...**
Hash Depth	IP Unicast IP Multicast IPX	Configure the hash depth for IP unicast, IP multicast, and IPX datagrams. Choices include: • **Hash-8** - An 8-bit memory bucket used to store information about the source or destination protocol address (or both). • **Hash -10** - A 10-bit memory bucket used to store information about the source or destination protocol address (or both). • **Hash-12** - A 12-bit memory bucket used to store information about the source or destination protocol address (or both).
Hash Mode	IP Unicast IP Multicast IPX	Configure the table hash lookup mode for the IP unicast, IP multicast and IPX forwarding table. Choices include: • **DA-only** - Forwarding entries input to the forwarding table are limited to using protocol destination address only. • **SA-DA** - Forwarding entries input to the forwarding table are limited to using destination and source address only.
Aging	IP Unicast IP Multicast IPX	Configure the IP unicast, IP multicast, or IPX forwarding table entry aging status as either enabled or disabled.
Age Interval	IP Unicast IP Multicast IPX	The IP unicast, IP multicast, or IPX forwarding table entry aging period (in seconds). The default value is 120 seconds.
Maximum Entries	IP Unicast IP Multicast IPX	The number of active entries in the IP unicast, IP multicast, or IPX forwarding table. This is the maximum number of active entries per fabric port. Additional flows are forwarded by the supervisor module. The default value is 15000.

Table 11-2. Layer 3 Cache Configuration - System Configuration

System Configuration	
Field...	**Defines...**
Maximum System Entries	A user specified number. This number is the maximum number of entries allowed for the entire system (all fabric ports). The default value is 130000.
Current System Entries	The current total number of entries for the entire system (all fabric ports). The default value is 0.
System Entries Failures	The current total system entry failures.

3. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

   Click **REFRESH** to update your system configuration.

   Or

   Click **CLEAR** to reset all configuration parameters to zero.

Monitoring the Forwarding Cache Statistics

Monitoring the forwarding cache statistics includes:

❒ Displaying Frame Fowarding Statistics

❒ Searching the Routing Cache for an Entry

Displaying Frame Fowarding Statistics

The frame forwarding statistics indicate the performance of each of the multilayer media modules in respect to Layer 3 routing and forwarding.

To display the frame forwarding statistics:

1. In the **L3 Forwarding Cache** section of the Web Agent window, click **Forwarding Statistics**. The Frame Forwarding Statistics dialog box opens.

2. Use Table 11-3 to review the forwarding statistics:

Table 11-3. Forwarding Statistical Parameters

Parameter	Defines the...
FIRE Fabric Port	Fabric port associated with the Layer 3 module. The switch has 13 fabric ports. Each module slot uses two fabric ports with the exception of the supervisor module slot which uses one fabric port. Hence, the supervisor module slot uses fabric port 1, the next media module slot uses fabric ports 2 and 3, and so on.
L3 Total (T2)	Total number of frames received on the fabric port.
L3 Frame Cache Hits	Number of packets received on the fabric port that were successfully matched against existing forwarding entries in the Layer 3 (L3) address cache.
Percent Cache Hits	Total percentage of successful matches between packets received on a fabric port and the percent of those packets that matched the Layer 3 address cache entries.
L3 Slow Path Frames	Number of frames received on a fabric port that were not successfully matched against existing forwarding entries in the Layer 3 (L3) address cache. Subsequently, these frames were forwarded to the supervisor module (slow path). All frames sent to the supervisor module are routed in software.
Percent Slow Path	Total percentage of unsuccessful matches between packets received on a fabric port and the percent of those packets that did not match the Layer 3 address cache entries.
L3 Drop Frames	Number of Layer 3 frames that were dropped because they did not match the Layer 3 address cache entries.
Percent Drops	Total percent of Layer 3 frames dropped.
RX Frame Count (T2)	Total number of frames received on a fabric port.
L2 Frame Count (T2)	Number of Layer 2 frames received on a fabric port that were forwarded on to an associated VLAN.

Searching the Routing Cache for an Entry

To search the L3 address cache:

1. In the **L3 Forwarding Cache** section of the Web Agent window, click **Entry Search**. The Route Cache Entry Search dialog box opens.
2. Select the search criteria you want to use to find more specific information on available routes. For example, if you want to find all entries in the routing cache that contain a VLAN entry of vlan_10.0.1.1, you would search by VLAN and specify vlan_10.0.1.1 as your search value.

3. Use Table 11-4 to determine the parameters you use in your search:

Table 11-4. *Route Cache Entry Search Parameters*

Parameter	Allows you to search for all entries...
Destination Address	Within the routing cache that match the specified destination address (IP address).
Source Address	Within the routing cache that match the specified source address (IP address).
Protocol	By protocol identifier. By default, this field is 0 for IP (for example, not supported by IP).
Destination Port	Within the routing cache that match the specified destination port (IPU, IPM, IPX).
Source Port	Within the routing cache that match the specified source port (IPU, IPM, IPX).
Comparison Value	Within the routing cache that match the specified comparison value (TCP/UDP). Values include: • **DA** - Destination address • **DASA** - Destination and source address • **DAPROT** - Destination address and protocol • **DADP** - Destination address and destination port number • **DASAPROT** - Destination and source address and protocol • **DASADPSP** - Destination and source address, and the corresponding destination and source port numbers
VLAN	Within the routing cache that match the specified VLAN name.
Rule Number	Within the routing cache that matches the specified rule number associated with an access list.
PRE	That match the PRE that is associated with the fabric port ID.

Displaying the Forwarding Cache

To display the forwarding cache information:

1. In the **L3 Forwarding Cache** section of the Web Agent window, click **Forwarding Cache**. The FE Cache dialog box opens.
2. To modify your FE Cache table, perform one of the following:
   - To delete one or more entries, select the entry and click **Flush Entry**.
   - To flush (clear) the entire table, click **Flush Table**.
   - To refresh the contents of the table, click **REFRESH**.

- To clear the statistics only, but still leave the entry in the table, click **Clear**.

3. Use Figure 11-5 to review the FE Cache fields:

Table 11-5. *FE Cache Parameters*

Parameter	Defines...
PRE	The Packet Routing Engine in question.
Type	The type of packet (for example, IP unicast, IP multicast).
Mode	The table mode which includes: • **DA-Only** • **SA & DA** • **SA only** The table mode indicates what values are used in a comparison to determine whether or not a packet is forwarded.
Memory Use in Bytes	Memory used by each entry.
Total Entries	The number of cumulative entries since the last time the statistics were cleared.
Current Entries	The number of active entries.
Aged Entries	The number of entries aged out.
Duplicate Add Attempts	The number of attempts at adding some slow path entries.
Failed Add Attempts	The number of failed attempts at adding a forwarding entry.
Entries Removed Due to Route Deletes	The number of entries removed because of route deletions.
Entries Removed Due to Route Changes	The number of entries removed because of route changes.
Lookup Hits	Cache hits.
Lookup Misses	Cache misses.
Lookup Levels	Cache depth.

12

Using VLANs, Spanning Tree, and Hunt Groups (Layer 2 and Layer 3)

Overview

This chapter and its procedures are common to both Layer 2 and Layer 3 configuration. Included in this chapter:

- ❒ VLAN Operation
- ❒ Creating and Implementing VLANs
- ❒ Using Spanning Tree Setup and Monitoring
- ❒ Using Hunt Groups to Aggregate Bandwidth between Switches

VLAN Operation

VLAN operation is based on three sets of rules:

- ❒ Ingress Rules
- ❒ Forwarding Rules
- ❒ Egress Rules

Ingress Rules

Every frame received by the switch is classified to one VLAN. There are two ways in which frames are classified to VLANs:

- ❒ Untagged frames are classified to the VLAN associated with the port on which the frame is received (Port-based VLANs).
- ❒ Tagged frames are classified to the VLAN identified by the VLAN tag in the tag header of the frame.

Note: The switch supports a feature called Automatic VLAN Creation for tagged frames. When this feature is enabled, the switch creates new VLANs when it receives packets from previously unknown VLANs.

Forwarding Rules

These rules determine the set of ports on the switch through which members of the VLAN can be reached. This is called binding a port to a VLAN. A port may be bound to a VLAN using four methods:

- ❒ Setting the Port VLAN attribute in the Switch Port Configuration dialog box of the port form. This identifies the VLAN to which all untagged frames received on the port are forwarded.

  Note: A port has one Port VLAN. Changing this to a new VLAN removes the port from the old VLAN.

- ❒ Setting the VLAN Binding attribute in the Switch Port Configuration dialog box to Bind to All. This causes the port to be bound to all VLANs known to the switch (for example, all current VLANs and all VLANs added in the future).
- ❒ Setting the VLAN Binding attribute in the Switch Port Configuration dialog box to Bind to Received. This causes the port to be bound to all VLANs (as identified by the VLAN tag in tagged frames) received on this port. Consequently, ports are bound to those VLANs that actually have members that are reachable through the port.
- ❒ Manually creating a VLAN Switch Port in the VLAN Switch Ports dialog box.

Egress Rules

For a given port/VLAN combination, egress rules determine whether frames transmitted from the port on the VLAN are tagged or untagged. This is accomplished by setting the Trunking Mode attribute in the Switch Port Configuration dialog box.

For example, choosing the IEEE 802.1Q trunk mode causes all frames transmitted out of the port to be tagged using the IEEE 802.1Q tag header format. Individual port/VLAN combinations may be changed to cause frames transmitted from the port to be untagged for particular VLANs.

Port-Based VLANs

VLAN assignment of a packet is based on global VLAN ID. Regardless of any name you assign to a VLAN, the switch looks only at the VLAN ID number to determine a packet’s VLAN destination.

Creating and Implementing VLANs

Adding users to VLANs includes:

- VLAN Considerations
- Creating a VLAN
- Assigning Ports To VLANs

VLAN Considerations

Be aware of the following issues when configuring VLANs:

- The default setting for Initial Hash Table Size (a number used to determine how much space is initially reserved for new address tables) supports 58 simultaneous VLANs (the switch supports 1,000 VLANs). To increase the number of VLANs you can implement, simply decrease the initial hash table size for each new address table instance.
- The switch powers up very slowly when large numbers of VLANs (more than 500) are configured. This problem will be addressed in an upcoming software release.
- If you set a port’s VLAN trunking mode to Clear, make sure not to change the VLAN Binding Type from the default value: Static.
- If you are using both the VLAN auto-learning feature and the Binding Type Bind to Received, make sure that you set the binding type before you set Autolearn to enable or else the port may not be automatically added to the VLAN.

Creating a VLAN

To create a VLAN:

1. In the **Switching Parameters** section of the Web Agent window, click **Virtual LANs**. The VLAN Configuration dialog box opens.
2. Click **CREATE**. The Create VLAN dialog box opens.
3. In the **Name** field, enter a **name** for the VLAN.
4. In the **ID** field, enter an **unused VLAN ID** (between 1 and 4095). VLAN IDs are global and must be consistent from switch to switch, even when switches are manufactured by different vendors.

5. Use Table 12-1 to configure the VLAN parameters:

Table 12-1. VLAN Parameters

Parameter	Definition
Name	Name assigned to this VLAN.
ID	Identifier used throughout the network to identify this VLAN. If you want ports on more than one device to participate in a particular VLAN, you must use the same VLAN ID to identify the VLAN on every device.
Initial Hash Table Size	Sets the number of Layer 2 address entries used to store information for this VLAN. Use the default value. The general implementation rule is: Use a smaller size when you implement lots of VLANs (more than 50). Use a larger size when you have lots of MAC addresses on the same VLAN in the network (more than 16,000). Note: The number of address for a given hash table is 4:1 (for example, if you have a hash table of 16 bytes, the VLAN can hold 64 addresses in it's table instance.
Auto Increment HT Size	Determines whether the number of memory "buckets" used by this VLAN's address table adjusts automatically when memory use become inefficient. Select true if you want the HT size to increase when the number of entries belonging to this VLAN reaches a pre-defined threshold. Select false to disable this feature.

