JUNOS® Software

Network Management Configuration Guide

Release 9.4

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JUNOS® Software Network Management Configuration Guide
Release 9.4

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About This Guide

This preface provides the following guidelines for using the *JUNOS® Software Network Management Configuration Guide*:

Objectives

This guide provides an overview of the network management features of the JUNOS software and describes how to manage networks with the JUNOS software.

NOTE: This guide documents Release 9.4 of the JUNOS software. For additional information about the JUNOS software—either corrections to or information that might have been omitted from this guide—see the software release notes at http://www.juniper.net/.

Audience

This guide is designed for network administrators who are configuring and monitoring a Juniper Networks M-series, MX-series, T-series, EX-series, or J-series router or switch.

To use this guide, you need a broad understanding of networks in general, the Internet in particular, networking principles, and network configuration. You must also be familiar with one or more of the following Internet routing protocols:

- Border Gateway Protocol (BGP)
- Distance Vector Multicast Routing Protocol (DVMRP)
- Intermediate System-to-Intermediate System (IS-IS)

- Internet Control Message Protocol (ICMP) router discovery
- Internet Group Management Protocol (IGMP)
- Multiprotocol Label Switching (MPLS)
- Open Shortest Path First (OSPF)
- Protocol-Independent Multicast (PIM)
- Resource Reservation Protocol (RSVP)
- Routing Information Protocol (RIP)
- Simple Network Management Protocol (SNMP)

Personnel operating the equipment must be trained and competent; must not conduct themselves in a careless, willfully negligent, or hostile manner; and must abide by the instructions provided by the documentation.

Supported Routing Platforms

For the features described in this manual, the JUNOS software currently supports the following routing platforms:

- J-series
- M-series
- MX-series
- T-series
- EX-series

Using the Indexes

This reference contains two indexes: a complete index that includes topic entries, and an index of statements and commands only.

In the index of statements and commands, an entry refers to a statement summary section only. In the complete index, the entry for a configuration statement or command contains at least two parts:

- The primary entry refers to the statement summary section.
- The secondary entry, *usage guidelines,* refers to the section in a configuration guidelines chapter that describes how to use the statement or command.

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the load merge or the load merge relative command. These commands cause the software to merge the incoming configuration into the current candidate configuration. If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the load merge command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the load merge relative command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following configuration to a file and name the file ex-script.conf. Copy the ex-script.conf file to the /var/tmp directory on your routing platform.

   ```
   system {
       scripts {
           commit {
               file ex-script.xsl;
           }
       }
   }
   interfaces {
       fxp0 {
           disable;
           unit 0 {
               family inet {
                   address 10.0.0.1/24;
               }
           }
       }
   }
   ```

2. Merge the contents of the file into your routing platform configuration by issuing the load merge configuration mode command:

   ```
   [edit]
   user@host# load merge /var/tmp/ex-script.conf
   load complete
   ```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following snippet to a file and name the file ex-script-snippet.conf. Copy the ex-script-snippet.conf file to the /var/tmp directory on your routing platform.

   ```
   commit {
   ```

```
file ex-script-snippet.xsl; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the load merge relative configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the load command, see the *JUNOS CLI User Guide*.

Documentation Conventions

Table 1 on page xliv defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

Table 2 on page xliv defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> **configure**

Table 2: Text and Syntax Conventions *(continued)*

Convention	Description	Examples
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host> show chassis alarms` `No alarms currently active`
Italic text like this	■ Introduces important new terms. ■ Identifies book names. ■ Identifies RFC and Internet draft titles.	■ A policy *term* is a named structure that defines match conditions and actions. ■ *JUNOS System Basics Configuration Guide* ■ RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*
Plain text like this	Represents names of configuration statements, commands, files, and directories; IP addresses; configuration hierarchy levels; or labels on routing platform components.	■ To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. ■ The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric *metric*>;
| (pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast | multicast (*string1* | *string2* | *string3*)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [*community-ids*]

Indention and braces ({ })	Identify a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	■ In the Logical Interfaces box, select **All Interfaces**. ■ To cancel the configuration, click **Cancel**.

Table 2: Text and Syntax Conventions *(continued)*

Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select **Protocols > Ospf**.

List of Technical Publications

Table 3 on page xlvi lists the software and hardware guides and release notes for Juniper Networks M-series, MX-series, and T-series routing platforms and describes the contents of each document. Table 4 on page l lists the books included in the *Network Operations Guide* series. Table 5 on page li lists the manuals and release notes supporting JUNOS software for J-series and SRX-series platforms. All documents are available at http://www.juniper.net/techpubs/.

Table 6 on page lii lists additional books on Juniper Networks solutions that you can order through your bookstore. A complete list of such books is available at http://www.juniper.net/books.

Table 3: Technical Documentation for Supported Routing Platforms

Book	Description
JUNOS Software for Supported Routing Platforms	
Access Privilege	Explains how to configure access privileges in user classes by using permission flags and regular expressions. Lists the permission flags along with their associated command-line interface (CLI) operational mode commands and configuration statements.
Broadband Subscriber Management Solutions	Describes residential subscriber management and how you can deploy solutions that include multisubscriber IP address assignment, service provisioning, authentication, authorization, accounting, and dynamic request services in your network
Class of Service	Provides an overview of the class-of-service (CoS) functions of the JUNOS software and describes how to configure CoS features, including configuring multiple forwarding classes for transmitting packets, defining which packets are placed into each output queue, scheduling the transmission service level for each queue, and managing congestion through the random early detection (RED) algorithm.
CLI User Guide	Describes how to use the JUNOS command-line interface (CLI) to configure, monitor, and manage Juniper Networks routing platforms. This material was formerly covered in the *JUNOS System Basics Configuration Guide*.
Feature Guide	Provides a detailed explanation and configuration examples for several of the most complex features in the JUNOS software.

Table 3: Technical Documentation for Supported Routing Platforms *(continued)*

Book	Description
High Availability	Provides an overview of hardware and software resources that ensure a high level of continuous routing platform operation and describes how to configure high availability (HA) features such as nonstop active routing (NSR) and graceful Routing Engine switchover (GRES).
MPLS Applications	Provides an overview of traffic engineering concepts and describes how to configure traffic engineering protocols.
Multicast Protocols	Provides an overview of multicast concepts and describes how to configure multicast routing protocols.
Multiplay Solutions	Describes how you can deploy IPTV and voice over IP (VoIP) services in your network.
MX-series Layer 2 Configuration Guide	Provides an overview of the Layer 2 functions of the MX-series routers, including configuring bridging domains, MAC address and VLAN learning and forwarding, and spanning-tree protocols. It also details the routing instance types used by Layer 2 applications. All of this material was formerly covered in the *JUNOS Routing Protocols Configuration Guide*.
MX-series Layer 2 Solutions Guide	Describes common configuration scenarios for the Layer 2 features supported on the MX-series routers, including basic bridged VLANs with normalized VLAN tags, aggregated Ethernet links, bridge domains, Multiple Spanning Tree Protocol (MSTP), and integrated routing and bridging (IRB).
Network Interfaces	Provides an overview of the network interface functions of the JUNOS software and describes how to configure the network interfaces on the routing platform.
Network Management	Provides an overview of network management concepts and describes how to configure various network management features, such as SNMP and accounting options.
Policy Framework	Provides an overview of policy concepts and describes how to configure routing policy, firewall filters, and forwarding options.
Protected System Domain	Provides an overview of the JCS 1200 platform and the concept of Protected System Domains (PSDs). The JCS 1200 platform, which contains up to six redundant pairs of Routing Engines running JUNOS software, is connected to a T320 router or to a T640 or T1600 routing node. To configure a PSD, you assign any number of Flexible PIC concentrators (FPCs) in the T-series routing platform to a pair of Routing Engines on the JCS 1200 platform. Each PSD has the same capabilities and functionality as a physical router, with its own control plane, forwarding plane, and administration.
Routing Protocols	Provides an overview of routing concepts and describes how to configure routing instances, and unicast routing protocols.
Secure Configuration Guide for Common Criteria and JUNOS-FIPS	Provides an overview of secure Common Criteria and JUNOS-FIPS protocols for the JUNOS software and describes how to install and configure secure Common Criteria and JUNOS-FIPS on a routing platform.

Table 3: Technical Documentation for Supported Routing Platforms *(continued)*

Book	Description
Services Interfaces	Provides an overview of the services interfaces functions of the JUNOS software and describes how to configure the services interfaces on the router.
Software Installation and Upgrade Guide	Describes the JUNOS software components and packaging and explains how to initially configure, reinstall, and upgrade the JUNOS system software. This material was formerly covered in the *JUNOS System Basics Configuration Guide*.
Subscriber Access	Provides an overview of the subscriber access features of the JUNOS software and describes how to configure subscriber access support on the router, including dynamic profiles, class of service, AAA, and access methods.
System Basics	Describes Juniper Networks routing platforms and explains how to configure basic system parameters, supported protocols and software processes, authentication, and a variety of utilities for managing your router on the network.
VPNs	Provides an overview and describes how to configure Layer 2 and Layer 3 virtual private networks (VPNs), virtual private LAN service (VPLS), and Layer 2 circuits. Provides configuration examples.
JUNOS References	
Hierarchy and RFC Reference	Describes the JUNOS configuration mode commands. Provides a hierarchy reference that displays each level of a configuration hierarchy, and includes all possible configuration statements that can be used at that level. This material was formerly covered in the *JUNOS System Basics Configuration Guide*.
Interfaces Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot interfaces.
Routing Protocols and Policies Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot routing policies and protocols, including firewall filters.
System Basics and Services Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot system basics, including commands for real-time monitoring and route (or path) tracing, system software management, and chassis management. Also describes commands for monitoring and troubleshooting services such as class of service (CoS), IP Security (IPsec), stateful firewalls, flow collection, and flow monitoring.
System Log Messages Reference	Describes how to access and interpret system log messages generated by JUNOS software modules and provides a reference page for each message.
J-Web User Guide	
J-Web Interface User Guide	Describes how to use the J-Web graphical user interface (GUI) to configure, monitor, and manage Juniper Networks routing platforms.
JUNOS API and Scripting Documentation	

Table 3: Technical Documentation for Supported Routing Platforms *(continued)*

Book	Description
JUNOScript API Guide	Describes how to use the JUNOScript application programming interface (API) to monitor and configure Juniper Networks routing platforms.
JUNOS XML API Configuration Reference	Provides reference pages for the configuration tag elements in the JUNOS XML API.
JUNOS XML API Operational Reference	Provides reference pages for the operational tag elements in the JUNOS XML API.
NETCONF API Guide	Describes how to use the NETCONF API to monitor and configure Juniper Networks routing platforms.
JUNOS Configuration and Diagnostic Automation Guide	Describes how to use the commit script and self-diagnosis features of the JUNOS software. This guide explains how to enforce custom configuration rules defined in scripts, how to use commit script macros to provide simplified aliases for frequently used configuration statements, and how to configure diagnostic event policies.
Hardware Documentation	
Hardware Guide	Describes how to install, maintain, and troubleshoot routing platforms and components. Each platform has its own hardware guide.
PIC Guide	Describes the routing platform's Physical Interface Cards (PICs). Each platform has its own PIC guide.
DPC Guide	Describes the Dense Port Concentrators (DPCs) for all MX-series routers.
JUNOScope Documentation	
JUNOScope Software User Guide	Describes the JUNOScope software graphical user interface (GUI), how to install and administer the software, and how to use the software to manage routing platform configuration files and monitor routing platform operations.
Advanced Insight Solutions (AIS) Documentation	
Advanced Insight Solutions Guide	Describes the Advanced Insight Manager (AIM) application, which provides a gateway between JUNOS devices and Juniper Support Systems (JSS) for case management and intelligence updates. Explains how to run AI-Scripts on Juniper Networks devices.
Release Notes	
JUNOS Release Notes	Summarize new features and known problems for a particular software release, provide corrections and updates to published JUNOS, JUNOScript, and NETCONF manuals, provide information that might have been omitted from the manuals, and describe upgrade and downgrade procedures.
Hardware Release Notes	Describe the available documentation for the routing platform and summarize known problems with the hardware and accompanying software. Each platform has its own release notes.

Table 3: Technical Documentation for Supported Routing Platforms *(continued)*

Book	Description
JUNOScope Release Notes	Contain corrections and updates to the published JUNOScope manual, provide information that might have been omitted from the manual, and describe upgrade and downgrade procedures.
AIS Release Notes	Summarize AIS new features and guidelines, identify known and resolved problems, provide information that might have been omitted from the manuals, and provide initial setup, upgrade, and downgrade procedures.
AIS AI-Scripts Release Notes	Summarize AI-Scripts new features, identify known and resolved problems, provide information that might have been omitted from the manuals, and provide instructions for automatic and manual installation, including deleting and rolling back.

Table 4: JUNOS Software Network Operations Guides

Book	Description
Baseline	Describes the most basic tasks for running a network using Juniper Networks products. Tasks include upgrading and reinstalling JUNOS software, gathering basic system management information, verifying your network topology, and searching log messages.
Interfaces	Describes tasks for monitoring interfaces. Tasks include using loopback testing and locating alarms.
MPLS	Describes tasks for configuring, monitoring, and troubleshooting an example MPLS network. Tasks include verifying the correct configuration of the MPLS and RSVP protocols, displaying the status and statistics of MPLS running on all routing platforms in the network, and using the layered MPLS troubleshooting model to investigate problems with an MPLS network.
MPLS Log Reference	Describes MPLS status and error messages that appear in the output of the show mpls lsp extensive command. The guide also describes how and when to configure Constrained Shortest Path First (CSPF) and RSVP trace options, and how to examine a CSPF or RSVP failure in a sample network.
MPLS Fast Reroute	Describes operational information helpful in monitoring and troubleshooting an MPLS network configured with fast reroute (FRR) and load balancing.
Hardware	Describes tasks for monitoring M-series and T-series routing platforms.

To configure and operate a J-series Services Router or an SRX-series Services Gateway running JUNOS software, you must also use the configuration statements and operational mode commands documented in JUNOS configuration guides and command references. To configure and operate a WX Integrated Services Module, you must also use WX documentation.

Table 5: JUNOS Software for J-series Services Routers and SRX-series Services Gateways Documentation

Book	Description
J-series and SRX-series Platforms	
JUNOS Software Interfaces and Routing Configuration Guide	Explains how to configure SRX-series and J-series interfaces for basic IP routing with standard routing protocols, ISDN service, firewall filters (access control lists), and class-of-service (CoS) traffic classification.
JUNOS Software Security Configuration Guide	Explains how to configure and manage SRX-series and J-series security services such as stateful firewall policies, IPsec VPNs, firewall screens, Network Address Translation (NAT), Public Key Cryptography, chassis clusters, Application Layer Gateways (ALGs), and Intrusion Detection and Prevention (IDP).
JUNOS Software Administration Guide	Shows how to monitor SRX-series and J-series devices and routing operations, firewall and security services, system alarms and events, and network performance. This guide also shows how to administer user authentication and access, upgrade software, and diagnose common problems.
JUNOS Software CLI Reference	Provides the complete configuration hierarchy available on SRX-series and J-series devices. This guide also describes the configuration statements and operational mode commands unique to these devices.
JUNOS Release Notes	Summarize new features and known problems for a particular release of JUNOS software, including JUNOS software for J-series and SRX-series devices.The release notes also contain corrections and updates to the manuals and software upgrade and downgrade instructions for JUNOS software.
J-series Only	
JUNOS Software Design and Implementation Guide	Provides guidelines and examples for designing and implementing IPsec VPNs, firewalls, and routing on J-series Services Routers running JUNOS software.
J-series Services Routers Quick Start	Explains how to quickly set up a J-series Services Router. This document contains router declarations of conformity.
J-series Services Router Hardware Guide	Provides an overview, basic instructions, and specifications for J-series Services Routers. This guide explains how to prepare a site, unpack and install the router, replace router hardware, and establish basic router connectivity. This guide contains hardware descriptions and specifications.
JUNOS Software Migration Guide	Provides instructions for migrating an SSG device running ScreenOS software to JUNOS software or upgrading a J-series device to a later version of the JUNOS software.
WXC Integrated Services Module Installation and Configuration Guide	Explains how to install and initially configure a WXC Integrated Services Module in a J-series Services Router for application acceleration.

Table 6: Additional Books Available Through http://www.juniper.net/books

Book	Description
Interdomain Multicast Routing	Provides background and in-depth analysis of multicast routing using Protocol Independent Multicast sparse mode (PIM SM) and Multicast Source Discovery Protocol (MSDP); details any-source and source-specific multicast delivery models; explores multiprotocol BGP (MBGP) and multicast IS-IS; explains Internet Gateway Management Protocol (IGMP) versions 1, 2, and 3; lists packet formats for IGMP, PIM, and MSDP; and provides a complete glossary of multicast terms.
JUNOS Cookbook	Provides detailed examples of common JUNOS software configuration tasks, such as basic router configuration and file management, security and access control, logging, routing policy, firewalls, routing protocols, MPLS, and VPNs.
MPLS-Enabled Applications	Provides an overview of Multiprotocol Label Switching (MPLS) applications (such as Layer 3 virtual private networks [VPNs], Layer 2 VPNs, virtual private LAN service [VPLS], and pseudowires), explains how to apply MPLS, examines the scaling requirements of equipment at different points in the network, and covers the following topics: point-to-multipoint label switched paths (LSPs), DiffServ-aware traffic engineering, class of service, interdomain traffic engineering, path computation, route target filtering, multicast support for Layer 3 VPNs, and management and troubleshooting of MPLS networks.
OSPF and IS-IS: Choosing an IGP for Large-Scale Networks	Explores the full range of characteristics and capabilities for the two major link-state routing protocols: Open Shortest Path First (OSPF) and IS-IS. Explains architecture, packet types, and addressing; demonstrates how to improve scalability; shows how to design large-scale networks for maximum security and reliability; details protocol extensions for MPLS-based traffic engineering, IPv6, and multitopology routing; and covers troubleshooting for OSPF and IS-IS networks.
Routing Policy and Protocols for Multivendor IP Networks	Provides a brief history of the Internet, explains IP addressing and routing (Routing Information Protocol [RIP], OSPF, IS-IS, and Border Gateway Protocol [BGP]), explores ISP peering and routing policies, and displays configurations for both Juniper Networks and other vendors' routers.
The Complete IS-IS Protocol	Provides the insight and practical solutions necessary to understand the IS-IS protocol and how it works by using a multivendor, real-world approach.

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at https://www.juniper.net/cgi-bin/docbugreport/. If you are using e-mail, be sure to include the following information with your comments:

- Document name
- Document part number
- Page number
- Software release version (not required for *Network Operations Guides [NOGs])*

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need postsales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the JTAC User Guide located at http://www.juniper.net/customers/support/downloads/710059.pdf.
- Product warranties—For product warranty information, visit http://www.juniper.net/support/warranty/.
- JTAC Hours of Operation —The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: http://www.juniper.net/customers/support/
- Search for known bugs: http://www2.juniper.net/kb/
- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/
- Download the latest versions of software and review release notes: http://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: https://www.juniper.net/alerts/
- Join and participate in the Juniper Networks Community Forum: http://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: http://www.juniper.net/cm/

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool located at https://tools.juniper.net/SerialNumberEntitlementSearch/.

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at http://www.juniper.net/cm/ .
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, visit us at http://www.juniper.net/support/requesting-support.html.

Part 1
Network Management Introduction

Chapter 1

Network Management Overview

This chapter contains the following topic:

Understanding the JUNOS Device Management Functions

After you have installed the device into your network, you need to manage the device within your network. Device management can be divided into five tasks:

- Fault management—Monitor the device; detect and fix faults.
- Configuration management—Configure device attributes.
- Accounting management—Collect statistics for accounting purposes.
- Performance management—Monitor and adjust device performance.
- Security management—Control device access and authenticate users.

The JUNOS software network management features work in conjunction with an operations support system (OSS) to manage the devices within the network. The JUNOS software can assist you in performing these management tasks, as described in Table 7 on page 4.

Table 7: JUNOS Device Management Features

Task	JUNOS Software Feature
Fault management	Monitor and see faults using: ■ Operational mode commands—For more information on operational mode commands, see the *JUNOS System Basics and Services Command Reference*, *JUNOS Interfaces Command Reference*, and *JUNOS Routing Protocols and Policies Command Reference*. ■ SNMP MIBs—For more information about SNMP MIBs, see "Juniper Networks Enterprise-Specific MIBs" on page 123. ■ Standard SNMP traps—For more information about standard SNMP traps, see "Standard SNMP Traps" on page 143. ■ Enterprise-specific SNMP traps—For more information about enterprise-specific traps, see "Juniper Networks Enterprise-Specific SNMP Traps" on page 131. ■ System log messages—For more information about how to configure system log messages, see the *JUNOS System Basics Configuration Guide*. For more information about how to view system log messages, see the *JUNOS System Log Messages Reference*.
Configuration management	■ Configure router attributes using the command-line interface (CLI), the JUNOScript API, and the NETCONF API. For more information on configuring the router using the CLI, see the *JUNOS System Basics Configuration Guide*. For more information on configuring the router using the APIs, see the *JUNOScript API Guide* and *NETCONF API Guide*. ■ Configuration Management MIB—For more information about the Configuration Management MIB, see "Juniper Networks Enterprise-Specific MIBs" on page 123.

Table 7: JUNOS Device Management Features *(continued)*

Task	JUNOS Software Feature
Accounting management	Perform the following accounting-related tasks: ■ Collect statistics for interfaces, firewall filters, destination classes, source classes, and the Routing Engine. For more information on collecting statistics, see "Configuring Accounting Options" on page 669. ■ Use interface-specific traffic statistics and other counters, available in the Standard Interfaces MIB, Juniper Networks enterprise-specific extensions to the Interfaces MIB, and media-specific MIBs, such as the enterprise-specific ATM MIB. ■ Use per-ATM virtual circuit (VC) counters, available in the enterprise-specific ATM MIB. ■ Group source and destination prefixes into source classes and destination classes and count packets for those classes. Collect destination class and source class usage statistics. For more information on classes, see "Juniper Networks Enterprise-Specific MIBs" on page 123, "Configuring Class Usage Profiles" on page 685, the *JUNOS Network Interfaces Configuration Guide*, and the *JUNOS Policy Framework Configuration Guide*. ■ Count packets as part of a firewall filter. For more information on firewall filter policies, see "Juniper Networks Enterprise-Specific MIBs" on page 123 and the *JUNOS Policy Framework Configuration Guide*. ■ Sample traffic, collect the samples, and send the collection to a host running the CAIDA cflowd utility. For more information on CAIDA and cflowd, see the *JUNOS Policy Framework Configuration Guide*.
Performance management	Monitor performance in the following ways: ■ Use operational mode commands. For more information on monitoring performance using operational mode commands, see the *JUNOS System Basics and Services Command Reference*. ■ Use firewall filter. For more information on performance monitoring using firewall filters, see the *JUNOS Policy Framework Configuration Guide*. ■ Sample traffic, collect the samples, and send the samples to a host running the CAIDA cflowd utility. For more information on CAIDA and cflowd, see the *JUNOS Policy Framework Configuration Guide*. ■ Use the enterprise-specific Class-of-Service MIB. For more information on this MIB, see "Juniper Networks Enterprise-Specific MIBs" on page 123.
Security management	Assure security in your network in the following ways: ■ Control access to the router and authenticate users. For more information on access control and user authentication, see the *JUNOS System Basics Configuration Guide*. ■ Control access to the router using SNMPv3 and SNMP over IPv6. For more information, see "Configuring the Local Engine ID" on page 50 and "Tracing SNMP Activity on a JUNOS Device" on page 46.

Chapter 2

Complete Network Management Configuration Statements

This chapter contains the following topics:

Configuration Statements at the [edit accounting-options] Hierarchy Level

This topic shows all possible configuration statements at the [edit accounting-options] hierarchy level and their level in the configuration hierarchy. When you are configuring the JUNOS software, your current hierarchy level is shown in the banner on the line preceding the user@host# prompt.

For a list of the complete configuration statement hierarchy, see the *JUNOS Hierarchy and RFC Reference*.

```
[edit]
accounting-options {
    class-usage-profile profile-name {
        file filename;
        interval minutes;
        destination-classes {
            destination-class-name;
        }
        source-classes {
            source-class-name;
        }
    }
    file filename {
        archive-sites {
        }
        files number;
        nonpersistent;
        size bytes;
        transfer-interval minutes;
    }
    filter-profile profile-name {
        counters {
            counter-name;
```

```
        }
        file filename;
        interval minutes;
    }
}
interface-profile profile-name {
    fields {
        field-name;
    }
    file filename;
    interval minutes;
}
mib-profile profile-name {
    file filename;
    interval seconds;
    objects-names {
        mib-object-name;
    }
    operation operation-name;
}
routing-engine-profile profile-name {
    fields {
        field-name;
    }
    file filename;
    interval minutes;
}
```

Configuration Statements at the [edit snmp] Hierarchy Level

This topic shows all possible configuration statements at the [edit snmp] hierarchy level and their level in the configuration hierarchy. When you are configuring the JUNOS software, your current hierarchy level is shown in the banner on the line preceding the user@host# prompt.

For a list of the complete configuration statement hierarchy, see the *JUNOS Hierarchy and RFC Reference*.

```
[edit]
snmp {
    client-list client-list-name {
        ip-addresses;
    }
    community community-name {
        authorization authorization;
        client-list-name client-list-name;
        clients {
            address restrict;
        }
        view view-name;
    }
    contact contact;
    description description;
    engine-id {
```

```
    (local engine-id | use-default-ip-address | use-mac-address);
}
filter-duplicates;
interface [ interface-names ];
location location;
name name;
nonvolatile {
    commit-delay seconds;
}
rmon {
    alarm index {
        description description;
        falling-event-index index;
        falling-threshold integer;
        falling-threshold-interval seconds;
        interval seconds;
        request-type (get-next-request | get-request | walk-request);
        rising-event-index index;
        rising-threshold integer;
        sample-type type;
        startup-alarm alarm;
        syslog-subtag syslog-subtag;
        variable oid-variable;
    }
    event index {
        community community-name;
        description description;
        type type;
    }
}
traceoptions {
    file filename <files number> <size size> <world-readable | no-world-readable>
        <match regex>;
    flag flag;
}
trap-group group-name {
    categories {
        category;
    }
    destination-port port-number;
    routing-instance instance;
    targets {
        address;
    }
    version (all | v1 | v2);
}
trap-options {
    agent-address outgoing-interface;
    source-address address;
}
v3 {
    notify name {
        tag tag-name;
        type (trap | inform);
    }
    notify-filter profile-name {
```

```
    oid oid (include | exclude);
}
snmp-community community-index {
    community-name community-name;
    security-name security-name;
    tag tag-name;
}
target-address target-address-name {
    address address;
    address-mask address-mask;
    inform-timeout number;
    inform-retry-count seconds;
    port port-number;
    routing-instance instance;
    tag-list tag-list;
    target-parameters target-parameters-name;
}
target-parameters target-parameters-name {
    notify-filter profile-name;
    parameters {
        message-processing-model (v1 | v2c | v3);
        security-model (usm | v1 | v2c);
        security-level (authentication | none | privacy);
        security-name security-name;
    }
}
usm {
    local-engine {
        user username {
            authentication-md5 {
                authentication-password authentication-password;
            }
            authentication-none;
            authentication-sha {
                authentication-password authentication-password;
            }
            privacy-3des {
                privacy-password privacy-password;
            }
            privacy-aes128 {
                privacy-password privacy-password;
            }
            privacy-des {
                privacy-password privacy-password;
            }
            privacy-none;
        }
    }
}
vacm {
    access {
        group group-name {
            default-context-prefix {
                security-model (any | usm | v1 | v2c) {
                    security-level (authentication | none | privacy) {
                        notify-view view-name;
```