6. Click **APPLY** to create the new VLAN, or **CANCEL** to restore previous settings.

Configuring VLAN Parameters

To configure all ports assigned to a VLAN:

1. In the **Switching Parameters** section of the Web Agent window, click **Virtual LANs**. The VLAN Configuration dialog box opens.
2. Click on the **Name** of the VLAN whose members you want to view. The VLAN Switch Ports dialog box opens.
3. Use Table 12-2 to configure the VLAN parameters:

Table 12-2. VLAN Switch Port Table Parameters

Parameter	Defines...
Port	The VLAN switch port.
Port Name	The user-assigned name for this port.

Table 12-2. VLAN Switch Port Table Parameters (Continued)

Parameter	Defines...
Binding Type	• **Static** - when ports are added manually and can be removed. • **Persistent** - when ports are bound to VLANs automatically but can not be removed. • **Dynamic** - when port is assigned to VLAN using automatic VLAN binding, which causes ports to bind to VLANs using the Bind to Received switch port setting and can be removed. Refer to "Configuring Port VLAN Parameters," in Chapter 2 for more information.
Frame Format	• **From Port** - causes port to send frames using the frame format specified in the Trunk Mode attribute of the corresponding switch port. Refer to "Configuring Port VLAN Parameters," in Chapter 2 for more information. • **Clear** - causes port to send untagged frames on this port for this VLAN.

4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Creating 3Com Mapping Tables

The Default 3Com Mapping Table maps 3Com VLAN 1 to 16 to the Lucent Default VLAN and 3Com VLANs 2 through 16 to the Lucent Discard VLAN. In a network with multiple 3Com devices, it's possible that some parts of a network will use different VLAN mappings for incoming 3Com tagged packets. The switch allows you to create additional 3Com mapping tables to use in situations where this occurs.

Note: 3Com trunks do not work across hunt groups.

To create additional mapping tables:

1. In the **Switching Parameters** section of the Web Agent window, click **3Com Mapping Table**. The 3Com Mapping Table dialog box opens.
2. Click **CREATE**. The Create 3Com Map Table dialog box opens.
3. In the **Name** field, enter a name for this entry.
4. Click **APPLY** save your changes, or **CANCEL** to restore previous settings.
5. In the **Switching Parameters** section of the Web Agent window, click **3Com Mapping Table**. The 3Com Mapping Table dialog box opens.

6. Use the corresponding pull-down menus to assign a Lucent VLAN ID association to each of the 16 available 3Com VLAN IDs.
7. In the **Name** column, click on **VLAN.**
8. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Note: The mapping instructions in the table called Default are fixed and cannot be changed. To actually map VLAN IDs, you must create new 3Com Mapping tables. Setting a port to use a 3Com mapping table causes it to ignore other VLAN tagging parameters. The switch assumes that only 3Com VLAN tags will be received on the selected port.

Assigning Ports To VLANs

Refer to “Configuring Switch Port Parameters,” in Chapter 3 for instructions on assigning ports to VLANs.

Using Spanning Tree Setup and Monitoring

Spanning trees are used to prevent loops from forming in your network. The spanning tree algorithm creates a single path through the network by ensuring that if more than one path exists between two parts of a network, only one of these paths is used, while the others are blocked.

Note: You should have a good understanding of spanning tree protocol before attempting to configure these parameters. Because of the number of “bridges” present in a switched networking environment, spanning tree structures can become extremely complex.

This section includes:

❒ Spanning Tree Bridge Options

❒ Managing Spanning Trees

❒ Configuring Spanning Tree Bridge Ports

❒ Disabling Spanning Tree Mode for the Port

Spanning Tree Bridge Options

The three spanning tree options are:

- ❐ If you use the default 802.1D spanning tree option, the entire switch is a bridge, for which spanning tree parameters can be set. Every port, regardless of VLAN membership, is part of the same spanning tree. The implication is that after resolving the spanning tree topology, only one trunk will be active, and all others will be blocked.
- ❐ If you use the Spanning Tree per VLAN option, each VLAN runs a separate spanning tree with its own BPDUs. This allows different ports to blocked or unblocked on different VLANs.
- ❐ If you use the dual layer spanning tree option, within a set of interconnected Cajun switches, you can set up a separate spanning tree for each VLAN. The switch then runs a second level of spanning tree to control routes between switches in the Cajun Network. This creates smaller spanning tree domains and provides quicker convergence upon reconfiguration.

Managing Spanning Trees

To manage spanning trees:

1. In the **Switching Parameters** section of the Web Agent window, click **Spanning Tree**. The Spanning Tree Information dialog box opens.
2. From the **Configuration** pull-down menu, select the **type** of spanning tree you want to implement.
3. Use Table 12-3 to select your Spanning Tree options:

Table 12-3. Spanning Tree Options

Parameter	Definition
IEEE 802.1D	Entire switch is a single IEEE 802.1D-compliant bridge. **Note:** When the spanning tree mode is set to IEEE 802.D, BPDUs are sent out ports in Clear (non-trunked) format even if the port has a trunking format (3Com, 802.1Q or Dual Layer) defined.
Per VLAN	Each VLAN functions as a separate IEEE 802.1D-compliant bridge. **Note:** If you disable spanning tree on a single VLAN, spanning tree will be re-enabled when the switch is reset. In order for spanning tree to function properly with 3Com trunked ports, the spanning tree mode should be set to per-VLAN. In Per VLAN spanning tree, there is one instance of spanning tree for each VLAN and the BPDUs are tagged with the VLAN ID, ensuring they are interpreted correctly on the receiving end.
Dual Layer	Spanning tree terminates at edge of the switch network. Spanning Tree per VLAN within the switch network.
Disable	Spanning tree not used.

4. Click **APPLY** save your changes, or **CANCEL** to restore previous settings.

5. In the **Bridge** column, click on a **bridge name** to set bridge parameters. The Spanning Tree Bridge Configuration dialog box opens.

6. Use Table 12-4 to select bridge-level parameters:

Table 12-4. Bridge-Level Parameters

Parameter	Definition
Mode	Determines whether spanning tree is enabled or disabled for this bridge.
Priority	STP Priority level for this bridge.
Bridge Max Age	Sets the maximum amount of time that this bridge retains bridging information before discarding. When the maximum age expires, the bridge assumes it has lost connection to the network, and sends out requests to be re-added to the spanning tree.
Bridge Hello Time	Time between generation of BPDUs by the root bridge.

Table 12-4. Bridge-Level Parameters (Continued)

Parameter	Definition
Bridge Forward Delay	Amount of delay used when a port transitions to the forwarding state. Set by the root bridge for the segment. **Note:** You must enter a value within the supported range or the configuration operation will fail. The supported value range for this parameter is 10-30.
Max Age	Current maximum age for this spanning tree. Determined by the root bridge.
Hello Time	Current hello time for this spanning tree. Determined by the root bridge.
Forward Delay	Current forwarding delay for this spanning tree. Set by the root bridge.

7. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Configuring Spanning Tree Bridge Ports

To configure spanning tree bridge ports:

1. In the **Switching Parameters** section of the Web Agent window, click **Spanning Tree**. The Spanning Tree Information dialog box opens.
2. In the **Bridge Ports** column, click the **port number** listed. The Spanning Tree Bridge Port Information dialog box opens.
3. Use Table 12-5 to configure the Spanning Tree Bridge port parameters:

Table 12-5. Spanning Tree Bridge Port Parameters

Parameter	Options
Bridge Port	The bridge port.
Port	The spanning tree bridge port number.
Name	The name assigned to the bridge port.

Table 12-5. Spanning Tree Bridge Port Parameters (Continued)

State	Current bridging state of the port. The options are: • **Disabled** - The port is disabled. • **Blocking** - The Spanning Tree algorithm has set this port's state to block, meaning that it is enabled, but not passing traffic. • **Listening** - The port is in a transitional state, waiting for the spanning tree algorithm to determine whether it should block or forward traffic. • **Learning** - The port is learning MAC addresses, but not yet forwarding traffic. • **Forwarding** - This port has been selected by the Spanning Tree algorithm to forward traffic, and is forwarding traffic currently. • **Down** - The port's physical port has no link detected.
Designated Root	Displays the Root bridge for this spanning tree.
Designated Bridge	The bridge identifier for the bridge considered to be the designated bridge for this segment.
Designated Port	The port identifier of the port on the designated bridge for this segment of the spanning tree.
Designated Cost	The path cost of the designated root of the segment connected to this port.
Forward Transitions	Number of times that this port has transitioned from blocking to forwarding.

4. In the **Bridge Port** column, click on the **Bridge Port number** to configure bridge port parameters. The Spanning Tree Port Configuration dialog box opens.

5. Use Table 12-6 to configure Spanning Tree Bridge Port Information parameters:

Table 12-6. Spanning Tree Bridge Port Information Parameters

Parameter	Definition
Enable	Sets whether or not spanning tree is active on this bridge port.
Priority	Sets the port's priority in the spanning tree algorithm. A port with a higher priority (lower priority number) is more likely to be chosen as the primary path in the spanning tree.

Table 12-6. Spanning Tree Bridge Port Information Parameters (Continued)

Parameter	Definition
Path Cost	Sets the spanning tree path cost for this port. The ports that you prefer be used by the spanning tree should have the lowest path cost. **Note:** Configuring the path cost for a link when the link is in the down state is not saved in the configuration NV memory. Establish the link first, before configuring the path cost.
Top. Change Detection	Allows you to enable or disable topology change detection. Specifies whether a Topology Change Notification (TCN) packet is sent through the root port (or if this switch is the root bridge, whether or not Fast Aging occurs) whenever the port enters the forwarding or blocking states. This attribute should only be used on port which connect to no other switches. **Note:** A topology change occurs when you change a port mirroring piggyback port.

6. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Disabling Spanning Tree Mode for the Port

To disable spanning tree mode for the port:

1. In the **System Configuration** section of the Web Agent window, click **Modules & Ports**. The Module Information dialog box opens.
2. In the **Switch Ports** column, click the switch port **number**. The Switch Ports dialog box opens.
3. In the **Name** column, click the **port number** to be disabled. The Switch Port Configuration dialog box for that port opens.
4. From the **Spanning Tree Mode** pull-down menu, select **Disable**.
5. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Using Hunt Groups to Aggregate Bandwidth between Switches

Hunt groups allow you to aggregate multiple switch ports into a single group, effectively combining the bandwidth into a single connection.

For example, if you connect three gigabit ports each on a pair of switches into a hunt group, the aggregated connection will have six gigabits of available bandwidth (full-duplex).

Hunt groups also provide fault tolerance. If a port in a hunt group fails, the remaining ports will continue forwarding the traffic on the link.

Hunt Group Considerations

Considerations before creating hunt groups include:

- The switches do not yet have a link discovery protocol. When creating a hunt group, you have to verify that the ports in a group on one switch are physically connected to the ports in that group on the other switch.
- If one end of a connection is in a hunt group, the other end of the connection should also be in a hunt group. If you don't do this, the forwarding behavior of the hunt group will be unpredictable.
- You should disable the ports in a hunt group until both ends of the link are configured.
- All ports in a hunt group must be the same speed.
- Packets arriving on different fabric ports within the switch will have loads balanced more evenly.
- Hunt groups will not load share if the source and destination traffic and the hunt group ports are on the same fabric port. Most I/O modules divide their ports evenly across two fabric ports. For 10-port and 12-port I/O modules, all ports use a single fabric port.
- The first port assigned to a hunt group becomes the flood port. It can not be changed unless the flood port is disabled.

Configuring Hunt Groups

To configure a hunt group:

1. Ensure that the same-speed ports that you are configuring into a hunt group are physically connected to each other (for example, in a four-port gigabit hunt group, ensure that you have four fiber cables with switch ports connected at each end).

   Note: Auto-negotiation should be disabled on the ports to further insure against speed mismatch.

2. From the **System Configuration** section of the Web Agent window, click **Modules and Ports**. The Module Information dialog box opens.
3. In the **Ports** column, click on the **port number**. The Physical Port Configuration dialog box opens.

4. For the selected port, click **Enable** to disable the port. The selection is removed and the port is disabled. Disable all of the ports you are adding to the hunt group if this is a new hunt group. If you are adding ports to an existing hunt group, disable the ports you are adding.

5. On the first switch, in the **Switching Parameters** section of the Web Agent window, select **Hunt Groups**. The first Hunt Group Configuration dialog box opens.

6. Use Table 12-7 to configure your Hunt group:

Table 12-7. *Hunt Group Configuration Dialog Box*

Button or Link	Function
Create	Summons a screen that allows you to add new hunt groups. **Note:** This button is unavailable if you have read-only privileges.
Delete	Deletes hunt groups that have a check next to the hunt group name.
Members	Lists port numbers of port that are members of the selected hunt group and opens the Hunt Group Members dialog box.
Redistribute	Redistributes the hunt group learned addresses. Click this button if you notice that a particular link has learned to many of the busiest ports. The button causes the MAC addresses to be redistributed among the hunt group ports.

7. Click **CREATE**. The second Hunt Group Configuration dialog box opens.

8. In the **Name** field, enter a **name** for the end of hunt group.

9. From the **Load Sharing** pull-down menu, select **Enable** to enable load sharing.

10. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Viewing Hunt Group Members

To view hunt group member details:

1. From the **Switching Parameters** section of the Web Agent window, click Hunt Groups. The Hunt Group Configuration dialog box opens.
2. In the **Members** column, click the highlighted **number**. The Hunt Group Members dialog box opens.

Adding Ports to a Hunt Group

After creating and naming a hunt group, you can add as many additional ports as you would like to the group.

To add additional ports:

1. From the **System Configuration** section of the Web Agent window, click **Modules and Ports**. The Module Information dialog box opens.
2. In the **Ports** column, click on the **port number**. The Physical Port Configuration dialog box opens.
3. For the selected port, click **Enable** to disable the port. The selection is deselected and the port is disabled.
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.
5. Click **Modules**, at the bottom of the page. The Module Information dialog box re-opens.
6. In the **Switch Ports** column, click the **number** for the module whose port(s) you are adding to the hunt group. The Switch Ports dialog box opens.
7. In the **Name** column, click the **port name** you want to configure. The Switch Port Configuration dialog box opens.
8. From the **Trunk Mode** pull-down menu, select the trunk group assignment of the port.
9. Click **APPLY** save your changes, or **CANCEL** to restore previous settings.
10. Repeat Steps 1-9 for any additional ports you would like to add to this hunt group.
11. Repeat the same steps on the switch at the other end of the hunt group connection.
12. From the **System Configuration** section of the Web Agent window, click **Modules & Ports**. The Module Information dialog box re-opens.
13. In the **Ports** column, click on the **port number**. The Physical Port Configuration dialog box opens.
14. For the selected port, click the **Enable** checkbox to enable the ports in the hunt group. The group begins functioning as a load-sharing connection.
15. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Note: If thousands of addresses have been learned on a port and a link in the hunt group goes down, the switch-over of traffic between ports may take several seconds.

13

Tuning Your Switch Performance (Layer 2 & Layer 3)

Overview

This chapter and its procedures are common to both Layer 2 and Layer 3 configuration. Buffer management features help you to optimize traffic throughput through the switch fabric.

Included in this chapter:

❒ How Queues Work

❒ Managing Buffers and Queues

How Queues Work

Frames are buffered in the I/O modules, before and after traversing the switch. Each queue can hold 256K bytes. (Architecturally they can support up to 1 MB each).

Each buffer is divided into two queues, one for High-priority Traffic and one for Normal-priority Traffic. The factory default is for the high-priority queue uses 20% (51K) of the buffer. The normal-priority queue uses the remaining 80% (205K). These values can be modified using either the Web Agent or SNMP.

Note: When you change these values, you must reboot the switch before they can take effect.

Less buffer memory gets assigned to the high-priority queue because the high-priority queue gets serviced more frequently than the normal-priority queue. Since a frame spends less time on the high-priority queue, less buffer space is required for the queue.

The Service Ratio can be chosen to match traffic patterns and performance requirements using a weighted round robin scheduling algorithm. The available service ratios of the algorithm are defined in "Managing Buffers and Queues". The factory default service ratio for fabric ports is 999/1. The factory default service ratio for physical ports is 1023 to 1. If there is traffic to be serviced from both the high- and normal-priority queues, 999 packets of high-priority traffic will be processed for each normal-priority packet.

When the high-priority queue fills up, incoming frames are dropped. The philosophy is if a high-priority frame is going to be late, it is not worth sending it at all. The normal-priority queue uses either IEEE 802.3X PAUSE (variable timed XOFF) flow control or Half Duplex collisions to shut off incoming frames before the queue overflows.

The switch implements two flow control disciplines along the entire path that frames travel. The default case is that when output buffers fill up, frames destined for a particular buffer will be dropped. This should only occur in a case where the output port is very congested. However, there is an optional mode which in which normal-priority frames are never dropped inside the switch. In this mode, input buffers may fill up. If they do, the affected input ports may use flow control to temporarily halt traffic from neighboring switches.

Managing Buffers and Queues

To manage buffers and queues:

1. From the **System Configuration** section of the Web Agent window, click **Modules and Ports**. The Module Information dialog box opens.
2. In the **Buffer Management** column, click the **Module number** for the module whose buffers you want to manage. The Buffer Management dialog box opens.
3. Use Table 3 to view your buffer management parameters.

Table 13-1. Buffer Management Parameters

Parameter	Definition
Fabric Port Buffers	Displays the port's fabric port buffers and allows you to open the Buffer Detail Configuration dialog box for the selected module. Service ratios: • **3 to 1** • **99 to 1** • **999 to 1** • **9999 to 1**
Physical Port Buffers	Displays the port's physical port buffers if available. Service ratios: • **31 to 1** • **63 to 1** • **127 to 1** • **255 to 1** • **511 to 1** • **1023 to 1** • **2047 to 1** • **4095 to 1** • **8191 to 1** • **16383 to 1** • **32767 to 1**

4. To manage your Fabric Port buffers, click on the **Fabric Port Buffer number** whose associated buffers you want to manage. The selected fabric port's Detailed Buffer Configuration dialog box opens.

5. Use Table 13-2 to manage your port's input and output buffer:

Table 13-2. Buffer Detailed Configuration Parameters

Parameter	Definition
Memory	The amount of physical memory associated with this buffer.
Age Timer	The amount of time a packet remains in the queue before being discarded as a stale packet. You may want to increase the timer value for ports connected to 10 MB/s ports, particularly 10 MB/s shared media, because you may want to queue packets longer before discarding them.

Table 13-2. Buffer Detailed Configuration Parameters (Continued)

Parameter	Definition
High Priority Allocation	Percent of the buffer's queueing space allotted to high priority traffic. Because the high-priority queue is serviced more frequently than the normal priority queue, raising this value may not necessarily provide better service. In fact, if you are using the high-priority queue for delay-sensitive traffic, you may want to reduce the amount of memory devoted to the high-priority queue. This ensures that packets that cannot be delivered in a timely manner are discarded. If you want the high priority queue to guarantee delivery of as many packets as possible, regardless of delay, increase this value. The change does not take effect until you reset the switch.
Priority Threshold	Some priority schemes have more than two queues (the IEEE allows up to 8, numbered 0 through 7). Set this parameter to the value at which the Cajun P550 switch starts sending packets to the high-priority queue. The default value (4) causes all traffic with a priority greater than or equal to 4 (4, 5, 6, and 7) to be assigned to the high-priority queue. Lucent recommends that you do not change this parameter.
High Priority Service Ratio	Determines how many times the high priority queue is serviced for each time the low priority queue is serviced. The ideal value changes from queue to queue, but the goal is to ensure that traffic mix guarantees optimal mix between high-priority and best effort traffic.
High and Normal Overflow Drops	Number of packets dropped because the associated buffer is full. Indicates that the device immediately before the queue is processing traffic faster than the next downstream element can process the same volume of traffic. For example, overflow drops on the input buffer indicate that traffic is arriving faster than the switch matrix can process it. Overflow drops on the output buffers indicates that the output port cannot handle the volume of the load being offered.
High and Normal Stale Drops	Number of packets dropped because they timed out waiting for service (using the age timer value). In the high-priority queue, this can help determine how efficiently the switch is processing "better never than late" traffic. Excessive stale drops on the high-priority queue may indicate the need to increase the service ratio on the high-priority queue.
Congestion Drops	Number of packets dropped because the switch controller has sensed congestion at the outbound port.

6. To manage your Physical Port buffers, repeat **Steps 1-4** to tune Physical Port (Fast Ethernet) buffers. Physical Port ports have additional buffers on both the input and output ports.

7. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

14

Managing Address Forwarding Tables (Layer 2 & Layer 3)

Overview

This chapter and its procedures are common to both Layer 2 and Layer 3 configuration. Included in this chapter:

❒ Configuring the Address Forwarding Table

❒ Searching the Switch Address Forwarding Table

❒ Adding Entries to the Address Forwarding Table Manually

Configuring the Address Forwarding Table

You can configure the following parameters when using the address forwarding table:

❒ **Address Age Time** - defines the length of time addresses remain active in the address forwarding table.

❒ **Super Age Time** - defines how long inactive addresses are stored in the address forwarding table before being deleted.

❒ **Address Table Sizing Parameters** - allow you to adjust what the switch does when address table use becomes inefficient.

The Address Table dialog box also provides information useful when working with Lucent support personnel.

Configuring the Age Timer and Super Age Timer

To change the aging values for all instances of the address table:

1. In the **Address Forwarding Table** section of the Web Agent window, click **Table Configuration**. The Address Forwarding Table Configuration dialog box opens.
2. In the **Age Time** field, enter a **new value**. The default of 300 seconds is the standards-recommended default. Aged out addresses become invalid until the switch sees another packet with the aged out entry's source address.

3. In the **Super Age Time** field, enter a **new value**. The Super Age Timer marks all invalid table entries, then checks to see if they remain invalid for the specified super age interval. This clears the table of entries that are no longer used. The default value is 7 days.

4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Controlling Reconfiguration of Address Table Sizes

Each VLAN you define creates a separate version of the switch address forwarding table. When these address tables become large, they may begin to use address space inefficiently.

If you leave the switch in its default state, it will adjust for growth automatically. However, this will lead to a few seconds of flooding packets when the address table reconfigures.

To manually control when a flood event occurs:

1. In the **Address Forwarding Table** section of the Web Agent window, click **Table Configuration**. The Address Forwarding Table Configuration dialog box opens.
2. Enter a new Auto-Sizing Utilization **Threshold percentage**, if you just want to cause the table reconfiguration to occur at a different level of usage efficiency. The default value of 40% is recommended for most applications. Raising the value might cause the table to be relearned more frequently, and will make address space usage more efficient.

3. In the **Instance IDs** column, click the **ID number** to achieve finer control of particular tables. The Address Table Instance dialog box opens for the instance ID selected.

Table 14-1. *Address Table Instance Parameters*

Parameter	Definition
VLAN Association	Displays the associated VLAN switch port and opens the VLAN Switch Port dialog box.
Total Number of Entries	Displays the total number of entries for this VLAN.
Entry Type	Displays the entry type for this VLAN. Options include: • **Learned** - Entry is dynamically learned. • **Management** - Entry is configured by the user statically. • **Self** - Entry is the switch's own address

Table 14-1. *Address Table Instance Parameters (Continued)*

Parameter	Definition
Entry Validity	Displays the entry validity for this VLAN. Options include: • **Valid** - Entry exists. • **Invalid** - Entry has aged out but still exists even though the port binding is invalid.
Hash Table	Displays the hash table parameters. Options include: • **Size** - It is recommended that the hash table size be 1/8th the size of the total number of addresses for the VLAN. • **Auto Increment** - Hash tables may grow dynamically larger if more addresses are discovered. Disabling auto-increment prevents these tables from growing dynamically at the risk of extra flooding.
Bucket Info	Displays parameters to monitor the efficiency of the hash table allocations. Options include: • **Count** - Indicates the hash table count. • **Capacity** - Indicates the hash table capacity. • **Utilization** - High utilization indicates that a larger hash table is needed.

4. From the **Hash Table/Size** pull-down menu, select the **new size** to alter the space available for this address table. The rule of thumb is: Tables with high Total Bucket Utilization (greater than 75%) can be made smaller. Tables with low Total Bucket Utilization (less than 40%) should be made larger. Note that the number of addresses for a given hash table is 4:1 (for example, if you have a hash table of 16 bytes, the VLAN can hold 64 addresses in it's table instance.