```
                    read-view view-name;
                    write-view view-name;
                }
            }
        }
    }
    security-to-group {
        security-model (usm | v1 | v2c) {
            security-name security-name {
                group group-name;
            }
        }
    }
  }
  view view-name {
    oid object-identifier (include | exclude);
  }
}
```

Part 2
Integrated Local Management Interface

Chapter 3

Integrated Local Management Interface Overview

This chapter contains the following topic:

Understanding Integrated Local Management Interface

The Integrated Local Management Interface (ILMI) provides a mechanism for Asynchronous Transfer Mode (ATM)-attached devices, such as hosts, routers, and ATM switches, to transfer management information. ILMI provides bidirectional exchange of management information between two ATM interfaces across a physical connection. ILMI information is exchanged over a direct encapsulation of Simple Network Management Protocol (SNMP) version 1 (RFC 1157, *A Simple Network Management Protocol*) over ATM Adaptation Layer 5 (AAL5) using a virtual path identifier/virtual channel identifier (VPI/VCI) value (VPI = 0, VCI = 16).

The JUNOS software supports only two ILMI Management Information Base (MIB) variables: atmfMYIPNmAddress and atmfPortMyIfname. For ATM1 and ATM2 intelligent queuing (IQ) interfaces, you can configure ILMI to communicate directly with an attached ATM switch to enable querying of the switch's IP address and port number.

For more information about configuring ILMI, see the *JUNOS Network Interfaces Configuration Guide*. For information about displaying ILMI statistics, see the *JUNOS Interfaces Command Reference*. For more information about the ILMI MIB, see the ATM Forum at http://www.atmforum.com/.

Part 3

Simple Network Management Protocol (SNMP)

Chapter 4
SNMP Overview

This chapter contains the following topics:

Understanding SNMP Implementation in the JUNOS Software

The Simple Network Management Protocol (SNMP) enables the monitoring of network devices from a central location. This topic provides an overview of SNMP and describes how SNMP is implemented in the JUNOS software.

This topic covers the following sections:

SNMP Architecture

The SNMP agent exchanges network management information with SNMP manager software running on a network management system (NMS), or host. The agent responds to requests for information and actions from the manager. The agent also controls access to the agent's Management Information Base (MIB), the collection of objects that can be viewed or changed by the SNMP manager.

The SNMP manager collects information on network connectivity, activity, and events by polling managed devices.

Communication between the agent and the manager occurs in one of the following forms:

- Get, GetBulk, and GetNext requests—The manager requests information from the agent; the agent returns the information in a Get response message.
- Set requests—The manager changes the value of a MIB object controlled by the agent; the agent indicates status in a Set response message.
- Traps notification—The agent sends traps to notify the manager of significant events that occur on the network device.

This topic contains the following sections:

Management Information Base

A MIB, or Management Information Base, is a hierarchy of information used to define managed objects in a network device. The MIB structure is based on a tree structure, which defines a grouping of objects into related sets. Each object in the MIB is associated with an object identifier (OID), which names the object. The "leaf" in the tree structure is the actual managed object instance, which represents a resource, event, or activity that occurs in your network device.

MIBs are either standard or enterprise-specific. Standard MIBs are created by the Internet Engineering Task Force (IETF) and documented in various RFCs. Depending on the vendor, many standard MIBs are delivered with the NMS software. You can also download the standard MIBs from the IETF Web site, http://www.ietf.org, and compile them into your NMS, if necessary.

For a list of standard supported MIBs, see "Standard SNMP MIBs Supported by the JUNOS Software" on page 22.

Enterprise-specific MIBs are developed and supported by a specific equipment manufacturer. If your network contains devices that have enterprise-specific MIBs, you must obtain them from the manufacturer and compile them into your network management software.

For a list of Juniper Networks enterprise-specific supported MIBs, see "Juniper Networks Enterprise-Specific MIBs" on page 123.

SNMP Traps and Informs

Routers can send notifications to SNMP managers when significant events occur on a network device, most often errors or failures. SNMP notifications can be sent as traps or inform requests. SNMP traps are unconfirmed notifications. SNMP informs are confirmed notifications.

SNMP traps are defined in either standard or enterprise-specific MIBs. Standard traps are created by the IETF and documented in various RFCs. The standard traps are compiled into the network management software. You can also download the standard traps from the IETF Web site, http://www.ietf.org.

For more information on standard traps supported by the JUNOS software, see "Standard SNMP Traps" on page 143.

Enterprise-specific traps are developed and supported by a specific equipment manufacturer. If your network contains devices that have enterprise-specific traps, you must obtain them from the manufacturer and compile them into your network management software.

For more information on enterprise-specific traps supported by the JUNOS software, see "Juniper Networks Enterprise-Specific SNMP Traps" on page 131. For information

on system logging severity levels for SNMP traps, see "System Logging Severity Levels for SNMP Traps" on page 21.

With traps, the receiver does not send any acknowledgment when it receives a trap and the sender cannot determine if the trap was received. To increase reliability, SNMP informs are supported in SNMPv3. An SNMP manager that receives an inform acknowledges the message with a response. For information on SNMP informs, see "Configuring SNMP Informs" on page 76.

SNMP Trap Queuing

The JUNOS software supports trap queuing to ensure that traps are not lost because of temporary unavailability of routes. Two types of queues, destination queues and a throttle queue, are formed to ensure delivery of traps and control the trap traffic.

The JUNOS software forms a destination queue when a trap to a particular destination is returned because the host is not reachable, and adds the subsequent traps to the same destination to the queue. The JUNOS software checks for availability of routes every 30 seconds, and sends the traps from the destination queue in a round-robin fashion. If the trap delivery fails, the trap is added back to the queue, and the delivery attempt counter and the next delivery attempt timer for the queue are reset. Subsequent attempts occur at progressive intervals of 1 minute, 2 minutes, 4 minutes, and 8 minutes. The maximum delay between the attempts is 8 minutes, and the maximum number of attempts is 10. After 10 unsuccessful attempts, the destination queue and all the traps in the queue are deleted.

The JUNOS software also has a throttle mechanism to control the number of traps (throttle threshold; default value of 100 traps) sent during a particular time period (throttle interval; default of 5 seconds) and to ensure consistency in trap traffic, especially when large number of traps are generated because of interface status changes. The throttle interval period begins when the first trap arrives at the throttle. All traps within the trap threshold are processed, and the traps beyond the threshold limit are queued. The maximum size of the throttle queue is 50k. When a trap is added to the throttle queue, or if the throttle queue has exceeded the maximum size, the trap is added back on top of the destination queue, and all subsequent attempts from the destination queue are stopped for a 30-second period, after which the destination queue restarts sending the traps.

NOTE: Users cannot configure the JUNOS software for trap queuing. Users cannot view any information about trap queues except what is available in the syslog.

System Logging Severity Levels for SNMP Traps

For some traps, when a trap condition occurs, regardless of whether the SNMP agent sends a trap to an NMS, the trap is logged if the system logging is configured to log an event with that system logging severity level. For more information about system logging severity levels, see the *JUNOS System Basics Configuration Guide*.

For more information on system logging severity levels for standard traps, see "Standard SNMP Traps" on page 143. For more information on system logging severity

levels for enterprise-specific traps, see “Juniper Networks Enterprise-Specific SNMP Traps” on page 131.

JUNOS SNMP Agent Features

The JUNOS SNMP agent software consists of an SNMP master agent that delegates all SNMP requests to subagents. Each subagent is responsible for the support of a specific set of MIBs.

The JUNOS software supports the following versions of SNMP:

- SNMPv1—The initial implementation of SNMP that defines the architecture and framework for SNMP.
- SNMPv2c—The revised protocol, with improvements to performance and manager-to-manager communications. Specifically, SNMPv2c implements community strings, which act as passwords when determining who, what, and how the SNMP clients can access the data in the SNMP agent. The community string is contained in SNMP Get, GetBulk, GetNext, and Set requests. The agent may require a different community string for Get, GetBulk, and GetNext requests (read-only access) than it does for Set requests (read-write access).
- SNMPv3—The most up-to-date protocol focuses on security. SNMPv3 defines a security model, user-based security model (USM), and a view-based access control model (VACM). SNMPv3 USM provides data integrity, data origin authentication, message replay protection, and protection against disclosure of the message payload. SNMPv3 VACM provides access control to determine whether a specific type of access (read or write) to the management information is allowed.

In addition, the JUNOS SNMP agent software accepts IPv4 and IPv6 addresses for transport over IPv4 and IPv6. For IPv6, the JUNOS software supports the following IPv6 over SNMP:

- SNMP data over IPv6 networks
- IPv6-specific MIB data
- SNMP agents for IPv6

Standard SNMP MIBs Supported by the JUNOS Software

Table 8 on page 23 contains the list of standard SNMP MIBs and RFCs that are supported on various JUNOS platforms. RFCs can be found at http://www.ietf.org.

NOTE: In Table 8 on page 23, a value of 1 in any of the platform columns (M, T, J, MX, and EX) denotes that the corresponding MIB is supported on that particular platform, and a value of 0 denotes that the MIB is not supported on the platform.

Table 8: Standard MIBs Supported on JUNOS Platforms

MIB/RFC	Platforms				
	M	T	J	MX	EX
IEEE 802.1ab section 12.1, *Link Layer Discovery Protocol (LLDP) MIB*	0	0	0	0	1
IEEE, 802.3ad, *Aggregation of Multiple Link Segments* Supported tables and objects: ■ dot3adAggPortTable, dot3adAggPortListTable, dot3adAggTable, and dot3adAggPortStatsTable ■ dot3adAggPortDebugTable (only dot3adAggPortDebugRxState, dot3adAggPortDebugMuxState, dot3adAggPortDebugActorSyncTransitionCount, dot3adAggPortDebugPartnerSyncTransitionCount, dot3adAggPortDebugActorChangeCount, and dot3adAggPortDebugPartnerChangeCount) ■ dot3adTablesLastChanged **NOTE:** Gigabit Ethernet interfaces on J-series Services Routers do not support the 802.3ad MIB.	1	1	1	1	1
RFC 1155, *Structure and Identification of Management Information for TCP/IP-based Internets*	1	1	1	1	1
RFC 1157, *A Simple Network Management Protocol (SNMP)*	1	1	1	1	1
RFC 1195, *Use of OSI IS-IS for Routing in TCP/IP and Dual Environments* (only the objects isisSystem, isisMANAreaAddr, isisAreaAddr, isisSysProtSupp, isisSummAddr, isisCirc, isisCircLevel, isisPacketCount, isisISAdj, isisISAdjAreaAddr, isisAdjIPAddr, isisISAdjProtSupp, isisRa, and isisIPRA are supported)	1	1	1	1	0
RFC 1212, *Concise MIB Definitions*	1	1	1	1	0

RFC 1213, *Management Information Base for Network Management of TCP/IP-Based Internets: MIB-II*. The JUNOS software supports the following areas:
■ MIB II and its SNMP version 2 derivatives, including:
  ■ Statistics counters
  ■ IP, except for ipRouteTable, which has been replaced by ipCidrRouteTable (RFC 2096, *IP Forwarding Table MIB*)
  ■ SNMP management
  ■ Interface management
■ SNMPv1 Get, GetNext requests, and version 2 GetBulk request
■ JUNOS software-specific secured access list
■ Master configuration keywords
■ Reconfigurations upon SIGHUP
	1	1	1	1	1

Table 8: Standard MIBs Supported on JUNOS Platforms *(continued)*

MIB/RFC	Platforms				
	M	T	J	MX	EX
RFC 1215, *A Convention for Defining Traps for use with the SNMP* (only MIB II SNMP version 1 traps and version 2 notifications)	1	1	1	1	1
RFC 1406, *Definitions of Managed Objects for the DS1 and E1 Interface Types* (T1 MIB is supported)	1	1	1	0	0
RFC 1407, *Definitions of Managed Objects for the DS3/E3 Interface Type* (T3 MIB is supported)	1	1	1	0	0
RFC 1657, *Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol (BGP-4) using SMIv2*	1	1	1	1	1
RFC 1695, *Definitions of Managed Objects for ATM Management Version 8.0 Using SMIv2*	1	1	1	0	0
RFC 1850, *OSPF Version 2 Management Information Base* (except for the ospfOriginateNewLsas and ospfRxNewLsas objects, the Host Table, and the traps ospfOriginateLSA, ospfLsdbOverflow, and ospfLsdbApproachingOverflow)	1	1	1	1	1
RFC 1901, *Introduction to Community-based SNMPv2*	1	1	1	1	0
RFC 1905, *Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)*	1	1	1	1	1
RFC 1907, *Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)* (replaced by RFC 3418)	1	1	1	1	1
RFC 2011, *SNMPv2 Management Information Base for the Internet Protocol Using SMIv2*	1	1	1	1	1
RFC 2012, *SNMPv2 Management Information Base for the Transmission Control Protocol Using SMIv2*	1	1	1	1	1
RFC 2013, *SNMPv2 Management Information Base for the User Datagram Protocol Using SMIv2*	1	1	1	1	1
RFC 2024, *Definitions of Managed Objects for Data Link Switching Using SMIv2* (except for the dlswInterface and dlswSdlc object groups; the dlswDirLocateMacTable, dlswDirNBTable, and dlswDirLocateNBTable tables; the dlswCircuitDiscReasonLocal and dlswCircuitDiscReasonRemote tabular objects; and the dlswDirMacCacheNextIndex and dlswDirNBCacheNextIndex scalar objects; read-only access)	1	1	1	1	0
RFC 2096, *IP Forwarding Table MIB* (The ipCidrRouteTable has been extended to include the tunnel name when the next hop is through an RSVP-signaled LSP.)	1	1	1	1	1
RFC 2115, *Management Information Base for Frame Relay DTEs Using SMIv2* (frDlcmiTable only; frCircuitTable and frErrTable are not supported.)	1	1	1	1	0

Table 8: Standard MIBs Supported on JUNOS Platforms *(continued)*

MIB/RFC	Platforms				
	M	T	J	MX	EX
RFC 2233, *The Interfaces Group MIB Using SMIv2*	1	1	1	1	0
RFC 2287, *Definitions of System-Level Managed Objects for Applications* (only the objects sysApplInstallPkgTable, sysApplInstallElmtTable, sysApplElmtRunTable, and sysApplMapTable)	1	1	1	1	1
RFC 2465, *Management Information Base for IP Version 6: Textual Conventions and General Group* (except for IPv6 interface statistics)	1	1	1	1	0
RFC 2495, *Definitions of Managed Objects for the DS1, E1, DS2, and E2 Interface Types* (except for dsx1FarEndConfigTable, dsx1FarEndCurrentTable, dsx1FarEndIntervalTable, dsx1FarEndTotalTable, and dsx1FracTable)	1	1	1	0	0
RFC 3896, *Definitions of Managed Objects for the DS3/E3 Interface Type* (except dsx3FarEndConfigTable, dsx3FarEndCurrentTable, dsx3FarEndIntervalTable, dsx3FarEndTotalTable, and dsx3FracTable)	1	1	1	0	0
RFC 2515, *Definitions of Managed Objects for ATM Management* (except atmVpCrossConnectTable, atmVcCrossConnectTable, and aal5VccTable)	1	1	1	0	0
RFC 3592, *Definitions of Managed Objects for the SONET/SDH Interface Type*	1	1	1	0	0
RFC 2570, *Introduction to Version 3 of the Internet-standard Network Management Framework*	1	1	1	1	1
RFC 2571, *An Architecture for Describing SNMP Management Frameworks* (read-only access)	1	1	1	1	1
RFC 2572, *Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)* (read-only access)	1	1	1	1	1
RFC 2576, *Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework*	1	1	1	1	1
RFC 2578, *Structure of Management Information Version 2 (SMIv2)*	1	1	1	1	1
RFC 2579, *Textual Conventions for SMIv2*	1	1	1	1	1
RFC 2580, *Conformance Statements for SMIv2*	1	1	1	1	0
RFC 2662. *Definitions of Managed Objects for ADSL Lines* (J-series Services Routers. All MIB tables, objects, and traps are applicable for the ADSL ATU-R agent.)	1	1	1	1	0
RFC 2665, *Definitions of Managed Objects for the Ethernet-like Interface Types*	1	1	1	1	1

Table 8: Standard MIBs Supported on JUNOS Platforms *(continued)*

MIB/RFC	Platforms				
	M	T	J	MX	EX
RFC 2787, *Definitions of Managed Objects for the Virtual Router Redundancy Protocol* (except row creation, the Set operation, and the object vrrpStatsPacketLengthErrors)	1	1	1	1	1
RFC 2790, *Host Resources MIB* ■ Only the hrStorageTable. The file systems /, /config, /var, and /tmp always return the same index number. When SNMP restarts, the index numbers for the remaining file systems might change. ■ Only the objects of the hrSystem and hrSWInstalled groups.	1	1	1	1	1
RFC 2819, *Remote Network Monitoring Management Information Base* (the etherStatsTable for Ethernet interfaces only and the objects alarmTable, eventTable, and logTable)	1	1	1	1	1
RFC 2863, *The Interfaces Group MIB*	1	1	1	1	1
RFC 2864, *The Inverted Stack Table Extension to the Interfaces Group MIB*	1	1	1	1	0
RFC 2922, *The Physical Topology (PTOPO) MIB*	0	0	0	0	1
RFC 2925, *Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations* (only the objects pingCtlTable, pingResultsTable, pingProbeHistoryTable, pingMaxConcurrentRequests, traceRouteCtlTable, traceRouteResultsTable, traceRouteProbeHistoryTable, and traceRouteHopsTable)	1	1	1	1	1
RFC 2932, *IPv4 Multicast Routing MIB*	1	1	1	1	1
RFC 2933, *Internet Group Management Protocol (IGMP) MIB*	1	1	1	1	0
RFC 2934, *Protocol Independent Multicast MIB for IPv4*	1	1	1	1	0
RFC 2981, *Event MIB*	1	1	1	1	0
RFC 3014, *Notification Log MIB*	1	1	1	1	0
RFC 3109, *IP Version 6 Management Information Base for The Multicast Listener Discovery Protocol*	1	1	1	1	0
RFC 3411, *An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks*	1	1	1	1	0
RFC 3412, *Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)*	1	1	1	1	0
RFC 3413, *Simple Network Management Protocol (SNMP) Applications* (except for the proxy MIB)	1	1	1	1	1

Table 8: Standard MIBs Supported on JUNOS Platforms *(continued)*

MIB/RFC	Platforms				
	M	T	J	MX	EX
RFC 3414, *User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)*	1	1	1	1	1
RFC 3415, *View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)*	1	1	1	1	1
RFC 3416, *Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)*	1	1	1	1	0
RFC 3417, *Transport Mappings for the Simple Network Management Protocol (SNMP)*	1	1	1	1	0
RFC 3418, *Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)* (replaces RFC 1907)	1	1	1	1	0
RFC 3498, *Definitions of Managed Objects for Synchronous Optical Network (SONET) Linear Automatic Protection Switching (APS) Architectures* (implemented under the Juniper Networks enterprise branch [jnxExperiment])	1	1	1	0	0
RFC 3592, *Definitions of Managed Objects for the Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Interface Type*	1	1	1	1	0
RFC 3621, *Power Ethernet MIB*	0	0	0	0	1
RFC 3637, *Definitions of Managed Objects for the Ethernet WAN Interface Sublayer* (except etherWisDeviceTable, etherWisSectionCurrentTable, and etherWisFarEndPathCurrentTable)	1	1	1	1	0
RFC 3811, *Definitions of Textual Conventions (TCs) for Multiprotocol Label Switching (MPLS) Management*	1	1	1	1	0
RFC 3812, *Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB)* (read only access) ■ MPLS tunnels as interfaces are not supported. ■ The following objects in the TunnelResource table are not supported: mplsTunnelResourceMeanRate, mplsTunnelResourceMaxBurstSize, mplsTunnelResourceMeanBurstSize, mplsTunnelResourceExBurstSize, mplsTunnelResourceWeight. ■ mplsTunnelPerfTable and mplsTunnelCRLDPResTable are not supported. ■ mplsTunnelCHopTable supported on ingress routers only. **NOTE:** The branch used by the proprietary LDP MIB (ldpmib.mib) conflicts with RFC 3812. ldpmib.mib has been deprecated and replaced by jnx-mpls-ldp.mib.	1	1	1	1	0

Table 8: Standard MIBs Supported on JUNOS Platforms *(continued)*

MIB/RFC	Platforms				
	M	T	J	MX	EX
RFC 3813, *Multiprotocol Label Switching (MPLS) Label Switching Router (LSR) Management Information Base (MIB)* (read only access. mplsInterfacePerfTable, mplsInSegmentPerfTable, mplsOutSegmentPerfTable, mplsInSegmentMapTable, mplsXCUp, and mplsXCDown are not supported.)	1	1	1	1	0
RFC 3815, *Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)* (only mplsLdpLsrID and mplsLdpSesPeerAddrTable)	1	1	1	1	0
RFC 3826, *The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model*	1	1	1	1	0
RFC 4188, *Definitions of Managed Objects for Bridges*—Supports 802.1D STP(1998). Supports only the following subtrees and objects: ■ dot1dStp subtree is supported on MX-series Ethernet Services routers. ■ dot1dTpFdbAddress, dot1dTpFdbPort, and dot1dTpFdbStatus objects from the dot1dTpFdbTable of the dot1dTp subtree are supported on EX-series Ethernet switches. **NOTE:** dot1dTpLearnedEntryDiscards and dot1dTpAgingTime objects are supported on M and T series routers.	0	0	0	1	1
RFC 4318, *Definitions of Managed Objects for Bridges with Rapid Spanning Tree Protocol*—Supports 802.1w and 802.1t extensions for RSTP.	1	1	1	1	0
RFC 4363b *Q-Bridge VLAN MIB*	0	0	0	0	1
RFC 4801, *Definitions of Textual Conventions for Generalized Multiprotocol Label Switching (GMPLS) Management Information Base (MIB)* (read-only access)	1	1	1	1	0
RFC 4802, *Generalized Multiprotocol Label Switching (GMPLS) Traffic Engineering (TE) Management Information Base (MIB)* (read-only access. gmplsTunnelReversePerfTable, gmplsTeScalars, gmplsTunnelTable, gmplsTunnelARHopTable, gmplsTunnelCHopTable, and gmplsTunnelErrorTable are not supported.)	1	1	1	1	0
RFC 4803, *Generalized Multiprotocol Label Switching (GMPLS) Label Switching Router (LSR) Management Information Base (MIB)* (read-only access. gmplsLabelTable and gmplsOutsegmentTable are not supported.) **NOTE:** The tables in GMPLS TE (RFC 4802) and LSR (RFC 4803) MIBs are extensions of the corresponding tables from the MPLS TE (RFC 3812) and LSR (RFC 3813) MIBs and use the same index as the MPLS MIB tables.	1	1	1	1	0

Table 8: Standard MIBs Supported on JUNOS Platforms *(continued)*

MIB/RFC	Platforms				
	M	T	J	MX	EX
Internet Assigned Numbers Authority, *IANAiftype Textual Convention MIB* (referenced by RFC 2233, available at ftp://ftp.isi.edu/mib/ianaiftype.mib)	1	1	1	1	1
Internet draft draft-blumenthal-aes-usm-08.txt, *The AES Cipher Algorithm in the SNMP User-based Security Model*	1	1	1	1	0
Internet draft draft-ietf-atommib-sonetaps-mib-10.txt, *Definitions of Managed Objects for SONET Linear APS Architectures* (as defined under the Juniper Networks enterprise branch [jnxExperiment] only)	1	1	1	1	0
Internet draft draft-ieft-bfd-mib-02.txt, *Bidirectional Forwarding Detection Management Information Base* (Represented by mib-jnx-bfd-exp.txt and implemented under the Juniper Networks enterprise branch [jnxExperiment]. Read only. Includes bfdSessUp and bfdSessDown traps. Does not support bfdSessPerfTable and bfdSessMapTable.)	1	1	1	1	1
Internet draft draft-ietf-idmr-igmp-mib-13.txt, *Internet Group Management Protocol (IGMP) MIB*	1	1	1	1	0
Internet draft draft-ietf-idr-bgp4-mibv2-04.txt, *Definitions of Managed Objects for the Fourth Version of Border Gateway Protocol (BGP-4), Second Version* (only jnxBgpM2PrefixInPrefixes, jnxBgpM2PrefixInPrefixesAccepted, and jnxBgpM2PrefixInPrefixesRejected objects)	1	1	1	1	0
Internet draft draft-reeder-snmpv3-usm-3desede-00.txt, *Extension to the User-Based Security Model (USM) to Support Triple-DES EDE in 'Outside' CBC Mode*	1	1	1	1	0
Internet draft draft-ietf-isis-wg-mib-07.txt, *Management Information Base for IS-IS*, (only isisISAdjTable, isisISAdjAreaAddrTable, isisISAdjIPAddrTable, and isisISAdjProtSuppTable)	1	1	1	1	1
Internet draft draft-ietf-ppvpn-mpls-vpn-mib-04.txt, *MPLS/BGP Virtual Private Network Management Information Base Using SMIv2* (only mplsVpnScalars, mplsVpnVrfTable, mplsVpnPerTable, and mplsVpnVrfRouteTargetTable)	1	1	1	1	0
Internet draft draft-ietf-msdp-mib-07.txt, *Multicast Source Discovery protocol MIB* (except msdpEstablished, msdpBackwardTransition, and msdpRequestsTable)	1	1	1	1	0
Internet draft draft-ietf-ospf-ospfv3-mib-11.txt, *Management Information Base for OSPFv3* (Represented by mib-jnx-ospfv3mib.txt and implemented under the Juniper Networks enterprise branch {jnxExperiment}. Support for ospfv3NbrTable only. Read only. Object names are prefixed by jnx. For example, jnxOspfv3NbrTable, jnxOspfv3NbrAddressType, and jnxOspfv3NbrPriority.)	1	1	1	1	0

Table 8: Standard MIBs Supported on JUNOS Platforms *(continued)*

MIB/RFC	Platforms				
	M	T	J	MX	EX
Internet draft draft-ietf-idmr-pim-mib-09.txt, *Protocol Independent Multicast (PIM) MIB*	1	1	1	1	0
ESO Consortium MIB, which can be found at http://www.snmp.com/eso/	1	1	1	1	0

Chapter 5

Configuring SNMP

This chapter contains the following topics:

Configuring SNMP on a JUNOS Device

By default, Simple Network Management Protocol (SNMP) is disabled on JUNOS devices. To enable SNMP on a JUNOS device, you must include the SNMP configuration statements at the [edit snmp] hierarchy level.

To configure the minimum requirements for SNMP, include the following statements at the [edit snmp] hierarchy level of the configuration:

```
[edit]
snmp {
    community public;
}
```

The community defined here as public grants read access to all MIB data to any client.

To configure complete SNMP features, include the following statements at the [edit snmp] hierarchy level:

```
snmp {
    client-list client-list-name {
        ip-addresses;
    }
    community community-name {
        authorization authorization;
        client-list-name client-list-name;
        clients {
            address restrict;
        }
        routing-instance routing-instance-name {
            clients {
            addresses;
            }
        }
        logical-system logical-system-name {
            routing-instance routing-instance-name {
                clients {
                addresses;
                }
            }
        }
        view view-name;
    }
    contact contact;
    description description;
    engine-id {
        (local engine-id | use-mac-address | use-default-ip-address);
    }
    filter-duplicates;
    health-monitor {
        falling-threshold integer;
        interval seconds;
        rising-threshold integer;
    }
    interface [ interface-names ];
```

```
    location location;
    name name;
    nonvolatile {
        commit-delay seconds;
    }
    rmon {
        alarm index {
            description text-description;
            falling-event-index index;
            falling-threshold integer;
            interval seconds;
            rising-event-index index;
            falling-threshold-interval seconds;
            request-type (get-next-request | get-request | walk-request);
            sample-type type;
            startup-alarm alarm;
            syslog-subtag syslog-subtag;
            variable oid-variable;
        }
        event index {
            community community-name;
            description text-description;
            type type;
        }
    }
    traceoptions {
        file filename <files number> <size size> <world-readable | no-world-readable>
            <match regex>;
        flag flag;
    }
    trap-group group-name {
        categories {
            category;
        }
        destination-port port-number;
        routing-instance instance;
        targets {
            address;
        }
        version (all | v1 | v2);
    }
    trap-options {
        agent-address outgoing-interface;
        source-address address;
    }
    view view-name {
        oid object-identifier (include | exclude);
    }
}
```

Configuring the System Contact on a JUNOS Device

You can specify an administrative contact for each system being managed by SNMP. This name is placed into the MIB II sysContact object. To configure a contact name, include the contact statement at the [edit snmp] hierarchy level:

```
[edit snmp]
contact contact;
```

If the name contains spaces, enclose it in quotation marks (" ").

Example: Configuring the System Contact

Define the system contact:

```
[edit]
snmp {
   contact "Juniper Berry, (650) 555-1234";
}
```

Configuring the System Location for a JUNOS Device

You can specify the location of each system being managed by SNMP. This string is placed into the MIB II sysLocation object. To configure a system location, include the location statement at the [edit snmp] hierarchy level:

```
[edit snmp]
location location;
```

If the location contains spaces, enclose it in quotation marks (" ").

Example: Configuring the System Location

Specify where the system is located:

```
[edit]
snmp {
   location "Row 11, Rack C";
}
```

Configuring the System Description on a JUNOS Device

You can specify a description for each system being managed by SNMP. This string is placed into the MIB II sysDescription object. To configure a description, include the description statement at the [edit snmp] hierarchy level:

```
[edit snmp]
description description;
```

If the description contains spaces, enclose it in quotation marks (" ").

Example: Configuring the System Description

Specify the system description:

```
[edit]
snmp {
   description "M40 router with 8 FPCs";
}
```

Filtering Duplicate SNMP Requests

By default, filtering duplicate get, getNext, and getBulk SNMP requests is disabled on JUNOS devices. If a network management station (NMS) retransmits a Get, GetNext, or GetBulk SNMP request too frequently to the router, it might interfere with the processing of previous requests and slow down the response time of the agent. Filtering these duplicate requests improves the response time of the SNMP agent. The JUNOS software uses the following information to determine if an SNMP request is a duplicate:

- Source IP address of the SNMP request
- Source UDP port of the SNMP request
- Request ID of the SNMP request

To filter duplicate SNMP requests, include the filter-duplicates statement at the [edit snmp] hierarchy level:

```
[edit snmp]
filter-duplicates;
```

Configuring the Commit Delay Timer

When a JUNOS device first receives an SNMP nonvolatile Set request, a JUNOScript session opens and prevents other users or applications from changing the candidate configuration (equivalent to the command-line interface [CLI] configure exclusive command). If the router does not receive new SNMP Set requests within 5 seconds (the default value), the candidate configuration is committed and the JUNOScript session closes (the configuration lock is released). If the router receives new SNMP Set requests while the candidate configuration is being committed, the SNMP Set request is rejected and an error is generated. If the router receives new SNMP Set requests before 5 seconds have elapsed, the commit-delay timer (the length of time between when the last SNMP request is received and the commit is requested) resets to 5 seconds.

By default, the timer is set to 5 seconds. To configure the timer for the SNMP Set reply and start of the commit, include the commit-delay statement at the [edit snmp nonvolatile] hierarchy level:

```
[edit snmp nonvolatile]
commit-delay seconds;
```

seconds is the length of the time between when the SNMP request is received and the commit is requested for the candidate configuration. For more information about the configure exclusive command and locking the configuration, see the *JUNOS CLI User Guide*.

Configuring the System Name

The JUNOS software enables you to override the system name by including the name statement at the [edit snmp] hierarchy level:

```
[edit snmp]
name name;
```

If the name contains spaces, enclose it in quotation marks (" ").

Example: Configuring the System Name

Specify the system name override:

```
[edit]
snmp {
    name "snmp 1";
}
```

Configuring the SNMP Community String

The SNMP community string defines the relationship between an SNMP server system and the client systems. This string acts like a password to control the clients' access to the server. To configure a community string in a JUNOS configuration, include the community statement at the [edit snmp] hierarchy level:

```
[edit snmp]
community name {
    authorization authorization;
    clients {
        default restrict;
        address restrict;
    }
    view view-name;
}
```

If the community name contains spaces, enclose it in quotation marks (" ").

The default authorization level for a community is read-only. To allow Set requests within a community, you need to define that community as authorization read-write. For Set requests, you also need to include the specific MIB objects that are accessible with read-write privileges using the view statement. The default view includes all supported MIB objects that are accessible with read-only privileges; no MIB objects are accessible with read-write privileges. For more information on the view statement, see "Configuring MIB Views" on page 45.

The clients statement lists the IP addresses of the clients (community members) that are allowed to use this community. If no clients statement is present, all clients are allowed. For *address*, you must specify an IPv4 or IPv6 address, not a hostname. Include the default restrict option to deny access to all SNMP clients for which access is not explicitly granted. We recommend that you always include the default restrict option to limit SNMP client access to the local router.

NOTE: Community names must be unique. You cannot configure the same community name at the [edit snmp community] and [edit snmp v3 snmp-community *community-index*] hierarchy levels.

Examples: Configuring the SNMP Community String

Grant read-only access to all clients. With the following configuration, the system responds to SNMP Get, GetNext, and GetBulk requests that contain the community string public:

```
[edit]
snmp {
    community public {
        authorization read-only;
    }
}
```

Grant all clients read-write access to the ping MIB and jnxPingMIB. With the following configuration, the system responds to SNMP Get, GetNext, GetBulk, and Set requests that contain the community string private and specify an OID contained in the ping MIB or jnxPingMIB hierarchy:

```
[edit]
snmp {
    view ping-mib-view {
        oid pingMIB include;
        oid jnxPingMIB include;
        community private {
            authorization read-write;
            view ping-mib-view;
        }
    }
}
```

The following configuration allows read-only access to clients with IP addresses in the range 1.2.3.4/24, and denies access to systems in the range fe80::1:2:3:4/64:

```
[edit]
snmp {
    community field-service {
        authorization read-only;
        clients {
            default restrict; # Restrict access to all SNMP clients not explicitly
            # listed on the following lines.
            1.2.3.4/24; # Allow access by all clients in 1.2.3.4/24 except
            fe80::1:2:3:4/64 restrict;# fe80::1:2:3:4/64.
        }
    }
}
```

Adding a Group of Clients to an SNMP Community

The JUNOS software enables you to add one or more groups of clients to an SNMP community. You can include the client-list-name *name* statement at the [edit snmp community *community-name*] hierarchy level to add all the members of the client list or prefix list to an SNMP community.

To define a list of clients, include the client-list statement followed by the IP addresses of the clients at the [edit snmp] hierarchy level:

```
[edit snmp]
   client-list client-list-name {
   ip-addresses;
}
```

You can configure a prefix list at the [edit policy options] hierarchy level. Support for prefix lists in the SNMP community configuration enables you to use a single list to configure the SNMP and routing policies. For more information on the prefix-list statement, see the *JUNOS Policy Framework Configuration Guide*.

To add a client list or prefix list to an SNMP community, include the client-list-name statement at the [edit snmp community *community-name*] hierarchy level:

```
[edit snmp community community-name]
client-list-name client-list-name;
```

NOTE: The client list and prefix list must not have the same name.

Example: Defining a Client List

```
[edit]
snmp {
   client-list clentlist1 {
      10.1.1.1/32;
      10.2.2.2/32;
   }
}
```

Example: Adding a Client List to an SNMP Community

```
[edit]
snmp {
   community community1 {
      authorization read-only;
      client-list-name clientlist1;
   }
}
```

Example: Adding a Prefix List to an SNMP Community

```
[edit]
policy-options{
   prefix-list prefixlist {
   10.3.3.3/32;
   10.5.5.5/32;
   }
}
snmp {
   community community2 {
   client-list-name prefixlist;
   }
}
```

Configuring SNMP Trap Options and Groups on a JUNOS Device

Some carriers have more than one trap receiver that forwards traps to a central NMS. This allows for more than one path for SNMP traps from a router to the central NMS

through different trap receivers. A JUNOS device can be configured to send the same copy of each SNMP trap to every trap receiver configured in the trap group.

The source address in the IP header of each SNMP trap packet is set to the address of the outgoing interface by default. When a trap receiver forwards the packet to the central NMS, the source address is preserved. The central NMS, looking only at the source address of each SNMP trap packet, assumes that each SNMP trap came from a different source.

In reality, the SNMP traps came from the same router, but each left the router through a different outgoing interface.

The statements discussed in the following sections are provided to allow the NMS to recognize the duplicate traps and to distinguish SNMPv1 traps based on the outgoing interface.

To configure SNMP trap options and trap groups, include the trap-options and trap-group statements at the [edit snmp] hierarchy level:

```
[edit snmp]
trap-options {
    agent-address outgoing-interface;
    source-address address;
}
trap-group group-name {
    categories {
        category;
    }
    destination-port port-number;
    targets {
        address;
    }
    version (all | v1 | v2);
}
```

Configuring SNMP Trap Options

Using SNMP trap options, you can set the source address of every SNMP trap packet sent by the router to a single address regardless of the outgoing interface. In addition, you can set the agent address of the SNMPv1 traps. For more information on the contents of SNMPv1 traps, see RFC 1157.

NOTE: SNMP cannot be associated with any routing instances other than the master routing instance.

To configure SNMP trap options, include the trap-options statement at the [edit snmp] hierarchy level:

```
[edit snmp]
trap-options {
    agent-address outgoing-interface;
    source-address address;
```

```
}
```

You must also configure a trap group for the trap options to take effect. For information about trap groups, see "Configuring SNMP Trap Groups" on page 41.

This topic contains the following sections:

Configuring the Source Address for SNMP Traps

You can configure the source address of trap packets in two ways: lo0 or a valid IPv4 address configured on one of the router interfaces. The value lo0 indicates that the source address of the SNMP trap packets will be set to the lowest loopback address configured on the interface lo0.

To specify a valid interface address as the source address for SNMP traps on one of the router interfaces, include the source-address statement at the [edit snmp trap-options] hierarchy level:

```
[edit snmp trap-options]
source-address address;
```

address is a valid IPv4 address configured on one of the router interfaces.

To specify the source address of the SNMP traps so that they will be sent to the lowest loopback address configured on the interface lo0, include the source-address statement at the [edit snmp trap-options] hierarchy level:

```
[edit snmp trap-options]
source-address lo0;
```

To enable and configure the loopback address, include the address statement at the [edit interfaces lo0 unit 0 family inet] hierarchy level:

```
[edit interfaces]
lo0 {
    unit 0 {
        family inet {
            address ip-address;
        }
    }
}
```

Configuring the Loopback Address as the Source Address of Trap Packets

To configure the loopback address and source address trap option:

```
[edit snmp]
trap-options {
    source-address lo0;
}
trap-group "urgent-dispatcher" {
    version v2;
    categories link startup;
    targets {
```

```
        192.168.10.22;
        172.17.1.2;
    }
}
[edit interfaces]
lo0 {
    unit 0 {
        family inet {
            address 10.0.0.1/32;
            address 127.0.0.1/32;
        }
    }
}
```

In this example, the IP address 10.0.0.1 is the source address of every trap sent from this router.

Configuring the Agent Address for SNMP Traps

The agent address is only available in SNMPv1 trap packets (see RFC 1157). By default, the router's default local address is used in the agent address field of the SNMPv1 trap. To configure the agent address, include the agent-address statement at the [edit snmp trap-options] hierarchy level. Currently, the agent address can only be the address of the outgoing interface:

```
[edit snmp]
trap-options {
    agent-address outgoing-interface;
}
```

Example: Configuring the Outgoing Interface as the Agent Address

Configure the outgoing interface as the agent address:

```
[edit snmp]
trap-options {
    agent-address outgoing-interface;
}
trap-group " urgent-dispatcher" {
    version v1;
    categories link startup;
    targets {
        192.168.10.22;
        172.17.1.2;
    }
}
```

In this example, each SNMPv1 trap packet sent has its agent address value set to the IP address of the outgoing interface.

Configuring SNMP Trap Groups

You can create and name a group of one or more types of SNMP traps and then define which systems receive the group of SNMP traps. The trap group must be

configured for SNMP traps to be sent. To create an SNMP trap group, include the trap-group statement at the [edit snmp] hierarchy level:

```
[edit snmp]
trap-group group-name {
    categories {
        category;
    }
    destination-port port-number;
    routing-instance instance;
    targets {
        address;
    }
    version (all | v1 | v2);
}
```

The trap group name can be any string and is embedded in the community name field of the trap. To configure your own trap group port, include the destination-port statement. The default destination port is port 162.

For each trap group that you define, you must include the target statement to define at least one system as the recipient of the SNMP traps in the trap group. Specify the IPv4 or IPv6 address of each recipient, not its hostname.

Specify the types of traps the trap group can receive in the categories statement. For information about which category traps belong to, see "Standard SNMP Traps" on page 143 and "Juniper Networks Enterprise-Specific SNMP Traps" on page 131.

Specify the routing instance used by the trap group in the routing-instance statement. All targets configured in the trap group use this routing instance.

A trap group can receive the following categories:

- authentication—Authentication failures
- chassis—Chassis or environment notifications
- configuration—Configuration notifications
- link—Link-related notifications (up-down transitions, DS-3 and DS-1 line status change, IPv6 interface state change, and Passive Monitoring PIC overload)

NOTE: To send Passive Monitoring PIC overload interface traps, select the link trap category.

- remote-operations—Remote operation notifications
- rmon-alarm—Alarm for RMON events
- routing—Routing protocol notifications
- sonet-alarms—SONET/SDH alarms

NOTE: If you omit the SONET/SDH subcategories, all SONET/SDH trap alarm types are included in trap notifications.

- loss-of-light—Loss of light alarm notification
- pll-lock—PLL lock alarm notification
- loss-of-frame—Loss of frame alarm notification
- loss-of-signal—Loss of signal alarm notification
- severely-errored-frame—Severely errored frame alarm notification
- line-ais—Line alarm indication signal (AIS) alarm notification
- path-ais—Path AIS alarm notification
- loss-of-pointer—Loss of pointer alarm notification
- ber-defect—SONET/SDH bit error rate alarm defect notification
- ber-fault—SONET/SDH error rate alarm fault notification
- line-remote-defect-indication—Line remote defect indication alarm notification
- path-remote-defect-indication—Path remote defect indication alarm notification
- remote-error-indication—Remote error indication alarm notification
- unequipped—Unequipped alarm notification
- path-mismatch—Path mismatch alarm notification
- loss-of-cell—Loss of cell delineation alarm notification
- vt-ais—Virtual tributary (VT) AIS alarm notification
- vt-loss-of-pointer—VT loss of pointer alarm notification
- vt-remote-defect-indication—VT remote defect indication alarm notification
- vt-unequipped—VT unequipped alarm notification
- vt-label-mismatch—VT label mismatch error notification
- vt-loss-of-cell—VT loss of cell delineation notification

- startup—System warm and cold starts
- vrrp-events—Virtual Router Redundancy Protocol (VRRP) events such as new-master or authentication failures

If you include SONET/SDH subcategories, only those SONET/SDH trap alarm types are included in trap notifications.

The version statement allows you to specify the SNMP version of the traps sent to targets of the trap group. If you specify v1 only, SNMPv1 traps are sent. If you specify v2 only, SNMPv2 traps are sent. If you specify all, both an SNMPv1 and an SNMPv2 trap are sent for every trap condition. For more information on the version statement, see version.

Example: Configuring SNMP Trap Groups

Set up a trap notification list named urgent-dispatcher for link and startup traps. This list is used to identify the network management hosts (1.2.3.4 and fe80::1:2:3:4) to which traps generated by the local router should be sent. The name specified for a trap group is used as the SNMP community string when the agent sends traps to the listed targets.