5. From the **Hash Table/Auto Increment** pull-down menu, select **False** to prevent the table size from reconfiguring automatically.

6. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

   If you want to relearn the entire table, click **Delete All Learned Entries**.

   If you want to delete all entries that are currently aged out, click **Delete All Invalid Learned Entries**.

Note: If you change the Hash Table Size, the switch relearns all addresses in that table, causing the switch to flood packets for a few seconds.

Searching the Switch Address Forwarding Table

The Address Forwarding Table can contain more than 24,000 entries on each switch. The switch Web Agent provides a utility that allows you to filter which addresses it displays, making the list more manageable. Multiple criteria can be selected to produce a sophisticated filter. The parameters are treated as "ands," meaning that displayed addresses must meet all selected criteria.

To filter the switch address forwarding table:

1. In the **Address Forwarding Table** section of the Web Agent window, click **Entry SearchTfi13.2222 0.00Tc24lent4054 0lay**adEn12(et)11(era)22(21 Tm01(f)-7(ress)a12(h)0g b

1.Se50lay

1.Se50lay

12. Use Table 14-2 to review your search criteria options:

Table 14-2. *Address Forwarding Table Parameters*

Parameter	Defines the...
Index	Index number of this address entry in the switch address forwarding table.
MAC Address	MAC address associated with this entry. This address is learned by the switch as an address to forward to the associated port.
Port	Port associated with this MAC address table entry. Use this setting to display the entries associated with that port. Options include: • **Forward** - Forwards the entry. • **Filter** - Filters the entry. • **Cpu** - Stores the entry.
Valid	Whether the port binding is valid. This helps the re-learn performance.
Group	Group number associated with this MAC address.
TblInst	Address table instance number associated with this MAC address.
Priority	Priority level associated with traffic forwarded to this MAC address. The options are: • **Normal** • **High** You can set this parameter on all learned entries.
Persistence	The persistence of the entry in the table can be set on all learned entries: • **Permanent -** The address is not aged out of the table. • **Invalid -** This entry is cleared from the table each time the switch resets. • **Ageout -** Address is cleared from the address forwarding table when the timeout interval expires. This is the state of all entries dynamically learned by the switch. It ensures that MAC addresses that are not active on the network do not remain in the switch address forwarding table indefinitely.
Status	The status of the address entry. Options include: • **Learned** • **Management** • **Self** • **Multicast**

Adding Entries to the Address Forwarding Table Manually

Adding entries manually is useful when you want to ensure the address forwarding table entries remain permanently.

To add an address manually:

1. In the **Address Forwarding Table** section of the Web Agent window, click **Entry Configuration**. The Static Address Configuration dialog box opens.
2. In the MAC Address **Value** field, enter the **MAC address** that you want to add to the table.
3. From the **VLAN** pull-down menu, select a **VLAN** for this entry.
4. From the **Port Binding** pull-down menu, select to forward or filter this port.
5. In the **Port Binding** field, enter the port that you want associated with this entry.
6. From the **Priority** pull-down menu, select a **priority level** for packets forward to this MAC address. High priority addresses move to the front of the switch packet buffers automatically.
7. Use Table 14-3 for configuring the persistence parameter:

Table 14-3. *Entry Persistence*

Parameter	Definition
Permanent	The address is saved in nonvolatile memory and is not aged out of the table.
Ageout	Address is cleared from the address forwarding table when the timeout interval expires. This is the state of all entries dynamically learned by the switch. It ensures that MAC addresses that are not active on the network do not remain in the switch address forwarding table indefinitely.

8. Click **APPLY** to save your changes, or **CANCEL** to clear the dialog box fields.

15

Managing Intelligent Multicasting (Layer 2 & Layer 3)

Overview

This chapter and its procedures address both Layer 2 and Layer 3 configurations. Included in this chapter:

- ❐ Introduction
- ❐ Configuring Global Intelligent Multicasting
- ❐ Displaying Router Ports
- ❐ Configuring Static Router Ports
- ❐ Searching for Intelligent Multicast Sessions
- ❐ Creating a Static Multicast Session
- ❐ Configuring IGMP Snooping (Layer 3 only)
- ❐ Configuring the LGMP Server
- ❐ Configuring/Viewing an LGMP Client
- ❐ Configuring/Viewing CGMP Snooping

Introduction

Intelligent multicasting refers to the forwarding of Layer 2 multicast traffic (packets with a multicast destination MAC address) to a subset of ports participating in a VLAN. With intelligent multicasting disabled, Layer 2 multicast traffic is flooded to all ports participating in the VLAN on which the traffic is received.

Intelligent multicasting is used to limit the forwarding of Layer 2 multicast traffic to only those ports within the VLAN that have clients attached to them that want to receive this multicast traffic. Limiting this forwarding reduces the amount of traffic to ports that do not have clients wanting to receive the multicast traffic.

A multicast session is Layer 2 multicast traffic within a VLAN. The switch supports 60 sessions per VLAN. A client port is a port with an attached host configured to receive (be a client of) a multicast session. Router ports are ports that are attached to (or in the path to) multicast routers and must be treated specially. All multicast traffic on a VLAN must be forwarded to the router.

You can manually create and delete multicast sessions through the user configuration. The addition of client and router ports can also be performed manually. Dynamic intelligent multicasting is achieved through IGMP snooping, LGMP (Lucent Group Membership Protocol), or CGMP (Cisco Group Management Protocol) snooping. All of these mechanisms are based on the assumption that the client host is running IGMP, requesting membership in the IP multicast session.

Note: If there is no multicast session created for a multicast flow in a VLAN, then that multicast flow will be flooded to all ports on the VLAN. Intelligent multicasting must be enabled for any dynamic intelligent multicasting to be active.

Layer 3 Dynamic Intelligent Multicasting

IGMP snooping is supported for VLANs that have IGMP interfaces enabled. This is the recommended means of supporting dynamic intelligent multicasting in Layer 3. For all VLANs that do not have an IGMP interface enabled, the Layer 2 dynamic intelligent multicasting mechanisms (LGMP client and CGMP snooping) are supported.

Note: For Layer 2 or Layer 3 LGMP to perform properly, VLAN IDs must match between switches. Specifically, if two switches are connected with a non-tagging link, the port-default VLANs of the ports connecting the two switches must be the same. This is because the VLAN is embedded in the LGMP message; and the receiving switch maps the LGMP message to the specified VLAN.

IGMP Snooping

IGMP snooping is only supported in Layer 3. As IGMP reports are received by the switch, IGMP sessions are created. Intelligent multicast sessions are created and the ports on which these reports are received are added to the appropriate sessions. When the IGMP session is terminated, the associated intelligent multicast session is deleted.

Note: IGMP snooping is only available for VLANs that have an IGMP interface enabled.

LGMP Server

Because Layer 2 cannot snoop IGMP messages, it requires Layer 3 to provide the necessary information through a Lucent proprietary protocol, Lucent Group Membership Protocol (LGMP).

Essentially, LGMP works by having the Layer 3 switch re-transmit received IGMP messages to the Layer 2 switches by sending them to a well known multicast MAC address. The Layer 2 switch then creates multicast sessions, adds clients to those sessions, and removes sessions dynamically, as if it were directly receiving the IGMP messages.

If more than one LGMP server is on a VLAN, one server will be elected as the *distributor*. Only the distributor disseminates intelligent multicasting information using LGMP packets.

Note: IGMP snooping must be enabled for LGMP server availability. An LGMP server is active only for VLANs that have an IGMP interface enabled.

Layer 2 Dynamic Intelligent Multicasting

Layer 2 does not support IGMP snooping to dynamically configure intelligent multicast sessions. Therefore, LGMP client or CGMP snooping is used to achieve dynamic intelligent multicasting.

LGMP Client

An LGMP server disseminates multicast session information using LGMP. An LGMP client creates multicast sessions, adds clients to those sessions, and removes sessions dynamically, using the information sent from the LGMP server.

CGMP Snooping

Cisco routers disseminate multicast session information via the CGMP protocol. The switch has the ability to listen to these messages and dynamically create multicast sessions, add client ports to those sessions, and remove sessions.

Pruning Dynamic Sessions, Client Ports, and Router Ports

Normally, dynamically created multicast sessions are removed by the application (for example, IGMP Snooping, LGMP, or CGMP Snooping) that created the session when the session is no longer active. You can also enable Automatic Session Pruning so that if a session has not been active for Session Pruning Time, it is automatically removed.

2. Use Table 15-1 to configure your global configuration setup:

Table 15-1. Intelligent Multicast Global Configuration

Parameter	Definition
Enable State	Select to enable or disable intelligent multicasting globally. The default value is Enabled.
Automatic Router Port Pruning	• **Enable** - Select to enable or disable automatic router port pruning. The default value is Enabled. • **Time** - Enter the time, in seconds, after which quiet learned router ports can be pruned. The valid range (in seconds) is 10 to 172800 (48 hours). The default value is 120 seconds.
Automatic Session Pruning	• **Enable** - Select to enable or disable removal of stale learned sessions. The default value is Enabled. • **Time** - Enter the time, in seconds, after which stale learned sessions can be removed. The valid range (in seconds) is 10 to 172800 (48 hours). The default value is 250 seconds.
Automatic Client Port Pruning	• **Enable** - Select to enable or disable automatic removal of quiet learned client ports from a session. The default value is Enabled. • **Time** - Enter the time, in minutes, after which quiet learned client ports can be automatically removed from a session. The valid range (in minutes) is 1 to 1440 (24 hours). The default value is 60 minutes.

3. Perform one of the following:

- **APPLY** to save your changes.
- **CANCEL** to restore previous settings.
- **Delete All Learned Sessions** to remove all learned multicast sessions.
- **Delete All Learned Client Ports** to remove all learned client ports from all multicast sessions.
- **Display/Configure Router Ports** to display the router ports and configure your static router ports. The Router Port Display/Configuration dialog box opens.

Note: Static sessions and client ports cannot be deleted using this dialog box. Refer to "Deleting a Multicast Session Client Port" and "Deleting a Static Multicast Session", later in this chapter for more information.

Displaying Router Ports

To display router ports:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **Global Configuration**. The Intelligent Multicast Global Configuration dialog box opens.

Note: You must enable intelligent multicasting on a global basis to make your router ports active. See “Configuring Global Intelligent Multicasting”, earlier in this chapter.

2. Click **Display/Configure Router Ports**. The Router Port Display/Configuration dialog box opens.
3. Use Table 15-2 for more information on router ports.

Table 15-2. Router Port Display Parameters

Parameter	Definition
Port	Displays the router port in the multicast session.
VLAN	Displays the port VLAN of the router.
Application	Displays the active applications of the router port. Applications include: • **Mgmt (Static)** • **IGMP** • **LGMP** • **CGMP**

4. Select a router port and click **DELETE** to remove a router port, or **CANCEL** to restore previous settings.

Configuring Static Router Ports

To configure a static router port:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **Global Configuration**. The Intelligent Multicast Global Configuration dialog box opens.

Note: You must enable intelligent multicasting on a global basis to make your static router port configuration active. See “Configuring Global Intelligent Multicasting”, earlier in this chapter.

2. Click **Display/Configure Router Ports**. The Router Port Display/Configuration dialog box opens.

3. In the **Static Router Port Configuration** section, enter a **port number** in the Port field.

4. In the **VLAN** column, click **All** to add this router port to all VLANs.

   Or

   From the **VLAN** pull-down menu, select a specific **VLAN**.

   Note: When adding a router port to all VLANs, the router port is added only to the VLANs bound to the switch port. To bind multiple VLANs to a switch port, refer to Chapter 3 in this guide.

5. Click **CREATE** to save your changes.

Searching for Intelligent Multicast Sessions

To perform a session search:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **Session Search**. The Intelligent Multicast Session Search dialog box opens.
2. Use Table 15-3 to configure your session search.

Table 15-3. Intelligent Multicast Session Search Parameters

Parameter	Display only multicast sessions...
IP Subnet	With this IP subnet. • **IP Address** - The destination IP multicast address portion of the subnet on which to search. • **IP Address Mask** - The subnet mask portion of the subnet on which to search.
MAC Address	That have this destination MAC address (or portion of this MAC address).
VLAN	That are on this VLAN.
Client Port	With a client port matching this switch port.
Session Type	Of this session type. • **Learned** - Session is dynamically learned. • **Mgmt** - Session is configured statically by the user.

3. Click **SEARCH** to begin the search for the multicast session. The Multicast Sessions dialog box opens with the search results.

4. Use Table 15-4 for more information on your multicast session search results.

Table 15-4. Multicast Sessions Parameters

Parameter	Definition
Select	Select the multicast session.
Session ID	Displays the multicast session identifier.
MAC Address	Displays the MAC address of the multicast session.
VLAN	Displays the VLAN on which the multicast session exists.
Type	Displays the type of multicast session. Options include: • **Learned** - Entry is dynamically learned. • **Mgmt** - Entry is configured statically by the user.
Client Ports	Displays the number of client ports in the multicast session and opens the Multicast Session Client Ports dialog box.
Application	Displays the active application(s) of the multicast session. Applications include: • **Mgmt** • **IGMP** • **LGMP** • **CGMP**

5. Click **DELETE** to remove your selected multicast session, or **CANCEL** to restore previous settings.

Note: Static (Mgmt) sessions can only be deleted through the Static Sessions dialog box.

Deleting a Multicast Session Client Port

To delete a multicast session client port:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **Session Search**. The Intelligent Multicast Session Search dialog box opens.
2. In the **Client Ports** column, click on the **client port number** for the selected multicast session. The Multicast Session Client Port dialog box opens.
3. Use Table 15-5 for more information on your multicast session client ports.

Table 15-5. Multicast Session Client Port Parameters

Parameter	Definition
Select	Select the multicast session client port.
Port	Displays the client port number.
Application	Displays the application(s) associated with this client port. Applications include: • **Mgmt** • **IGMP** • **LGMP** • **CGMP**

4. Click **DELETE** to remove your selected multicast session client port, or **CANCEL** to restore previous settings.

Note: Static (Mgmt) client ports can only be removed through the Static Sessions dialog box.

Creating a Static Multicast Session

To create a new static multicast session:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **Static Sessions**. The Static Multicast Sessions dialog box opens.

Note: You must enable intelligent multicasting on a global basis to make your static multicast session active. See “Configuring Global Intelligent Multicasting”, earlier in this chapter.

2. Click **Create New Session** to create a new static multicast session. The Static Multicast Session Configuration dialog box opens.

3. Use Table 15-6 to configure the new multicast session.

Table 15-6. *Static Multicast Session Configuration Parameters*

Parameter	Definition
IP Address	The IP address of the new static multicast session. The range must be between 224.0.1.0 to 239.255.255.255.
MAC Address	Enter the MAC address of the new static multicast session. Specifying the MAC address is not used for an IP multicast session.
VLAN	Enter the VLAN associated with the new multicast session. Click All to add all VLANs to the multicast session, or select a specific VLAN from the pull-down menu.

4. Click **CREATE** to create the new static multicast session, or **CANCEL** to restore previous settings.

Deleting Static Multicast Sessions

To delete a static multicast session:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **Static Sessions**. The Static Multicast Sessions dialog box opens.
2. Use Table 15-7 for more information on static multicast sessions.

Table 15-7. *Static Multicast Sessions Parameters*

Parameter	Definition
Select	Select the static multicast session to be modified.
VLAN	Displays the VLAN on which the static multicast session exists.
MAC Address	Displays the MAC address of the static multicast session.
IP Address	Displays the IP address associated with the static multicast session, if available.
Static Client Ports	Displays the number of static client ports associated with the static multicast session and opens the Static Multicast Session Client Ports dialog box.

3. Click **DELETE** to remove your selected static multicast session, or **CANCEL** to restore previous settings.

Creating Static Client Ports

To create a static client port:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **Static Sessions**. The Static Multicast Sessions dialog box opens.
2. In the **Static Client Ports** column, click the **number**. The Static Multicast Sessions Client Ports dialog box opens.
3. In the **Port** field, enter the new port number to be added.
4. Click **Add Client Port**. The new static client port is added.

Note: You can only add static client ports to static sessions on VLANs that the port is bound to or on sessions created for All VLANs.

Deleting Static Client Ports

To delete static client ports:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **Static Sessions**. The Static Multicast Sessions dialog box opens.
2. In the **Static Client Ports** column, click the **number**. The Static Multicast Sessions Client Ports dialog box opens.
3. **Select a port** and click **DELETE** to remove the static client port, or **CANCEL** to restore previous settings.

Configuring IGMP Snooping (Layer 3 only)

To configure IGMP snooping:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **IGMP Snooping**. The IGMP Snooping dialog box opens.

2. Use Table 15-8 for more information on IGMP snooping.

***Table 15-8.** IGMP Snooping Parameters*

Parameter	Definition
Enable State	Select to enable or disable IGMP snooping. The default value is Disabled.
Intelligent Multicast Session Statistics	• **New Sessions Created** - Displays the number of new session created by IGMP snooping. • **Sessions Destroyed** - Displays the number of sessions removed by IGMP snooping. • **New Client Ports Added** - Displays the number of new client ports added by IGMP snooping. • **New Router Ports Added** - Displays the number of new router ports added by IGMP snooping. • **Router Ports Removed** - Displays the number of router ports removed by IGMP snooping.

3. Perform one of the following:

   - Click **APPLY** to save your changes.
   - Click **CANCEL** to restore previous settings.
   - Click **CLEAR** to clear the statistics.
   - Click **REFRESH** to refresh the contents of the table.

Note: IGMP snooping only works on VLANS that have an IGMP interface enabled. You must enable intelligent multicasting on a global basis to make IGMP snooping configuration active.

Configuring the LGMP Server

To configure the LGMP server:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **LGMP Server**. The LGMP Server Configuration dialog box opens.

Note: You must enable intelligent multicasting on a global basis to make the LGMP Server active. LGMP serving is only active on VLANs that have an IGMP interface enabled and IGMP snooping is globally enabled.

2. Use Table 15-9 to configure the LGMP server.

Table 15-9. LGMP Server Configuration Parameters

Parameter	Definition
Enable State	Select to enable or disable LGMP server configuration. The default value is Disabled.
Proxy Mode	Select to enable or disable Proxy mode. Proxy mode allows the server to send LGMP router report and leave messages on behalf of neighbor routers on the same VLAN.
Server ID Priority	The priority of the LGMP server on this switch. The server ID priority and the IP address associated with the VLAN determine whether the LGMP server wins LGMP distribution election. The lower the number the more likely it will win the election. The valid range is 0 to 255. The default value is 128.
Router Report Time	The time interval (in seconds) between router reports sent by the LGMP server in distributor state. The valid range is 10 to 10,000. The default value is 125 seconds.
Robustness Variable	The scalar value used by non-distributor LGMP servers when timing out the LGMP server in the distributor state. The valid range is 2 to 10. The default value is 2.
LGMP Servers	Displays the number of LGMP servers and opens the LGMP Server Display per VLAN dialog box. **Note:** Only VLANs that have an active IGMP interface can be LGMP servers.
LGMP Message Reception Statistics	• **Router Report** - Displays the number of LGMP router report messages received. • **Invalid** - Displays the number of LGMP messages received with an invalid payload.

Table 15-9. LGMP Server Configuration Parameters (Continued)

Parameter	Definition
LGMP Message Transmission Statistics	• **Report** - Displays the number of LGMP report messages transmitted. • **Leave** - Displays the number of LGMP leave messages transmitted. • **End Session** - Displays the number of LGMP end session messages transmitted. • **Router Report** - Displays the number of LGMP router report messages transmitted. • **Router Leave** - Displays the number of LGMP router leave messages transmitted.
Intelligent Multicast Session Statistics	• **Client Ports Added**- Displays the number of add client events generated by LGMP. • **Client Ports Removed** - Displays the number of remove client events generated by LGMP. • **Sessions Removed**- Displays the number of remove session events generated by LGMP. • **Router Ports Added**- Displays the number of add router events generated by LGMP. • **Router Ports Removed**- Displays the number of remove router events generated by LGMP.

3. Click...

   - **APPLY** to save your changes.
   - **CANCEL** to restore previous settings.
   - **CLEAR** to clear the statistics.
   - **REFRESH** to refresh the contents of the table.

Modifying the LGMP Server Display per VLAN

To modify the LGMP server display per VLAN:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **LGMP Server**. The LGMP Server Configuration dialog box opens.

Note: You must enable intelligent multicasting on a global basis to make your LGMP server per VLAN configuration active.

2. In the **LGMP Servers** column, click the **number**. The LGMP Server Display per VLAN opens.

3. Use Table 15-10 to configure the LGMP server display per VLAN.

Table 15-10. LGMP Server Display per VLAN Parameters

Parameter	Definition
Select	Select the LGMP server to modify.
VLAN	Displays the VLAN associated with the LGMP server.
State	Displays the current state of the LGMP server. • **Distributor** - The LGMP server serves LGMP messages to LGMP clients. • **Non-Distributor** - The LGMP server monitors the current distributor.
LGMP Message Reception Statistics	• **Router Report** - Displays the number of LGMP router report messages received per VLAN. • **Invalid** - Displays the number of LGMP messages received with an invalid payload per VLAN.
LGMP Messages Transmission Statistics	• **Report** - Displays the number of LGMP report messages transmitted per VLAN. • **Leave** - Displays the number of LGMP leave messages transmitted per VLAN. • **End Session** - Displays the number of LGMP end session messages transmitted per VLAN. • **Router Report** - Displays the number of LGMP router report messages transmitted per VLAN. • **Router Leave** - Displays the number of LGMP router leave messages transmitted per VLAN.
Intelligent Multicast Session Statistics	• **Client Ports Added**- Displays the number of add client events generated by LGMP per VLAN. • **Client Ports Removed**- Displays the number of remove client events generated by LGMP per VLAN. • **Sessions Removed**- Displays the number of remove session events generated by LGMP per VLAN. • **Router Ports Added**- Displays the number of add router events generated by LGMP per VLAN. • **Router Ports Removed**- Displays the number of remove router events generated by LGMP per VLAN.

Configuring/Viewing an LGMP Client

To configure an LGMP client and view its statistics:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **LGMP Client**. The LGMP Client Configuration dialog box opens.

Note: You must enable intelligent multicasting on a global basis to make your LGMP client configuration active.

2. Use Table 15-11 for more information on the LGMP client parameters

Table 15-11. LGMP Client Configuration Parameters

Parameter	Definition
Enable State	Select to enable or disable LGMP client. The default value is Disabled.
LGMP Clients	Displays the number of LGMP clients per VLAN and opens the LGMP Client Displays per VLAN dialog box.
LGMP Message Reception Statistics	• **Report** - Displays the number of LGMP report messages received. • **Leave** - Displays the number of LGMP leave messages received. • **End Session** - Displays the number of LGMP end session messages received. • **Router Report** - Displays the number of LGMP router report messages received. • **Router Leave** - Displays the number of LGMP router leaves messages received. • **Invalid** - Displays the number of LGMP messages received with an invalid payload.
Intelligent Multicast Session Statistics	• **New Client Ports Added** - Displays the number of new clients added by LGMP. • **Existing Client Ports Removed** - Displays the number of clients removed by LGMP. • **Existing Sessions Removed** - Displays the number of sessions removed by LGMP. • **New Router Ports Added** - Displays the number of new routers added by LGMP. • **Existing Router Ports Removed** - Displays the number of new routers removed by LGMP.

3. Click...

- **APPLY** to save your changes.
- **CANCEL** to restore previous settings.
- **CLEAR** to clear the statistics.
- **REFRESH** to refresh the contents of the table.

Modifying LGMP Clients Per VLAN

To modify LGMP clients per VLAN:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **LGMP Client**. The LGMP Client Configuration dialog box opens.

Note: You must enable intelligent multicasting on a global basis to make your LGMP client per VLAN configuration active.

2. **In the LGMP Clients** column, click the **number**. The LGMP Client Display per VLAN dialog box opens.
3. Use Table 15-12 for more information on clients per VLAN parameters.