```
[edit]
snmp {
   trap-group "urgent-dispatcher" {
      version v2;
      categories link startup;
      targets {
         1.2.3.4;
         fe80::1:2:3:4;
      }
   }
}
```

Configuring the Interfaces on Which SNMP Requests Can Be Accepted

By default, all router interfaces have SNMP access privileges. To limit the access through certain interfaces only, include the interface statement at the [edit snmp] hierarchy level:

```
[edit snmp]
interface [ interface-names ];
```

Specify the names of any logical or physical interfaces that should have SNMP access privileges. Any SNMP requests entering the router from interfaces not listed are discarded.

Example: Configuring Secured Access List Checking

Grant SNMP access privileges only to devices on interfaces so-0/0/0 and at-1/0/1. The following example does this by configuring a list of logical interfaces:

```
[edit]
snmp {
   interface [ so-0/0/0.0 so-0/0/0.1 at-1/0/1.0 at-1/0/1.1 ];
}
```

The following example grants the same access by configuring a list of physical interfaces:

```
[edit]
snmp {
   interface [ so-0/0/0 at-1/0/1 ];
}
```

Configuring filter-interfaces Options to Hide Interfaces from SNMP Get and GetNext Outputs

The JUNOS software enables you to filter out information related to specific interfaces from the output of SNMP Get and GetNext requests performed on interface-related MIBs such as IF MIB, ATM MIB, RMON MIB, and the Juniper Networks enterprise-specific IF MIB.

You can use the following options of the filter-interfaces statement at the [edit snmp] hierarchy level to specify interfaces that must be hidden from the SNMP Get and GetNext query outputs:

- interfaces—to hide interfaces that match regular expressions specified using this option.
- all-internal-interfaces—to hide the internal interfaces.

```
[edit]
   snmp {
   filter-interfaces {
      interfaces {
         interface1;
         interface2;
      }
      all-internal-interfaces;
   }
}
```

However, note that these settings are limited to SNMP operations, and the users can continue to access information related to the interfaces (including those hidden using the filter-interfaces options) using the appropriate JUNOS CLI commands.

Configuring MIB Views

By default, an SNMP community grants read access and denies write access to all supported MIB objects (even communities configured as authorization read-write). To restrict or grant read or write access to a set of MIB objects, you must configure a MIB view and associate the view with a community.

To configure MIB views, include the view statement at the [edit snmp] hierarchy level:

```
[edit snmp]
view view-name {
   oid object-identifier (include | exclude);
}
```

The view statement defines a MIB view and identifies a group of MIB objects. Each MIB object of a view has a common OID prefix. Each object identifier represents a subtree of the MIB object hierarchy. The subtree can be represented either by a sequence of dotted integers (such as 1.3.6.1.2.1.2) or by its subtree name (such as interfaces). A configuration statement uses a view to specify a group of MIB objects on which to define access. You can also use wildcard character asterisk (*) to include

OIDs that match a particular pattern in the SNMP view. To enable a view, you must associate the view with a community.

NOTE: To remove an OID completely, use the delete view all oid *oid-number* command but omit the include parameter.

To associate MIB views with a community, include the view statement at the [edit snmp community *community-name*] hierarchy level:

```
[edit snmp community community-name]
view view-name;
```

Example: Ping Proxy MIB

Restrict the ping-mib community to read and write access of the Ping MIB and jnxpingMIB only. Read or write access to any other MIB using this community is not allowed.

```
[edit snmp]
view ping-mib-view {
    oid 1.3.6.1.2.1.80 include; #pingMIB
    oid jnxPingMIB include; #jnxPingMIB
}
community ping-mib {
    authorization read-write;
    view ping-mib-view;
}
```

For more information on the Ping MIB, see RFC 2925 and "Juniper Networks Enterprise-Specific MIBs" on page 123.

Tracing SNMP Activity on a JUNOS Device

Simple Network Management Protocol (SNMP) tracing operations track activity for SNMP agents and record the information in log files. The logged error descriptions provide detailed information to help you solve problems faster.

By default, the JUNOS software does not trace any SNMP activity. If you include the traceoptions statement at the [edit snmp] hierarchy level, the default tracing behavior is the following:

- Important activities are logged in files located in the /var/log directory. Each log is named after the SNMP agent that generates it. Currently, the following log files are created in the /var/log directory when the traceoptions statement is used:
  - chassisd
  - craftd
  - ilmid
  - mib2d
  - rmopd

  - serviced
  - snmpd
- When a trace file named *filename* reaches its maximum size, it is renamed *filename*.0, then *filename*.1, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten. (For more information about how log files are created, see the *JUNOS System Log Messages Reference*.)
- Log files can be accessed only by the user who configures the tracing operation.

You cannot change the directory (/var/log) in which trace files are located. However, you can customize the other trace file settings by including the following statements at the [edit snmp] hierarchy level:

```
[edit snmp]
traceoptions {
   file filename  <files number> <size size> <world-readable | no-world-readable>
      <match regex>;
   flag flag;
}
```

These statements are described in the following sections:

- Configuring the SNMP Log Filename on page 47
- Configuring the Number and Size of SNMP Log Files on page 47
- Configuring Access to the Log File on page 48
- Configuring a Regular Expression for Lines to Be Logged on page 48
- Configuring the Trace Operations on page 48

Configuring the SNMP Log Filename

By default, the name of the file that records trace output is snmpd. You can specify a different name by including the file statement at the [edit snmp traceoptions] hierarchy level:

```
[edit snmp traceoptions]
file filename;
```

Configuring the Number and Size of SNMP Log Files

By default, when the trace file reaches 128 kilobytes (KB) in size, it is renamed *filename*.0, then *filename*.1, and so on, until there are three trace files. Then the oldest trace file (*filename*.2) is overwritten.

You can configure the limits on the number and size of trace files by including the following statements at the [edit snmp traceoptions] hierarchy level:

```
[edit snmp traceoptions]
file files number size size;
```

For example, set the maximum file size to 2 MB, and the maximum number of files to 20. When the file that receives the output of the tracing operation (*filename*) reaches 2 MB, *filename* is renamed *filename*.0, and a new file called *filename* is created. When the new *filename* reaches 2 MB, *filename*.0 is renamed *filename*.1 and *filename* is renamed *filename*.0. This process repeats until there are 20 trace files. Then the oldest file (*filename*.19) is overwritten by the newest file (*filename*.0).

The number of files can be from 2 through 1000 files. The file size of each file can be from 10 KB through 1 gigabyte (GB).

Configuring Access to the Log File

By default, log files can be accessed only by the user who configures the tracing operation.

To specify that any user can read all log files, include the file world-readable statement at the [edit snmp traceoptions] hierarchy level:

```
[edit snmp traceoptions]
file world-readable;
```

To explicitly set the default behavior, include the file no-world-readable statement at the [edit snmp traceoptions] hierarchy level:

```
[edit snmp traceoptions]
file no-world-readable;
```

Configuring a Regular Expression for Lines to Be Logged

By default, the trace operation output includes all lines relevant to the logged activities.

You can refine the output by including the match statement at the [edit snmp traceoptions file *filename*] hierarchy level and specifying a regular expression (regex) to be matched:

```
[edit snmp traceoptions]
file filename match regex;
```

Configuring the Trace Operations

By default, only important activities are logged. You can specify which trace operations are to be logged by including the following flag statement (with one or more tracing flags) at the [edit snmp traceoptions] hierarchy level:

```
[edit snmp traceoptions]
flag {
   all;
   configuration;
   database;
   events;
   general;
   interface-stats;
   nonvolatile-sets;
```

```
    pdu;
    policy:
    protocol-timeouts;
    routing-socket;
    server;
    subagent;
    timer;
    varbind-error;
}
```

Table 9 on page 49 describes the meaning of the SNMP tracing flags.

Table 9: SNMP Tracing Flags

Flag	Description	Default Setting
all	Log all operations.	Off
configuration	Log reading of configuration at the [edit snmp] hierarchy level.	Off
database	Log events involving storage and retrieval in events database.	Off
events	Log important events.	Off
general	Log general events.	Off
interface-stats	Log physical and logical interface statistics.	Off
nonvolatile-set	Log nonvolatile SNMP set request handling.	Off
pdu	Log SNMP request and response packets.	Off
policy	Log policy processing.	Off
protocol-timeouts	Log SNMP response timeouts.	Off
routing-socket	Log routing socket calls.	Off
server	Log communication with processes that are generating events.	Off
subagent	Log subagent restarts.	Off
timer	Log internal timer events.	Off
varbind-error	Log variable binding errors.	Off

To display the end of the log for an agent, issue the show log *agent*d | last operational mode command:

```
[edit]
user@host# run show log agentd | last
```

where *agent* is the name of an SNMP agent.

Example: Tracing SNMP Activity

Trace information about SNMP packets:

```
[edit]
snmp {
    traceoptions {
        file size 10k files 5;
        flag pdu;
        flag protocol-timeouts;
        flag varbind-error;
    }
}
```

Configuring the Local Engine ID

For information about configuring a local engine ID as the administratively unique identifier for an SNMPv3 engine, see “Configuring the Local Engine ID” on page 56.

Chapter 6

SNMPv3 Overview

This chapter contains the following topic:

SNMPv3 Overview

In contrast to SNMP version 1 (SNMPv1) and SNMP version 2 (SNMPv2), SNMP version 3 (SNMPv3) supports authentication and encryption. SNMPv3 uses the user-based security model (USM) for message security and the view-based access control model (VACM) for access control. USM specifies authentication and encryption. VACM specifies access-control rules.

USM uses the concept of a user for which security parameters (levels of security, authentication, privacy protocols, and keys) are configured for both the agent and the manager. Messages sent using USM are better protected than messages sent with community strings, where passwords are sent in the clear. With USM, messages exchanged between the manager and the agent can have data integrity checking and data origin authentication. USM protects against message delays and message replays by using time indicators and request IDs. Encryption is also available.

To complement the USM, SNMPv3 uses the VACM, a highly granular access-control model for SNMPv3 applications. Based on the concept of applying security policies to the name of the groups querying the agent, the agent decides whether the group is allowed to view or change specific Management Information Base (MIB) objects. VACM defines collections of data (called views), groups of data users, and access statements that define which views a particular group of users can use for reading, writing, or receiving traps.

Trap entries in SNMPv3 are created by configuring the notify, notify filter, target address, and target parameters. The notify statement specifies the type of notification (trap) and contains a single tag. The tag defines a set of target addresses to receive a trap. The notify filter defines access to a collection of trap OIDs. The target address defines a management application's address and other attributes to be used in sending notifications. Target parameters define the message processing and security parameters to be used in sending notifications to a particular management target.

To configure SNMPv3, perform the following tasks:

- Creating SNMPv3 Users on page 57
- Configuring MIB Views on page 45

Chapter 7

Configuring SNMPv3

This chapter contains the following topics:

Complete SNMPv3 Configuration Statements

To configure SNMPv3, include the following statements at the [edit snmp v3] and [edit snmp] hierarchy levels:

```
[edit snmp]
engine-id {
    (local engine-id | use-fxp0-mac-address | use-default-ip-address);
}
view view-name {
    oid object-identifier (include | exclude);
}
[edit snmp v3]
notify  name {
    tag tag-name;
    type (trap | inform);
}
notify-filter profile-name {
    oid object-identifier (include | exclude);
}
snmp-community community-index {
    community-name community-name;
    security-name security-name;
    tag tag-name;
}
target-address target-address-name {
    address address;
    address-mask address-mask;
    inform-retry-count number;
    inform-timeout seconds;
    port port-number;
    routing-instance instance;
    tag-list tag-list;
    target-parameters target-parameters-name;
}
target-parameters target-parameters-name {
    notify-filter profile-name;
    parameters {
        message-processing-model (v1 | v2c | v3);
        security-model (usm | v1 | v2c);
        security-level (authentication | none | privacy);
        security-name security-name;
    }
}
usm {
    (local-engine | remote-engine engine-id) {
        user username {
            authentication-md5 {
                authentication-password authentication-password;
            }
            authentication-none;
            authentication-sha {
                authentication-password authentication-password;
            }
            privacy-3des {
```

```
            privacy-password privacy-password;
        }
        privacy-aes128 {
            privacy-password privacy-password;
        }
        privacy-des {
            privacy-password privacy-password;
        }
        privacy-none;
    }
  }
}
vacm {
  access {
    group group-name {
      default-context-prefix {
        security-model (any | usm | v1 | v2c) {
          security-level (authentication | none | privacy) {
            notify-view view-name;
            read-view view-name;
            write-view view-name;
          }
        }
      }
    }
  }
  security-to-group {
    security-model (usm | v1 | v2c) {
      security-name security-name {
        group group-name;
      }
    }
  }
}
```

Minimum SNMPv3 Configuration on a JUNOS Device

To configure the minimum requirements for SNMPv3, include the following statements at the [edit snmp v3] and [edit snmp] hierarchy levels of the JUNOS configuration:

```
[edit snmp]
view view-name {
  oid object-identifier (include | exclude);
}
[edit snmp v3]
notify  name {
  tag tag-name;
}
notify-filter profile-name {
  oid object-identifier (include | exclude);
}
snmp-community community-index {
  security-name security-name;
}
target-address target-address-name {
```

```
    address address;
    target-parameters target-parameters-name;
}
target-parameters target-parameters-name {
    notify-filter profile-name;
    parameters {
        message-processing-model (v1 | v2c | v3);
        security-model (usm | v1 | v2c);
        security-level (authentication | none | privacy);
        security-name security-name;
    }
}
usm {
    local-engine {
        user username {
        }
    }
}
vacm {
    access {
        group group-name {
            default-context-prefix {
                security-model (any | usm | v1 | v2c) {
                    security-level (authentication | none | privacy) {
                    }
                }
            }
        }
    }
    security-to-group {
        security-model (usm | v1 | v2c) {
            security-name security-name {
                group group-name;
            }
        }
    }
}
```

NOTE: You must configure at least one view (notify, read, or write) at the [edit snmp view-name] hierarchy level.

Configuring the Local Engine ID

By default, the local engine ID uses the default IP address of the router. The local engine ID is the administratively unique identifier for the SNMPv3 engine. This statement is optional. To configure the local engine ID, include the engine-id statement at the [edit snmp] hierarchy level:

```
[edit snmp]
engine-id {
    (local engine-id-suffix | use-default-ip-address | use-mac-address);
}
```

- local *engine-id-suffix*—The engine ID suffix is explicitly configured.
- use-default-ip-address—The engine ID suffix is generated from the default IP address.
- use-mac-address—The SNMP engine identifier is generated from the Media Access Control (MAC) address of the management interface on the routing platform.

The local engine ID is defined as the administratively unique identifier of an SNMPv3 engine, and is used for identification, not for addressing. There are two parts of an engine ID: prefix and suffix. The prefix is formatted according to the specifications defined in RFC 3411, *An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks*. You can configure the suffix here.

NOTE: SNMPv3 authentication and encryption keys are generated based on the associated passwords and the engine ID. If you configure or change the engine ID, you must commit the new engine ID before you configure SNMPv3 users. Otherwise the keys generated from the configured passwords will be based on the previous engine ID. For the engine ID, we recommend using the MAC address of fxp0.

Creating SNMPv3 Users

For each SNMPv3 user, you can specify the username, authentication type, authentication password, privacy type, and privacy password. After the password is entered, a key based on the engine ID and password is generated and is written to the configuration file. After key generation, the password is deleted from this file.

NOTE: You can only configure one encryption type for each SNMPv3 user.

To create users, include the user statement at the [edit snmp v3 usm local-engine] hierarchy level:

```
[edit snmp v3 usm local-engine]
user username;
```

username is the name that identifies the SNMPv3 user.

To configure user authentication and encryption, include the following statements at the [edit snmp v3 usm local-engine user *username*] hierarchy level:

```
[edit snmp v3 usm local-engine user username]
authentication-md5 {
    authentication-password authentication-password;
}
authentication-sha {
    authentication-password authentication-password;
}
authentication-none;
privacy-aes128 {
    privacy-password privacy-password;
```

```
}
privacy-des {
    privacy-password privacy-password;
}
privacy-3des {
    privacy-password privacy-password;
}
privacy-none;
```

Configuring the SNMPv3 Authentication Type

By default, in a JUNOS configuration the SNMPv3 authentication type is set to none.

This topic includes the following sections:

Configuring MD5 Authentication

To configure the message digest algorithm (MD5) as the authentication type for an SNMPv3 user, include the authentication-md5 statement at the [edit snmp v3 usm local-engine user *username*] hierarchy level:

```
[edit snmp v3 usm local-engine user username]
authentication-md5 {
    authentication-password authentication-password;
}
```

authentication-password is the password used to generate the key used for authentication.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Configuring SHA Authentication

To configure the secure hash algorithm (SHA) as the authentication type for an SNMPv3 user, include the authentication-sha statement at the [edit snmp v3 usm local-engine user *username*] hierarchy level:

```
[edit snmp v3 usm local-engine user username]
authentication-sha {
    authentication-password authentication-password;
}
```

authentication-password is the password used to generate the key used for authentication.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Configuring No Authentication

To configure no authentication for an SNMPv3 user, include the authentication-none statement at the [edit snmp v3 usm local-engine user *username*] hierarchy level:

```
[edit snmp v3 usm local-engine user username]
authentication-none;
```

Configuring the Encryption Type

By default, encryption is set to none.

NOTE: Before you configure encryption, you must configure the MD5 or SHA authentication.

Before you configure the privacy-3des and privacy-aes128 statements, you must install the jcrypto package.

This topic includes the following sections:

Configuring the Advanced Encryption Standard Algorithm

To configure the Advanced Encryption Standard (AES) algorithm for an SNMPv3 user, include the privacy-aes128 statement at the [edit snmp v3 usm local-engine user *username*] hierarchy level:

```
[snmp v3 usm local-engine user username]
privacy-aes128 {
    privacy-password privacy-password;
}
```

privacy-password is the password used to generate the key used for encryption.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Configuring the Data Encryption Algorithm

To configure the data encryption algorithm (DES) for an SNMPv3 user, include the privacy-des statement at the [edit snmp v3 usm local-engine user *username*] hierarchy level:

```
[edit snmp v3 usm local-engine user username]
privacy-des {
    privacy-password privacy-password;
}
```

privacy-password is the password used to generate the key used for encryption.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Configuring Triple DES

To configure triple DES for an SNMPv3 user, include the privacy-3des statement at the [edit snmp v3 usm local-engine user *username*] hierarchy level:

```
[snmp v3 usm local-engine user username]
privacy-3des {
    privacy-password privacy-password;
}
```

privacy-password is the password used to generate the key used for encryption.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Configuring No Encryption

To configure no encryption for an SNMPv3 user, include the privacy-none statement at the [edit snmp v3 usm local-engine user *username*] hierarchy level:

```
[edit snmp v3 usm local-engine user username]
privacy-none;
```

Example: Creating SNMPv3 Users Configuration

Define SNMPv3 users:

```
[edit]
snmp {
    v3 {
        usm {
            local-engine {
                user user1 {
                    authentication-md5 {
                        authentication-password authentication-password;
                    }
                    privacy-des {
                        privacy-password password;
                    }
                }
                user user2 {
                    authentication-sha {
                        authentication-password authentication-password;
                    }
                    privacy-none;
                }
                user user3 {
                    authentication-none;
                    privacy-none;
                }
                user user4 {
                    authentication-md5 {
                        authentication-password authentication-password;
                    }
                    privacy-des {
                        privacy-password authentication-password;
                    }
                }
                user user5 {
                    authentication-sha {
                        authentication-password authentication-password;
                    }
                    privacy-aes128 {
                        privacy-password authentication-password;
                    }
                }
            }
        }
    }
}
```

Defining Access Privileges for an SNMP Group

The Simple Network Management Protocol version 3 (SNMPv3) uses the view-based access control model (VACM), which allows you to configure the access privileges granted to a group. Access is controlled by filtering the MIB objects available for a specific operation through a predefined view. You assign views to determine the objects that are visible for read, write, and notify operations for a particular group, using a particular context, a particular security model (v1,v2c, or usm), and particular security level (authenticated, privacy, or none). For information about how to configure views, see "Configuring MIB Views" on page 45.

You define user access to management information at the [edit snmp v3 vacm] hierarchy level. All access control within VACM operates on groups, which are collections of users as defined by USM, or community strings as defined in the SNMPv1 and SNMPv2c security models. The term *security-name* refers to these generic end users. The group to which a specific security name belongs is configured at the [edit snmp v3 vacm security-to-group] hierarchy level. That security name can be associated with a group defined at the [edit snmp v3 vacm security-to-group] hierarchy level. A group identifies a collection of SNMP users that share the same access policy. You then define the access privileges associated with a group at the [edit snmp v3 vacm access] hierarchy level. Access privileges are defined using views. For each group, you can apply different views depending on the SNMP operation; for example, reads (get, getNext, or getBulk) writes (set), notifications, the security level used (authentication, privacy, or none), and the security model (v1, v2c, or usm) used within an SNMP request.

You configure members of a group with the security-name statement. For v3 packets using USM, the security name is the same as the username. For SNMPv1 or SNMPv2c packets, the security name is determined based on the community string. Security names are specific to a security model. If you are also configuring VACM access policies for SNMPv1 or SNMPv2c packets, you must assign security names to groups for each security model (SNMPv1 or SNMPv2c) at the [edit snmp v3 vacm security-to-group] hierarchy level. You must also associate a security name with an SNMP community at the [edit snmp v3 snmp-community *community-index*] hierarchy level.

To configure the access privileges for an SNMP group, include statements at the [edit snmp v3 vacm] hierarchy level:

```
[edit snmp v3 vacm]
access {
    group group-name {
        default-context-prefix {
            security-model (any | usm | v1 | v2c) {
                security-level (authentication | none | privacy) {
                    notify-view view-name;
                    read-view view-name;
                    write-view view-name;
                }
            }
        }
    }
}
security-to-group {
```

```
    security-model (usm | v1 | v2c) {
        security-name security-name {
            group group-name;
        }
    }
}
```

Configuring the Access Privileges Granted to a Group

This topics includes the following sections:

Configuring the Group

To configure the access privileges granted to a group, include the **group** statement at the [**edit snmp v3 vacm access**] hierarchy level:

```
[edit snmp v3 vacm access]
group group-name;
```

group-name is a collection of SNMP users that belong to a common SNMP list that defines an access policy. Users belonging to a particular SNMP group inherit all access privileges granted to that group.

Configuring the Security Model

To configure the security model, include the **security-model** statement at the [**edit snmp v3 vacm access group** *group-name* **default-context-prefix**] hierarchy level:

```
[edit snmp v3 vacm access group group-name default-context-prefix]
security-model (any | usm | v1 | v2c);
```

- **any**—Any security model
- **usm**—SNMPv3 security model
- **v1**—SNMPV1 security model
- **v2c**—SNMPv2c security model

Configuring the Security Level

To configure the access privileges granted to packets with a particular security level, include the **security-level** statement at the [**edit snmp v3 vacm access group** *group-name* **default-context-prefix security-model** (**any** | **usm** | **v1** | **v2c**)] hierarchy level:

```
[edit snmp v3 vacm access group group-name default-context-prefix security-model
(any | usm | v1 | v2c)]
```

security-level (authentication | none | privacy);

- none—Provides no authentication and no encryption.
- authentication—Provides authentication but no encryption.
- privacy—Provides authentication and encryption.

NOTE: Access privileges are granted to all packets with a security level equal to or greater than that configured. If you are configuring the SNMPv1 or SNMPv2c security model, use none as your security level. If you are configuring the SNMPv3 security model (USM), use the authentication, none, or privacy security level.

Associating MIB Views with an SNMP User Group

MIB views define access privileges for members of a group. Separate views can be applied for each SNMP operation (read, write, and notify) within each security model (usm, v1, and v2c) and each security level (authentication, none, and privacy) supported by SNMP.

To associate MIB views with an SNMP user group, include the following statements at the [edit snmp v3 vacm access group *group-name* default-context-prefix security-model (any | usm | v1 | v2c) security-level (authentication | none | privacy)] hierarchy level:

```
[edit snmp v3 vacm access group group-name default-context-prefix security model
   (any | usm | v1 | v2c) security-level (authentication | none | privacy)]
notify-view view-name;
read-view view-name;
write-view view-name;
```

NOTE: You must associate at least one view (notify, read, or write) at the [edit snmp v3 vacm access group *group-name* default-context-prefix security-model (any | usm | v1 | v2c) security-level (authentication | none | privacy)] hierarchy level.

You must configure the MIB view at the [edit snmp view *view-name*] hierarchy level. For information about how to configure MIB views, see “Configuring MIB Views” on page 45.

This section describes the following topics related to this configuration:

Configuring the Notify View

To associate notify access with an SNMP user group, include the **notify-view** statement at the [**edit snmp v3 vacm access group** *group-name* **default-context-prefix security-model (any | usm | v1 | v2c) security-level (authentication | none | privacy)**] hierarchy level:

```
[edit snmp v3 vacm access group group-name default-context-prefix security-model
   (any | usm | v1 | v2c) security-level (authentication | none | privacy)]
notify-view view-name;
```

view-name specifies the notify access, which is a list of notifications that can be sent to each user in an SNMP group. A view name cannot exceed 32 characters.

Configuring the Read View

To associate a read view with an SNMP group, include the **read-view** statement at the [**edit snmp v3 vacm access group** *group-name* **default-context-prefix security-model (any | usm | v1 | v2c) security-level (authentication | none | privacy)**] hierarchy level:

```
[edit snmp v3 vacm access group group-name default-context-prefix security-model
   (any | usm | v1 | v2c) security-level (authentication | none | privacy)]
read-view view-name;
```

view-name specifies read access for an SNMP user group. A view name cannot exceed 32 characters.

Configuring the Write View

To associate a write view with an SNMP user group, include the **write-view** statement at the [**edit snmp v3 vacm access group** *group-name* **default-context-prefix security-model (any | usm | v1 | v2c) security-level (authentication | none | privacy)**] hierarchy level:

```
[edit snmp v3 vacm access group group-name default-context-prefix security-model
   (any | usm | v1 | v2c) security-level (authentication | none | privacy)]
write-view view-name;
```

view-name specifies write access for an SNMP user group. A view name cannot exceed 32 characters.

Example: Access Privilege Configuration

Define access privileges:

```
[edit snmp v3]
access {
   group group1 {
      default-context-prefix {
         security-model usm {          #Define an SNMPv3 security model
            security-level privacy {
               notify-view nv1;
               read-view rv1;
               write-view wv1;
            }
```

```
        }
      }
    }
    group group2 {
      default-context-prefix {
        security-model usm {          #Define an SNMPv3 security model
          security-level authentication {
            read-view rv2;
            write-view wv2;
          }
        }
      }
    }
    group group3 {
      default-context-prefix {
        security-model v1 {           #Define an SNMPv3 security model
          security-level none {
            read-view rv3;
            write-view wv3;
          }
        }
      }
    }
}
```

Assigning Security Names to Groups

To assign security names to groups, include the following statements at the [edit snmp v3 vacm security-to-group] hierarchy level:

```
[edit snmp v3 vacm security-to-group]
security-model (usm | v1 | v2c) {
   security-name security-name {
      group group-name;
   }
}
```

This topic includes the following sections:

Configuring the Security Model

To configure the security model, include the security-model statement at the [edit snmp v3 vacm security-to-group] hierarchy level:

```
[edit snmp v3 vacm security-to-group]
security-model (usm | v1 | v2c);
```

- usm—SNMPv3 security model
- v1—SNMPv1 security model

- v2c—SNMPv2 security model

Configuring the Security Name

To associate a security name with a user or community string, include the security-name statement at the [edit snmp v3 vacm security-to-group security-model (usm | v1 | v2c)] hierarchy level:

```
[edit snmp v3 vacm security-to-group security-model (usm | v1 | v2c)]
security-name security-name;
```

security-name is the username configured at the [edit snmp v3 usm local-engine user *username*] hierarchy level. For SNMPv1 and SNMPv2c, the security name is the community string configured at the [edit snmp v3 snmp-community *community-index*] hierarchy level. For information about configuring usernames, see "Creating SNMPv3 Users" on page 57. For information about configuring a community string, see "Configuring the SNMPv3 Community" on page 80.

NOTE: The USM security name is separate from the SNMPv1 and SNMPv2c security name. If you are supporting SNMPv1 and SNMPv2c, you must configure separate security names within the security-to-group configuration at the [edit snmp v3 vacm access] hierarchy level.

Configuring the Group

After you have created users, v1, or v2 security names, you associate them with a group. A group is a set of security names belonging to a particular security model. A group defines the access rights for all users belonging to it. Access rights define what SNMP objects can be read, written to, or created. A group also defines what notifications a user is allowed to receive.

If you already have a group that is configured with all of the view and access permissions that you want to give a user, you can add the user to that group. If you want to give a user view and access permissions that no other groups have, or if you do not have any groups configured, create a group and add the user to it.

To configure the access privileges granted to a group, include the group statement at the [edit snmp v3 vacm security-to-group security-model (usm | v1 | v2c) security-name *security-name*] hierarchy level:

```
[edit snmp v3 vacm security-to-group security-model (usm | v1 | v2c) security-name
   security-name]
group group-name;
```

group-name identifies a collection of SNMP security names that share the same access policy. For more information about groups, see "Defining Access Privileges for an SNMP Group" on page 62.

Example: Security Group Configuration

Assign security names to groups:

```
vacm {
   security-to-group {
      security-model usm {
         security-name user1 {
            group group1;
         }
         security-name user2 {
            group group2;
         }
         security-name user3 {
            group group3;
         }
      }
   }
}
```

Configuring SNMPv3 Traps on a JUNOS Device

In SNMPv3, traps and informs are created by configuring the notify, target-address, and target-parameters parameters. Traps are unconfirmed notifications and informs are confirmed notifications. This section describes how to configure SNMP traps. For information on configuring SNMP informs, see "Configuring SNMP Informs" on page 76.

The target address defines a management application's address and parameters to be used in sending notifications. Target parameters define the message processing and security parameters that are used in sending notifications to a particular management target. SNMPv3 also lets you define SNMPv1 and SNMPv2c traps.

NOTE: When you configure SNMP traps, make sure your configured access privileges allow the traps to be sent. Access privileges are configured at the [edit snmp v3 vacm access] and [edit snmp v3 vacm security-to-group] hierarchy levels.

To configure SNMP traps, include the following statements at the [edit snmp v3] hierarchy level:

```
[edit snmp v3]
notify name {
   tag tag-name;
   type (trap | inform);
}
notify-filter name {
   oid object-identifier (include | exclude);
}
target-address target-address-name {
   address address;
   address-mask address-mask;
   port port-number;
```

```
    routing-instance instance;
    tag-list tag-list;
    target-parameters target-parameters-name;
}
target-parameters target-parameters-name {
    notify-filter profile-name;
    parameters {
        message-processing-model (v1 | v2c | v3);
        security-model (usm | v1 | v2c);
        security-level (authentication | none | privacy);
        security-name security-name;
    }
}
```

Configuring the SNMPv3 Trap Notification

The notify statement specifies the type of notification (trap) and contains a single tag. The tag defines a set of target addresses to receive a trap. The tag list contains one or more tags and is configured at the [edit snmp v3 target-address *target-address-name*] hierarchy level. If the tag list contains this tag, the JUNOS software sends a notification to all the target addresses associated with this tag.

To configure the trap notifications, include the notify statement at the [edit snmp v3] hierarchy level:

```
[edit snmp v3]
notify name {
    tag tag-name;
    type trap;
}
```

name is the name assigned to the notification.

tag-name defines the target addresses that are sent this notification. All the target-addresses that have this tag in their tag list are sent this notification. The *tag-name* is not included in the notification.

trap is the type of notification.

NOTE: Each notify entry name must be unique.

The JUNOS software supports two types of notification: trap and inform.

For information about how to configure the tag list, see "Configuring the Tag List" on page 72.

Example: Trap Notification Configuration

Specify three sets of destinations to send traps:

```
[edit snmp v3]
notify n1 {
    tag router1;
    type trap;
```

```
}
notify n2 {
    tag router2;
    type trap
}
notify n3 {
    tag router3;
    type trap;
}
```

Configuring the Trap Notification Filter

SNMPv3 uses the notify filter to define which traps (or which objects from which traps) will be sent to the network management system (NMS). The trap notification filter limits the type of traps that are sent to the NMS.

Each object identifier represents a subtree of the MIB object hierarchy. The subtree can be represented either by a sequence of dotted integers (such as 1.3.6.1.2.1.2) or by its subtree name (such as interfaces). You can also use the wildcard character asterisk (*) in the OID to specify object identifiers that match a particular pattern.

To configure the trap notifications filter, include the notify-filter statement at the [edit snmp v3] hierarchy level:

```
[edit snmp v3]
notify-filter profile-name;
```

profile-name is the name assigned to the notify filter.

By default, the OID is set to include. To define access to traps (or objects from traps), include the oid statement at the [edit snmp v3 notify-filter *profile-name*] hierarchy level:

```
[edit snmp v3 notify-filter profile-name]
oid oid (include | exclude);
```

oid is the object identifier. All MIB objects represented by this statement have the specified OID as a prefix. It can be specified either by a sequence of dotted integers or by a subtree name.

- include—Include the subtree of MIB objects represented by the specified OID.
- exclude—Exclude the subtree of MIB objects represented by the specified OID.

Configuring the Trap Target Address

The target address defines a management application's address and parameters that are used in sending notifications. It can also identify management stations that are allowed to use specific community strings. When you receive a packet with a recognized community string and a tag is associated with it, the JUNOS software looks up all the target addresses with this tag and verifies that the source address of this packet matches one of the configured target addresses.

NOTE: You must configure the address mask when you configure the SNMP community.

To specify where you want the traps to be sent and define what SNMPv1 and SNMP2vc packets are allowed, include the target-address statement at the [edit snmp v3] hierarchy level:

```
[edit snmp v3]
target-address target-address-name;
```

target-address-name is the string that identifies the target address.

To configure the target address properties, include the following statements at the [edit snmp v3 target-address *target-address-name*] hierarchy level:

```
[edit snmp v3 target-address target-address-name]
address address;
address-mask address-mask;
port port-number;
routing-instance instance;
tag-list tag-list;
target-parameters target-parameters-name;
```

This section includes the following topics:

Configuring the Address

To configure the address, include the address statement at the [edit snmp v3 target-address *target-address-name*] hierarchy level:

```
[edit snmp v3 target-address target-address-name]
address address;
```

address is the SNMP target address.

Configuring the Address Mask

The address mask specifies a set of addresses that are allowed to use a community string and verifies the source addresses for a group of target addresses.

To configure the address mask, include the address-mask statement at the [edit snmp v3 target-address *target-address-name*] hierarchy level:

```
[edit snmp v3 target-address target-address-name]
address-mask address-mask;
```

address-mask combined with the address defines a range of addresses. For information about how to configure the community string, see "Configuring the SNMPv3 Community" on page 80.

Configuring the Port

By default, the UDP port is set to 162. To configure a different port number, include the port statement at the [edit snmp v3 target-address *target-address-name*] hierarchy level:

```
[edit snmp v3 target-address target-address-name]
port port-number;
```

port-number is the SNMP target port number.

Configuring the Routing Instance

Traps are sent over the default routing instance, To configure the routing instance for sending traps, include the routing-instance statement at the [edit snmp v3 target-address *target-address-name*] hierarchy level:

```
[edit snmp v3 target-address target-address-name]
routing-instance instance;
```

instance is the name of the routing instance. To configure a routing instance within a logical system, specify the logical system name followed by the routing instance name. Use a slash (/) to separate the two names (for example, test-lr/test-ri). To configure the default routing instance on a logical system, specify the logical system name followed by default (for example, test-lr/default).

Configuring the Tag List

Each target-address statement can have one or more tags configured in its tag list. Each tag can appear in more than one tag list. When a significant event occurs on the network device, the tag list identifies the targets to which a notification is sent.

To configure the tag list, include the tag-list statement at the [edit snmp v3 target-address *target-address-name*] hierarchy level:

```
[edit snmp v3 target-address target-address-name]
tag-list "tag-list";
```

tag-list specifies one or more tags as a space-separated list enclosed within double quotes.

For information about how to specify a tag at the [edit snmp v3 notify *notify-name*] hierarchy level, see "Configuring the SNMPv3 Trap Notification" on page 69.

Example: Configuring the Tag List

In the following example, two tag entries (router1 and router2) are defined at the [edit snmp v3 notify *notify-name*] hierarchy level. When an event triggers a notification, the

JUNOS software sends a trap to all target addresses that have router1 or router2 configured in their target-address tag list. This results in the first two targets getting one trap each, and the third target getting two traps.