Table 15-12. LGMP Client Display per VLAN Parameters

Parameter	Definition
Select	Select the LGMP client to modify.
VLAN	Displays the VLAN associated with the LGMP client.
LGMP Message Reception Statistics	• **Report** - Displays the number of LGMP report messages received per VLAN. • **Leave** - Displays the number of LGMP leave messages received per VLAN. • **End Session** - Displays the number of LGMP end session messages received per VLAN. • **Router Report** - Displays the number of LGMP router report messages received per VLAN. • **Router Leave** - Displays the number of LGMP router leaves messages received per VLAN. • **Invalid** - Displays the number of LGMP messages received with an invalid payload per VLAN.
Intelligent Multicast Session Statistics	• **New Client Ports Added** - Displays the number of new clients added by LGMP per VLAN. • **Existing Client Ports Removed** - Displays the number of clients removed by LGMP per VLAN. • **Existing Sessions Removed** - Displays the number of sessions removed by LGMP per VLAN. • **New Router Ports Added** - Displays the number of new routers added by LGMP per VLAN. • **Existing Router Ports Removed** - Displays the number of new routers removed by LGMP per VLAN.

4. Click...
   - **CLEAR** to reset selected row information.
   - **CLEAR ALL** to reset all statistics.
   - **REFRESH** to view the latest information.

Configuring/Viewing CGMP Snooping

To configure CGMP snooping and view its statistics:

1. In the **Intelligent Multicasting** section of the Web Agent window, click **CGMP Snooping**. The CGMP Snooping dialog box opens.

Note: You must enable intelligent multicasting on a global basis to make CGMP snooping configuration active.

2. Use Table 15-13 for more information on CGMP snooping parameters.

Table 15-13. *CGMP Snooping Parameters*

Parameter	Definition
Enable State	Select to enable or disable CGMP snooping.
CGMP Packet Reception Statistics	• **Join Messages Received** - Displays the number of CGMP join messages received. • **Leave Messages Received** - Displays the number of CGMP leave messages received. • **Unknown Messages Received** - Displays the number of unknown CGMP messages received.
Intelligent Multicast Session Statistics	• **New Sessions Created** - Displays the number of new multicast sessions created by CGMP snooping. • **New Client Ports Added** - Displays the number of new client ports added to a multicast session by CGMP snooping. • **Existing Sessions Removed** - Displays the number of existing multicast sessions that have been removed by CGMP snooping. • **All Sessions Removed** - Displays the number of times that all multicast sessions created by CGMP snooping were removed. • **New Router Ports Added** - Displays the number of new router ports added by CGMP snooping. • **Existing Router Ports Removed** - Displays the number of router ports that were created by the CGMP snooper and were then removed by CGMP snooping.

3. Click **APPLY** to save your changes or **CANCEL** to restore previous settings.

   Or

   Click **CLEAR** to clear the statistics or **REFRESH** to refresh the contents of the table.

16

Monitoring the Cajun Switch (Layer 2 & Layer 3)

Overview

This chapter and its procedures are common to both Layer 2 and Layer 3 configuration. Included in this chapter:

- Interpreting Front Panel LED Displays
- Checking Active Alarms
- Using the Event Subsystem
- Setting Log Size

Interpreting Front Panel LED Displays

Use Table 16-1 to interpret the state of the front-panel LEDs:

Table 16-1. *Front Panel LED Display Interpretation*

Module...	LED...	Behavior...	Indicates...
All Modules	Module Status	Solid green	Normal operation.
		Flashing yellow	Diagnostic failure.
		Off	Module not operational or not receiving power.
Gigabit Modules	TX and RX	Flashing yellow	Port sending/receiving traffic.
		Off	Port not sending/receiving traffic.
	Port	Solid green	Port enabled with link up.
		Flashing green	Port disabled with link up.
		Flashing yellow	Hardware failure.
		Off	No link.

Table 16-1. *Front Panel LED Display Interpretation (Continued)*

Module...	LED...	Behavior...	Indicates...
	HD/FD	Solid green	Full-duplex operation negotiated.
		Flashing yellow	Hardware failure.
		Off	No link.
10/100 Modules	Port	Solid green, with yellow flash	Port enabled and sending and receiving traffic Traffic indicated by yellow flashes.
		Flashing green	Port disabled with link up.
		Flashing yellow	Hardware failure.
		Off	No link.

Checking Temperature Status and Configuring Thresholds

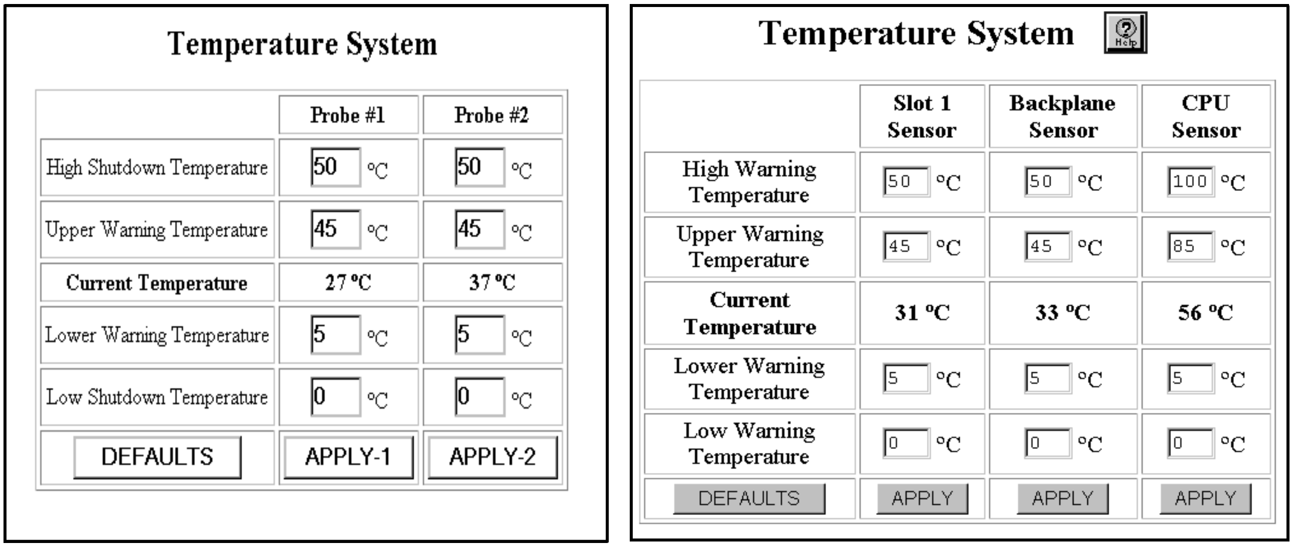
To view the temperature system:

1. In the **System Information** section of the Web Agent window, click **Temperature**. The Temperature System dialog box opens.

Figure 16-1. *Example Temperature System Dialog Boxes*

Layer 2 Supervisor P550

Layer 3 Supervisor P550R



Temperature System

	Probe #1	Probe #2
High Shutdown Temperature	50 °C	50 °C
Upper Warning Temperature	45 °C	45 °C
Current Temperature	**27 °C**	**37 °C**
Lower Warning Temperature	5 °C	5 °C
Low Shutdown Temperature	0 °C	0 °C
DEFAULTS	APPLY-1	APPLY-2

Temperature System

	Slot 1 Sensor	Backplane Sensor	CPU Sensor
High Warning Temperature	50 °C	50 °C	100 °C
Upper Warning Temperature	45 °C	45 °C	85 °C
Current Temperature	**31 °C**	**33 °C**	**56 °C**
Lower Warning Temperature	5 °C	5 °C	5 °C
Low Warning Temperature	0 °C	0 °C	0 °C
DEFAULTS	APPLY	APPLY	APPLY

2. Use Table 16-2 to set the threshold values:

Table 16-2. Temperature Thresholds

Threshold	Defines...
High Shutdown Temperature (Layer 2)/High Warning Temperature (Layer 3)	Value in degrees Celsius that when passed causes the switch to send a trap to the network management station and triggers a shutdown. By default, this value is 50 degrees Celsius. For the Layer 3 CPU sensor, the default value is 100 degrees Celsius.
Upper Warning Temperature	Value in degrees Celsius that when passed causes the switch to send a warning that the temperature is approaching the high temperature threshold. By default, this value is 45 degrees Celsius. For the Layer 3 CPU sensor, the default value is 85 degrees Celsius.
Lower Warning Temperature	Value that in degrees Celsius that when passed causes the switch to send a warning that the temperature is approaching the low temperature threshold. By default, this value is 5 degrees Celsius.
Low Shutdown Temperature (Layer 2)/Low Warning Temperature (Layer 3)	How low the temperature must drop on the switch to reset the warning and high thresholds. This value prevents the switch from sending traps continually if the temperature is hovering around the threshold value. By default, this value is 0 degrees Celsius.

Checking Active Alarms

Each switch stores a table of active alarms. This allows you to view a list of open issues in the switch without having to view the entire event log. By doing this, you can quickly obtain a snapshot of the switch’s health.

Viewing the Active Alarm Table

To view the Active Alarm Table in the **Event Subsystem** section of the Web Agent window, click **Active Alarms**. The Active Alarm Table opens.

Using the Event Subsystem

There are two switch system activity logs for Layer 3:

❒ **Event Log -** stores a large table of events. The size of the table is user-settable. Because these events are stored in switch memory, the list is cleared each time the switch reboots.

❒ **Shutdown Log** - stores the same information as the Event Log, but generally in a smaller table because the table is stored in the switch's nonvolatile RAM (NVRAM). This log list is particularly useful in assessing the cause of a switch failure, because the information is retained even after the switch restarts.

Configuring the Protocol Event Log

You can use the protocol event log to enable RIP and OSPF packet tracing for Layer 3 only. RIP requests and responses received and sent through all RIP interfaces are logged to the event log as protocol events. OSPF packet types received and sent through all OSPF interfaces are logged to the event log as protocol events. AppleTalk packet types received and sent through all AppleTalk interfaces are logged to the event log as protocol events. LDAP packet types received and sent through all LDAP interfaces are logged to the event log as protocol events.

Note: Enabling the protocol event log may cause the event log to be rapidly filled with protocol events.

To configure the protocol event log:

1. In the **Event Subsystem** section of the Web Agent window, click **Event Configuration**. The Event Management dialog box opens.
2. In the **ID** column, click one of the following:
   - **RIP**
   - **OSPF**
   - **LDAP**
   - **AppleTalk**
3. Use Table 16-8 to configure Event Table actions. (Log and Console are the only available settings).
4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.
5. In the **Event Subsystem** of the Web Agent, click P**rotocol Event Configuration**. The Protocol Event Management window opens.

6. Use Table 16-3 to configure your protocol event log settings:

Table 16-3. Protocol Event Log Settings

Parameter	Enables or disables the logging of...
Fault	Serious errors that can cause a system crash, for example, panic.
Error	Serious errors that will not cause a system crash but can contribute protocol problems.
Warning	Non-critical errors.
Info	Event details.
Trace	RIP and OSPF packet tracing.
Debug	Event messages used to troubleshoot a network problem.

7. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Viewing the Event and Shutdown Logs

To view the Event and Shutdown logs:

1. In the **Event Subsystem** section of the Web Agent window, click either **Event Log** or **Shutdown Log**. An Event or Shutdown Log Search dialog box opens.
2. In the **Search By:** column, click the **Severity Level** checkbox.
3. From the **Severity Level** pull-down menu, select the severity level to filter on a particular severity level for events.
4. From the **Event Type** pull-down menu, select an **event** to filter on a particular Event Type. The selected event log entries open in the Event Log dialog box.
5. Use Table 16-4 for a description of the entries in the event and shutdown logs:

Table 16-4. Event and Shutdown Log Entries

Entry	Definition
Log ID	Displays the number of this event in the log FIFO (First In First Out).
Event ID	Displays an index that identifies the event class.
Time Stamp	Displays the date and time the event was recorded in the log.

Table 16-4. Event and Shutdown Log Entries (Continued)

Entry	Definition
Severity	Displays the severity of the event. The possibilities are: • **Informative** • **Warning** • **Error** • **Severe Error** • **Failure**
Type	Displays a description of the event type (System start, Status Change, for example).
Description	Displays a text string that describes the specific event.

6. Click...

   - **SEARCH** to view the event or shutdown logs. The Event or Shutdown Log dialog box opens.
   - **CANCEL** to restore previous settings.
   - **CLEAR EVENT LOG** to clear the event log settings.

Note: If you have write-access, you can clear the event log by clicking Clear Event Log. If you have read-access only, this option is not available.

Viewing Event Statistics

To view event statistics:

1. In the **Event Subsystem** section of the Web Agent, click **Event Statistics**. The Event Statistics dialog box opens.

2. Use Table 16-5 for more information on the event statistics.

Table 16-5. Event Statistics Parameters

Parameter	Definition
Event Log wraps	Displays the number of times the Event Log has wrapped. This results in the oldest events being overwritten. Depending on how many events have been sent to the Event Log and when it was last cleared, the Event Log may or may not wrap. When the event log wraps the old events are discarded and replaced with the newest events.
Events dropped due to overload of event system	Displays the number of events the Event System has had to drop to prevent overloading. The Event System paces events being sent to it to prevent the switch from only processing events. You can reduce the number of events being generated by deselecting unwanted events from the **Event Subsystem>Event Configuration** dialog box. If your switch is a Layer 3 switch, you may also want to disable select protocol event log settings in the **Event Subsystem>Protocol Event Configuration** dialog box.
Events dropped due to event system queue full	Displays the number of events the Event System has had to drop due to a full Event System queue. You can reduce the number of events being generated by deselecting unwanted events from the **Event Subsystem>Event Configuration** dialog box. If your switch is a Layer 3 switch, you may also want to disable select protocol event log settings in the **Event Subsystem>Protocol Event Configuration** dialog box.

Setting Log Size

To set log size:

1. In the **Event Subsystem** section of the Web Agent window, click **Event Configuration**. The Event Management dialog box opens.
2. From the **Event Log** pull-down menu, select the **number of entries** you want to store in each of the switch event logs.

3. Use Table 16-6 to configure your switch event and shutdown log:

Table 16-6. Event and Shutdown Logs

Log	Purpose
Event Log	A detailed, ongoing record of events that occur in the switch. This log is stored in memory and is erased if the system shuts down or reboots.
Shutdown Log	Contains a list of events that occurred before the last switch shutdown. Because it is stored in nonvolatile memory, this log is preserved during a switch reboot or shutdown. This list is designed to help you analyze the events that occurred immediately prior to a switch shutdown or reset.

4. Use Table 16-7 for a definition of the event classes:

Table 16-7. Event Table

Class	Determines whether or not the switch sends a notification...
Start	Upon system start.
System	For system events.
Configuration	For each configuration change (for example, enabling and disabling ports).
Temperature Status	Of temperature status changes. Temperature status message could precede a switch shutdown, and are often critical.
Resource	Upon a change in system resources.
Fan Status	Of fan status. Fan failures will eventually lead to overheating the system. Fan Status message provide a good early warning for a failure that could eventually cause the switch to shut down.
Service Port Status/User Port Status	Of Port status changes for service and user ports. Set a port as either service port/user port from the port configuration page. The purpose of this feature is to allow you to use different notification level for critical (service ports), if desired.
Authentication Failure	When the switch detects an authentication failure. This is a security-related feature used to detect unauthorized SNMP activity.
Bridge Status	Of changes in bridge status.
Switch Fabric	Of failures in the switch fabric. These are critical failures and should be monitored closely.

Table 16-7. Event Table (Continued)

Class	Determines whether or not the switch sends a notification...
OSPF	For OSPF events if OSPF protocol event logging is enabled.
RIP	For RIP events if RIP protocol event logging is enabled.
LDAP	For LDAP events if LDAP protocol event logging is enabled.
AppleTalk	For AppleTalk events if AppleTalk protocol event logging is enabled.

5. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

Configuring Event Notification

To configure event notification:

1. In the **Event Subsystem** section of the Web Agent window, click **Event Configuration**. The Event Management dialog box opens.
2. In the **ID** column, click **event type**. The delivery of event information is enabled when this type of event occurs.
3. Use Table 16-8 to configure Event Table actions. If no events are selected, no action will be taken when an event of this event class occurs.

Table 16-8. Event Table Actions

Setting...	Determines...
Log	Event entry entered in event and shutdown logs.
Trap	SNMP trap message (event notification) sent to designated trap receivers.
Console	Displays the event information to the console serial port connected at the switch front panel.

4. Click **APPLY** to save your changes, or **CANCEL** to restore previous settings.

17

Analyzing Network Performance Using RMON and Ethernet Statistics (Layer 2 & Layer 3)

Overview

This chapter and its procedures are common to both Layer 2 and Layer 3 configuration. Included in this chapter:

- ❐ Viewing Statistics
- ❐ Setting Up a Mirror Port

Viewing Statistics

The switch interface provides a variety of statistics that allow you to monitor network performance and troubleshoot network problems.

To access network statistics:

1. In the **Statistics** section of the Web Agent window, click **Modules & Ports**. The Module Statistics dialog box opens.
2. Click **Clear Counters** to get a fresh view of the statistics being gathered. This resets all of the counters to zero, so that you can track the counters from a specific point forward.
3. In the **Module** column, click the **module identifier** to view statistics for a specific port on this module. The Port Statistics dialog box opens.
4. Click **Clear Counters** to get a fresh view of the statistics being gathered. This resets all of the counters to zero so that you can track the counters from a particular point forward.
5. In the **Name** column, click the **port identifier** to view statistics for this specific port. The Ethernet Interface Statistics dialog box opens.
6. Click either **30 second** or **30 minute** RMON History Samples. The Ethernet Interface history statistics window opens.

7. Use *Table 17-1* to interpret the Ethernet Interface statistical values:

Table 17-1. *Interpreting Ethernet Interface Statistics*

Statistic	Indicates	Actions
Sample	The sample number.	N/A
Interval Start	The date and time this log entry was made.	N/A
Utilization	Percentage of utilization.	The percentage of available bandwidth used by traffic.
Bytes	Raw number of octets received at the interface. Provides some indication of the amount of network bandwidth being used.	A sharp increase could indicate a need to reconfigure the network.
Packets	Counts the raw number of readable Ethernet packets of legal length received at the interface.	A sharp increase could indicate a need to reconfigure the network. (However, octets are a better indication of bandwidth utilization.)
Broadcasts	Broadcast packets are a normal part of network operation. For example, IP networks use broadcasts as part of Address Resolution Protocol (ARP) to resolve network addresses.	Uses monitoring to recognize oncoming broadcast storms. Broadcast storms occur when stations are creating traffic that generates more traffic. **Possible cause:** Broadcasts cause every host on a network segment to process the packet. **Possible actions:** • To prevent broadcast storms, use VLANs to limit the area of the network that each broadcast packet affects. In general, each VLAN creates a separate broadcast domain. More VLANs mean less proliferation of broadcast packets. • Monitor the broadcast rate of your network during normal operation. • Establish a baseline. • Use Rate Limiting to reduce broadcasts.

***Table 17-1.** Interpreting Ethernet Interface Statistics (Continued)*

Statistic	Indicates	Actions
Multicasts	Normal during network operation. For example, multicast packets are to send target video streams to selected stations on the network, and are part of the operation of the Spanning Tree Protocol.	**Possible causes:** • Too many multicast frames can consume valuable network bandwidth. **Possible actions:** • Using Intelligent Multicasting can significantly reduce multicast traffic on individual ports. • Segmenting the network into smaller VLANs and routing between them can also help control proliferation of multicasts.
CRC (Cyclic Redundancy Check) or Alignment Errors	Counts of the number of times that the number of bits in a frame cannot be divided by 8 (that is, cannot be broken into legal octets), and that contain a Frame Check Sequence validation error. Typically caused by turning equipment on or off, and by noise on twisted pair segments. These errors can also result from configuring a network that does not comply with 802.3 standards. In a standards-compliant Ethernet network, CRC or alignment errors represent transit and receive bit errors. The Ethernet standard allows 1 in 10^8 bit error rate, but you should expect performance to be less than 1 in 10^{12} packets. Rates in excess of one error per one thousand packets indicate a serious problem.	**Possible causes:** • Defect at the transmitting station. • Turning equipment on or off. This should cause only a few errors. • Damaged cables. • Interference on network cabling. **Possible actions (respectively):** • Use port error statistics to isolate the problem. Check the transceiver or adapter card connected to the port where the problem seems to originate. Also check the cable and cable connections for damage. • Normal operation, no action required. • Check cables for damage. • Inspect cable runs to see if they are too close to noisy devices, and check for problems with network devices.

Table 17-1. *Interpreting Ethernet Interface Statistics (Continued)*

Statistic	Indicates	Actions
Undersized Packets	Count of packets with a valid CRC that violate the minimum Ethernet packet size. These malformed packets are most often the result of software errors.	**Possible cause:** Device or application creating non-compliant packets. **Possible action:** Use a network analyzer to identify the transceiver which at the source of the problem. If necessary, replace transceiver, network adapter, or station.
Oversized Packets	Count of packets with a valid CRC that violate the maximum Ethernet packet size. These malformed packets are most often the result of software errors.	**Possible cause:** Device or application creating non-compliant packets. **Possible action:** Use a network analyzer to identify the transceiver which at the source of the problem. If necessary, replace transceiver, network adapter, or station.
Fragments	Fragments or runts result from normal collision activity in Ethernet networks. A runt packet is an incomplete packet that is long enough to be detected by an Ethernet interface.	**Possible causes:** • Interference on network cabling. • A Transceiver attached to the Repeater is generating Signal Quality Errors (SQE). **Possible actions (respectively):** • Inspect cable runs to see if they are too close to noisy devices, and check for problems with network devices. • Disable SQE on the Transceiver.

Table 17-1. *Interpreting Ethernet Interface Statistics (Continued)*

Statistic	Indicates	Actions
Jabbers	Jabbers indicate that devices on the networks are sending improper electrical signals. Because Ethernet uses electrical signalling to determine whether or not it is okay to transmit, a jabber condition can halt all traffic on a segment.	**Possible causes:** • Bad network interface card • Repeater network with looped traffic **Possible actions (respectively):** • Replace network interface card. • Rewire network to remove the loop.
Collisions (half-duplex links only)	Counts number of times that packets have collided on the network. Collisions increase as network use of shared segments increases. Therefore, if the collision rate increases without an increase of network use, it might indicate a problem. Guidelines for appropriate collision rates are: • 10 percent: Normal collision rate for shared Ethernet segment. • 30 percent: Collisions begin to interfere with performance. • 70 percent: Practical limit for network to remain functioning. A full-duplex link should not show collision activity. In a switched network, collisions should be rare, unless your switched segments attach to multiple ends stations (a perfectly legal configuration option).	**Possible causes:** • Busy network • Broken adapter (not listening before broadcasting) • Network loop **Possible actions (respectively):** • If you have multiple stations on a switch segment, reconfigure network into segments with fewer stations. • Isolate each adapter to see if the problem ceases. • Activate spanning tree to resolve loops automatically. • Ensure that there are no connections to the same station where both connections are simultaneously active.

Setting Up a Mirror Port

Configuring an RMON mirror port allows you to mirror traffic from a port or set of ports to a specific mirror port, where you can attach a sniffer or RMON probe. The switch supports a single mirror port and a single source port for each switch fabric port. For example, 20-port Fast Ethernet cards have two fabric ports (one for ports 1 through 10, one for ports 11 through 20). You can set up a single source port and a single mirror port for each set of ports associated with a fabric port. You can also choose to mirror all traffic from a particular fabric port to the mirror port, or set up multiple source ports to mirror traffic to a single mirror port.

Packets addressed to the CPU, such as pings, are duplicated out of the mirror port. Tagged packets that are sent into a source port with a VLAN ID to which the source port is not bound, are not transmitted out the mirror port. VLAN tag information is not propagated to the mirror port.

Note: To prevent unnecessary traffic flooding on a mirror port, put the mirror port on the same VLAN as the source port.

To set up an RMON mirror port:

1. In the **Port Mirroring** section of the Web Agent window, click **Sampling**. The Port Mirroring Information dialog box opens.
2. Use Table 17-2 to view your port mirroring information.

Table 17-2. Port Mirroring Information Parameters

Parameter	Definition
Configure Source	Select the configuration source port. Provides a link to the Port Mirroring Configuration dialog box.
Source Port	Displays the port under investigation.
Mirror Port	Displays the port that transmits mirrored data.
Mirror Port Name	Displays the name of the mirror port device.
Piggyback Port	Displays the name of the port that is used for bi-directional port mirroring. When used as a mirror port, it is unavailable for other uses.
Sampler Type	Displays the speed of sampling that is performed for source port traffic.
Max Packets per Second	Displays the maximum number of packets per second that are served by the mirror port.

3. In the **Configure Source** column, click a **source port** for the traffic. The Port Mirroring Configuration dialog box opens.

4. Use Table 17-3 to select options for the mirror port:

Table 17-3. Port Mirroring Configuration Parameters

Parameter	Definition
Source Port(s)	List of available selections. Enables you to select a particular source port associated with the selected fabric port. You can also select all ports. **Note:** To mirror inbound traffic only, select a source port and a mirror port, not a piggyback port.
Mirror Port	Port from which you want to send the traffic. This port can be on another module in the switch. Once a specific port associated with a fabric port has been designated a mirror port, other ports associated with that fabric port no longer appear on the selection list.

Table 17-3. Port Mirroring Configuration Parameters (Continued)

Parameter	Definition
Piggyback Port	Port used to enable bi-directional port mirroring. If no piggyback port is specified, only received traffic from the source port will go to the mirror port. The piggyback port should have the same bandwidth as the source port. Only one port per fabric can be used as a piggyback port. Sampling rates have no effect on transmitted information. **Considerations:** • You cannot use a port that has been designated as a piggyback port. • Once a port has been designated as a piggyback port, the link light is turned on, even if there is no connection on the selected port. • The piggyback port is displayed in place of the source port in the VLAN menu. • If the source and piggyback ports are at a higher bandwidth than the mirror port's bandwidth, the traffic on the source port may exceed the bandwidth that the mirror port can handle. • The piggyback port will always show that it is using multi-layer tagging. • A spanning tree topology change occurs when you change a piggyback port. • Piggyback ports display in certain views of the Cajun P550 Switch user interface where you typically expect to find information about a source port. For example, the VLAN Switch Ports list, which displays the list of ports associated with a VLAN, includes the piggyback port but not the source port. In the Intelligent Multicast Session Search and Static Multicast Sessions views, the piggyback port displays in place of the source port when piggyback port mirroring is enabled. **Note:** To mirror outbound traffic only, select a source, mirror, and piggyback port. Set the sampling to disable. Since disabling sampling only applies to inbound traffic, only outbound traffic is received.
Sampler Type	Selects how often you want the mirror port to receive traffic samples: • **Always** - sends all samples. • **Periodic** - sends samples at the interval described below. • **Disabled** - shuts off traffic samples to the mirror port, but keeps the association intact.
Sampling Interval	Displays the number of packets per second that are served by the mirror port.

Note: Sampling only applies to inbound traffic.

18

Downloading New Operational Code to the Switch (Layer 2 & Layer 3)

Overview

This chapter and its procedures are common to both Layer 2 and Layer 3 configuration. Included in this chapter:

- ❒ Upgrading from a Previous Version
- ❒ Downloading the Image
- ❒ Selecting the Image for Reboot
- ❒ Resetting the Switch

Upgrading from a Previous Version

Version 4.0 of the Cajun P550 switch handles configuration files differently from version 3.0 and 3.1. In version 4.0, all configuration information is contained in a `startup.txt` file that is stored in NVRAM on the switch. Previous versions used `*.cfg` files that contained information about multiple types of configuration data.

In many cases, when you upgrade the embedded software of the switch from version 3.0 or 3.1 to version 4.0, the earlier version of the software is located in the APP1 memory location on the switch, and you install the version 4.0 software image into APP2. If you want to retain version 3.0 or 3.1 on the switch for a potential downgrade: before you decide where to install the version 4.0 software image, find out which APP you booted from, then load the new image into the other APP. For example, if you boot version 3.0 or 3.1 from APP1, download version 4.0 into APP2.

Saving the Previous Configuration

Before you upgrade your system, save your previous configuration to a file or directory on a TFTP server.

To save your current configuration through the Web Agent:

1. In the **Memory Subsystems** section of the Web Agent window, click **TFTP Update**. The TFTP Update dialog box opens.
2. In the **TFTP Server IP Address** field, enter the **IP address** of the TFTP server to which you will save the previous configuration.
3. In the **File Name** field, enter a file name for the configuration file.
4. From the **TFTP Target Section** pull-down menu, select **Save Configuration**.
5. Click **Update** in **Perform Update Now**.
6. Click **Status** in **Get Status of Most Recent Update** to ensure that the configuration file was saved properly.

To save your current configuration through the command line on version 3.0 or 3.1:

Enter the following command to save your configuration to a file on a TFTP server:

```
download save_cfg <IP address> <file name>
```

where `<IP address>` is the IP address of the TFTP server where you will save the software and `<file name>` is the name you provide for the configuration file.

Downloading the Image

To download the version 4.0 software image from a TFTP server to an APP location through the Web Agent:

1. In the **Memory Subsystems** section of the Web Agent window, click **TFTP Update**.
2. In the **TFTP Server Address** field, enter the IP address of the TFTP server that has the 4.0 version of the switch software.
3. In the **File Name** field, enter the name of the file to download:
   - Enter **m2200-v4.0.0.bin** to download version 4.0 for the Cajun P220 switch (Layer 2)
   - Enter **m5500-v4.0.0.bin** to download version 4.0 for the Cajun P550 switch (Layer 2)
   - Enter **m5500r-v4.0.0.bin** to download version 4.0 for the Cajun P550R switch (Layer 3)

4. From the **TFTP Target Section** pull-down menu, select the download location.

   For example, select APP2 to download the new version to APP2 on the switch. If version 3.0 or 3.1 is installed in APP1, download version 4.0 to APP2.

5. Click **Update** in **Perform Update Now**.

6. Optional: Click **Status** in **Get Status of Most Recent Update** to ensure that the new image downloaded properly.

To download the version 4.0 software image to an APP location on the switch through the command line on version 3.0 or 3.1:

1. Recommended: Find the location where you want to save the image by entering the following command at the system prompt:

   ```
   fep get
   ```

   This command reads and displays information about the content stored in locations, such as APP1 and APP2, on the switch. If version 3.0 or 3.1 is installed in APP1, install version 4.0 in APP2.

2. Download the embedded software to the specified APP location by entering the following command at the system prompt:

   ```
   download <APPname> <IP address> <file name>
   ```

   where

❒ `<APPname>` is the location in flash memory on the switch where you will download the new image.

❒ `<IP address>` is the IP address of the server from which you download the new image

❒ `<file name>` is the name of the file that contains the new image. Enter one of the following file names:

- **m2200-v4.0.0.bin** to download version 4.0 for the Cajun P220 switch (Layer 2)
- **m5500-v4.0.0.bin** to download version 4.0 for the Cajun P550 switch (Layer 2)
- **m5500r-v4.0.0.bin** to download version 4.0 for the Cajun P550R switch (Layer 3)

Selecting the Image for Reboot

To view and power up the downloaded image from the Web Agent:

1. In the **Memory Subsystems** section, click **FEPROM Contents**. The FEPROM dialog box opens.
2. In the **Power Up/Reset Image** pull-down menu, select the APP location into which you downloaded version 4.0 and click **APPLY**.

To set the location from which you download the software through the command line, enter the following command at the system prompt on version 3.0 or 3.1:

```
fep set <APPname>
```

where `<APPname>` is the APP location in flash memory on the switch that contains the new image.

Resetting the Switch

To reset the switch through the Web Agent after downloading version 4.0:

1. In the **System Information** section of the Web Agent, click **System Reset**.
2. In response to the question, **Do you want to reset the switch?** click **Yes**.

   The switch resets with the selected version.

To reset the switch through the command line interface after downloading version 4.0:

1. At the **system** prompt, enter the following command:

   ```
   reset
   ```
2. In response to the question, **Are you sure you want to continue?** enter **Y**.

   The switch resets with the selected version.

A

FCC Notice

FCC Notice — Class A Computing Device:

This equipment generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC rules, which are designed to provide reasonable protection against such radio frequency interference. Operation of this equipment in a residential area may cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference. Any modifications to this device - unless expressly approved by the manufacturer - can void the user's authority to operate this equipment under part 15 of the FCC rules.

VCCI Notice — Class A Computing Device:

This equipment is in the Class A category (information equipment to be used in commercial and/or industrial areas) and conforms to the standards set by the Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines aimed at preventing radio interference in commercial and/or industrial areas. Consequently, when used in a residential area or in an adjacent area thereto, radio interference may be caused to radios and TV receivers. Read the instructions for correct handling.

CE Notice — Class A Computing Device:

Warning!

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Achtung!

Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Avertissement!

Cet appareil est un appareil de Classe A. Dans un environnement résidentiel cet appareil peut provoquer des brouillages radioélectriques. Dans ce cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.

B

Supported MIB Groups

MIBs Supported by Layer 2 and Layer 3 Switches

The following section lists, by protocol, public and private Management Information Bases (MIBs) supported by the Cajun P220, Cajun P550, and Cajun P550R switches. Note that all MIBs supported by Layer 2 switches also are supported by the Layer 3 switch. For information about additional MIBs supported by the Cajun P550R, refer to MIBs Supported by the Layer 3 Switch on page B-2.

IPX Interface MIBs

The following public and private MIBs define the attributes of IPX interfaces.

The Novel MIB is not currently supported

Private IPX Interface MIBs

The following private IPX interface MIBs are supported:

- cjnipxifmgmt.mib
- cjnipx.mib
- cjnipxrip.mib
- cjnipxsap.mib

Prominet MIB

The following components of the private Prominet MIB are supported:

- ProminetMIB.txt
- cjnSwitchRoot.mib
- cjnRoot.mib

IEEE 802.3 MAU Management

RFC 1155.smi is supported.

IEEE 802.3 Statistics Group

RFC 1398.mib is supported.

Bridge MIB

RFC 1493.mib is supported.

SNMPv2

RFC 1907.mib is supported.

RMON

RFC 1757.mib is supported.

MIBs Supported by the Layer 3 Switch

The following section lists, by protocol, public and private Management Information Bases (MIBs) supported by the Cajun P550R switch, the Layer 3 switch. For information about additional MIBs supported by the Cajun P550R switch, refer to MIBs Supported by Layer 2 and Layer 3 Switches on page B-1.

RIP Version 1.0 and 2.0

Standard MIB

RFC 1724 is supported.

Private MIB

The private MIB, cjniprip.mib is supported.

OSPF Version 2.0

Standard MIB

RFC 1850 is supported.

Private MIB

The private MIB cjnospf.mib is supported.

VRRP

Standard MIB

The current draft of the Virtual Redundancy Router Protocol (VRRP) MIB is supported: draft-ietf-vrrp-mib-04.mib.

Private MIB

The private cjniplrrp.mib is supported.

IGMP

Standard MIB

The current draft of the Internet Group Membership Protocol (IGMP) MIB is supported: draft-ietf-idmr-igmp-mib-07.mib.

Private MIB

The private cjnigmp.mib is supported.

IP Interface

The private cjhnipifmgmt.mib is supported.

IP Version 4.0 and Services

Standard MIB

The following standard MIBs for Internet Protocol version 4.0 and services are supported:

- RFC 1213.mib
- RFC 2011.mib
- RFC 2012.mib
- RFC 2013.mib

Private MIB

The following private MIBs are supported for Internet Protocol version 4.0 and services:

- cjnipv4.mib
- cjnipv4serv.mib

IP Forwarding/Route Table

Standard MIB

RFC 2096.mib is supported.

Private MIB

The private cjnipfwd.mib is supported.

DVMRP

Standard MIB

The current draft of the DVMRP MIB is supported: draft-thaler-dvmrp-mib-9.mib.

Private MIB

The private cjndvmrp.mib is supported.

AppleTalk

Standard MIB

RFC 1243.mib is supported.

Private MIB

The private cjnatalk.mib is supported.

IP Access List

The private MIB that defines IP access list format, cjnipalist.mib, is supported.

Policy Capability MIB for LDAP

The private MIB that defines policy capabilities for the Lightweight Directory Access Protocol (LDAP), cjnpolicycap.mib, is supported.

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