```
[edit snmp v3]
notify n1 {
   tag router1; # Identifies a set of target addresses
   type trap; # Defines the type of notification
}
notify n2 {
   tag router2;
   type trap;
}
target-address ta1 {
   address 10.1.1.1;
   address-mask 255.255.255.0;
   port 162;
   tag-list router1;
   target-parameters tp1;
}
target-address ta2 {
   address 10.1.1.2;
   address-mask 255.255.255.0;
   port 162;
   tag-list router2;
   target-parameters tp2;
}
target-address ta3 {
   address 10.1.1.3;
   address-mask 255.255.255.0;
   port 162;
   tag-list “router1 router2”; #Define multiple tags in the target address tag list
   target-parameters tp3;
}
```

NOTE: When you configure SNMP traps, make sure your configured access privileges allow the traps to be sent. Configure access privileges at the [edit snmp v3 vacm access] hierarchy level.

Applying Target Parameters

The target-parameters statement at the [edit snmp v3] hierarchy level applies the target parameters configured at the [edit snmp v3 target-parameters *target-parameters-name*] hierarchy level.

To reference configured target parameters, include the target-parameters statement at the [edit snmp v3 target-address *target-address-name*] hierarchy level:

```
[edit snmp v3 target-address target-address-name]
target-parameters target-parameters-name;
```

target-parameters-name is the name associated with the message processing and security parameters that are used in sending notifications to a particular management target.

Defining and Configuring the Trap Target Parameters

Target parameters define the message processing and security parameters that are used in sending notifications to a particular management target.

To define a set of target parameters, include the target-parameters statement at the [edit snmp v3] hierarchy level:

```
[edit snmp v3]
target-parameters target-parameters-name;
```

target-parameters-name is the name assigned to the target parameters.

To configure target parameter properties, include the following statements at the [edit snmp v3 target-parameters *target-parameter-name*] hierarchy level:

```
[edit snmp v3 target-parameters target-parameter-name]
notify-filter profile-name;
parameters {
    message-processing-model (v1 | v2c | V3);
    security-level (authentication | none | privacy);
    security-model (usm | v1 | v2c);
    security-name security-name;
}
```

This topic includes the following sections:

Applying the Trap Notification Filter

To apply the trap notification filter, include the notify-filter statement at the [edit snmp v3 target-parameters *target-parameter-name*] hierarchy level:

```
[edit snmp v3 target-parameters target-parameter-name]
notify-filter profile-name;
```

profile-name is the name of a configured notify filter. For information about configuring notify filters, see “Configuring the Trap Notification Filter” on page 70.

Configuring the Target Parameters

To configure target parameter properties, include the following statements at the [edit snmp v3 target-parameters *target-parameter-name* parameters] hierarchy level:

```
[edit snmp v3 target-parameters target-parameter-name parameters]
message-processing-model (v1 | v2c | v3);
security-model (usm | v1 | v2c);
```

```
security-level (authentication | none | privacy);
security-name security-name;
```

This section includes the following topics:

Configuring the Message Processing Model

The message processing model defines which version of SNMP to use when generating SNMP notifications. To configure the message processing model, include the message-processing-model statement at the [edit snmp v3 target-parameters *target-parameter-name* parameters] hierarchy level:

```
[edit snmp v3 target-parameters target-parameter-name parameters]
message-processing-model (v1 | v2c | v3);
```

- v1—SNMPv1 message processing model
- v2c—SNMPv2c message processing model
- v3—SNMPV3 message processing model

Configuring the Security Model

To define the security model to use when generating SNMP notifications, include the security-model statement at the [edit snmp v3 target-parameters *target-parameter-name* parameters] hierarchy level:

```
[edit snmp v3 target-parameters target-parameter-name parameters]
security-model (usm | v1 | v2c);
```

- usm—SNMPv3 security model
- v1—SNMPv1 security model
- v2c—SNMPv2c security model

Configuring the Security Level

The security-level statement specifies whether the trap is authenticated and encrypted before it is sent.

To configure the security level to use when generating SNMP notifications, include the security-level statement at the [edit snmp v3 target-parameters *target-parameter-name* parameters] hierarchy level:

```
[edit snmp v3 target-parameters target-parameter-name parameters]
security-level (authentication | none | privacy);
```

- authentication—Provides authentication but no encryption.
- none—No security. Provides no authentication and no encryption.
- privacy—Provides authentication and encryption.

NOTE: If you are configuring the SNMPv1 or SNMPV2c security model, use none as your security level. If you are configuring the SNMPv3 (USM) security model, use the authentication or privacy security level.

Configuring the Security Name

To configure the security name to use when generating SNMP notifications, include the security-name statement at the [edit snmp v3 target-parameters *target-parameter-name* parameters] hierarchy level:

```
[edit snmp v3 target-parameters target-parameter-name parameters]
security-name security-name;
```

If the USM security model is used, the security-name identifies the user that is used when the notification is generated. If the v1 or v2c security models are used, security-name identifies the SNMP community used when the notification is generated.

NOTE: The access privileges for the group associated with a security name must allow this notification to be sent.

If you are using the v1 or v2 security models, the security name at the [edit snmp v3 vacm security-to-group] hierarchy level must match the security name at the [edit snmp v3 snmp-community *community-index*] hierarchy level.

Configuring SNMP Informs

The JUNOS software supports two types of notifications: traps and informs. With traps, the receiver does not send any acknowledgment when it receives a trap. Therefore, the sender cannot determine if the trap was received. A trap may be lost because a problem occurred during transmission. To increase reliability, an inform is similar to a trap except that the inform is stored and retransmitted at regular intervals until one of these conditions occurs:

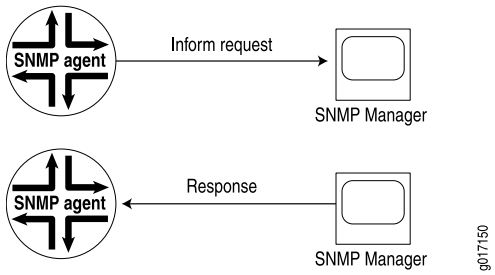
- The receiver (target) of the inform returns an acknowledgment to the SNMP agent.
- A specified number of unsuccessful retransmissions have been attempted and the agent discards the inform message.

If the sender never receives a response, the inform can be sent again. Thus, informs are more likely to reach their intended destination than traps are. Informs use the

same communications channel as traps (same socket and port) but have different protocol data unit (PDU) types.

Informs are more reliable than traps, but they consume more network and router resources (See Figure 1 on page 77). Unlike a trap, an inform is held in memory until a response is received or the timeout is reached. Also, traps are sent only once, whereas an inform may be retried several times. Use informs when it is important that the SNMP manager receive all notifications. However, if you are more concerned about network traffic or router memory, use traps.

Figure 1: Inform Request and Response



For information on configuring SNMP traps, see “Configuring SNMPv3 Traps on a JUNOS Device” on page 68.

Configuring the Remote Engine and Remote User

To send inform messages to an SNMPv3 user on a remote device, you must first specify the engine identifier for the SNMP agent on the remote device where the user resides. The remote engine ID is used to compute the security digest for authenticating and encrypting packets sent to a user on the remote host. When sending an inform message, the agent uses the credentials of the user configured on the remote engine (inform target).

To configure a remote engine and remote user to receive and respond to SNMP informs, include the following statements at the [edit snmp v3] hierarchy level:

```
[edit snmp v3]
usm {
   remote-engine engine-id {
      user username {
         authentication-md5 {
            authentication-key key;
         }
         authentication-none;
         authentication-sha {
            authentication-key key;
         }
         privacy-3des {
            privacy-key key;
         }
         privacy-aes128 {
            privacy-key key;
```

```
            }
            privacy-des {
               privacy-key key;
            }
            privacy-none;
         }
      }
   }
```

For informs, remote-engine *engine-id* is the identifier for the SNMP agent on the remote device where the user resides.

For informs, user *username* is the user on a remote SNMP engine who receives the informs.

Informs generated can be unauthenticated, authenticated, or authenticated_and_encrypted, depending on the security level of the SNMPv3 user configured on the remote engine (the inform receiver). The authentication key is used for generating message authentication code (MAC). The privacy key is used to encrypt the inform PDU part of the message.

Example: Configuring the Remote Engine ID and Remote Users

The following example configures user u10 located on remote engine 0x800007E5804089071BC6D10A41 and the user's authentication and privacy keys. The keys are autogenerated from the passwords entered by the command-line interface (CLI) user.

```
[edit snmp v3]
usm {
   remote-engine 800007E5804089071BC6D10A41 {
      user u10 {
         authentication-md5 {
            authentication-key "$9$D0jP536901Riktu1IcSwY2gUj5QF3
            /CYgQF/Cu0xN-bwgZGiqP5iH.5TF/9WLX7wYoaUkqfoaAp
            0BEhSreW87s24aUjsY4ZDjq.RhcyWLNdbg4Zs
            YJDHkTQ69Apu1EcyrvWQF/tuOREYg4ajHmPQF39
            Ygz3n6At8XxNYgik.PTz7-ikmfn6vW8XVw";
         }
      }
      privacy-des {
         privacy-key "$9$MZZXxdwYgJUjIKJGiH5T69Au0IrlM7NbeK24
         aJDjO1IRylM8Xbwg1R24aJDjHqm5n/Ap0ORhn6evLXbwmf5T
         /CRhSyKM5QEcleW87-Vbs4JGD.mT-VwgaZkqfTznAphSrlM8yr
         Wx7dsYTzF36AtuO1EcpuNdwYoa69CuRhcyleM8rlaZGjq.O1IEhr";
      }
   }
}
```

Configuring the Inform Notification Type and Target Address

To configure the inform notification type and target information, include the following statements at the [edit snmp v3] hierarchy level:

```
[edit snmp v3]
notify name {
   tag tag-name;
   type (trap | inform);
}
target-address target-address-name {
   address address;
   address-mask address-mask;
   inform-retry-count number;
   inform-timeout seconds;
   port port-number;
   routing-instance instance;
   tag-list tag-list;
   target-parameters target-parameters-name;
}
target-parameters target-parameters-name {
   notify-filter profile-name;
   parameters {
      message-processing-model (v1 | v2c | v3);
      security-model (usm | v1 | v2c);
      security-level (authentication | none | privacy);
      security-name security-name;
   }
}
```

notify *name* is the name assigned to the notification. Each notify entry name must be unique.

tag *tag-name* defines the target addresses that are sent this notification. The notification is sent to all target addresses that have this tag in their tag list. The *tag-name* is not included in the notification. For information about how to configure the tag list, see “Configuring the Tag List” on page 72.

type inform is the type of notification.

target-address *target-address-name* identifies the target address. The target address defines a management application’s address and parameters that are used to respond to informs.

inform-timeout *seconds* is the number of seconds to wait for an acknowledgment. If no acknowledgment is received within the timeout period, the inform is retransmitted. The default timeout is 15 seconds.

inform-retry-count *number* is the maximum number of times an inform is transmitted if no acknowledgment is received. The default is 3. If no acknowledgment is received after the inform is transmitted the maximum number of times, the inform message is discarded.

message-processing-model defines which version of SNMP to use when SNMP notifications are generated. Informs require a v3 message processing model.

security-model defines the security model to use when SNMP notifications are generated. Informs require a usm security model.

security-level specifies whether the inform is authenticated and encrypted before it is sent. For the usm security model, the security level must be one of the following:

- authentication—Provides authentication but no encryption.
- privacy—Provides authentication and encryption.

security-name identifies the username that is used when generating the inform.

Example: Configuring the Inform Notification Type and Target Address

In the following example, target 172.17.20.184 is configured to respond to informs. The inform timeout is 30 seconds and the maximum retransmit count is 3. The inform is sent to all targets in the tl1 list. The security model for the remote user is usm and the remote engine username is u10.

```
[edit snmp v3]
notify n1 {
    type inform;
    tag tl1;
}
notify-filter nf1 {
    oid .1.3 include;
}
target-address ta1 {
    address 172.17.20.184;
    inform-timeout 30;
    inform-retry-count 3;
    tag-list tl1;
    address-mask 255.255.255.0;
    target-parameters tp1;
}
target-parameters tp1 {
    parameters {
        message-processing-model v3;
        security-model usm;
        security-level privacy;
        security-name u10;
    }
    notify-filter nf1;
}
```

Configuring the SNMPv3 Community

The SNMP community defines the relationship between an SNMP server system and the client systems. This statement is optional.

To configure the SNMP community, include the snmp-community statement at the [edit snmp v3] hierarchy level:

```
[edit snmp v3]
snmp-community community-index;
```

community-index is the index for the SNMP community.

To configure the SNMP community properties, include the following statements at the [edit snmp v3 snmp-community *community-index*] hierarchy level:

```
[edit snmp v3 snmp-community community-index]
community-name community-name;
security-name security-name;
tag tag-name;
```

This section includes the following topics:

- Configuring the Community Name on page 81
- Configuring the Security Names on page 81
- Configuring the Tag on page 82

Configuring the Community Name

The community name defines the SNMP community. The SNMP community authorizes SNMPv1 or SNMPv2c clients. The access privileges associated with the configured security name define which MIB objects are available and the operations (read, write, or notify) allowed on those objects.

To configure the SNMP community name, include the community-name statement at the [edit snmp v3 snmp-community *community-index*] hierarchy level:

```
[edit snmp v3 snmp-community community-index]
community-name community-name;
```

community-name is the community string for an SNMPv1 or SNMPv2c community.

If unconfigured, it is the same as the community index.

If the community name contains spaces, enclose it in quotation marks (“ “).

NOTE: Community names must be unique. You cannot configure the same community name at the [edit snmp community] and [edit snmp v3 snmp-community *community-index*] hierarchy levels. The configured community name at the [edit snmp v3 snmp-community *community-index*] hierarchy level is encrypted. You cannot view the community name after you have configured it and committed your changes. In the CLI, the community name is concealed.

Configuring the Security Names

To assign a community string to a security name, include the security-name statement at the [edit snmp v3 snmp-community *community-index*] hierarchy level:

```
[edit snmp v3 snmp-community community-index]
security-name security-name;
```

security-name is used when access control is set up. The security-to-group configuration at the [edit snmp v3 vacm] hierarchy level identifies the group.

NOTE: This security name must match the security name configured at the [edit snmp v3 target-parameters *target-parameters-name* parameters] hierarchy level when you configure traps.

Configuring the Tag

To configure the tag, include the tag statement at the [edit snmp v3 snmp-community *community-index*] hierarchy level:

```
[edit snmp v3 snmp-community community-index]
tag tag-name;
```

tag-name identifies the address of managers that are allowed to use a community string.

Example: SNMPv3 Community Configuration

Define an SNMP community:

```
[edit snmp v3]
snmp-community index1 {
    community-name "$9$JOZi.QF/AtOz3"; # SECRET-DATA
    security-name john;
    tag router1; # Identifies managers that are allowed to use
    # a community string
    target-address ta1 {
        address 10.1.1.1;
        address-mask 255.255.255.0; # Defines the range of addresses
        port 162;
        tag-list router1;
        target-parameters tp1; # Applies configured target parameters
    }
}
```

Example: SNMPv3 Configuration

Define an SNMPv3 configuration:

```
[edit snmp]
engine-id {
    use-fxp0-mac-address;
}
view jnxAlarms {
    oid 1.3.6.1.4.1.2636.3.4 include;
}
view interfaces {
    oid 1.3.6.1.2.1.2 include;
}
```

```
view ping-mib {
   oid 1.3.6.1.2.1.80 include;
}
[edit snmp v3]
notify n1 {
   tag router1; # Identifies a set of target addresses
   type trap;# Defines type of notification
}
notify n2 {
   tag host1;
   type trap;
}
notify-filter nf1 {
   oid .1 include; # Defines which traps to send
} # In this case, includes all traps
notify-filter nf2 {
   oid 1.3.6.1.4.1 include; # Sends enterprise-specific traps only
}
notify-filter nf3 {
   oid 1.3.6.1.2.1.1.5 include; # Sends BGP traps only
}
snmp-community index1 {
   community-name "$9$JOZi.QF/AtOz3"; # SECRET-DATA
   security-name john; # Matches the security name at the target parameters
   tag host1; # Finds the addresses that are allowed to be used with
}
target-address ta1 {# Associates the target address with the group
               # san-francisco.
   address 10.1.1.1;
   address-mask 255.255.255.0; # Defines the range of addresses
   port 162;
   tag-list router1;
   target-parameters tp1; # Applies configured target parameters
}
target-address ta2 {
   address 10.1.1.2;
   address-mask 255.255.255.0;
   port 162;
   tag-list host1;
   target-parameters tp2;
}
target-address ta3 {
   address 10.1.1.3;
   address-mask 255.255.255.0;
   port 162;
   tag-list “router1 host1”;
   target-parameters tp3;
}
target-parameters tp1 { # Defines the target parameters
   notify-filter nf1; # Specifies which notify filter to apply
   parameters {
      message-processing-model v1;
      security-model v1;
      security-level none;
      security-name john; # Matches the security name configured at the
   } # [edit snmp v3 snmp-community community-index hierarchy level.
```

```
}
target-parameters tp2 {
   notify-filter nf2;
   parameters {
      message-processing-model v1;
      security-model v1;
      security-level none;
      security-name john;
   }
}
target-parameters tp3 {
   notify-filter nf3;
   parameters {
      message-processing-model v1;
      security-model v1;
      security-level none;
      security-name john;
   }
}
usm {
   local-engine { #Defines authentication and encryption for SNMPv3 users
      user user1 {
         authentication-md5 {
            authentication-password authentication-password;
         }
         privacy-des {
            privacy-password privacy-password;
         }
      }
      user user2 {
         authentication-sha {
            authentication-password authentication-password;
         }
         privacy-none;
      }
      user user3 {
         authentication-none;
         privacy-none;
      }
      user user4 {
         authentication-sha {
            authentication-password authentication-password;
         }
         privacy-aes128 {
            privacy-password privacy-password;
         }
      }
      user user5 {
         authentication-sha {
            authentication-password authentication-password;
         }
         privacy-none;
      }
   }
}
vacm {
```

```
    access {
        group san-francisco { #Defines the access privileges for the group
            default-context-prefix { # called san-francisco
                security-model v1 {
                    security-level none {
                        notify-view ping-mib;
                        read-view interfaces;
                        write-view jnxAlarms;
                    }
                }
            }
        }
    }
    security-to-group {
        security-model v1 {
            security-name john { # Assigns john to the security group
                group san-francisco; # called san-francisco
            }
            security-name bob {
                group new-york;
            }
            security-name elizabeth {
                group chicago;
            }
        }
    }
}
```

Chapter 8

SNMP Remote Operations

This chapter contains the following topics:

SNMP Remote Operations Overview

A Simple Network Management Protocol (SNMP) remote operation is any process on the router that can be controlled remotely using SNMP. The JUNOS software currently provides support for two SNMP remote operations: the Ping Management Information Base (MIB) and Traceroute MIB, defined in RFC 2925. Using these MIBs, an SNMP client in the network management system (NMS) can:

- Start a series of operations on a router
- Receive notification when the operations are complete
- Gather the results of each operation

The JUNOS software also provides extended functionality to these MIBs in the Juniper Networks enterprise-specific extensions jnxPingMIB and jnxTraceRouteMIB. For more information about jnxPingMIB and jnxTraceRouteMIB, see “Juniper Networks Enterprise-Specific MIBs” on page 123.

This topic covers the following sections:

SNMP Remote Operation Requirements

To use SNMP remote operations, you should be experienced with SNMP conventions. You must also configure the JUNOS software to allow the use of the remote operation MIBs.

Setting SNMP Views

All remote operation MIBs supported by the JUNOS software require that the SNMP clients have read-write privileges. The default SNMP configuration of the JUNOS software does not provide clients with a community string with such privileges.

To set read-write privileges for an SNMP community string, include the following statements at the [edit snmp] hierarchy level:

```
snmp {
    view view-name;
    oid object-identifier (include | exclude);
}
community community-name {
    authorization authorization;
    view view-name;
}
```

Example: Setting SNMP Views

To create a community named remote-community that grants SNMP clients read-write access to the Ping MIB, jnxPing MIB, Traceroute MIB, and jnxTraceRoute MIB, include the following statements at the [edit snmp] hierarchy level:

```
snmp {
    view remote-view {
        oid 1.3.6.1.2.1.80 include; # pingMIB
        oid 1.3.6.1.4.1.2636.3.7 include; # jnxPingMIB
        oid 1.3.6.1.2.1.81 include; # traceRouteMIB
        oid 1.3.6.1.4.1.2636.3.8 include; # jnxTraceRouteMIB
    }
    community remote-community {
        view remote-view;
        authorization read-write;
    }
}
```

For more information on the community statement, see “Configuring the SNMP Community String” on page 36 and community.

For more information on the view statement, see “Configuring MIB Views” on page 45 and view.

Setting Trap Notification for Remote Operations

In addition to configuring the remote operations MIB for trap notification, you must also configure the JUNOS software. You must specify a target host for remote operations traps.

To configure trap notification for SNMP remote operations, include the categories and targets statements at the [edit snmp trap-group *group-name*] hierarchy level:

```
[edit snmp trap-group group-name]
   categories {
      category;
   }
   targets {
      address;
   }
}
```

Example: Setting Trap Notification for Remote Operations

Specify 172.17.12.213 as a target host for all remote operation traps:

```
snmp {
   trap-group remote-traps {
      categories remote-operations;
      targets {
         172.17.12.213;
      }
   }
}
```

For more information on trap groups, see "Configuring SNMP Trap Groups" on page 41.

Using Variable-Length String Indexes

All tabular objects in the remote operations MIBs supported by JUNOS are indexed by two variables of type SnmpAdminString. For more information on SnmpAdminString, see RFC 2571.

JUNOS does not handle SnmpAdminString any differently from the octet string variable type. However, the indexes are defined as variable length. When a variable length string is used as an index, the length of the string must be included as part of the OID.

Example: Set Variable-Length String Indexes

To reference the pingCtlTargetAddress variable of a row in pingCtlTable where pingCtlOwnerIndex is bob and pingCtlTestName is test, use the following OID:

```
pingMIB.pingObjects.pingCtlTable.pingCtlEntry.pingCtlTargetAddress."bob"."test"
1.3.6.1.2.1.80.1.2.1.4.3.98.111.98.4.116.101.115.116
```

For more information on the definition of the Ping MIB, see RFC 2925.

Enabling Logging

The SNMP error code returned in response to SNMP requests can only provide a generic description of the problem. The error descriptions logged by the remote operations process can often provide more detailed information on the problem and help you to solve the problem faster. This logging is not enabled by default. To enable logging, include the flag general statement at the [edit snmp traceoptions] hierarchy level:

```
snmp {
    traceoptions {
        flag general;
    }
}
```

For more information on traceoptions, see “Tracing SNMP Activity on a JUNOS Device” on page 46.

If the remote operations process receives an SNMP request that it cannot accommodate, the error is logged in the /var/log/rmopd file. To monitor this log file, issue the monitor start rmopd command in operational mode of the command-line interface (CLI).

Using the Ping MIB

A ping test is used to determine whether packets sent from the local host reach the designated host and are returned. If the designated host can be reached, the ping test provides the approximate round-trip time for the packets. Ping test results are stored in pingResultsTable and pingProbeHistoryTable.

RFC 2925 is the authoritative description of the Ping MIB in detail and provides the ASN.1 MIB definition of the Piing MIB.

Starting a Ping Test

Before you start a ping test, configure a Ping MIB view. This allows SNMP Set requests on pingMIB. To start a ping test, create a row in pingCtlTable and set pingCtlAdminStatus to enabled. The minimum information that must be specified before setting pingCtlAdminStatus to enabled is:

- pingCtlOwnerIndexSnmpAdminString
- pingCtlTestNameSnmpAdminString
- pingCtlTargetAddressInetAddress
- pingCtlTargetAddressTypeInetAddressType
- pingCtlRowStatusRowStatus

For all other values, defaults are chosen unless otherwise specified. pingCtlOwnerIndex and pingCtlTestName are used as the index, so their values are specified as part of the OID. To create a row, set pingCtlRowStatus to createAndWait or createAndGo on a row that does not already exist. A value of active for pingCtlRowStatus indicates that all necessary information has been supplied and the test can begin; pingCtlAdminStatus can be set to enabled. An SNMP Set request that sets pingCtlRowStatus to active will fail if the necessary information in the row is not specified or is inconsistent. For information about how to configure a view, see "Setting SNMP Views" on page 88.

There are two ways to start a ping test:

- Using Multiple Set PDUs on page 91
- Using a Single Set PDU on page 91

Using Multiple Set PDUs

You can use multiple Set request PDUs (multiple PDUs, with one or more varbinds each) and set the following variables in this order to start the test:

- pingCtlRowStatus to createAndWait
- All appropriate test variables
- pingCtlRowStatus to active

  The JUNOS software now verifies that all necessary information to run a test has been specified.
- pingCtlAdminStatus to enabled

Using a Single Set PDU

You can use a single Set request PDU (one PDU, with multiple varbinds) to set the following variables to start the test:

- pingCtlRowStatus to createAndGo
- All appropriate test variables
- pingCtlAdminStatus to enabled

Monitoring a Running Ping Test

When pingCtlAdminStatus is successfully set to enabled, the following is done before the acknowledgment of the SNMP Set request is sent back to the client:

- pingResultsEntry is created if it does not already exist.
- pingResultsOperStatus transitions to enabled.

For more information, see the following sections:

pingResultsTable

While the test is running, pingResultsEntry keeps track of the status of the test. The value of pingResultsOperStatus is enabled while the test is running and disabled when it has stopped.

The value of pingCtlAdminStatus remains enabled until you set it to disabled. Thus, to get the status of the test, you must examine pingResultsOperStatus.

The pingCtlFrequency variable can be used to schedule many tests for one pingCtlEntry. After a test ends normally (you did not stop the test) and the pingCtlFrequency number of seconds has elapsed, the test is started again just as if you had set pingCtlAdminStatus to enabled. If you intervene at any time between repeated tests (you set pingCtlAdminStatus to disabled or pingCtlRowStatus to notInService), the repeat feature is disabled until another test is started and ends normally. A value of 0 for pingCtlFrequency indicates this repeat feature is not active.

pingResultsIpTgtAddr and pingResultsIpTgtAddrType are set to the value of the resolved destination address when the value of pingCtlTargetAddressType is dns. When a test starts successfully and pingResultsOperStatus transitions to enabled:

- pingResultsIpTgtAddr is set to null-string.
- pingResultsIpTgtAddrType is set to unknown.

pingResultsIpTgtAddr and pingResultsIpTgtAddrType are not set until pingCtlTargetAddress can be resolved to a numeric address. To retrieve these values, poll pingResultsIpTgtAddrType for any value other than unknown after successfully setting pingCtlAdminStatus to enabled.

At the start of a test, pingResultsSentProbes is initialized to 1 and the first probe is sent. pingResultsSentProbes increases by 1 each time a probe is sent.

As the test runs, every pingCtlTimeOut seconds, the following occur:

- pingProbeHistoryStatus for the corresponding pingProbeHistoryEntry in pingProbeHistoryTable is set to requestTimedOut.
- A pingProbeFailed trap is generated, if necessary.
- An attempt is made to send the next probe.

NOTE: No more than one outstanding probe exists for each test.

For every probe, you can receive one of the following results:

- The target host acknowledges the probe with a response.
- The probe times out; there is no response from the target host acknowledging the probe.
- The probe could not be sent.

Each probe result is recorded in pingProbeHistoryTable. For more information on pingProbeHistoryTable, see "pingProbeHistoryTable" on page 93.

When a response is received from the target host acknowledging the current probe:

- pingResultsProbeResponses increases by 1.
- The following variables are updated:
  - pingResultsMinRtt—Minimum round-trip time
  - pingResultsMaxRtt—Maximum round-trip time
  - pingResultsAverageRtt—Average round-trip time
  - pingResultsRttSumOfSquares—Sum of squares of round-trip times
  - pingResultsLastGoodProbe—Timestamp of the last response

NOTE: Only probes that result in a response from the target host contribute to the calculation of the round-trip time (RTT) variables.

When a response to the last probe is received or the last probe has timed out, the test is complete.

pingProbeHistoryTable

An entry in pingProbeHistoryTable (pingProbeHistoryEntry) represents a probe result and is indexed by three variables:

- The first two variables, pingCtlOwnerIndex and pingCtlTestName, are the same ones used for pingCtlTable, which identifies the test.
- The third variable, pingProbeHistoryIndex, is a counter to uniquely identify each probe result.

The maximum number of pingProbeHistoryTable entries created for a given test is limited by pingCtlMaxRows. If pingCtlMaxRows is set to 0, no pingProbeHistoryTable entries will be created for that test.

Each time a probe result is determined, a pingProbeHistoryEntry is created and added to pingProbeHistoryTable. pingProbeHistoryIndex of the new pingProbeHistoryEntry is 1 greater than the last pingProbeHistoryEntry added to pingProbeHistoryTable for that test. pingProbeHistoryIndex is set to 1 if this is the first entry in the table. The same test can be run multiple times, so this index keeps growing.

If pingProbeHistoryIndex of the last pingProbeHistoryEntry added is 0xFFFFFFFF, the next pingProbeHistoryEntry added has pingProbeHistoryIndex set to 1.

The following is recorded for each probe result:

- pingProbeHistoryResponse—Time to live (TTL)
- pingProbeHistoryStatus—What happened and why
- pingProbeHistoryLastRC—Return code (RC) value of ICMP packet
- pingProbeHistoryTime—Timestamp when probe result was determined

When a probe cannot be sent, pingProbeHistoryResponse is set to 0. When a probe times out, pingProbeHistoryResponse is set to the difference between the time when the probe was discovered to be timed out and the time when the probe was sent.

Generating Traps

For any trap to be generated, the appropriate bit of pingCtlTrapGeneration must be set. You must also configure a trap group to receive remote operations. A trap is generated under the following conditions:

- A pingProbeFailed trap is generated every time pingCtlTrapProbeFailureFilter number of consecutive probes fail during the test.
- A pingTestFailed trap is generated when the test completes and at least pingCtlTrapTestFailureFilter number of probes fail.
- A pingTestCompleted trap is generated when the test completes and fewer than pingCtlTrapTestFailureFilter probes fail.

NOTE: A probe is considered a failure when pingProbeHistoryStatus of the probe result is anything besides responseReceived.

For information about how to configure a trap group to receive remote operations, see “Configuring SNMP Trap Groups” on page 41 and “Example: Setting Trap Notification for Remote Operations” on page 89.

Gathering Ping Test Results

You can either poll pingResultsOperStatus to find out when the test is complete or request that a trap be sent when the test is complete. For more information on pingResultsOperStatus, see “pingResultsTable” on page 92. For more information on Ping MIB traps, see “Generating Traps” on page 94.

The statistics calculated and then stored in pingResultsTable include:

- pingResultsMinRtt—Minimum round-trip time
- pingResultsMaxRtt—Maximum round-trip time
- pingResultsAverageRtt—Average round-trip time

- pingResultsProbeResponses—Number of responses received
- pingResultsSentProbes—Number of attempts to send probes
- pingResultsRttSumOfSquares—Sum of squares of round-trip times
- pingResultsLastGoodProbe—Timestamp of the last response

You can also consult pingProbeHistoryTable for more detailed information on each probe. The index used for pingProbeHistoryTable starts at 1, goes to 0xFFFFFFFF, and wraps to 1 again.

For example, if pingCtlProbeCount is 15 and pingCtlMaxRows is 5, then upon completion of the first run of this test, pingProbeHistoryTable contains probes like those in Table 10 on page 95.

Table 10: Results in pingProbeHistoryTable: After the First Ping Test

pingProbeHistoryIndex	Probe Result
11	Result of 11th probe from run 1
12	Result of 12th probe from run 1
13	Result of 13th probe from run 1
14	Result of 14th probe from run 1
15	Result of 15th probe from run 1

Upon completion of the first probe of the second run of this test, pingProbeHistoryTable will contain probes like those in Table 11 on page 95.

Table 11: Results in pingProbeHistoryTable: After the First Probe of the Second Test

pingProbeHistoryIndex	Probe Result
12	Result of 12th probe from run 1
13	Result of 13th probe from run 1
14	Result of 14th probe from run 1
15	Result of 15th probe from run 1
16	Result of 1st probe from run 2

Upon completion of the second run of this test, pingProbeHistoryTable will contain probes like those in Table 12 on page 96.

Table 12: Results in pingProbeHistoryTable: After the Second Ping Test

pingProbeHistoryIndex	Probe Result
26	Result of 11th probe from run 2
27	Result of 12th probe from run 2
28	Result of 13th probe from run 2
29	Result of 14th probe from run 2
30	Result of 15th probe from run 2

History entries can be deleted from the MIB in two ways:

- More history entries for a given test are added and the number of history entries exceeds pingCtlMaxRows. The oldest history entries are deleted to make room for the new ones.
- You delete the entire test by setting pingCtlRowStatus to destroy.

Stopping a Ping Test

To stop an active test, set pingCtlAdminStatus to disabled. To stop the test and remove its pingCtlEntry, pingResultsEntry, and any pingHistoryEntry objects from the MIB, set pingCtlRowStatus to destroy.

Interpreting Ping Variables

This section clarifies the ranges for the following variables that are not explicitly specified in the Ping MIB:

- pingCtlDataSize—The value of this variable represents the total size of the payload (in bytes) of an outgoing probe packet. This payload includes the timestamp (8 bytes) that is used to time the probe. This is consistent with the definition of pingCtlDataSize (maximum value of 65,507) and the standard ping application.

  If the value of pingCtlDataSize is between 0 and 8 inclusive, it is ignored and the payload is 8 bytes (the timestamp). The Ping MIB assumes all probes are timed, so the payload must always include the timestamp.

  For example, if you wish to add an additional 4 bytes of payload to the packet, you must set pingCtlDataSize to 12.
- pingCtlDataFill—The first 8 bytes of the data segment of the packet is for the timestamp. After that, the pingCtlDataFill pattern is used in repetition. The default pattern (when pingCtlDataFill is not specified) is (00, 01, 02, 03 ... FF, 00, 01, 02, 03 ... FF, ...).
- pingCtlMaxRows—The maximum value is 255.

- pingMaxConcurrentRequests—The maximum value is 500.
- pingCtlTrapProbeFailureFilter and pingCtlTrapTestFailureFilter—A value of 0 for pingCtlTrapProbeFailureFilter or pingCtlTrapTestFailureFilter is not well defined by the Ping MIB. If pingCtlTrapProbeFailureFilter is 0, pingProbeFailed traps will not be generated for the test under any circumstances. If pingCtlTrapTestFailureFilter is 0, pingTestFailed traps will not be generated for the test under any circumstances.

Using the Traceroute MIB

A traceroute test approximates the path packets take from the local host to the remote host.

RFC 2925 is the authoritative description of the Traceroute MIB in detail and provides the ASN.1 MIB definition of the Traceroute MIB. This section provides the following information:

Starting a Traceroute Test

Before you start a traceroute test, configure a Traceroute MIB view. This allows SNMP Set requests on tracerouteMIB. To start a test, create a row in traceRouteCtlTable and set traceRouteCtlAdminStatus to enabled. You must specify at least the following before setting traceRouteCtlAdminStatus to enabled:

- traceRouteCtlOwnerIndexSnmpAdminString
- traceRouteCtlTestNameSnmpAdminString
- traceRouteCtlTargetAddressInetAddress
- traceRouteCtlRowStatusRowStatus

For all other values, defaults are chosen unless otherwise specified. traceRouteCtlOwnerIndex and traceRouteCtlTestName are used as the index, so their values are specified as part of the OID. To create a row, set traceRouteCtlRowStatus to createAndWait or createAndGo on a row that does not already exist. A value of active for traceRouteCtlRowStatus indicates that all necessary information has been specified and the test can begin; traceRouteCtlAdminStatus can be set to enabled. An SNMP Set request that sets traceRouteCtlRowStatus to active will fail if the necessary information in the row is not specified or is inconsistent. For information about how to configure a view, see “Setting SNMP Views” on page 88.

There are two ways to start a traceroute test:

- Using Multiple Set PDUs on page 98
- Using a Single Set PDU on page 98

Using Multiple Set PDUs

You can use multiple Set request PDUs (multiple PDUs, with one or more varbinds each) and set the following variables in this order to start the test:

- traceRouteCtlRowStatus to createAndWait
- All appropriate test variables
- traceRouteCtlRowStatus to active

  The JUNOS software now verifies that all necessary information to run a test has been specified.
- traceRouteCtlAdminStatus to enabled

Using a Single Set PDU

You can use a single Set request PDU (one PDU, with multiple varbinds) to set the following variables to start the test:

- traceRouteCtlRowStatus to createAndGo
- All appropriate test variables
- traceRouteCtlAdminStatus to enabled

Monitoring a Running Traceroute Test

When traceRouteCtlAdminStatus is successfully set to enabled, the following is done before the acknowledgment of the SNMP Set request is sent back to the client:

- traceRouteResultsEntry is created if it does not already exist.
- traceRouteResultsOperStatus transitions to enabled.

For more information, see the following sections:

- traceRouteResultsTable on page 98
- traceRouteProbeResultsTable on page 99
- traceRouteHopsTable on page 101
- Generating Traps on page 102

traceRouteResultsTable

While the test is running, this traceRouteResultsTable keeps track of the status of the test. The value of traceRouteResultsOperStatus is enabled while the test is running and disabled when it has stopped.

The value of traceRouteCtlAdminStatus remains enabled until you set it to disabled. Thus, to get the status of the test, you must examine traceRouteResultsOperStatus.

The traceRouteCtlFrequency variable can be used to schedule many tests for one traceRouteCtlEntry. After a test ends normally (you did not stop the test) and traceRouteCtlFrequency number of seconds has elapsed, the test is started again just as if you had set traceRouteCtlAdminStatus to enabled. If you intervene at any time between repeated tests (you set traceRouteCtlAdminStatus to disabled or traceRouteCtlRowStatus to notInService), the repeat feature will be disabled until another test is started and ends normally. A value of 0 for traceRouteCtlFrequency indicates this repeat feature is not active.

traceRouteResultsIpTgtAddr and traceRouteResultsIpTgtAddrType are set to the value of the resolved destination address when the value of traceRouteCtlTargetAddressType is dns. When a test starts successfully and traceRouteResultsOperStatus transitions to enabled:

- traceRouteResultsIpTgtAddr is set to null-string.
- traceRouteResultsIpTgtAddrType is set to unknown.

traceRouteResultsIpTgtAddr and traceRouteResultsIpTgtAddrType are not set until traceRouteCtlTargetAddress can be resolved to a numeric address. To retrieve these values, poll traceRouteResultsIpTgtAddrType for any value other than unknown after successfully setting traceRouteCtlAdminStatus to enabled.

At the start of a test, traceRouteResultsCurHopCount is initialized to traceRouteCtlInitialTtl, and traceRouteResultsCurProbeCount is initialized to 1. Each time a probe result is determined, traceRouteResultsCurProbeCount increases by 1. While the test is running, the value of traceRouteResultsCurProbeCount reflects the current outstanding probe for which results have not yet been determined.

The traceRouteCtlProbesPerHop number of probes is sent for each TTL value. When the result of the last probe for the current hop is determined, provided that the current hop is not the destination hop, traceRouteResultsCurHopCount increases by 1, and traceRouteResultsCurProbeCount resets to 1.

At the start of a test, if this is the first time this test has been run for this traceRouteCtlEntry, traceRouteResultsTestAttempts and traceRouteResultsTestSuccesses are initialized to 0.

At the end of each test execution, traceRouteResultsOperStatus transitions to disabled, and traceRouteResultsTestAttempts increases by 1. If the test was successful in determining the full path to the target, traceRouteResultsTestSuccesses increases by 1, and traceRouteResultsLastGoodPath is set to the current time.

traceRouteProbeResultsTable

Each entry in traceRouteProbeHistoryTable is indexed by five variables:

- The first two variables, traceRouteCtlOwnerIndex and traceRouteCtlTestName, are the same ones used for traceRouteCtlTable and to identify the test.
- The third variable, traceRouteProbeHistoryIndex, is a counter, starting from 1 and wrapping at FFFFFFFF. The maximum number of entries is limited by traceRouteCtlMaxRows.
- The fourth variable, traceRouteProbeHistoryHopIndex, indicates which hop this probe is for (the actual TTL value). Thus, the first traceRouteCtlProbesPerHop number of entries created when a test starts have a value of traceRouteCtlInitialTtl for traceRouteProbeHistoryHopIndex.
- The fifth variable, traceRouteProbeHistoryProbeIndex, is the probe for the current hop. It ranges from 1 to traceRouteCtlProbesPerHop.

While a test is running, as soon as a probe result is determined, the next probe is sent. A maximum of traceRouteCtlTimeOut seconds elapses before a probe is marked with status requestTimedOut and the next probe is sent. There is never more than one outstanding probe per traceroute test. Any probe result coming back after a probe times out is ignored.

Each probe can:

- Result in a response from a host acknowledging the probe
- Time out with no response from a host acknowledging the probe
- Fail to be sent

Each probe status is recorded in traceRouteProbeHistoryTable with traceRouteProbeHistoryStatus set accordingly.

Probes that result in a response from a host record the following data:

- traceRouteProbeHistoryResponse—Round-trip time (RTT)
- traceRouteProbeHistoryHAddrType—The type of HAddr (next argument)
- traceRouteProbeHistoryHAddr—The address of the hop

All probes, regardless of whether a response for the probe is received, have the following recorded:

- traceRouteProbeHistoryStatus—What happened and why
- traceRouteProbeHistoryLastRC—Return code (RC) value of the ICMP packet
- traceRouteProbeHistoryTime—Timestamp when the probe result was determined

When a probe cannot be sent, traceRouteProbeHistoryResponse is set to 0. When a probe times out, traceRouteProbeHistoryResponse is set to the difference between the time when the probe was discovered to be timed out and the time when the probe was sent.

traceRouteHopsTable

Entries in traceRouteHopsTable are indexed by three variables:

- The first two, traceRouteCtlOwnerIndex and traceRouteCtlTestName, are the same ones used for traceRouteCtlTable and identify the test.
- The third variable, traceRouteHopsHopIndex, indicates the current hop, which starts at 1 (not traceRouteCtlInitialTtl).

When a test starts, all entries in traceRouteHopsTable with the given traceRouteCtlOwnerIndex and traceRouteCtlTestName are deleted. Entries in this table are only created if traceRouteCtlCreateHopsEntries is set to true.

A new traceRouteHopsEntry is created each time the first probe result for a given TTL is determined. The new entry is created whether or not the first probe reaches a host. The value of traceRouteHopsHopIndex is increased by 1 for this new entry.

NOTE: Any traceRouteHopsEntry can lack a value for traceRouteHopsIpTgtAddress if there are no responses to the probes with the given TTL.

Each time a probe reaches a host, the IP address of that host is available in the probe result. If the value of traceRouteHopsIpTgtAddress of the current traceRouteHopsEntry is not set, then the value of traceRouteHopsIpTgtAddress is set to this IP address. If the value of traceRouteHopsIpTgtAddress of the current traceRouteHopsEntry is the same as the IP address, then the value does not change. If the value of traceRouteHopsIpTgtAddress of the current traceRouteHopsEntry is different from this IP address, indicating a path change, a new traceRouteHopsEntry is created with:

- traceRouteHopsHopIndex variable increased by 1
- traceRouteHopsIpTgtAddress set to the IP address

NOTE: A new entry for a test is added to traceRouteHopsTable each time a new TTL value is used or the path changes. Thus, the number of entries for a test may exceed the number of different TTL values used.

When a probe result is determined, the value traceRouteHopsSentProbes of the current traceRouteHopsEntry increases by 1. When a probe result is determined, and the probe reaches a host:

- The value traceRouteHopsProbeResponses of the current traceRouteHopsEntry is increased by 1.
- The following variables are updated:
  - traceRouteResultsMinRtt—Minimum round-trip time
  - traceRouteResultsMaxRtt—Maximum round-trip time
  - traceRouteResultsAverageRtt—Average round-trip time

- traceRouteResultsRttSumOfSquares—Sum of squares of round-trip times
- traceRouteResultsLastGoodProbe—Timestamp of the last response

NOTE: Only probes that reach a host affect the round-trip time values.

Generating Traps

For any trap to be generated, the appropriate bit of traceRouteCtlTrapGeneration must be set. You must also configure a trap group to receive remote operations. Traps are generated under the following conditions:

- traceRouteHopsIpTgtAddress of the current probe is different from the last probe with the same TTL value (traceRoutePathChange).
- A path to the target could not be determined (traceRouteTestFailed).

A path to the target was determined (traceRouteTestCompleted).

For information about how to configure a trap group to receive remote operations, see "Configuring SNMP Trap Groups" on page 41 and "Example: Setting Trap Notification for Remote Operations" on page 89.

Monitoring Traceroute Test Completion

When a test is complete, traceRouteResultsOperStatus transitions from enabled to disabled. This transition occurs in the following situations:

- The test ends successfully. A probe result indicates that the destination has been reached. In this case, the current hop is the last hop. The rest of the probes for this hop are sent. When the last probe result for the current hop is determined, the test ends.
- traceRouteCtlMaxTtl threshold is exceeded. The destination is never reached. The test ends after the number of probes with TTL value equal to traceRouteCtlMaxttl have been sent.
- traceRouteCtlMaxFailures threshold is exceeded. The number of consecutive probes that end with status requestTimedOut exceeds traceRouteCtlMaxFailures.
- You end the test. You set traceRouteCtlAdminStatus to disabled or delete the row by setting traceRouteCtlRowStatus to destroy.
- You misconfigured the traceroute test. A value or variable you specified in traceRouteCtlTable is incorrect and will not allow a single probe to be sent. Because of the nature of the data, this error could not be determined until the test was started; that is, until after traceRouteResultsOperStatus transitioned to enabled. When this occurs, one entry is added to traceRouteProbeHistoryTable with traceRouteProbeHistoryStatus set to the appropriate error code.

If traceRouteCtlTrapGeneration is set properly, either the traceRouteTestFailed or traceRouteTestCompleted trap is generated.

Gathering Traceroute Test Results

You can either poll traceRouteResultsOperStatus to find out when the test is complete or request that a trap be sent when the test is complete. For more information on traceResultsOperStatus, see "traceRouteResultsTable" on page 98. For more information on Traceroute MIB traps, see "Generating Traps" on page 102.

Statistics are calculated on a per-hop basis and then stored in traceRouteHopsTable. They include the following for each hop:

- traceRouteHopsIpTgtAddressType—Address type of host at this hop
- traceRouteHopsIpTgtAddress—Address of host at this hop
- traceRouteHopsMinRtt—Minimum round-trip time
- traceRouteHopsMaxRtt—Maximum round-trip time
- traceRouteHopsAverageRtt—Average round-trip time
- traceRouteHopsRttSumOfSquares—Sum of squares of round-trip times
- traceRouteHopsSentProbes—Number of attempts to send probes
- traceRouteHopsProbeResponses—Number of responses received
- traceRouteHopsLastGoodProbe—Timestamp of last response

You can also consult traceRouteProbeHistoryTable for more detailed information on each probe. The index used for traceRouteProbeHistoryTable starts at 1, goes to 0xFFFFFFFF, and wraps to 1 again.

For example, assume the following:

- traceRouteCtlMaxRows is 10.
- traceRouteCtlProbesPerHop is 5.
- There are eight hops to the target (the target being number eight).
- Each probe sent results in a response from a host (the number of probes sent is not limited by traceRouteCtlMaxFailures).

In this test, 40 probes are sent. At the end of the test, traceRouteProbeHistoryTable would have a history of probes like those in Table 13 on page 103.

Table 13: traceRouteProbeHistoryTable

HistoryIndex	HistoryHopIndex	HistoryProbeIndex
31	7	1
32	7	2
33	7	3

Table 13: traceRouteProbeHistoryTable *(continued)*

HistoryIndex	HistoryHopIndex	HistoryProbeIndex
34	7	4
35	7	5
36	8	1
37	8	2
38	8	3
39	8	4
40	8	5

Stopping a Traceroute Test

To stop an active test, set traceRouteCtlAdminStatus to disabled. To stop a test and remove its traceRouteCtlEntry, traceRouteResultsEntry, traceRouteProbeHistoryEntry, and traceRouteProbeHistoryEntry objects from the MIB, set traceRouteCtlRowStatus to destroy.

Traceroute Variables

This section clarifies the ranges for the following variables that are not explicitly specified in the Traceroute MIB:

- traceRouteCtlMaxRows—The maximum value for traceRouteCtlMaxRows is 2550. This represents the maximum TTL (255) multiplied by the maximum for traceRouteCtlProbesPerHop (10). Therefore, the traceRouteProbeHistoryTable accommodates one complete test at the maximum values for one traceRouteCtlEntry. Usually, the maximum values are not used and the traceRouteProbeHistoryTable is able to accommodate the complete history for many tests for the same traceRouteCtlEntry.
- traceRouteMaxConcurrentRequests—The maximum value is 50. If a test is running, it has one outstanding probe. traceRouteMaxConcurrentRequests represents the maximum number of traceroute tests that have traceRouteResultsOperStatus with a value of enabled. Any attempt to start a test with traceRouteMaxConcurrentRequests tests running will result in the creation of one probe with traceRouteProbeHistoryStatus set to maxConcurrentLimitReached and that test will end immediately.
- traceRouteCtlTable—The maximum number of entries allowed in this table is 100. Any attempt to create a 101st entry will result in a BAD_VALUE message for SNMPv1 and a RESOURCE_UNAVAILABLE message for SNMPv2.

Chapter 9

SNMP Support for Routing Instances

This chapter contains the following topics:

Understanding SNMP Support for Routing Instances

The JUNOS software enables SNMP managers for all routing instances to request and manage SNMP data related to the corresponding routing instances and logical system networks.

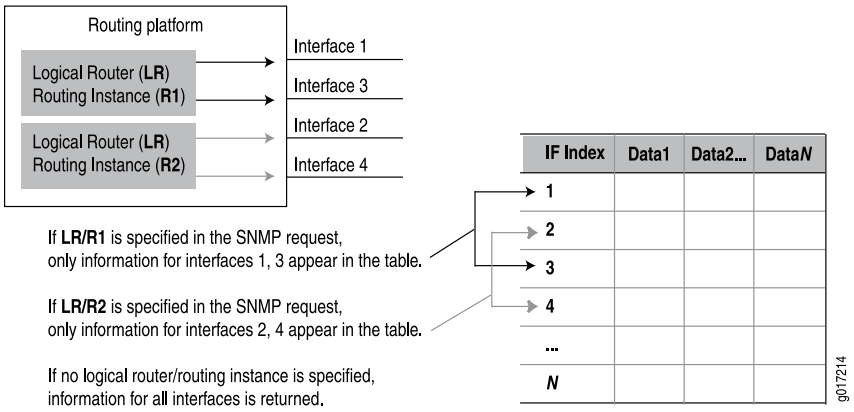
In the JUNOS software:

- Clients from routing instances other than the default can access MIB objects and perform SNMP operations only on the logical system networks to which they belong.
- Clients from the default routing instance can access information related to all routing instances and logical system networks.

Before JUNOS Release 8.4, only the SNMP manager in the default routing instance (inet.0) had access to the MIB objects

With the increase in virtual private network (VPN) service offerings, this feature is useful particularly for service providers who need to obtain SNMP data for specific routing instances (see Figure 2 on page 106). Service providers can use this information for their own management needs or export the data for use by their customers.

Figure 2: SNMP Data for Routing Instances



If no routing instance is specified in the request, the SNMP agent operates as before:

- For non–routing table objects, all instances will be exposed.
- For routing table objects, only those associated with the default routing instance will be exposed.

NOTE: The actual protocol data units (PDUs) are still exchanged over the default (inet.0) routing instance, but the data contents returned are dictated by the routing instance specified in the request PDUs.

Support Classes for MIB Objects

When a routing instance is specified, all routing-related MIB objects return data maintained by the routing instance in the request. For all other MIB objects, the data returned is segregated according to that routing instance. For example, only those interfaces assigned to that routing instance (for example, the logical interfaces [ifls] as well as their corresponding physical interfaces [ifds]) are exposed by the SNMP agent. Similarly, objects with an unambiguous attachment to an interface (for example, addresses) are segregated as well.

For those objects where the attachment is ambiguous (for example, objects in sysApplMIB), no segregation is done and all instances are visible in all cases.

Another category of objects is visible only when no logical system is specified (only within the default logical system) regardless of the routing instance within the default logical system. Objects in this category are Chassis MIB objects, objects in the SNMP group, RMON alarm, event and log groups, Ping MIB objects, configuration management objects, and V3 objects.

In summary, to support routing instances, MIB objects fall into one of the following categories:

- Class 1—Data is segregated according to the routing instance in the request. This is the most granular of the segregation classes.
- Class 2—Data is segregated according to the logical system specified in the request. The same data is returned for all routing instances that belong to a particular logical system. Typically, this applies to routing table objects where it is difficult to extract routing instance information or where routing instances do not apply.
- Class 3—Data is exposed only for the default logical system. The same set of data is returned for all routing instances that belong to the default logical system. If you specify another logical system (not the default), no data is returned. Typically this class applies to objects implemented in subagents that do not monitor logical system changes and register their objects using only the default context (for example, Chassis MIB objects).
- Class 4—Data is not segregated by routing instance. The same data is returned for all routing instances. Typically, this applies to objects implemented in subagents that monitor logical system changes and register or deregister all their objects for each logical system change. Objects whose values cannot be segregated by routing instance fall into this class.

See "MIB Support Details" on page 111 for a list of the objects associated with each class.

Identifying a Routing Instance

With this feature, routing instances are identified by either the context field in v3 requests or encoded in the community string in v1 or v2c requests.

When encoded in a community string, the routing instance name appears first and is separated from the actual community string by the @ character.

To avoid conflicts with valid community strings that contain the @ character, the community is parsed only if typical community string processing fails. For example, if a routing instance named RI is configured, an SNMP request with RI@public is processed within the context of the RI routing instance. Access control (views, source address restrictions, access privileges, and so on) is applied according to the actual community string (the set of data after the @ character—in this case public). However, if the community string RI@public is configured, the PDU is processed according to that community and the embedded routing instance name is ignored.

Logical systems perform a subset of the actions of a physical router and have their own unique routing tables, interfaces, policies, and routing instances. When a routing instance is defined within a logical system, the logical system name must be encoded along with the routing instance using a slash (/) to separate the two. For example, if the routing instance RI is configured within the logical system LS, that routing instance must be encoded within a community string as LS/RI@public. When a routing instance is configured outside a logical system (within the default logical system), no logical system name (or / character) is needed.

Also, when a logical system is created, a default routing instance (named default) is always created within the logical system. This name should be used when querying

data for that routing instance (for example, LS/default@public). For v3 requests, the name *logical system/routing instance* should be identified directly in the context field.

NOTE: To identify a VLAN spanning tree instance (VSTP on MX series Ethernet Services router), specify the routing instance name followed by a double colon (::) and the VLAN ID. For example, to identify VSTP instance for VLAN 10 in the global default routing instance, include default::10@public in the context (SNMPv3) or community (SNMPv1 or v2) string.

Enabling SNMP Access over Routing Instances

To enable SNMP managers in routing instances other than the default routing instance to access SNMP information, include the routing-instance-access statement in the SNMP configuration.

```
[edit]
user@router1# show snmp
routing-instance-access;
```

If this statement is not included in the SNMP configuration, the JUNOS software will not allow SNMP managers from routing instances other than the default routing instance to access SNMP information.

Specifying a Routing Instance in an SNMPv1 or SNMPv2c Community

You can specify the routing instance along with the client information when you add a client to an SNMP community. To specify the routing instance to which a client belongs, include the routing-instance statement followed by the routing instance name and client information in the SNMP configuration.

The following example shows the configuration statement to add routing instance test-ri to SNMP community community1.

NOTE: Routing instances specified at the [edit snmp community *community-name*] hierarchy level are added to the default logical system in the community.

```
[edit snmp]
community community1 {
    clients {
        10.209.152.33/32;
    }
    routing-instance test-ri {
        clients {
            10.19.19.1/32;
        }
    }
}
```

If the routing instance is defined within a logical system, include the routing-instance statement at the [edit snmp community *community-name* logical-system *logical-system-name*] hierarchy level, as in the following example:

```
[edit snmp]
community community1 {
   clients {
      10.209.152.33/32;
   }
   logical-system test-LS {
      routing-instance test-ri {
         clients {
            10.19.19.1/32;
         }
      }
   }
}
```

Example: Configuring Interface Settings for a Routing Instance

This example shows an 802.3ad ae0 interface configuration allocated to a routing instance named INFrtd:

```
[edit chassis]
aggregated-devices {
   ethernet {
      device-count 5;
   }
}
[edit interfaces ae0]
vlan-tagging;
aggregated-ether-options {
   minimum-links 2;
   link-speed 100m;
}
unit 0 {
   vlan-id 100;
   family inet {
      address 10.1.0.1/24;
   }
}
[edit interfaces fe-1/1/0]
fastether-options {
   802.3ad ae0;
}
[edit interfaces fe-1/1/1]
fastether-options {
   802.3ad ae0;
}
[edit routing-instances]
INFrtd {
   instance-type virtual-router;
   interface fe-1/1/0.0;
   interface fe-1/1/1.0;
   interface fe-1/1/5.0;
```

```
    interface ae0.0;
    protocols {
        ospf {
            area 0.0.0.0 {
                interface all;
            }
        }
    }
}
```

The following snmpwalk command shows how to retrieve SNMP-related information from router1 and the 802.3ae bundle interface belonging to routing instance INFrtd with the SNMP community public:

```
freebsd# snmpwalk -Os router1 INFrtd@public dot3adAggTable
dot3adAggMACAddress.59 = 0:90:69:92:93:f0
dot3adAggMACAddress.65 = 0:90:69:92:93:f0
dot3adAggActorSystemPriority.59 = 0
dot3adAggActorSystemPriority.65 = 0
dot3adAggActorSystemID.59 = 0:0:0:0:0:0
dot3adAggActorSystemID.65 = 0:0:0:0:0:0
dot3adAggAggregateOrIndividual.59 = true(1)
dot3adAggAggregateOrIndividual.65 = true(1)
dot3adAggActorAdminKey.59 = 0
dot3adAggActorAdminKey.65 = 0
dot3adAggActorOperKey.59 = 0
dot3adAggActorOperKey.65 = 0
dot3adAggPartnerSystemID.59 = 0:0:0:0:0:0
dot3adAggPartnerSystemID.65 = 0:0:0:0:0:0
dot3adAggPartnerSystemPriority.59 = 0
dot3adAggPartnerSystemPriority.65 = 0
dot3adAggPartnerOperKey.59 = 0
dot3adAggPartnerOperKey.65 = 0
dot3adAggCollectorMaxDelay.59 = 0
dot3adAggCollectorMaxDelay.65 = 0
```

Configuring Access Lists for SNMP Access over Routing Instances

You can create and maintain access lists to manage access to SNMP information. Access list configuration enables you to allow or deny SNMP access to clients of a specific routing instance.

The following example shows how to create an access list:

```
[edit snmp]
routing-instance-access {
    access-list {
        ri1 restrict;
        ls1/default;
        ls1/ri2;
        ls1*;
    }
}
```

The configuration given in the example:

- Restricts clients in ri1 from accessing SNMP information.
- Allows clients in ls1/default, ls1/ri2, and all other routing instances with names starting with ls1 to access SNMP information.

You can use the wildcard character (*) to represent a string in the routing instance name.

NOTE: You cannot restrict the SNMP manager of the default routing instance from accessing SNMP information.

Trap Support for Routing Instances

When configured under the trap-group object, all v1 and v2c traps that apply to routing instances (or interfaces belonging to a routing instance) have the routing instance name encoded in the community string. The encoding is identical to that used in request PDUs.

For traps configured under the v3 framework, the routing instance name is carried in the context field when the v3 message processing model has been configured. For other message processing models (v1 or v2c), the routing instance name is not carried in the trap message header (and not encoded in the community string).

You can restrict the trap receivers from receiving traps that are not related to the logical system networks to which they belong. To do this, include the logical-system-trap-filter statement at the [edit snmp] hierarchy level:

```
[edit snmp]
logical-system-trap-filter;
```

If the logical-system-trap-filter statement is not included in the SNMP configuration, all traps are forwarded to the configured routing instance destinations. However, even when this statement is configured, the trap receiver associated with the default routing instance will receive all SNMP traps.

MIB Support Details

Table 14 on page 111 shows enterprise-specific MIB objects supported by the JUNOS software and provides notes detailing how they are handled when a routing instance is specified in an SNMP request. An en dash (–) indicates that the item is not applicable.

Table 14: MIB Support for Routing Instances (Juniper Networks MIBs)

Object	Support Class	Description/Notes
jnxProducts(1)	–	Product Object IDs

Table 14: MIB Support for Routing Instances (Juniper Networks MIBs) *(continued)*

Object	Support Class	Description/Notes
jnxServices(2)	–	Services
jnxMibs(3) jnxBoxAnatomy(1)	Class 3	Objects will be exposed only for the default logical system.
mpls(2)	Class 2	All instances within a logical system will be exposed. Data will not be segregated down to the routing instance level.
ifJnx(3)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxAlarms(4)	Class 3	Objects will be exposed only for the default logical system.
jnxFirewalls(5)	Class 4	Data is not segregated by routing instance. All instances will be exposed.
jnxDCUs(6)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxPingMIB(7)	Class 3	Objects will be exposed only for the default logical system.
jnxTraceRouteMIB(8)	Class 3	Objects will be exposed only for the default logical system.
jnxATM(10)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxIpv6(11)	Class 4	Data is not segregated by routing instance. All instances will be exposed.
jnxIpv4(12)	Class 1	jnxIpv4AddrTable(1). Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxRmon(13)	Class 3	jnxRmonAlarmTable(1). Objects will be exposed only for the default logical system.
jnxLdp(14)	Class 2	jnxLdpTrapVars(1). All instances within a logical system will be exposed. Data will not be segregated down to the routing instance level.

Table 14: MIB Support for Routing Instances (Juniper Networks MIBs) *(continued)*

Object	Support Class	Description/Notes
jnxCos(15) jnxCosIfqStatsTable(1) jnxCosFcTable(2) jnxCosFcIdTable(3) jnxCosQstatTable(4)	Class 3	Objects will be exposed only for the default logical system.
jnxScu(16) jnxScuStatsTable(1)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxRpf(17) jnxRpfStatsTable(1)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxCfgMgmt(18)	Class 3	Objects will be exposed only for the default logical system.
jnxPMon(19) jnxPMonFlowTable(1) jnxPMonErrorTable(2) jnxPMonMemoryTable(3)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxSonet(20) jnxSonetAlarmTable(1)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxAtmCos(21) jnxCosAtmVcTable(1) jnxCosAtmScTable(2) jnxCosAtmVcQstatsTable(3) jnxCosAtmTrunkTable(4)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
ipSecFlowMonitorMIB(22)	–	–
jnxMac(23) jnxMacStats(1)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
apsMIB(24)	Class 3	Objects will be exposed only for the default logical system.
jnxChassisDefines(25)	Class 3	Objects will be exposed only for the default logical system.

Table 14: MIB Support for Routing Instances (Juniper Networks MIBs) *(continued)*

Object	Support Class	Description/Notes
jnxVpnMIB(26)	Class 2	All instances within a logical system will be exposed. Data will not be segregated down to the routing instance level.
jnxSericesInfoMib(27)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxCollectorMIB(28)	Class 1	Only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.
jnxHistory(29)	–	–
jnxSpMIB(32)	Class 3	Objects will be exposed only for the default logical system.

Table 15 on page 115 shows Class 1 MIB objects (standard and enterprise-specific MIBs) supported by the JUNOS software. With Class 1 objects, only those logical interfaces (and their parent physical interfaces) that belong to a specific routing instance will be exposed.

Table 15: Class 1 MIB Objects (Standard and Juniper MIBs)

Class	MIB	Objects
Class 1	802.3ad.mib	(dot2adAgg) MIB objects:
		dot3addAggTable
		dot3adAggTablw
		dot3adAggPortListTable
		dot3adAggPortTable
		dot3adAggPortStatsTable
		dot3adAggPortDebugTable
	rfc2863a.mib	ifTable
		ifXTable
		ifStackTable
	rfc2011a.mib	ipAddrTable
		ipNetToMediaTable
	rtmib.mib	ipForward (ipCidrRouteTable)
	rfc2665a.mib	dot3StatsTable
		dot3ControlTable
		dot3PauseTable
	rfc2495a.mib	dsx1ConfigTable
		dsx1CurrentTable
		dsx1IntervalTable
		dsx1TotalTable
		dsx1FarEndCurrentTable
		dsx1FarEndIntervalTable
		dsx1FarEndTotalTable
		dsx1FracTable …
	rfc2496a.mib	dsx3 (dsx3ConfigTable)
	rfc2115a.mib	frDlcmiTable (and related MIB objects)
	rfc3592.mib	

Table 15: Class 1 MIB Objects (Standard and Juniper MIBs) *(continued)*

Class	MIB	Objects
		sonetMediumTable (and related MIB objects)
	rfc3020.mib	mfrMIB mfrBundleTable mfrMibBundleLinkObjects mfrBundleIfIndexMappingTable (and related MIB objects)
	ospf2mib.mib	All objects
	ospf2trap.mib	All objects
	bgpmib.mib	All objects
	rfc2819a.mib	Example: etherStatsTable

Table 15: Class 1 MIB Objects (Standard and Juniper MIBs) *(continued)*

Class	MIB	Objects
Class 1	rfc2863a.mib	Examples:
		ifXtable
		ifStackTable
	rfc2665a.mib	etherMIB
	rfc2515a.mib	atmMIB objects
		Examples:
		atmInterfaceConfTable
		atmVplTable
		atmVclTable
	rfc2465.mib	ip-v6mib
		Examples:
		ipv6IfTable
		ipv6AddrPrefixTable
		ipv6NetToMediaTable
		ipv6RouteTable
	rfc2787a.mib	vrrp mib
	rfc2932.mib	ipMRouteMIB
		ipMRouteStdMIB
	mroutemib.mib	ipMRoute1MIBObjects
	isismib.mib	isisMIB
	pimmib.mib	pimMIB
	msdpmib.mib	msdpmib
	jnx-if-extensions.mib	Examples:
		ifJnxTable
		ifChassisTable
	jnx-dcu.mib	jnxDCUs
	jnx-atm.mib	

Table 15: Class 1 MIB Objects (Standard and Juniper MIBs) *(continued)*

Class	MIB	Objects
		Examples:
		jnxAtmIfTable
		jnxAtmVCTable
		jnxAtmVpTable
	jnx-ipv4.mib	jnxipv4
		Example: jnxIpv4AddrTable
	jnx-cos.mib	Examples:
		jnxCosIfqStatsTable
		jnxCosQstatTable
	jnx-scu.mib	Example: jnxScuStatsTable
	jnx-rpf.mib	Example: jnxRpfStatsTable
	jnx-pmon.mib	Example: jnxPMonFlowTable
	jnx-sonet.mib	Example: jnxSonetAlarmTable
Class 1	jnx-atm-cos.mib	Examples:
		jnxCosAtmVcTable
		jnxCosAtmVcScTable
		jnxCosAtmVcQstatsTable
		jnxCosAtmTrunkTable
	jnx-mac.mib	Example: jnxMacStatsTable
	jnx-services.mib	Example: jnxSvcFlowTableAggStatsTable
	jnx-coll.mib	jnxCollectorMIB
		Examples:
		jnxCollPicIfTable
		jnxCollFileEntry

Table 16 on page 119 shows Class 2 MIB objects (standard and enterprise-specific MIBs) supported by the JUNOS software. With Class 2 objects, all instances within a logical system will be exposed. Data will not be segregated down to the routing instance level.

Table 16: Class 2 MIB Objects (Standard and Juniper MIBs)

Class	MIB	Objects
Class 2	rfc3813.mib	mplsLsrStdMIB Examples: mplsInterfaceTable mplsInSegmentTable mplsOutSegmentTable mplsLabelStackTable mplsXCTable (and related MIB objects)
	igmpmib.mib	igmpStdMIB
	l3vpnmib.mib	mplsVpnmib
	jnx-mpls.mib	Example: mplsLspList
	jnx-ldp.mib	jnxLdp Example: jnxLdpStatsTable
	jnx-vpn.mib	jnxVpnMIB
	jnx-bgpmib2.mib	jnxBgpM2Experiment

Table 17 on page 120 shows Class 3 MIB objects (standard and enterprise-specific MIBs) supported by the JUNOS software. With Class 3, objects will be exposed only for the default logical system.

Table 17: Class 3 MIB Objects (Standard and Juniper MIBs)

Class	MIB	Objects
Class 3	rfc2819a.mib	rmonEvents
		alarmTable
		logTable
		eventTable
		agentxMIB
	rfc2925a.mib	pingmib
	rfc2925b.mib	tracerouteMIB
	jnxchassis.mib	jnxBoxAnatomy
	jnx-chassis-alarm.mib	jnxAlarms
	jnx-ping.mib	jnxPingMIB
	jnx-traceroute.mib	jnxTraceRouteMIB
	jnx-rmon.mib	jnxRmonAlarmTable
	jnx-cos.mib	Example: jnxCosFcTable
	jnx-cfgmgmt.mib	Example: jnxCfgMgmt
	jnx-sonetaps.mib	apsMIBObjects
	jnx-sp.mib	jnxSpMIB
	ggsn.mib	ejnmobileipABmib
	rfc1907.mib	snmpModules
	snmpModules	Examples:
		snmpMIB snmpFrameworkMIB

Table 18 on page 121 shows Class 4 MIB objects (standard and enterprise-specific MIBs) supported by the JUNOS software. With Class 4 objects, data is not segregated by routing instance. All instances will be exposed.

Table 18: Class 4 MIB Objects (Standard and Juniper MIBs)

Class	MIB	Objects
Class 4	system	Example: sysORTable
	rfc2011a.mib	ip (ipDefaultTTL, ipInReceives)
		icmp
	rfc2012a.mib	tcp
		tcpConnTable
		ipv6TcpConnTable
	rfc2013a.mib	udp
		udpTable
		ipv6UdpTable
	rfc2790a.mib	hrSystem
	rfc2287a.mib	sysApplOBJ
	jnx-firewall.mib	jnxFirewalls
	jnx-ipv6.mib	jnxIpv6

Chapter 10

Juniper Networks Enterprise-Specific MIBs

This chapter contains the following section

Juniper Networks Enterprise-Specific MIBs

The JUNOS software supports the following enterprise-specific Management Information Bases (MIBs):

NOTE: For detailed interpretation of Juniper Networks enterprise-specific MIBs, see Part 7,"Juniper Networks Enterprise-Specific MIBs" on page 289.

- AAA Objects MIB—Provides support for monitoring user authentication, authorization, and accounting through the RADIUS, LDAP, SecurID, and local authentication servers. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-user-aaa.txt.
- Access Authentication Objects MIB—Provides support for monitoring firewall authentication, including data about the users trying to access firewall-protected resources and the firewall authentication service itself. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-auth.txt.
- Alarm MIB—Provides support for alarms from the router. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-chassis-alarm.txt.
- Analyzer MIB—Contains analyzer and remote analyzer data related to port mirroring on the EX-series Ethernet switches. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-analyzer.txt.
- ATM CoS MIB—Provides support for monitoring Asynchronous Transfer Mode, version 2 (ATM2) virtual circuit (VC) class-of-service (CoS) configurations. It also provides CoS queue statistics for all VCs that have CoS configured. For a

downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-atm-cos.txt.

- ATM MIB—Provides support for ATM interfaces and virtual connections. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-atm.txt.
- BFD MIB—Provides support for monitoring Bidirectional Forwarding Detection (BFD) sessions. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-bfd.txt.
- BGP4 V2 MIB—Contains objects used to monitor Border Gateway Protocol (BGP) peer-received prefix counters. It is based upon similar objects in the MIB documented in Internet draft draft-ietf-idr-bgp4-mibv2-03.txt, Definitions of Managed Objects for the Fourth Version of Border Gateway Protocol (BGP-4), Second Version. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-bgpmib2.txt.
- Chassis MIB—Provides support for environmental monitoring (power supply state, board voltages, fans, temperatures, and air flow) and inventory support for the chassis, System Control Board (SCB), System and Switching Board (SSB), Switching and Forwarding Model (SFM), Flexible PIC Concentrators (FPCs), and Physical Interface Cards (PICs). For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-chassis.txt.
- Chassis Definitions for Router Model MIB—Contains the object identifiers (OIDs) that are used by the Chassis MIB to identify platform and chassis components. The Chassis MIB provides information that changes often, whereas the Chassis Definitions for Router Model MIB provides information that changes less often. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-chas-defines.txt.
- Chassis Forwarding MIB—Enables J-series Services Routers to fully support the JUNOS health monitor. This MIB extends the scope of health monitoring to include JUNOS forwarding process (fwdd) components. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-chassis-fwdd.txt.
- Class-of-Service MIB—Provides support for monitoring interface output queue statistics per interface and per forwarding class. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-cos.txt.
- Configuration Management MIB—Provides notification for configuration changes as SNMP traps. Each trap contains the time at which the configuration change was committed, the name of the user who made the change, and the method by which the change was made. A history of the last 32 configuration changes is kept in jnxCmChgEventTable. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-cfgmgmt.txt.
- Destination Class Usage MIB—Provides support for monitoring packet counts based on the ingress and egress points for traffic transiting your networks. Ingress points are identified by input interface. Egress points are identified by destination prefixes grouped into one or more sets, known as destination classes. One counter is managed per interface per destination class, up to a maximum of 16 counters per interface. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-dcu.txt.

- DNS Objects MIB—Provides support for monitoring DNS proxy queries, requests, responses, and failures. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-dns.txt.
- Dynamic Flow Capture MIB—Provides support for monitoring the operational status of dynamic flow capture PICs. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-dfc.txt.
- Ethernet MAC MIB—Monitors media access control (MAC) statistics on Gigabit Ethernet intelligent queuing (IQ) interfaces. It collects MAC statistics; for example, inoctets, inframes, outoctets, and outframes on each source MAC address and virtual LAN (VLAN) ID for each Ethernet port. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-mac.txt.
- Event MIB—Defines a generic trap that can be generated using an op script or event policy. This MIB provides the ability to specify a system log string and raise a trap if that system log string is found. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-event.txt.
- Experimental MIB—Contains object identifiers for experimental MIBs. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-exp.txt.
- Firewall MIB—Provides support for monitoring firewall filter counters. Routers must have the Internet Processor II ASIC to perform firewall monitoring. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-firewall.txt.
- Flow Collection Services MIB—Provides statistics on files, records, memory, FTP, and error states of a monitoring services interface. It also provides SNMP traps for unavailable destinations, unsuccessful file transfers, flow overloading, and memory overloading. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-coll.txt.
- Host Resources MIB—Extends the hrStorageTable object, providing a measure of the usage of each file system on the router in percentage. Previously, the objects in the hrStorageTable measured the usage in allocation units—hrStorageUsed and hrStorageAllocationUnits—only. Using the percentage measurement, you can more easily monitor and apply thresholds on usage. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-hostresources.txt.
- Interface MIB—Extends the standard ifTable (RFC 2863) with additional statistics and Juniper Networks enterprise-specific chassis information. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-if-extensions.txt.
- IP Forward MIB—Extends the standard IP Forwarding Table MIB (RFC 2096) to include CIDR forwarding information. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ipforward.txt.
- IPSec Monitoring MIB—Provides operational and statistical information related to the IPSec and IKE tunnels on Juniper Networks routing platforms. For a

downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ipsec-monitor-asp.txt.

- IPSec Generic Flow Monitoring Object MIB—Based on jnx-ipsec-monitor-mib, this MIB provides support for monitoring IPSec and IPSec VPN management objects. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ipsec-flow-mon.txt.
- IPSec VPN Objects MIB—Provides support for monitoring IPSec and IPSec VPN management objects for Juniper security product lines. This MIB is an extension of jnx-ipsec-flow-mon.mib. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-ipsec-vpn.txt.
- IPv4 MIB—Provides additional Internet Protocol version 4 (IPv4) address information, supporting the assignment of identical IPv4 addresses to separate interfaces. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ipv4.txt.
- IPv6 and ICMPv6 MIB—Provides IPv6 and Internet Control Message Protocol version 6 (ICMPv6) statistics. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ipv6.txt.
- L2ALD MIB—Contains information on Layer-2 Address Learning Daemon and related traps, such as routing instance MAC limit trap and interface MAC limit trap. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-l2ald.txt.
- L2CP Features MIB—Provides information about Layer 2 Control Protocols-based features on MX-series Ethernet Services routers. Currently, the JUNOS software supports only the jnxDot1dStpPortRootProtectEnabled, jnxDot1dStpPortRootProtectState, and jnxPortRootProtectStateChangeTrap objects. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-l2cp-features.txt.
- L2TP MIB—Provides information on Layer 2 Transport Protocol (L2TP) tunnels and sessions. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-l2tp.txt.
- LDP MIB—Provides Label Distribution Protocol (LDP) statistics and defines LDP label-switched path (LSP) notifications. LDP traps support only IPv4 standards. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ldp.txt.
- Multiple Instance Multiple Spanning Tree protocol (MIMSTP) MIB—Provides information on MSTP instances (that is, routing instances of type Virtual Switch/Layer 2 control, also known as virtual contexts), MSTIs within the MSTP instance, and VLANs associated with the MSTI. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-mimstp.txt.
- MPLS MIB—Provides Multiprotocol Label Switching (MPLS) information and defines MPLS notifications. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-mpls.txt.

NOTE: To collect information about MPLS statistics on transit routers, use the enterprise-specific RSVP MIB (mib-jnx-rsvp.txt) instead of the enterprise-specific MPLS MIB (mib-jnx-mpls.txt).

- MPLS LDP MIB—Contains object definitions as described in RFC 3815, *Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)*. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-mpls-ldp.txt.

NOTE: Objects in the MPLS LDP MIB were supported in earlier releases of JUNOS software as a proprietary LDP MIB (mib-ldpmib.txt). Because the branch used by the proprietary LDP (mib-ldpmib.txt) conflicts with RFC 3812, the proprietary LDP MIB (mib-ldpmib.txt) has been deprecated and replaced by the enterprise-specific MPLS LDP MIB (mib-jnx-mpls-ldp.txt).

- Network Address Translation (NAT) Objects MIB—Provides support for monitoring network address translation (NAT). This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-nat.txt.
- Packet Forwarding Engine MIB—Provides notification statistics for Packet Forwarding Engines. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-pfe.txt.
- PAE Extension MIB—Extends the standard IEEE802.1x PAE Extension MIB, and contains information for Static MAC Authentication. The enterprise-specific PAE Extension MIB is supported only on EX-series Ethernet switches. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-pae-extension.txt.
- Passive Monitoring MIB—Performs traffic flow monitoring and lawful interception of packets transiting between two routers. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-pmon.txt.
- Ping MIB—Extends the standard Ping MIB control table (RFC 2925). Items in this MIB are created when entries are created in pingCtlTable of the Ping MIB. Each item is indexed exactly as it is in the Ping MIB. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ping.txt.
- Policy Objects MIB—Provides support for monitoring the security policies that control the flow of traffic from one zone to another. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-policy.txt.
- Pseudowire TDM MIB—Extends the standard Pseudowire MIB, and contains information about configuration and statistics for specific pseudowire types. The enterprise-specific Pseudowire TDM MIB is the Juniper Networks implementation of the standard Managed Objects for TDM over Packet Switched Network MIB

(draft-ietf-pwe3-tdm-mib-08.txt). For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-pwtdm.txt.

- Real-time Performance Monitoring Protocol (RPM) MIB—Provides real-time performance-related data and enables you to access jitter measurements and calculations via SNMP. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-rpm.txt.
- Reverse-Path-Forwarding MIB—Monitors statistics for traffic that is rejected because of reverse-path-forwarding (RPF) processing. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-rpf.txt

NOTE: The enterprise-specific RPF MIB is not supported on EX-series Ethernet switches.

- Resource Reservation Protocol (RSVP) traffic engineering (TE) MIB—Provides information about RSVP-TE sessions that correspond to MPLS LSPs on transit routing platforms in the service provider core network. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-rsvp.txt.

NOTE: To collect information about MPLS statistics on transit routers, use the enterprise-specific RSVP MIB (mib-jnx-rsvp.txt) instead of the enterprise-specific MPLS MIB (mib-jnx-mpls.txt).

- RMON Events and Alarms MIB—Supports the JUNOS extensions to the standard Remote Monitoring (RMON) Events and Alarms MIB (RFC 2819). The extension augments alarmTable with additional information about each alarm. Two new traps are also defined to indicate when problems are encountered with an alarm. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-rmon.txt.
- Secure Access Port MIB—Contains information about secure access port configuration on EX-series Ethernet switches. The EX-series Ethernet switches use DHCP snooping and dynamic ARP inspection mechanisms to extend security capabilities on interfaces. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-secure-access-port.txt.
- Security Interface Extension Objects MIB—Provides support for the security management of interfaces. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-if-ext.txt.
- Security Screening Objects MIB—Defines the MIB for the Juniper Networks Enterprise Firewall screen functionality. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-screening.txt.

- Services PIC MIB—Provides statistics for Adaptive Services (AS) PICs and defines notifications for AS PICs. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-sp.txt.
- SONET/SDH Interface Management MIB—Monitors the current alarm for each SONET/SDH interface. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-sonet.txt.
- SONET Automatic Protection Switching MIB—Monitors any SONET interface that participates in Automatic Protection Switching (APS). For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-sonetaps.txt.
- SPU Monitoring MIB—Provides support for monitoring SPUs on SRX 5600 and 5800 devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-spu-monitoring.txt
- Source Class Usage MIB—Counts packets sent to customers by performing a lookup on the IP source address and the IP destination address. The Source Class Usage (SCU) MIB makes it possible to track traffic originating from specific prefixes on the provider core and destined for specific prefixes on the customer edge. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-scu.txt.
- Structure of Management Information MIB—Explains how the Juniper Networks enterprise-specific MIBs are structured. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-smi.txt.
- Structure of Management Information MIB for EX-series Ethernet switches—Defines a MIB branch for switching-related MIB definitions for the EX-series Ethernet switches. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ex-smi.txt.
- Structure of Management Information MIB—Contains object identifiers (OIDs) for the security branch of the MIBs used in the JUNOS software for J-series and SRX-series devices product, services and traps. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-smi.txt
- System Log MIB—Enables notification of an SNMP trap-based application when an important system log message occurs. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-syslog.txt.
- Traceroute MIB—Supports the JUNOS extensions of traceroutes and remote operations. Items in this MIB are created when entries are created in the traceRouteCtlTable of the Traceroute MIB. Each item is indexed exactly the same way as it is in the Traceroute MIB. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-traceroute.txt.
- Utility MIB—Provides SNMP support for exposing JUNOS data and has tables that contain information on each type of data, such as integer and string. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-util.txt.
- Virtual Chassis MIB—Contains information about virtual chassis on EX-series Ethernet switches. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-virtual-chassis.txt.

- VLAN MIB—Contains information about prestandard IEEE 802.10 VLANs and their association with LAN emulation clients. The enterprise-specific VLAN MIB is supported only on EX-series Ethernet switches. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-vlan.txt.
- VPN MIB—Provides monitoring for Layer 3 VPNs, Layer 2 VPNs, and virtual private LAN service (VPLS) (read access only). For a downloadable version of the MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-vpn.txt.
- VPN Certificate Objects MIB—Provides support for monitoring the local and CA certificates loaded on the router. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-cert.txt.

Chapter 11

Juniper Networks Enterprise-Specific SNMP Traps

This chapter summarizes the enterprise-specific SNMP traps supported by the JUNOS software. For scalability reasons, the Multiprotocol Label Switching (MPLS) traps are generated by the ingress router only. For information on disabling the generation of MPLS traps, see the *JUNOS MPLS Applications Configuration Guide*.

NOTE: All enterprise-specific SNMP traps supported by the JUNOS software can be sent in version 1 and 2 formats.

The JUNOS software supports the following enterprise-specific traps:

Juniper Networks Enterprise-Specific SNMP Version 1 Traps

The JUNOS software supports enterprise-specific SNMP version 1 traps shown in Table 19 on page 132. The traps are organized first by trap category and then by trap name. The system logging severity levels are listed for those traps that have them. Traps that do not have corresponding system logging severity levels are marked with an en dash (–).

For more information about system log messages, see the *JUNOS System Log Messages Reference*. For more information about configuring system logging, see the *JUNOS System Basics Configuration Guide*. To view the Juniper Networks enterprise-specific

SNMP version 1 traps, see “Juniper Networks Enterprise-Specific MIBs” on page 123 and select the corresponding Juniper Networks enterprise-specific MIB. For more information about chassis traps, see “Chassis Traps” on page 380.

Table 19 on page 132 lists the Juniper Networks enterprise-specific supported SNMP version 1 traps.

Table 19: Juniper Networks Enterprise-Specific Supported SNMP Version 1 Traps

Trap Category	Trap Name	Enterprise ID	Generic Trap Number	Specific Trap Number	System Logging Severity Level	System Log Tag
Chassis (alarm conditions)	jnxPowerSupplyFailure	1.3.6.1.4.1.2636.4.1	6	1	Warning	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFanFailure	1.3.6.1.4.1.2636.4.1	6	2	Critical	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxOverTemperature	1.3.6.1.4.1.2636.4.1	6	3	Alert	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxRedundancySwitchOver	1.3.6.1.4.1.2636.4.1	6	4	Critical	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruRemoval	1.3.6.1.4.1.2636.4.1	6	5	Notice	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruInsertion	1.3.6.1.4.1.2636.4.1	6	6	Notice	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruPowerOff	1.3.6.1.4.1.2636.4.1	6	7	Notice	CHASSISD_ SNMP_TRAP
Chassis (alarm conditions)	jnxFruPowerOn	1.3.6.1.4.1.2636.4.1	6	8	Notice	CHASSISD_ SNMP_TRAP
Chassis (alarm conditions)	jnxFruFailed	1.3.6.1.4.1.2636.4.1	6	9	Warning	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruOffline	1.3.6.1.4.1.2636.4.1	6	10	Notice	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruOnline	1.3.6.1.4.1.2636.4.1	6	11	Notice	CHASSISD_ SNMP _TRAP

Table 19: Juniper Networks Enterprise-Specific Supported SNMP Version 1 Traps *(continued)*

Trap Category	Trap Name	Enterprise ID	Generic Trap Number	Specific Trap Number	System Logging Severity Level	System Log Tag
Chassis (alarm conditions)	jnxFruCheck	1.3.6.1.4.1.2636.4.1	6	12	Warning	CHASSISD_ SNMP_ TRAP
Chassis (cleared alarm conditions)	jnxPowerSupplyOk	1.3.6.1.4.1.2636.4.2	6	1	Critical	CHASSISD_ SNMP_ TRAP
Chassis (cleared alarm conditions)	jnxFanOK	1.3.6.1.4.1.2636.4.2	6	2	Critical	CHASSISD_ SNMP_ TRAP
Chassis (cleared alarm conditions)	jnxTemperatureOK	1.3.6.1.4.1.2636.4.2	6	3	Alert	CHASSISD_ SNMP_ TRAP
Configuration	jnxCmCfgChange	1.3.6.1.4.1.2636.4.5	6	1	–	–
Configuration	jnxCmRescueChange	1.3.6.1.4.1.2636.4.5	6	2	–	–
Link	jnxCollUnavailableDest	1.3.6.1.4.1.2636.4.8	6	1	–	–
Link	jnxCollUnavailableDestCleared	1.3.6.1.4.1.2636.4.8	6	2	–	–
Link	jnxCollUnsuccessfulTransfer	1.3.6.1.4.1.2636.4.8	6	3	–	–
Link	jnxCollFlowOverload	1.3.6.1.4.1.2636.4.8	6	4	–	–
Link	jnxCollFlowOverloadCleared	1.3.6.1.4.1.2636.4.8	6	5	–	–
Link	jnxCollMemoryUnavailable	1.3.6.1.4.1.2636.4.8	6	6	–	–
Link	jnxCollMemoryAvailable	1.3.6.1.4.1.2636.4.8	6	7	–	–
Link	jnxCollFtpAutoSwitchoverTo Secondary	1.3.6.1.4.1.2636.4.8	6	8	–	–
Link	jnxCollFtpRequestedSwitchover ToSecondary	1.3.6.1.4.1.2636.4.8	6	9	–	–
Link	jnxCollFtpRequestedSwitchover ToPrimary	1.3.6.1.4.1.2636.4.8	6	10	–	–
Link	jnxPMonOverloadSet	1.3.6.1.4.1.2636.4.7.0.1	6	1	–	–
Link	jnxPMonOverloadCleared	1.3.6.1.4.1.2636.4.7.0.2	6	2	–	–

Table 19: Juniper Networks Enterprise-Specific Supported SNMP Version 1 Traps *(continued)*

Trap Category	Trap Name	Enterprise ID	Generic Trap Number	Specific Trap Number	System Logging Severity Level	System Log Tag
Link	jnxapsEventSwitchover	1.3.6.1.4.1.2636.3.24.2	6	1	–	–
Link	jnxapsEventModeMismatch	1.3.6.1.4.1.2636.3.24.2	6	2	–	–
Link	apsEventChannelMismatch	1.3.6.1.4.1.2636.3.24.2	6	3	–	–
Link	apsEventPSBF	1.3.6.1.4.1.2636.3.24.2	6	4	–	–
Link	apsEventFEPLF	1.3.6.1.4.1.2636.3.24.2	6	5	–	–
Remote operations	jnxPingRttThresholdExceeded	1.3.6.1.4.1.2636.4.9	6	1	–	–
Remote operations	jnxPingRttStdDevThreshold Exceeded	1.3.6.1.4.1.2636.4.9	6	2	–	–
Remote operations	jnxPingRttJitterThresholdExceeded	1.3.6.1.4.1.2636.4.9	6	3	–	–
Remote operations	jnxPingEgressThresholdExceeded	1.3.6.1.4.1.2636.4.9	6	4	–	–
Remote operations	jnxPingEgressStdDevThresholdExceeded	1.3.6.1.4.1.2636.4.9	6	5	–	–
Remote operations	jnxPingEgressJitterThresholdExceeded	1.3.6.1.4.1.2636.4.9	6	6	–	–
Remote operations	jnxPingIngressThresholdExceeded	1.3.6.1.4.1.2636.4.9	6	7	–	–
Remote operations	jnxPingIngressStddevThresholdExceeded	1.3.6.1.4.1.2636.4.9	6	8	–	–
Remote operations	jnxPingIngressJitterThresholdExceeded	1.3.6.1.4.1.2636.4.9	6	9	–	–
Routing	jnxLdpLspUp	1.3.6.1.4.1.2636.4.4	6	1	–	–
Routing	jnxLdpLspDown	1.3.6.1.4.1.2636.4.4	6	2	–	–
Routing	jnxLdpSesUp	1.3.6.1.4.1.2636.4.4	6	3	–	–
Routing	jnxLdpSesDown	1.3.6.1.4.1.2636.4.4	6	4	–	–
Routing	mplsLspUp	1.3.6.1.4.1.2636.3.2.4	6	1	–	–
Routing	mplsLspDown	1.3.6.1.4.1.2636.3.2.4	6	2	–	–
Routing	mplsLspChange	1.3.6.1.4.1.2636.3.2.4	6	3	–	–

Table 19: Juniper Networks Enterprise-Specific Supported SNMP Version 1 Traps *(continued)*

Trap Category	Trap Name	Enterprise ID	Generic Trap Number	Specific Trap Number	System Logging Severity Level	System Log Tag
Routing	mplsLspPathDown	1.3.6.1.4.1.2636.3.2.4	6	4	–	–
Routing	jnxVpnIfUp	1.3.6.1.4.1.2636.3.26	6	1	–	–
Routing	jnxVpnIfDown	1.3.6.1.4.1.2636.3.26	6	2	–	–
Routing	jnxVpnPwUp	1.3.6.1.4.1.2636.3.26	6	3	–	–
Routing	jnxVpnPwDown	1.3.6.1.4.1.2636.3.26	6	4	–	–
RMON alarm	jnxRmonAlarmGetFailure	1.3.6.1.4.1.2636.4.3	6	1	–	–
RMON alarm	jnxRmonGetOk	1.3.6.1.4.1.2636.4.3	6	2	–	–
SONET alarm	jnxSonetAlarmSet	1.3.6.1.4.1.2636.4.6	6	1	–	–
SONET alarm	jnxSonetAlarmCleared	1.3.6.1.4.1.2636.4.6	6	2	–	–

Juniper Networks Enterprise-Specific SNMP Version 2 Traps

The JUNOS software supports the enterprise-specific SNMP version 2 traps shown in Table 20 on page 135. The traps are organized first by trap category and then by trap name. The system logging severity levels are listed for those traps that have them. Traps that do not have corresponding system logging severity levels are marked with an en dash (–).

For more information about system messages, see the *JUNOS System Log Messages Reference*. For more information about configuring system logging, see the *JUNOS System Basics Configuration Guide*. To view the Juniper Networks enterprise-specific SNMP version 2 traps, see the "Juniper Networks Enterprise-Specific MIBs" on page 123 and select the corresponding Juniper Networks enterprise-specific MIB. For more information about chassis traps, see "Chassis Traps" on page 380.

Table 20: Enterprise-Specific Supported SNMP Version 2 Traps

Trap Category	Trap Name	snmpTrapOID	System Logging Severity Level	System Log Tag
Chassis (alarm conditions)	jnxPowerSupplyFailure	1.3.6.1.4.1.2636.4.1.1	Alert	CHASSISD_ SNMP_ TRAP

Table 20: Enterprise-Specific Supported SNMP Version 2 Traps *(continued)*

Trap Category	Trap Name	snmpTrapOID	System Logging Severity Level	System Log Tag
Chassis (alarm conditions)	jnxFanFailure	1.3.6.1.4.1.2636.4.1.2	Critical	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxOverTemperature	1.3.6.1.4.1.2636.4.1.3	Critical	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxRedundancySwitchOver	1.3.6.1.4.1.2636.4.1.4	Critical	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruRemoval	1.3.6.1.4.1.2636.4.1.5	Notice	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruInsertion	1.3.6.1.4.1.2636.4.1.6	Notice	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruPowerOff	1.3.6.1.4.1.2636.4.1.7	Notice	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruPowerOn	1.3.6.1.4.1.2636.4.1.8	Notice	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruFailed	1.3.6.1.4.1.2636.4.1.9	Warning	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruOffline	1.3.6.1.4.1.2636.4.1.10	Notice	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruOnline	1.3.6.1.4.1.2636.4.1.11	Notice	CHASSISD_ SNMP_ TRAP
Chassis (alarm conditions)	jnxFruCheck	1.3.6.1.4.1.2636.4.1.12	Notice	CHASSISD_ SNMP_ TRAP
Chassis (cleared alarm conditions)	jnxPowerSupplyOK	1.3.6.1.4.1.2636.4.2.1	Critical	CHASSISD_ SNMP_ TRAP
Chassis (cleared alarm conditions)	jnxFanOK	1.3.6.1.4.1.2636.4.2.2	Critical	CHASSISD_ SNMP_ TRAP
Chassis (cleared alarm conditions)	jnxTemperatureOK	1.3.6.1.4.1.2636.4.2.3	Alert	CHASSISD_ SNMP_ TRAP
Configuration	jnxCmCfgChange	1.3.6.1.4.1.2636.4.5.0.1	–	–
Configuration	jnxCmRescueChange	1.3.6.1.4.1.2636.4.5.0.2	–	–
Link	jnxCollUnavailableDest	1.3.6.1.4.1.2636.4.8.0.1	–	–
Link	jnxCollUnavailableDestCleared	1.3.6.1.4.1.2636.4.8.0.2	–	–

Table 20: Enterprise-Specific Supported SNMP Version 2 Traps *(continued)*

Trap Category	Trap Name	snmpTrapOID	System Logging Severity Level	System Log Tag
Link	jnxCollUnsuccessfulTransfer	1.3.6.1.4.1.2636.4.8.0.3	–	–
Link	jnxCollFlowOverload	1.3.6.1.4.1.2636.4.8.0.4	–	–
Link	jnxCollFlowOverloadCleared	1.3.6.1.4.1.2636.4.8.0.5	–	–
Link	jnxCollMemoryUnavailable	1.3.6.1.4.1.2636.4.8.0.6	–	–
Link	jnxCollMemoryAvailable	1.3.6.1.4.1.2636.4.8.0.7	–	–
Link	jnxCollFtpAutoSwitchoverToSecordary	1.3.6.1.4.1.2636.4.8.0.8	–	–
Link	jnxCollFtpRequested SwitchovertoSecondary	1.3.6.1.4.1.2636.4.8.0.9	–	–
Link	jnxCollFtpRequested SwitchoverToPrimary	1.3.6.1.4.1.2636.4.8.0.10	–	–
Link	jnxPMonOverloadSet	1.3.6.1.4.1.2636.4.7.0.1	–	–
Link	jnxPMonOverloadCleared	1.3.6.1.4.1.2636.4.7.0.2	–	–
Link	jnxapsEventSwitchover	1.3.6.1.4.1.2636.3.24.2.0.1	–	–
Link	jnxapsEventModeMismatch	1.3.6.1.4.1.2636.3.24.2.0.2	–	–
Link	apsEventChannelMismatch	1.3.6.1.4.1.2636.3.24.2.0.3	–	–
Link	apsEventPSBF	1.3.6.1.4.1.2636.3.24.2.0.4	–	–
Link	apsEventFEPLF	1.3.6.1.4.1.2636.3.24.2.0.5	–	–
Remote operations	jnxPingRttThresholdExceeded	1.3.6.1.4.1.2636.4.9.0.1	–	–
Remote operations	jnxPingRttStdDevThresholdExceeded	1.3.6.1.4.1.2636.4.9.0.2	–	–
Remote operations	jnxPingRttJitterThresholdExceeded	1.3.6.1.4.1.2636.4.9.0.3	–	–
Remote operations	jnxPingEgressThresholdExceeded	1.3.6.1.4.1.2636.4.9.0.4	–	–
Remote operations	jnxPingEgressStdDevThresholdExceed	1.3.6.1.4.1.2636.4.9.0.5	–	–
Remote operations	jnxPingEgressJitterThresholdExceeded	1.3.6.1.4.1.2636.4.9.0.6	–	–

Table 20: Enterprise-Specific Supported SNMP Version 2 Traps *(continued)*

Trap Category	Trap Name	snmpTrapOID	System Logging Severity Level	System Log Tag
Remote operations	jnxPingIngressThresholdExceeded	1.3.6.1.4.1.2636.4.9.0.7	–	–
Remote operations	jnxPingIngressStddevThresholdExceeded	1.3.6.1.4.1.2636.4.9.0.8	–	–
Remote operations	jnxPingIngressJitterThresholdExceedd	1.3.6.1.4.1.2636.4.9.0.9	–	–
Routing	jnxLdpLspUp	1.3.6.1.4.1.2626.4.4.0.1	–	–
Routing	jnxLdpLspDown	1.3.6.1.4.1.2626.4.4.0.2	–	–
Routing	jnxLdpSesUp	1.3.6.1.4.1.2626.4.4.0.3	–	–
Routing	jnxLdpSesDown	1.3.6.1.4.1.2626.4.4.0.4	–	–
Routing	mplsLspUp	1.3.6.1.4.1.2636.3.2.4.1	–	–
Routing	mplsLspDown	1.3.6.1.4.1.2636.3.2.4.2	–	–
Routing	mplsLspChange	1.3.6.1.4.1.2636.3.2.4.3	–	–
Routing	mplsLspPathDown	1.3.6.1.4.1.2636.3.2.4.4	–	–
Routing	jnxVpnIfUp	1.3.6.1.4.1.2636.3.26.0.1	–	–
Routing	jnxVpnIfDown	1.3.6.1.4.1.2636.3.26.0.2	–	–
Routing	jnxVpnPwUp	1.3.6.1.4.1.2636.3.26.0.3	–	–
Routing	jnxVpnPwDown	1.3.6.1.4.1.2636.3.26.0.4	–	–
Routing	jnxAccessAuthServiceUp	1.3.6.1.4.1.2636.3.51.1.0.1	–	–
Routing	jnxAccessAuthServiceDown	1.3.6.1.4.1.2636.3.51.1.0.2	–	–
Routing	jnxAccessAuthServerDisabled	1.3.6.1.4.1.2636.3.51.1.0.3	–	–
Routing	jnxAccessAuthServerEnabled	1.3.6.1.4.1.2636.3.51.1.0.4	–	–
Routing	jnxJsFwAuthFailure	1.3.6.1.4.1.2636.3.39.1.2.1.0.1	–	–
Routing	jnxJsFwAuthServiceUp	1.3.6.1.4.1.2636.3.39.1.2.1.0.2	–	–
Routing	jnxJsFwAuthServiceDown	1.3.6.1.4.1.2636.3.39.1.2.1.0.3	–	–
Routing	nxJsFwAuthCapacityExceeded	1.3.6.1.4.1.2636.3.39.1.2.1.0.4	–	–
Routing	jnxJsNatAddrPoolThresholdStatus	1.3.6.1.4.1.2636.3.39.1.7.1.0.1	–	–

Table 20: Enterprise-Specific Supported SNMP Version 2 Traps *(continued)*

Trap Category	Trap Name	snmpTrapOID	System Logging Severity Level	System Log Tag
Routing	jnxJsScreenAttack	1.3.6.1.4.1.2636.3.39.1.8.1.0.1	Warning	RT_SCREEN_ICMP, RT_SCREEN_IP, RT_SCREEN_SESSION_LIMIT, RT_SCREEN_TCP, RT_SCREEN_UDP
Routing	jnxJsScreenCfgChange	1.3.6.1.4.1.2636.3.39.1.8.1.0.2	–	–
RMON alarm	jnxRmonAlarmGetFailure	1.3.6.1.4.1.2636.4.3.0.1	–	–
RMON alarm	jnxRmonGetOk	1.3.6.1.4.1.2636.4.3.0.2	–	–
SONET alarm	jnxSonetAlarmSet	1.3.6.1.4.1.2636.4.6.0.1	–	–
SONET alarm	jnxSonetAlarmCleared	1.3.6.1.4.1.2636.4.6.0.2	–	–

Juniper Networks Enterprise-Specific LDP Traps

For information on the enterprise-specific LDP traps, see "Interpreting the Enterprise-Specific LDP MIB" on page 637.

Disabling LDP Traps

You can disable the LDP LSP notifications by including the trap disable statement at the [show protocols ldp log-updown] hierarchy level.

Juniper Networks Enterprise-Specific Version 2 Traps on EX-Series Ethernet Switches

EX-series Ethernet switches support the following enterprise-specific traps:

- jnxSecAccessdsRateLimitCrossed
- jnxSecIfMacLimitExceeded
- jnxStormEventNotification

For more information about the enterprise-specific traps supported on EX-series, see "Interpreting the Enterprise-Specific Secure Access Port MIB" on page 659.

Juniper Networks Enterprise-Specific Version 2 Traps on MX960 Platforms

On the MX960 platform, SNMP traps are generated when the MAC address table on a logical interface or on a bridging-domain reaches its maximum number of entries. You can enable or disable the MAC address learning feature and also configure the

maximum number of MAC entries that a logical interface or bridging-domain can store in the MAC address table.

The following traps, defined in the L2ALD MIB, jnxl2ald.mib, are generated when the respective MAC limit is reached:

- jnxl2aldRoutingInstMacLimit: Generated when the number of MAC addresses for the given routing instance, jnxl2aldRoutingInst, exceeds the set limit.
- jnxl2aldInterfaceMacLimit: Generated when the number of MAC addresses for the given physical interface exceeds the configured limit.
- jnxl2aldGlobalMacLimit:Generated when the number of MAC addresses for the entire system exceeds the configured limit

Raising Traps for Events Based on System Log Messages

Event policies can include an action that raises traps for events based on system log messages. This feature enables notification of an SNMP trap-based application when an important system log message occurs. You can convert any system log message (for which there are no corresponding traps) into a trap. This feature is valuable for customers who use network management system traps rather than system log messages to monitor their networks.

For information on converting system log messages into traps, see the *JUNOS Configuration and Diagnostic Automation Guide*. For information on the System Log MIB that provides support for this feature, see "Interpreting the Enterprise-Specific System Log MIB" on page 483.

Unsupported Enterprise-Specific SNMP Traps

Enterprise-specific SNMP traps that are defined in JUNOS software but are not generated are shown in Table 21 on page 140. For a list of standard traps that are defined in JUNOS software, but are not generated, see "Unsupported Standard SNMP Traps" on page 160.

Table 21: Unsupported Enterprise-Specific SNMP Traps

MIB	Trap Name	Description
jnx-bgpmib2.mib	jnxBgpM2Established	Generated when the BGP finite state machine (FSM) enters the Established state.
	jnxBgpM2BackwardTransition	Generated when the BGP finite state machine moves from a higher-numbered state to a lower-numbered state.
jnx-sonetaps.mib	apsEventFEPLF	Generated when the value of an instance of apsStatusFEPLFs increments.

Spoofing Enterprise-Specific SNMP Traps

You can use the request snmp spoof-trap operational mode command to mimic SNMP trap behavior. The contents of the traps (the values and instances of the objects carried in the trap) can be specified on the command line or they can be spoofed automatically. This feature is useful if you want to trigger SNMP traps from routers and ensure they are processed correctly within your existing network management infrastructure, but find it difficult to simulate the error conditions that trigger many of the traps on the router. For more information, see the *JUNOS System Basics and Services Command Reference*.

Chapter 12

Standard SNMP Traps

This chapter summarizes the standard SNMP traps supported by the JUNOS software. For scalability reasons, the Multiprotocol Label Switching (MPLS) traps are generated by the ingress router only. For information on disabling the generation of MPLS traps, see the *JUNOS MPLS Applications Configuration Guide*.

The JUNOS software supports the following standard SNMP traps:

Standard SNMP Version 1 Traps

Table 22 on page 143 provides an overview of the standard traps for SNMPv1. The traps are organized first by trap category and then by trap name, and include their enterprise ID, generic trap number, and specific trap number. The system logging severity levels are listed for those traps that have them with their corresponding system log tag. Traps that do not have corresponding system logging severity levels are marked with an en dash (–) in the table.

For more information on system log messages, see the *JUNOS System Log Messages Reference*. For more information about configuring system logging, see the *JUNOS System Basics Configuration Guide*.

Table 22: Standard Supported SNMP Version 1 Traps

Trap Category	Trap Name	Enterprise ID	Generic Trap Number	Specific Trap Number	System Logging Severity Level	Syslog Tag
Startup	authenticationFailure	1.3.6.1.4.1.2636	4	0	Notice	SNMPD_ TRAP_ GEN _FAILURE
Link	linkDown	1.3.6.1.4.1.2636	2	0	Warning	SNMP_ TRAP_LINK _DOWN

Table 22: Standard Supported SNMP Version 1 Traps *(continued)*

Trap Category	Trap Name	Enterprise ID	Generic Trap Number	Specific Trap Number	System Logging Severity Level	Syslog Tag
Link	linkUp	1.3.6.1.4.1.2636	3	0	Info	SNMP_TRAP _LINK_UP
Remote operations	pingProbeFailed	1.3.6.1.2.1.80.0	6	1	Info	SNMP_TRAP _PING_ PROBE_ FAILED
Remote operations	pingTestFailed	1.3.6.1.2.1.80.0	6	2	Info	SNMP_TRAP_ PING_TEST _FAILED
Remote operations	pingTestCompleted	1.3.6.1.2.1.80.0	6	3	Info	SNMP_TRAP_ PING_TEST_ COMPLETED
Remote operations	traceRoutePathChange	1.3.6.1.2.1.81.0	6	1	Info	SNMP_TRAP_ TRACE_ROUTE_ PATH_CHANGE
Remote operations	traceRouteTestFailed	1.3.6.1.2.1.81.0	6	2	Info	SNMP_TRAP_ TRACE_ROUTE_ TEST_FAILED
Remote operations	traceRouteTestCompleted	1.3.6.1.2.1.81.0	6	3	Info	SNMP_TRAP_ TRACE_ROUTE_ TEST_COMPLETED
RMON alarm	fallingAlarm	1.3.6.1.2.1.16	6	2	–	–
RMON alarm	risingAlarm	1.3.6.1.2.1.16	6	1	–	–
Routing	bgpEstablished	1.3.6.1.2.1.15.7	6	1	–	–
Routing	bgpBackwardTransition	1.3.6.1.2.1.15.7	6	2	–	–
Routing	ospfVirtIfStateChange	1.3.6.1.2.1.14.16.2	6	1	–	–
Routing	ospfNbrStateChange	1.3.6.1.2.1.14.16.2	6	2	–	–
Routing	ospfVirtNbrStateChange	1.3.6.1.2.1.14.16.2	6	3	–	–
Routing	ospfIfConfigError	1.3.6.1.2.1.14.16.2	6	4	–	–
Routing	ospfVirtIfConfigError	1.3.6.1.2.1.14.16.2	6	5	–	–
Routing	ospfIfAuthFailure	1.3.6.1.2.1.14.16.2	6	6	–	–
Routing	ospfVirtIfAuthFailure	1.3.6.1.2.1.14.16.2	6	7	–	–
Routing	ospfIfRxBadPacket	1.3.6.1.2.1.14.16.2	6	8	–	–
Routing	ospfVirtIfRxBadPacket	1.3.6.1.2.1.14.16.2	6	9	–	–

Table 22: Standard Supported SNMP Version 1 Traps *(continued)*

Trap Category	Trap Name	Enterprise ID	Generic Trap Number	Specific Trap Number	System Logging Severity Level	Syslog Tag
Routing	ospfTxRetransmit	1.3.6.1.2.1.14.16.2	6	10	–	–
Routing	ospfVirtIfTxRetransmit	1.3.6.1.2.1.14.16.2	6	11	–	–
Routing	ospfMaxAgeLsa	1.3.6.1.2.1.14.16.2	6	13	–	–
Routing	ospfIfStateChange	1.3.6.1.2.1.14.16.2	6	16	–	–
Startup	coldStart	1.3.6.1.4.1.2636	0	0	Critical	SNMPD_TRAP_COLD_START
Startup	warmStart	1.3.6.1.4.1.2636	1	0	Error	SNMPD_TRAP_WARM_START
VRRP	vrrpTrapNewMaster	1.3.6.1.2.1.68	6	1	Warning	VRRPD_NEWMASTER_TRAP
VRRP	vrrpTrapAuthFailure	1.3.6.1.2.1.68	6	2	Warning	VRRPD_AUTH_FAILURE_TRAP

SNMPv1 also supports the following standard traps:

- SNMP Version 1 Standard Traps on page 145
- SNMP Version 1 Ping Traps MIB on page 146
- SNMP Version 1 Traceroute Traps MIB on page 147
- SNMP Version 1 VRRP Traps MIB on page 148

SNMP Version 1 Standard Traps

The JUNOS software supports the standard SNMP version 1 traps, which are taken from RFC 1215, *Convention for defining traps for use with the SNMP*:

```
coldStartTRAP-TYPE
ENTERPRISEsnmp
DESCRIPTION
"A coldStart trap signifies that the sending protocol entity is reinitializing
itself such that the agent's configuration or the protocol entity implementation
may be altered."
::= 0
warmStartTRAP-TYPE
ENTERPRISEsnmp
DESCRIPTION
"A warmStart trap signifies that the sending protocol entity is reinitializing
itself such that neither the agent configuration nor the protocol entity
implementation is altered."
::= 1
linkDown TRAP-TYPE
ENTERPRISE snmp
OBJECTS {
   ifIndex
```

```
    ifAdminStatus
    ifOperStatus
    ifName
    }
    DESCRIPTION
    "A linkDown trap signifies that the sending protocol entity recognizes a failure
    in one of the communication links represented in the agent's configuration."
    ::= 2
    linkUp TRAP-TYPE
    ENTERPRISE snmp
    OBJECTS {
      ifIndex
      ifAdminStatus
      ifOperStatus
      ifName
      }
      DESCRIPTION
      "A linkUp trap signifies that the sending protocol entity recognizes that one of
      the communication links represented in the agent's configuration has come
      up."
      ::= 3
      authenticationFailure TRAP-TYPE
      ENTERPRISE snmp
      DESCRIPTION
      "An authenticationFailure trap signifies that the sending protocol entity is the
      addressee of a protocol message that is not properly authenticated. While
      implementations of the SNMP must be capable of generating this trap, they
      must also be capable of suppressing the emission of such traps via an
      implementation-specific mechanism."
      ::= 4
      egpNeighborLoss TRAP-TYPE
      ENTERPRISE snmp
      VARIABLES { egpNeighAddr }
        DESCRIPTION
        "An egpNeighborLoss trap signifies that an EGP neighbor for whom the sending
        protocol entity was an EGP peer has been marked down and the peer
        relationship no longer obtains."
        ::= 5
      }
    }
}
```

SNMP Version 1 Ping Traps MIB

The JUNOS software supports the SNMP traps from RFC 2925, *Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations*, converted to SNMPv1 format:

```
-definition of ping MIB traps
SNMP Version 1 Traceroute Traps MIB
pingProbeFailed TRAP-TYPE
ENTERPRISE pingMIB
VARIABLES {
  pingCtlTargetAddressType, pingCtlTargetAddress,
  pingResultsOperStatus, pingResultsIpTargetAddressType,
```

```
    pingResultsIpTargetAddress, pingResultsMinRtt,
    pingResultsMaxRtt, pingResultsAverageRtt,
    pingResultsProbeResponses, pingResultsSentProbes,
    pingResultsRttSumOfSquares, pingResultsLastGoodProbe
}
STATUSmandatory
DESCRIPTION
"Generated when a probe failure is detected when the corresponding
pingCtlTrapGeneration object is set to probeFailure(0) subject to the value of
pingCtlTrapProbeFailureFilter. The object pingCtlTrapProbeFailureFilter can be
used to specify the number of successive probe failures that are required
before this notification can be generated."
::= 1
pingTestFailedTRAP-TYPE
ENTERPRISEpingMIB
VARIABLES {
    pingCtlTargetAddressType, pingCtlTargetAddress,
    pingResultsOperStatus, pingResultsIpTargetAddressType,
    pingResultsIpTargetAddress, pingResultsMinRtt,
    pingResultsMaxRtt, pingResultsAverageRtt,
    pingResultsProbeResponses, pingResultsSentProbes,
    pingResultsRttSumOfSquares, pingResultsLastGoodProbe
}
STATUSmandatory
DESCRIPTION
"Generated when a ping test is determined to have failed when the
corresponding pingCtlTrapGeneration object is set to testFailure(1). In this
instance pingCtlTrapTestFailureFilter should specify the number of probes in a
test required to have failed in order to consider the test as failed."
::= 2
pingTestCompletedTRAP-TYPE
ENTERPRISE pingMIB
VARIABLES {
    pingCtlTargetAddressType, pingCtlTargetAddress,
    pingResultsOperStatus, pingResultsIpTargetAddressType,
    pingResultsIpTargetAddress, pingResultsMinRtt,
    pingResultsMaxRtt, pingResultsAverageRtt,
    pingResultsProbeResponses, pingResultsSentProbes,
    pingResultsRttSumOfSquares, pingResultsLastGoodProbe
}
STATUSmandatory
DESCRIPTION
"Generated at the completion of a ping test when the
corresponding pingCtlTrapGeneration object is set to
testCompletion(4)."
::= 3
```

SNMP Version 1 Traceroute Traps MIB

The JUNOS software supports the SNMP traps from RFC 2925, *Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations*, converted to SNMPv1 format:

```
-definition of traceroute traps
traceRoutePathChangeTRAP-TYPE
```

```
ENTERPRISEtraceRouteMIB
VARIABLES {
   traceRouteCtlTargetAddressType,
   traceRouteCtlTargetAddress,
   traceRouteResultsIpTgtAddrType,
   traceRouteResultsIpTgtAddr
}
STATUSmandatory
DESCRIPTION
"The path to a target has changed."
::= 1
traceRouteTestFailedTRAP-TYPE
ENTERPRISEtraceRouteMIB
VARIABLES {
   traceRouteCtlTargetAddressType,
   traceRouteCtlTargetAddress,
   traceRouteResultsIpTgtAddrType,
   traceRouteResultsIpTgtAddr
}
STATUSmandatory
DESCRIPTION
"Could not determine the path to a target."
::= 2
traceRouteTestCompletedTRAP-TYPE
ENTERPRISEtraceRouteMIB
VARIABLES {
   traceRouteCtlTargetAddressType,
   traceRouteCtlTargetAddress,
   traceRouteResultsIpTgtAddrType,
   traceRouteResultsIpTgtAddr
}
STATUSmandatory
DESCRIPTION
"The path to a target has just been determined."
::= 3
```

SNMP Version 1 VRRP Traps MIB

The JUNOS software supports the SNMP traps from RFC 2787, *Definitions of Managed Objects for the Virtual Router Redundancy Protocol*, converted to SNMPv1 format:

```
-definition of vrrp traps
vrrpTrapNewMasterTRAP-TYPE
ENTERPRISEvrrpMIB
VARIABLES {
   vrrpOperMasterIpAddr
}
STATUSmandatory
DESCRIPTION
"The newMaster trap indicates that the sending agent has transitioned to
'Master' state."
::= 1
vrrpTrapAuthFailureTRAP-TYPE
ENTERPRISEvrrpMIB
VARIABLES {
```

```
    vrrpTrapPacketSrc
    vrrpTrapAuthErrorType
}
STATUSmandatory
DESCRIPTION
"A vrrpAuthFailure trap signifies that a packet has been received from a router
whose authentication key or authentication type conflicts with this router's
authentication key or authentication type. Implementation of this trap is
optional."
::= 2
```

Standard SNMP Version 2 Traps

Table 23 on page 149 provides an overview of the standard SNMPv2 traps supported by the JUNOS software. The traps are organized first by trap category and then by trap name and include their snmpTrapOID. The system logging severity levels are listed for those traps that have them with their corresponding system log tag. Traps that do not have corresponding system logging severity levels are marked with an en dash (–) in the table.

For more information about system log messages, see the *JUNOS System Log Messages Reference*. For more information about configuring system logging, see the *JUNOS System Basics Configuration Guide*.

Table 23: Standard Supported SNMP Version 2 Traps

Trap Category	Trap Name	snmpTrapOID	System Logging Severity Level	Syslog Tag
Startup	authenticationFailure	1.3.6.1.6.3.1.1.5.5	Notice	SNMPD_TRAP _GEN_FAILURE
Link	linkDown	1.3.6.1.6.3.1.1.5.3	Warning	SNMP_TRAP_ LINK_DOWN
Link	linkUp	1.3.6.1.6.3.1.1.5.4	Info	SNMP_TRAP_ LINK_UP
Remote operations	pingProbeFailed	1.3.6.1.2.1.80.0.1	Info	SNMP_TRAP_ PING_PROBE_ FAILED
Remote operations	pingTestFailed	1.3.6.1.2.1.80.0.2	Info	SNMP_TRAP_PING_ TEST_FAILED
Remote operations	pingTestCompleted	1.3.6.1.2.1.80.0.3	Info	SNMP_TRAP_PING _TEST_COMPLETED
Remote operations	traceRoutePathChange	1.3.6.1.2.1.81.0.1	Info	SNMP_TRAP_TRACE_ ROUTE_PATH_ CHANGE
Remote operations	traceRouteTestFailed	1.3.6.1.2.1.81.0.2	Info	SNMP_TRAP_TRACE_ ROUTE_TEST_FAILED
Remote operations	traceRouteTestCompleted	1.3.6.1.2.1.81.0.3	Info	SNMP_TRAP_TRACE_ ROUTE_TEST_COMPLETED
RMON alarm	fallingAlarm	1.3.6.1.2.1.16.0.1	–	–

Table 23: Standard Supported SNMP Version 2 Traps *(continued)*

Trap Category	Trap Name	snmpTrapOID	System Logging Severity Level	Syslog Tag
RMON alarm	risingAlarm	1.3.6.1.2.1.16.0.2	–	–
Routing	bgpEstablished	1.3.6.1.2.1.15.7.1	–	–
Routing	bgpBackwardTransition	1.3.6.1.2.1.15.7.2	–	–
Routing	ospfVirtIfStateChange	1.3.6.1.2.1.14.16.2.1	–	–
Routing	ospfNbrStateChange	1.3.6.1.2.1.14.16.2.2	–	–
Routing	ospfVirtNbrStateChange	1.3.6.1.2.1.14.16.2.3	–	–
Routing	ospfIfConfigError	1.3.6.1.2.1.14.16.2.4	–	–
Routing	ospfVirtIfConfigError	1.3.6.1.2.1.14.16.2.5	–	–
Routing	ospfIfAuthFailure	1.3.6.1.2.1.14.16.2.6	–	–
Routing	ospfVirtIfAuthFailure	1.3.6.1.2.1.14.16.2.7	–	–
Routing	ospfIfRxBadPacket	1.3.6.1.2.1.14.16.2.8	–	–
Routing	ospfVirtIfRxBadPacket	1.3.6.1.2.1.14.16.2.9	–	–
Routing	ospfTxRetransmit	1.3.6.1.2.1.14.16.2.10	–	–
Routing	ospfVirtIfTxRetransmit	1.3.6.1.2.1.14.16.2.11	–	–
Routing	ospfMaxAgeLsa	1.3.6.1.2.1.14.16.2.13	–	–
Routing	ospfIfStateChange	1.3.6.1.2.1.14.16.2.16	–	–
Startup	coldStart	1.3.6.1.6.3.1.1.5.1	Critical	SNMPD_TRAP_ COLD_START
Startup	warmStart	1.3.6.1.6.3.1.1.5.2	Error	SNMPD_TRAP_ WARM_START
VRRP	vrrpTrapNewMaster	1.3.6.1.2.1.68.0.1	Warning	VRRPD_NEWMASTER _TRAP
VRRP	vrrpTrapAuthFailure	1.3.6.1.2.1.68.0.2	Warning	VRRPD_AUTH_FAILURE_TRAP

The JUNOS software supports the following standard SNMP version 2 traps:

- SNMP Version 2 Standard Traps on page 151
- SNMP Version 2 MPLS Traps on page 152
- SNMP Version 2 OSPF Traps MIB on page 153
- SNMP Version 2 Ping Traps MIB on page 157

SNMP Version 2 Standard Traps

The JUNOS software supports the standard SNMP version traps, which are taken from RFC 1907, *Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)*, and RFC 2863, *The Interfaces Group MIB*:

```
coldStartNOTIFICATION-TYPE
STATUScurrent
DESCRIPTION
"A coldStart trap signifies that the SNMPv2 entity, acting in an agent role, is
reinitializing itself and that its configuration may have been altered."
::= { snmpTraps 1 }
   warmStartNOTIFICATION-TYPE
   STATUScurrent
   DESCRIPTION
   "A warmStart trap signifies that the SNMPv2 entity, acting in an agent role, is
   reinitializing itself such that its configuration is unaltered."
   ::= { snmpTraps 2 }
      linkDownNOTIFICATION-TYPE
      OBJECTS {
         ifIndex
         ifAdminStatus
         ifOperStatus
         ifName
      }
      STATUScurrent
      DESCRIPTION
      "A linkDown trap signifies that the SNMP entity, acting in an agent role, has
      detected that the ifOperStatus object for one of its communication links is about
      to enter the down state from some other state (but not from the notPresent
      state). This other state is indicated by the included value of ifOperStatus."
      ::= { snmpTraps 3 }
         linkUpNOTIFICATION-TYPE
         OBJECTS {
            ifIndex
            ifAdminStatus
            ifOperStatus
            ifName
         }
         STATUScurrent
         DESCRIPTION
         "A linkUp trap signifies that the SNMP entity, acting in an agent role, has
         detected that the ifOperStatus object for one of its communication links left
            the
         down state and transitioned into some other state (but not into the notPresent
         state). This other state is indicated by the included value of ifOperStatus."
         ::= { snmpTraps 4 }
            authenticationFailureNOTIFICATION-TYPE
            STATUScurrent
            DESCRIPTION
            "An authenticationFailure trap signifies that the SNMPv2 entity, acting in an
```

```
                agent role, has received a protocol message that is not properly
                  authenticated.
                While all implementations of the SNMPv2 must be capable of generating
                this trap, the snmpEnableAuthenTraps object indicates whether this trap will
                  be
                generated."
                ::= { snmpTraps 5 }
                }
            }
        }
    }
}
```

SNMP Version 2 MPLS Traps

The JUNOS software supports the Multiprotocol Label Switching (MPLS) SNMP version 2 traps defined in RFC 3812, *Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base*.

You can disable the MPLS traps by including the no-trap option at the [edit protocol mpls log-updown] hierarchy level. For information on disabling the generation of MPLS traps, see the *JUNOS MPLS Applications Configuration Guide*.

The JUNOS software supports the following MPLS traps:

- mplsTunnelUp—Generated when an mplsTunnelOperStatus object for one of the configured tunnels leaves the down state and transitions into another state, other than the notPresent state.
- mplsTunnelDown—Generated when an mplsTunnelOperStatus object for one of the configured tunnels enters the down state from a state other than the notPresent state.

NOTE: When an LSP flaps, only the ingress and egress routers of that LSP generate the mplsTunnelUp and mplsTunnelDown traps. Previously, all the routers associated with an LSP—that is, the ingress, egress, and the transit routers—used to generate the traps when the LSP flaps.

- mplsTunnelRerouted—Generated when a tunnel is rerouted.
- mplsTunnelReoptimized—Generated when a tunnel is reoptimized.

NOTE: In the JUNOS software releases earlier than 8.4, mplsTunnelReoptimized was generated every time the optimization timer expired; that is, when the optimization-timer exceeded the value set for the optimize-timer statement at the [edit protocols mpls label-switched-path path-name] hierarchy level. However, in Release 8.4 and later, this trap is generated only when the path is reoptimized, and not when the optimization-timer expires.

SNMP Version 2 OSPF Traps MIB

The JUNOS software supports the Open Shortest Path First (OSPF) SNMP version 2 traps. The following descriptions are taken from RFC 1850, *OSPF Version 2 Management Information Base*:

```
ospfIfStateChangeNOTIFICATION-TYPE
OBJECTS {
   ospfRouterId, – The originator of the trap
   ospfIfIpAddress,
   ospfAddressLessIf,
}
STATUS current
DESCRIPTION
"An ospfIfStateChange trap signifies that there has been a change in the state of a
non-virtual OSPF interface. This trap should be generated when the interface state
regresses (e.g., goes from Dr to Down) or progresses to a terminal state (i.e.,
Point-to-Point, DR Other, Dr, or Backup)."
::= { ospfTraps 16 }
   ospfVirtIfStateChange NOTIFICATION-TYPE
   OBJECTS {
      ospfRouterId, – The originator of the trap
      ospfVirtIfAreaId,
      ospfVirtIfNeighbor,
   }
   STATUScurrent
   DESCRIPTION
   "An ospfIfStateChange trap signifies that there has been a change in the state of
   an OSPF virtual interface. This trap should be generated when the interface state
   regresses (e.g., goes from Point-to-Point to Down) or progresses to a terminal
   state (i.e., Point)."
   ::= { ospfTraps 1 }
      ospfNbrStateChange NOTIFICATION-TYPE
      OBJECTS {
         ospfRouterId, – The originator of the trap
         ospfNbrIpAddr,
         ospfNbrAddressLessIndex,
         ospfNbrRtrId,
         ospfNbrState
      }
      STATUScurrent
      DESCRIPTION
      "An ospfNbrStateChange trap signifies that there has been a change in the state
      of a non-virtual OSPF neighbor. This trap should be generated when the neighbor
      state regresses (e.g., goes from Attempt or Full to 1-Way or Down) or progresses
         to a terminal state (e.g., 2-Way or Full). When a neighbor transitions from or to
      Full on non-broadcast multi-access and broadcast networks, the trap should be
      generated by the designated router. A designated router transitioning to Down
      will be noted by ospfIfStateChange."
      ::= { ospfTraps 2 }
         ospfVirtNbrStateChange NOTIFICATION-TYPE
         OBJECTS {
            ospfRouterId, – The originator of the trap
            ospfVirtNbrArea,
            ospfVirtNbrRtrId,
```

```
    ospfVirtNbrState
}
STATUS current
DESCRIPTION
"An ospfIfStateChange trap signifies that there has been a change in the state
of an OSPF virtual neighbor. This trap should be generated when the neighbor
state regresses (e.g., goes from Attempt or Full to 1-Way or Down) or progresses
    to a terminal state (e.g., Full)."
::= { ospfTraps 3 }
    ospfIfConfigError NOTIFICATION-TYPE
    OBJECTS {
        ospfRouterId, – The originator of the trap
        ospfIfIpAddress,
        ospfAddressLessIf,
        ospfPacketSrc, – The source IP address
        ospfConfigErrorType, – Type of error
        ospfPacketType
    }
    STATUScurrent
    DESCRIPTION
    "An ospfIfConfigError trap signifies that a packet has been received on a
    non-virtual interface from a router whose configuration parameters conflict
        with
    this router's configuration parameters. Note that the event optionMismatch
    should cause a trap only if it prevents an adjacency from forming."
    ::= { ospfTraps 4 }
        ospfVirtIfConfigError NOTIFICATION-TYPE
        OBJECTS {
            ospfRouterId, – The originator of the trap
            ospfVirtIfAreaId,
            ospfVirtIfNeighbor,
            ospfConfigErrorType, – Type of error
            ospfPacketType
        }
        STATUScurrent
        DESCRIPTION
        "An ospfConfigError trap signifies that a packet has been received on a
            virtual
        interface from a router whose configuration parameters conflict with this
            router's
        configuration parameters. Note that the event optionMismatch should
            cause a
        trap only if it prevents an adjacency from forming."
        ::= { ospfTraps 5 }
            ospfIfAuthFailure NOTIFICATION-TYPE
            OBJECTS {ospfRouterId, – The originator of the trap
                ospfIfIpAddress,
                ospfAddressLessIf,
                ospfPacketSrc, – The source IP address
                ospfConfigErrorType, – authTypeMismatch or
                – authFailure
                ospfPacketType
            }
            STATUScurrent
            DESCRIPTION
```

```
"An ospfIfAuthFailure trap signifies that a packet has been received on
   a
non-virtual interface from a router whose authentication key or
   authentication type
conflicts with this router's authentication key or authentication type."
::= { ospfTraps 6 }
   ospfVirtIfAuthFailure NOTIFICATION-TYPE
   OBJECTS {
      ospfRouterId, – The originator of the trap
      ospfVirtIfAreaId,
      ospfVirtIfNeighbor,
      ospfConfigErrorType, – authTypeMismatch or
      – authFailure
   }
   STATUScurrent
   DESCRIPTION
   "An ospfVirtIfAuthFailure trap signifies that a packet has been received
      on a
   virtual interface from a router whose authentication key or
      authentication type
   conflicts with this router's authentication key or authentication type."
   ::= { ospfTraps 7 }
      ospfIfRxBadPacket NOTIFICATION-TYPE
      OBJECTS {
         ospfRouterId, – The originator of the trap
         ospfIfIpAddress,
         ospfAddressLessIf,
         ospfPacketSrc, – The source IP address
         ospfPacketType
      }
      STATUScurrent
      DESCRIPTION
      "An ospfIfRxBadPacket trap signifies that an OSPF packet has been
         received on
      a nonvirtual interface that cannot be parsed."
      ::= { ospfTraps 8 }
         ospfVirtIfRxBadPacket NOTIFICATION-TYPE
         OBJECTS {
            ospfRouterId, – The originator of the trap
            ospfVirtIfAreaId,
            ospfVirtIfNeighbor,
            ospfPacketType
         }
         STATUScurrent
         DESCRIPTION
         "An ospfRxBadPacket trap signifies that an OSPF packet has
            been received on a
         virtual interface that cannot be parsed."
         ::= { ospfTraps 9 }
            ospfTxRetransmit NOTIFICATION-TYPE
            OBJECTS {
               ospfRouterId, – The originator of the trap
               ospfIfIpAddress,
               ospfAddressLessIf,
               ospfNbrRtrId, – Destination
               ospfPacketType,
```

```
        ospfLsdbType,
        ospfLsdbLsid,
        ospfLsdbRouterId
      }
      STATUScurrent
      DESCRIPTION
      "An ospfTxRetransmit trap signifies that an OSPF packet has
        been retransmitted
      on a nonvirtual interface. All packets that may be retransmitted
        are associated
      with an LSDB entry. The LS type, LS ID, and Router ID are used
        to identify the
      LSDB entry."
      ::= { ospfTraps 10 }
        ospfVirtIfTxRetransmit NOTIFICATION-TYPE
        OBJECTS {
          ospfRouterId, – The originator of the trap
          ospfVirtIfAreaId,
          ospfVirtIfNeighbor,
          ospfPacketType,
          ospfLsdbType,
          ospfLsdbLsid,
          ospfLsdbRouterId
        }
        STATUScurrent
        DESCRIPTION
        "An ospfTxRetransmit trap signifies that an OSPF packet has
          been retransmitted
        on a virtual interface. All packets that may be retransmitted
          are associated with
        an LSDB entry. The LS type, LS ID, and Router ID are used
          to identify the LSDB
        entry."
        ::= { ospfTraps 11 }
          ospfMaxAgeLsa NOTIFICATION-TYPE
            OBJECTS {
              ospfRouterId, – The originator of the trap
              ospfLsdbAreaId, – 0.0.0.0 for AS Externals
              ospfLsdbType,
              ospfLsdbLsid,
              ospfLsdbRouterId
            }
            STATUScurrent
            DESCRIPTION
            "An ospfMaxAgeLsa trap signifies that one of the LSAs
              in the router's link-state
            database has aged to MaxAge."
            ::= { ospfTraps 13 }
            }
          }
        }
      }
    }
  }
}
```

```
            }
          }
        }
      }
    }
}
```

SNMP Version 2 Ping Traps MIB

The following descriptions for the SNMPv2 ping traps are from RFC 2925, *Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations*:

```
pingProbeFailedNOTIFICATION-TYPE
OBJECTS {
   pingCtlTargetAddressType,
   pingCtlTargetAddress,
   pingResultsOperStatus,
   pingResultsIpTargetAddressType,
   pingResultsIpTargetAddress,
   pingResultsMinRtt,
   pingResultsMaxRtt,
   pingResultsAverageRtt,
   pingResultsProbeResponses,
   pingResultsSentProbes,
   pingResultsRttSumOfSquares,
   pingResultsLastGoodProbe
}
STATUScurrent
DESCRIPTION
"Generated when a probe failure is detected when the corresponding
pingCtlTrapGeneration object is set to probeFailure(0) subject to the value of
pingCtlTrapProbeFailureFilter. The object pingCtlTrapProbeFailureFilter can be
used to specify the number of successive probe failures that are required
before this notification can be generated."
::= { pingNotifications 1 }
   pingTestFailedNOTIFICATION-TYPE
   OBJECTS {
      pingCtlTargetAddressType,
      pingCtlTargetAddress,
      pingResultsOperStatus,
      pingResultsIpTargetAddressType,
      pingResultsIpTargetAddress,
      pingResultsMinRtt,
      pingResultsMaxRtt,
      pingResultsAverageRtt,
      pingResultsProbeResponses,
      pingResultsSentProbes,
      pingResultsRttSumOfSquares,
      pingResultsLastGoodProbe
   }
   STATUScurrent
   DESCRIPTION
   "Generated when a ping test is determined to have failed when the
   corresponding pingCtlTrapGeneration object is set to testFailure(1). In this
   instance pingCtlTrapTestFailureFilter should specify the number of probes in a
```

```
    test required to have failed in order to consider the test as failed."
    ::= { pingNotifications 2 }
      pingTestCompletedNOTIFICATION-TYPE
      OBJECTS {
        pingCtlTargetAddressType,
        pingCtlTargetAddress,
        pingResultsOperStatus,
        pingResultsIpTargetAddressType,
        pingResultsIpTargetAddress,
        pingResultsMinRtt,
        pingResultsMaxRtt,
        pingResultsAverageRtt,
        pingResultsProbeResponses,
        pingResultsSentProbes,
        pingResultsRttSumOfSquares,
        pingResultsLastGoodProbe
      }
      STATUScurrent
      DESCRIPTION
      "Generated at the completion of a ping test when the corresponding
      pingCtlTrapGeneration object is set to testCompletion(4)."
      ::= { pingNotifications 3 }
      }
    }
}
```

SNMP Version 2 Traceroute Traps MIB

The following descriptions for the SNMPv2 traceroute traps are from RFC 2925, *Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations*:

```
traceRoutePathChangeNOTIFICATION-TYPE
OBJECTS {
  traceRouteCtlTargetAddressType,
  traceRouteCtlTargetAddress,
  traceRouteResultsIpTgtAddrType,
  traceRouteResultsIpTgtAddr
}
STATUScurrent
DESCRIPTION
"The path to a target has changed."
::= { traceRouteNotifications 1 }
  traceRouteTestFailedNOTIFICATION-TYPE
  OBJECTS {
    traceRouteCtlTargetAddressType,
    traceRouteCtlTargetAddress,
    traceRouteResultsIpTgtAddrType,
    traceRouteResultsIpTgtAddr
  }
  STATUScurrent
  DESCRIPTION
  "Could not determine the path to a target."
  ::= { traceRouteNotifications 2 }
    traceRouteTestCompletedNOTIFICATION-TYPE
    OBJECTS {
```

```
        traceRouteCtlTargetAddressType,
        traceRouteCtlTargetAddress,
        traceRouteResultsIpTgtAddrType,
        traceRouteResultsIpTgtAddr
      }
      STATUScurrent
      DESCRIPTION
      "The path to a target has just been determined."
      ::= { traceRouteNotifications 3 }
      }
    }
}
```

SNMP Version 2 VRRP Traps MIB

The following descriptions for the SNMPv2 Virtual Router Redundancy Protocol (VRRP) traps are from RFC 2787, *Definitions of Managed Objects for the Virtual Router Redundancy Protocol*:

```
— vrrp trap definitions
vrrpTrapPacketSrcOBJECT-TYPE
SYNTAX IpAddress
MAX-ACCESSaccessible-for-notify
STATUScurrent
DESCRIPTION
"The IP address of an inbound VRRP packet. Used by
vrrpTrapAuthFailure trap."
::= { vrrpOperations 5 }
   vrrpTrapAuthErrorTypeOBJECT-TYPE
   SYNTAXINTEGER {
      invalidAuthType (1),
      authTypeMismatch (2),
      authFailure (3)
   }
   MAX-ACCESSaccessible-for-notify
   STATUScurrent
   DESCRIPTION
   "Potential types of configuration conflicts. Used by vrrpAuthFailure trap."
}
```

Standard SNMP Traps on EX-Series Ethernet Switches

Apart from the standard SNMP traps listed in the preceding sections, JUNOS software also supports the following standard traps on the EX-series Ethernet switches:

- ptopoConfigChange—Generated when the value of ptopoLastChangeTime changes. Enables a network management system to trigger physical topology table maintenance polls. (RFC 2622, *PTOPO MIB*)
- pethPsePortOnOffNotification—Generated when the power supply status of a PSE port changes. Indicates whether the PSE port is supplying power to the PD port or not. (RFC 3621*Power Ethernet MIB*)

- pethMainPowerUsageOnNotification—Generated when the PSE threshold indicator is on.(RFC 3621*Power Ethernet MIB*)
- pethMainPowerUsageOffNotification—Generated when the PSE threshold indicator is off. (RFC 3621*Power Ethernet MIB*)

Unsupported Standard SNMP Traps

Standard SNMP traps that are defined in JUNOS software but are not generated are shown in Table 24 on page 161. For a list of enterprise-specific traps that are defined in JUNOS software, but are not generated, see "Unsupported Enterprise-Specific SNMP Traps" on page 140.

Table 24: Unsupported Standard SNMP Traps

MIB	Trap Name	Description
isismib.mib	isisDatabaseOverload	Generated when the system enters or leaves the overload state.
	isisManualAddressDrops	Generated when one of the manual areaAddresses assigned to the system is ignored when computing routes.
	isisCorruptedLSPDetected	Generated when an LSP stored in memory becomes corrupted.
	isisAttemptToExceedMaxSequence	Generated when the sequence number on a generated LSP wraps the 32-bit sequence counter and the number is purged.
	isisIDLenMismatch	Generated when a PDU is received with a different value for the system ID length. This trap includes an index to identify the circuit where the PDU was received and the PDU header.
	isisMaxAreaAddressesMismatch	Generated when a PDU with a different value for the maximum area addresses is received.
	isisOwnLSPPurge	Generated when a PDU is received with a system ID and zero age. This notification includes the circuit index if available.
	isisSequenceNumberSkip	Generated when an LSP is received with a system ID and different contents, indicating the LSP may require a higher sequence number.
	isisAuthenticationTypeFailure	Generated when a PDU with the wrong authentication type field is received.
	isisAuthenticationFailure	Generated when a PDU with an incorrect authentication information field is received.
	isisVersionSkew	Generated when a hello PDU from an IS running a different version of the protocol is received.
	isisAreaMismatch	Generated when a hello PDU from an IS which does not share any area address is received.
	isisRejectedAdjacency	Generated when a hello PDU from an IS is received, but no adjacency is established because of a lack of resources.
	isisLSPTooLargeToPropagate	Generated when an LSP which is larger than the dataLinkBlockSize for a circuit is attempted, but not propagated.
	isisOriginatingLSPBufferSizeMismatch	Generated when a Level 1 LSP or Level 2 LSP is received that is larger than the local value for originating L1LSPBufferSize or originating L2LSPBufferSize, respectively, or when a Level 1 LSP or Level 2 LSP is received containing the originating LSPBufferSize option and the value in the PDU option field does not match the local value for originating L1LSPBufferSize or originating L2LSPBufferSize, respectively.
	isisProtocolsSupportedMismatch	Generated when a non-pseudonode, segment 0 LSP is received that has no matching protocols.

Table 24: Unsupported Standard SNMP Traps *(continued)*

MIB	Trap Name	Description
l3vpnmib.mib	mplsVrfIfUp	Generated when the ifOperStatus of an interface associated with a VRF changes to the up(1) state, or when an interface with ifOperStatus = up(1) is associated with a VRF.
	mplsVrfIfDown	Generated when the ifOperStatus of an interface associated with a VRF changes to the down(1) state, or when an interface with ifOperStatus = up(1) state is disassociated from a VRF.
	mplsNumVrfRouteMidThreshExceeded	Generated when the number of routes contained by the specified VRF exceeds the value indicated by mplsVrfMidRouteThreshold.
	mplsNumVrfRouteMaxThreshExceeded	Generated when the number of routes contained by the specified VRF reaches or attempts to exceed the maximum allowed value as indicated by mplsVrfMaxRouteThreshold.
	mplsNumVrfSecIllglLblThrshExcd	Generated when the number of illegal label violations on a VRF as indicated by mplsVpnVrfSecIllegalLblVltns has exceeded mplsVpnVrfSecIllegalLblRcvThrsh.
ldpmib.mib	mplsLdpInitSesThresholdExceeded	Generated when the value of mplsLdpEntityInitSesThreshold is not zero and the number of session initialization messages exceeds the value of mplsLdpEntityInitSesThreshold.
	mplsLdpPathVectorLimitMismatch	Generated when the mplsLdpEntityPathVectorLimit does not match the value of the mplsLdpPeerPathVectorLimit for a specific entity.
	mplsLdpSessionUp	Generated when the value of mplsLdpSesState enters the operational(5) state.
	mplsLdpSessionDown	Generated when the value of mplsLdpSesState leaves the operational(5) state.
msdpmib.mib	msdpEstablished	Generated when the MSDP FSM enters the Established state.
	msdpBackwardTransition	Generated when the MSDP FSM moves from a higher numbered state to a lower numbered state.

Table 24: Unsupported Standard SNMP Traps *(continued)*

MIB	Trap Name	Description
ospf2trap.mib	ospfVirtualIfConfigError	Generated when a packet is received on a virtual interface from a router whose configuration parameters conflict with the receiving router's configuration parameters.
	ospfVirtualIfAuthFailure	Generated when a packet is received on a virtual interface from a router whose authentication key or authentication type conflicts with the receiving router's authentication key or authentication type.
	ospfVirtualIfRxBadPacket	Generated when an OSPF packet is received on a virtual interface and cannot be parsed.
	ospfOriginateLsa	Generated when a new LSA is originated by the router because of a topology change.
	ospfLsdbOverflow	Generated when the number of LSAs in the router's link-state database exceeds the value of ospfExtLsdbLimit.
	ospfLsdbApproachingOverflow	Generated when the number of LSAs in the router's link-state database exceeds 90% of the value of ospfExtLsdbLimit.
rfc1747.mib	sdlcPortStatusChange	Generated when the state of an SDLC port transitions to active or inactive.
	sdlcLSStatusChange	Generated when the state of an SDLC link station transitions to contacted or disconnected.
rfc2115a.mib	frDLCIStatusChange	Generated when a virtual circuit changes state (has been created or invalidated, or has toggled between the active and inactive states).
rfc2662.mib	adslAtucRateChangeTrap	Generated when the ATUCs transmit rate has changed (RADSL mode only).
	adslAtucPerfLofsThreshTrap	Generated when the loss of framing 15-minute interval threshold is reached.
	adslAtucInitFailureTrap	Generated when ATUC initialization fails.
	adslAturPerfLprsThreshTrap	Generated when the loss of power 15-minute interval threshold is reached.
	adslAturRateChangeTrap	Generated when the ATURs transmit rate changes (RADSL mode only).
rfc3020.mib	mfrMibTrapBundleLinkMismatch	Generated when a bundle link mismatch is detected.
rfc3813.mib	mplsXCUp	Generated when mplsXCOperStatus for one or more contiguous entries in mplsXCTable enters the up(1) state from some other state.
	mplsXCDown	Generated when mplsXCOperStatus for one or more contiguous entries in mplsXCTable enters the down(2) state from some other state.

Spoofing Standard SNMP Traps

You can use the request snmp spoof-trap operational mode command to mimic SNMP trap behavior. The contents of the traps (the values and instances of the objects carried in the trap) can be specified on the command line or they can be spoofed automatically. This feature is useful if you want to trigger SNMP traps from routers and ensure they are processed correctly within your existing network management infrastructure, but find it difficult to simulate the error conditions that trigger many of the traps on the router. For more information, see the *JUNOS System Basics and Services Command Reference*.

Chapter 13

Summary of SNMP Configuration Statements

The following sections explain each of the Simple Network Management Protocol (SNMP) configuration statements. The statements are organized alphabetically.

agent-address

Syntax agent-address outgoing-interface;

Hierarchy Level [edit snmp trap-options]

Release Information Statement introduced before JUNOS Release 7.4.

Description Set the agent address of all SNMPv1 traps generated by this router. Currently, the only option is outgoing-interface, which sets the agent address of each SNMPv1 trap to the address of the outgoing interface of that trap.

Options outgoing-interface—Value of agent address of all SNMPv1 traps generated by this router. The outgoing-interface option sets the agent address of each SNMPv1 trap to the address of the outgoing interface of that trap.
Default: disabled (The agent address is not specified in SNMPv1 traps.)

Usage Guidelines See "Configuring the Agent Address for SNMP Traps" on page 41.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

authorization

Syntax authorization *authorization*;

Hierarchy Level [edit snmp community *community-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Set the access authorization for SNMP Get, GetBulk, GetNext, and Set requests.

Options *authorization*—Access authorization level:

- read-only—Enable Get, GetNext, and GetBulk requests.
- read-write—Enable all requests, including Set requests. You must configure a view to enable Set requests.

  Default: read-only

Usage Guidelines See "Configuring the SNMP Community String" on page 36.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

categories

Syntax
```
categories {
   category;
}
```

Hierarchy Level [edit snmp trap-group *group-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define the types of traps that will be sent to the targets of the named trap group.

Default If you omit the categories statement, all trap types are included in trap notifications.

Options *category*—Name of a trap type.

Values: authentication, chassis, configuration, link, remote-operations, rmon-alarm, routing, sonet-alarms, startup , vrrp-events

Usage Guidelines See "Configuring SNMP Trap Groups" on page 41.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

client-list

Syntax
client-list *client-list-name* {
    ip-addresses;
}

Hierarchy Level [edit snmp]

Release Information Statement introduced in JUNOS Release 8.5.

Description Define a list of SNMP clients.

Options *client-list-name*—Name of the client list.

ip-addresses—IP addresses of the SNMP clients to be added to the client list,

Usage Guidelines See "Adding a Group of Clients to an SNMP Community" on page 37.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

client-list-name

Syntax client-list-name *client-list-name*;

Hierarchy Level [edit snmp community *community-name*]

Release Information Statement introduced in JUNOS Release 8.5.

Description Add a client list or prefix list to an SNMP community.

Options *client-list-name*—Name of the client list or prefix list.

Usage Guidelines See "Adding a Group of Clients to an SNMP Community" on page 37.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

clients

Syntax
```
clients {
   address <restrict>;
}
```

Hierarchy Level [edit snmp community *community-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify the IPv4 or IPv6 addresses of the SNMP client hosts that are authorized to use this community.

Default If you omit the clients statement, all SNMP clients using this community string are authorized to access the router.

Options *address*—Address of an SNMP client that is authorized to access this router. You must specify an address, not a hostname. To specify more than one client, include multiple *address* options.

restrict—(Optional) Do not allow the specified SNMP client to access the router.
Default: The client is granted access.

Usage Guidelines See "Configuring the SNMP Community String" on page 36.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

commit-delay

Syntax commit-delay *seconds*;

Hierarchy Level [edit snmp nonvolatile]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the timer for the SNMP Set reply and start of the commit.

Default 5 seconds

Usage Guidelines See "Configuring the Commit Delay Timer" on page 35.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

community

Syntax

```
community community-name {
    authorization authorization;
    client-list-name client-list-name;
    clients {
        address restrict;
    }
    view view-name;
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define an SNMP community. An SNMP community authorizes SNMP clients based on the source IP address of incoming SNMP request packets. A community also defines which MIB objects are available and the operations (read-only or read-write) allowed on those objects.

The SNMP client application specifies an SNMP community name in Get, GetBulk, GetNext, and Set SNMP requests.

Default If you omit the community statement, all SNMP requests are denied.

Options *community-name*—Community string. If the name includes spaces, enclose it in quotation marks (" ").

The remaining statements are explained separately.

Usage Guidelines See "Configuring the SNMP Community String" on page 36.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

contact

Syntax contact *contact*;

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define the value of the MIB II sysContact object, which is the contact person for the managed system.

Options *contact*—Name of contact person. If the name includes spaces, enclose it in quotation marks (" ").

Usage Guidelines See "Configuring the System Contact on a JUNOS Device" on page 34.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

description

Syntax description *description*;

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define the value of the MIB II sysDescription object, which is the description of the system being managed.

Options *description*—System description. If the name includes spaces, enclose it in quotation marks (" ").

Usage Guidelines See "Configuring the System Description on a JUNOS Device" on page 34.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

destination-port

Syntax destination-port *port-number*;

Hierarchy Level [edit snmp trap-group]

Release Information Statement introduced before JUNOS Release 7.4.

Description Assign a trap port number other than the default.

Default If you omit this statement, the default port is 162.

Options *port-number*—SNMP trap port number.

Usage Guidelines See "Configuring SNMP Trap Groups" on page 41.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

engine-id

See engine-id

filter-duplicates

Syntax filter-duplicates;

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Filter duplicate Get, GetNext, or GetBulk SNMP requests.

Usage Guidelines See "Filtering Duplicate SNMP Requests" on page 35.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

filter-interfaces

Syntax
```
filter-interfaces {
    interfaces{
        interface 1;
        interface 2;
    }
    all-internal-interfaces;
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced in Release 9.4.

Description Filter out information related to specific interfaces from the output of SNMP Get and GetNext requests performed on interface-related MIBs.

Options interfaces—Specifies the interfaces to filter out from the output of SNMP Get and GetNext requests.

all-internal-interfaces—Filters out information related to internal interfaces from the output of SNMP Get and GetNext requests.

Usage Guidelines See "Configuring filter-interfaces Options to Hide Interfaces from SNMP Get and GetNext Outputs" on page 45.

Required Privilege Level snmp

interface

Syntax interface [*interface-names*];

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the interfaces on which SNMP requests can be accepted.

Default If you omit this statement, SNMP requests entering the router through any interface will be accepted.

Options *interface-names*—Names of one or more logical interfaces.

Usage Guidelines See "Configuring the Interfaces on Which SNMP Requests Can Be Accepted" on page 44.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

location

Syntax location *location*;

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define the value of the MIB II sysLocation object, which is the physical location of the managed system.

Options *location*—Location of the local system. You must enclose the name within quotation marks (" ").

Usage Guidelines See "Configuring the System Location for a JUNOS Device" on page 34.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

logical-system

Syntax
```
logical-system logical-system-name {
    routing-instance routing-instance-name;
}
```

Hierarchy Level [edit snmp community *community-name*],
[edit snmp trap-group],
[edit snmp trap-options]

Release Information Statement introduced in JUNOS Release 9.3

NOTE: The logical-system statement replaces the logical-router statement, and is backward compatible with the JUNOS software versions not lower than Release 8.3.

Description Specify a logical system name for SNMP v1 and v2c clients.

Options *logical-system-name*–Name of the logical system.

routing-instance *routing-instance-name*–Statement to specify a routing instance associated with the logical system.

Usage Guidelines See "Specifying a Routing Instance in an SNMPv1 or SNMPv2c Community" on page 108.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

name

Syntax name *name*;

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Set the system name from the command-line interface.

Options *name*—System name override.

Usage Guidelines See “Configuring the System Name” on page 35.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

nonvolatile

Syntax
```
nonvolatile {
    commit-delay seconds;
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure options for SNMP Set requests.

The statement is explained separately in this chapter.

Usage Guidelines See “Configuring the Commit Delay Timer” on page 35.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

oid

Syntax oid *object-identifier* (include | exclude);

Hierarchy Level [edit snmp view *view-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify an object identifier (OID) used to represent a subtree of MIB objects.

Options *object-identifier*—OID used to represent a subtree of MIB objects. All MIB objects represented by this statement have the specified OID as a prefix. It can be specified either by a sequence of dotted integers or by a subtree name.

include—Include the subtree of MIB objects represented by the specified OID.

exclude—Exclude the subtree of MIB objects represented by the specified OID.

Usage Guidelines See "Configuring MIB Views" on page 45.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

routing-instance

Syntax routing-instance *routing-instance-name*;

Hierarchy Level [edit snmp community *community-name*],
[edit snmp community *community-name* logical-system *logical-system-name*],
[edit snmp trap-group *group*]

Release Information Statement introduced in JUNOS Release 8.3.
Added to [edit snmp community *community-name*] hierarchy level in JUNOS Release 8.4
Added to [edit snmp community *community-name* logical-system *logical-system-name*] in JUNOS Release 9.1

Description Specify a routing instance for SNMPv1 and SNMPv2 trap targets. All targets configured in the trap group use this routing instance.

Options *routing-instance-name*—Name of the routing instance.

If the routing instance is defined within a logical system, include the logical-system *logical-system-name* statement at the [edit snmp community *community-name*] hierarchy level and then, specify the routing-instance statement under the [edit snmp community *community-name* logical-system *logical system-name*] hierarchy level.

Usage Guidelines See "Configuring SNMP Trap Groups" on page 41 and "Specifying a Routing Instance in an SNMPv1 or SNMPv2c Community" on page 108.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

snmp

Syntax snmp { ... }
}

Hierarchy Level [edit]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure SNMP.

Usage Guidelines See "Configuring SNMP" on page 31.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

source-address

Syntax source-address *address*;

Hierarchy Level [edit snmp trap-options]

Release Information Statement introduced before JUNOS Release 7.4.

Description Set the source address of every SNMP trap packet sent by this router to a single address regardless of the outgoing interface. If the source address is not specified, the default is to use the address of the outgoing interface as the source address.

Options *address*—Source address of SNMP traps. You can configure the source address of trap packets two ways: lo0 or a valid IPv4 address configured on one of the router interfaces. The value lo0 indicates that the source address of all SNMP trap packets will be set to the lowest loopback address configured at interface lo0.
Default: disabled (The source address is the address of the outgoing interface.)

Usage Guidelines See "Configuring the Source Address for SNMP Traps" on page 40.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

targets

Syntax
```
targets {
    address;
}
```

Hierarchy Level [edit snmp trap-group *group-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure one or more systems to receive SNMP traps.

Options *address*—IPv4 or IPv6 address of the system to receive traps. You must specify an address, not a hostname.

Usage Guidelines See "Configuring SNMP Trap Groups" on page 41.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

traceoptions

Syntax

```
traceoptions {
    file filename <files number> <size size> <world-readable | no-world-readable><match
        regex>;
    flag flag;
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.
file *filename* option added in JUNOS Release 8.1.
world-readable | no-world-readable option added in JUNOS Release 8.1.
match *regex* option added in JUNOS Release 8.1.

Description The output of the tracing operations is placed into log files in the /var/log directory. Each log file is named after the SNMP agent that generates it. Currently, the following logs are created in the /var/log directory when the traceoptions statement is used:

- chassisd
- craftd
- ilmid
- mib2d
- rmopd
- serviced
- snmpd

Options

file *filename*—By default, the name of the log file that records trace output is the name of the process being traced (for example, mib2d or snmpd). Use this option to specify another name.

world-readable | no-world-readable—(Optional) By default, log files can be accessed only by the user who configures the tracing operation. The world-readable option enables any user to read the file. To explicitly set the default behavior, use the no-world-readable option.

files *number*—(Optional) Maximum number of trace files per SNMP subagent. When a trace file (for example, snmpd) reaches its maximum size, it is archived by being renamed to snmpd.0. The previous snmpd.1 is renamed to snmpd.2, and so on. The oldest archived file is deleted.
Range: 2 through 1000 files
Default: 10 files

flag *flag*—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements:

- all—Log all SNMP events.

- configuration—Log reading of configuration at the [edit snmp] hierarchy level.
- database—Log events involving storage and retrieval in the events database.
- events—Log important events.
- general—Log general events.
- interface-stats—Log physical and logical interface statistics.
- nonvolatile-sets—Log nonvolatile SNMP set request handling.
- pdu—Log SNMP request and response packets.
- policy—Log policy processing.
- protocol-timeouts—Log SNMP response timeouts.
- routing-socket—Log routing socket calls.
- server—Log communication with processes that are generating events.
- subagent—Log subagent restarts.
- timer-events—Log internally generated events.
- varbind-error—Log variable binding errors.

match *regex*—(Optional) Refine the output to include lines that contain the regular expression.

size *size*—(Optional) Maximum size, in kilobytes (KB), of each trace file before it is closed and archived.
Range: 10 KB through 1 GB
Default: 1000 KB

Usage Guidelines See "Tracing SNMP Activity on a JUNOS Device" on page 46.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

trap-group

Syntax

```
trap-group group-name {
    categories {
        category;
    }
    destination-port port-number;
    routing-instance instance;
    targets {
        address;
    }
    version (all | v1 | v2);
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Create a named group of hosts to receive the specified trap notifications. The name of the trap group is embedded in SNMP trap notification packets as one variable binding (varbind) known as the community name. At least one trap group must be configured for SNMP traps to be sent.

Options *group-name*—Name of the trap group. If the name includes spaces, enclose it in quotation marks (" ").

The remaining statements are explained separately.

Usage Guidelines See “Configuring SNMP Trap Groups” on page 41.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

trap-options

Syntax
```
trap-options {
    agent-address outgoing-interface;
    source-address address;
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Using SNMP trap options, you can set the source address of every SNMP trap packet sent by the router to a single address, regardless of the outgoing interface. In addition, you can set the agent address of each SNMPv1 trap. For more information on the contents of SNMPv1 traps, see RFC 1157.

Options The remaining statements are explained separately.
Default: disabled

Usage Guidelines See "Configuring SNMP Trap Groups" on page 41.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

version

Syntax version (all | v1 | v2);

Hierarchy Level [edit snmp trap-group *group-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify the version number of SNMP traps.

Options all—Send an SNMPv1 and SNMPv2 trap for every trap condition.

v1—Send SNMPv1 traps only.

v2—Send SNMPv2 traps only.
Default: all

Usage Guidelines See "Configuring SNMP Trap Groups" on page 41.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

view

See the following sections:

- view (Associating MIB View with a Community) on page 182
- view (Configuring MIB View) on page 183

view (Associating MIB View with a Community)

Syntax view *view-name*;

Hierarchy Level [edit snmp community *community-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Associate a view with a community. A view represents a group of MIB objects.

Options *view-name*—Name of the view. You must use a view name already configured in the view statement at the [edit snmp] hierarchy level.

Usage Guidelines See "Configuring the SNMP Community String" on page 36.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

view (Configuring MIB View)

Syntax
```
view view-name {
    oid object-identifier (include | exclude);
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define a MIB view. A MIB view identifies a group of MIB objects. Each MIB object in a view has a common OID prefix. Each object identifier represents a subtree of the MIB object hierarchy. The view statement uses a view to specify a group of MIB objects on which to define access. To enable a view, you must associate the view with a community by including the view statement at the [edit snmp community *community-name*] hierarchy level.

NOTE: To remove an OID completely, use the delete view all oid oid-number command but omit the include parameter.

Options *view-name*—Name of the view

The remaining statements are explained separately.

Usage Guidelines See "Configuring MIB Views" on page 45.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics community

Chapter 14

Summary of SNMPv3 Configuration Statements

The following sections explain each of the SNMPv3 configuration statements. The statements are organized alphabetically.

address

Syntax address *address*;

Hierarchy Level [edit snmp v3 target-address *target-address-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify the SNMP target address.

Options *address*—IPv4 address of the system to receive traps or informs. You must specify an address, not a hostname.

Usage Guidelines See "Configuring the Address" on page 71.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration

address-mask

Syntax address-mask *address-mask*;

Hierarchy Level [edit snmp v3 target-address *target-address-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Verify the source addresses for a group of target addresses.

Options *address-mask* combined with the address defines a range of addresses.

Usage Guidelines See "Configuring the Address Mask" on page 71.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration

authentication-md5

Syntax
```
authentication-md5 {
    authentication-password authentication-password;
}
```

Hierarchy Level [edit snmp v3 usm local-engine user *username*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure MD5 as the authentication type for the SNMPv3 user.

Options *authentication-password*—Password that generates the key used for authentication.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

NOTE: You can only configure one authentication type for each SNMPv3 user.

Usage Guidelines See "Configuring MD5 Authentication" on page 58.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

authentication-none

Syntax authentication-none;

Hierarchy Level [edit snmp v3 usm local-engine user *username*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure no authentication for the SNMPv3 user.

NOTE: You can only configure one authentication type for each SNMPv3 user.

Usage Guidelines See "Configuring No Authentication" on page 59.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

authentication-password

Syntax authentication-password *authentication-password*;

Hierarchy Level [edit snmp v3 usm local-engine user *username* authentication-md5],
[edit snmp v3 usm local-engine user *username* authentication-sha]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure password for authentication.

Options *authentication-password*—Password used to generate the key used for authentication.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Usage Guidelines See "Configuring MD5 Authentication" on page 58 and "Configuring SHA Authentication" on page 58.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

authentication-sha

Syntax
```
authentication-sha {
    authentication-password authentication-password;
}
```

Hierarchy Level [edit snmp v3 usm local-engine user *username*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the SHA as the authentication type for the SNMPv3 user

NOTE: You can only configure one authentication type for each SNMPv3 user.

Options *authentication-password*—The password used to generate the key used for authentication.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Usage Guidelines See “Configuring SHA Authentication” on page 58.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

community-name

Syntax community-name *community-name*;

Hierarchy Level [edit snmp v3 snmp-community *community-index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description The community name defines an SNMP community. The SNMP community authorizes SNMPv1 or SNMPv2 clients. The access privileges associated with the configured security name define which MIB objects are available and the operations (notify, read, or write) allowed on those objects.

Options *community-name*—Community string for an SNMPv1 or SNMPv2c community. If unconfigured, it is the same as the community index. If the name includes spaces, enclose it in quotation marks (" ").

NOTE: Community names must be unique. You cannot configure the same community name at the [edit snmp community] and [edit snmp v3 snmp-community *community-index*] hierarchy levels.

The community name at the [edit snmp v3 snmp-community *community-index*] hierarchy level is encrypted and not displayed in the CLI.

Usage Guidelines See "Configuring the SNMPv3 Community" on page 80.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

engine-id

Syntax

```
engine-id {
    (local engine-id-suffix | use-default-ip-address | use-mac-address);
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description The local engine ID is defined as the administratively unique identifier of an SNMPv3 engine, and is used for identification, not for addressing. There are two parts of an engine ID: prefix and suffix. The prefix is formatted according to the specifications defined in RFC 3411, *An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks*. You can configure the suffix here.

NOTE: SNMPv3 authentication and encryption keys are generated based on the associated passwords and the engine ID. If you configure or change the engine ID, you must commit the new engine ID before you configure SNMPv3 users. Otherwise the keys generated from the configured passwords will be based on the previous engine ID.

For the engine ID, we recommend using the MAC address of fxp0.

Options

local *engine-id-suffix*—Explicit setting for the engine ID suffix.

use-default-ip-address—The engine ID suffix is generated from the default IP address.

use-mac-address—The SNMP engine identifier is generated from the MAC address of the management interface on the routing platform.
Default: use-default-ip-address

Usage Guidelines See "Configuring the Local Engine ID" on page 56.

Required Privilege Level

snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

group

See the following sections:

group (Configuring)

Syntax group *group-name*;

Hierarchy Level [edit snmp v3 vacm access]

Release Information Statement introduced before JUNOS Release 7.4.

Description Assign the security name to a group.

Options *group-name*—SNMPv3 group name created for the SNMPv3 group.

Usage Guidelines See "Configuring the Group" on page 63.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

group (Defining Access Privileges for an SNMPv3 Group)

Syntax group *group-name*;

Hierarchy Level [edit snmp v3 vacm security-to-group security-model (usm | v1 | v2c) security-name *security-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define access privileges granted to a group.

Options *group-name*—Identifies a collection of SNMP security names that belong to the same access policy SNMP.

Usage Guidelines See "Configuring the Group" on page 67.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

inform-retry-count

Syntax inform-retry-count *number*;

Hierarchy Level [edit snmp v3 target-address *target-address-name*]

Release Information Statement introduced in JUNOS Release 7.4.

Description Configure the retry count for SNMP informs.

Options *number*—Maximum number of times the inform is transmitted if no acknowledgment is received. If no acknowledgment is received after the inform is transmitted the maximum number of times, the inform message is discarded.
Default: 3 times

Usage Guidelines See "Configuring SNMP Informs" on page 76.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics inform-timeout

inform-timeout

Syntax inform-timeout *seconds*;

Hierarchy Level [edit snmp v3 target-address *target-address-name*]

Release Information Statement introduced in JUNOS Release 7.4.

Description Configure the timeout period (in seconds) for SNMP informs.

Options *seconds*—Number of seconds to wait for an inform acknowledgment. If no acknowledgment is received within the timeout period, the inform is retransmitted.
Default: 15

Usage Guidelines See "Configuring SNMP Informs" on page 76.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics inform-retry-count

local-engine

Syntax

```
local-engine {
    user username {
        authentication-md5 {
            authentication-password authentication-password;
        }
        authentication-sha {
            authentication-password authentication-password;
        }
        authentication-none;
        privacy-aes128 {
            privacy-password privacy-password;
        }
        privacy-des {
            privacy-password privacy-password;
        }
        privacy-3des {
            privacy-password privacy-password;
        }
        privacy-none {
            privacy-password privacy-password;
        }
    }
}
```

Hierarchy Level [edit snmp v3 usm]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure local-engine information for the user-based security model (USM).

The remaining statements are explained separately.

Usage Guidelines See “Creating SNMPv3 Users” on page 57.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

message-processing-model

Syntax message-processing-model (v1 | v2c | v3);

Hierarchy Level [edit snmp v3 target-parameters *target-parameter-name* parameters]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the message processing model to be used when generating SNMP notifications.

Options v1—SNMPv1 message process model.

v2c—SNMPv2c message process model.

v3—SNMPv3 message process model.

Usage Guidelines See "Configuring the Message Processing Model" on page 75.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

notify

Syntax
```
notify name {
    tag tag-name;
    type (trap | inform);
}
```

Hierarchy Level [edit snmp v3]

Release Information Statement introduced before JUNOS Release 7.4.
type inform option added in JUNOS Release 7.4.

Description Select management targets for notifications as well as the type of notifications. Notifications can be either traps or informs.

Options *name*—Name assigned to the notification.

tag-name—Notifications are sent to all targets configured with this tag.

type—Notification type is trap or inform. Traps are unconfirmed notifications. Informs are confirmed notifications.

Usage Guidelines See "Configuring the SNMPv3 Trap Notification" on page 69 and "Configuring the Inform Notification Type and Target Address" on page 78.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

notify-filter

See the following sections:

- notify-filter (Applying to Management Target) on page 195
- notify-filter (Configuring) on page 195

notify-filter (Applying to Management Target)

Syntax notify-filter *profile-name*;

Hierarchy Level [edit snmp v3 target-parameters *target-parameters-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify the notify filter to be used by a specific set of target parameters.

Options *profile-name*—Name of the notify filter to apply to notifications.

Usage Guidelines See "Applying the Trap Notification Filter" on page 74.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

notify-filter (Configuring)

Syntax
```
notify-filter profile-name {
    oid oid (include | exclude);
}
```

Hierarchy Level [edit snmp v3]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define a group of MIB objects on which to define access. The notify filter limits the type of traps or informs sent to the NMS.

Options *profile-name*—Name assigned to the notify filter.

The remaining statement is explained separately.

Usage Guidelines See "Configuring the Trap Notification Filter" on page 70.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics oid

notify-view

Syntax notify-view *view-name*;

Hierarchy Level [edit snmp v3 vacm access group *group-name* default-context-prefix security-model (any | usm | v1 | v2c) security-level (authentication | none | privacy)]

Release Information Statement introduced before JUNOS Release 7.4.

Description Associate the view with a community or a group name (SNMPv3).

Options *view-name*—Name of the view to which the SNMP user group has access.

Usage Guidelines See "Configuring the Notify View" on page 65.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics See Configuring MIB Views on page 45.

oid

Syntax oid *oid* (include | exclude);

Hierarchy Level [edit snmp v3 notify-filter *profile-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify an object identifier (OID) used to represent a subtree of MIB objects.

Options *oid*—Object identifier used to represent a subtree of MIB objects. All MIB objects represented by this statement have the specified OID as a prefix. It can be specified either by a sequence of dotted integers or by a subtree name.

include—Include the subtree of MIB objects represented by the specified OID.

exclude—Exclude the subtree of MIB objects represented by the specified OID.

Usage Guidelines See "Configuring the Trap Notification Filter" on page 70.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

parameters

Syntax
```
parameters {
    message-processing-model (v1 | v2c | v3);
    security-model (usm | v1 | v2c);
    security-level (none | authentication | privacy);
    security-name security-name;
}
```

Hierarchy Level [edit snmp v3 target-parameters *target-parameters-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure a set of target parameters.

The remaining statements are explained separately.

Usage Guidelines See "Defining and Configuring the Trap Target Parameters" on page 74.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

port

Syntax port *port-number*;

Hierarchy Level [edit snmp v3 target-address *target-address-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure a UDP port number for an SNMP target.

Default If you omit this statement, the default port is 162.

Options *port-number*—Port number for the SNMP target.

Usage Guidelines See "Configuring the Port" on page 72.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

privacy-3des

Syntax

```
privacy-3des {
    privacy-password privacy-password;
}
```

Hierarchy Level [edit snmp v3 usm local-engine user *username*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the triple Data Encryption Standard (3DES) for the SNMPv3 user.

Options *privacy-password*—The password used to generate the key used for encryption.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Usage Guidelines See "Configuring the Encryption Type" on page 59.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

privacy-aes128

Syntax

```
privacy-aes128 {
    privacy-password privacy-password;
}
```

Hierarchy Level [edit snmp v3 usm local-engine user *username*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the Advanced Encryption Standard encryption algorithm (CFB128-AES-128 Privacy Protocol) for the SNMPv3 user.

Options *privacy-password*—The password used to generate the key used for encryption.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Usage Guidelines See "Configuring the Encryption Type" on page 59.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

privacy-des

Syntax
```
privacy-des {
    privacy-password privacy-password;
}
```

Hierarchy Level [edit snmp v3 usm local-engine user *username*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure Data Encryption Standard (DES) for the SNMPv3 user.

Options *privacy-password*—The password used to generate the key used for encryption.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Usage Guidelines See "Configuring the Encryption Type" on page 59.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

privacy-none

Syntax
```
privacy-none;
```

Hierarchy Level [edit snmp v3 usm local-engine user *username*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure no encryption for the SNMPv3 user.

Usage Guidelines See "Configuring the Encryption Type" on page 59.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

privacy-password

Syntax privacy-password *privacy-password*;

Hierarchy Level [edit snmp v3 usm local-engine user *username* privacy-3des],
[edit snmp v3 usm local-engine user *username* privacy-aes128],
[edit snmp v3 usm local-engine user *username* privacy-des]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure a privacy password for the SNMPv3 user.

Options *privacy-password*—The password used to generate the key used for encryption.

SNMPv3 has special requirements when you create plain-text passwords on a routing platform:

- The password must be at least eight characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.

Usage Guidelines See "Configuring the Encryption Type" on page 59.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

read-view

Syntax read-view *view-name*;

Hierarchy Level [edit snmp v3 vacm access group *group-name* default-context-prefix security-model (any | usm | v1 | v2c) security-level (authentication | none | privacy)]

Release Information Statement introduced before JUNOS Release 7.4.

Description Associate the view with a community or a group name (SNMPv3).

Options *view-name*—The name of the view to which the SNMP user group has access.

Usage Guidelines See "Configuring the Read View" on page 65.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics Configuring MIB Views on page 45

remote-engine

Syntax

```
remote-engine engine-id {
    user username {
        authentication-md5 {
            authentication-password authentication-password;
        }
        authentication-sha {
            authentication-password authentication-password;
        }
        authentication-none;
        privacy-aes128 {
            privacy-password privacy-password;
        }
        privacy-des {
            privacy-password privacy-password;
        }
        privacy-3des {
            privacy-password privacy-password;
        }
        privacy-none {
            privacy-password privacy-password;
        }
    }
}
```

Hierarchy Level [edit snmp v3 usm]

Release Information Statement introduced in JUNOS Release 7.4.

Description Configure remote engine information for the user-based security model (USM). To send inform messages to an SNMPv3 user on a remote device, you must configure the engine identifier for the SNMP agent on the remote device where the user resides.

The remaining statements are explained separately.

Options *engine-id*—Engine identifier. Used to compute the security digest for authenticating and encrypting packets sent to a user on the remote host.

Usage Guidelines See “Configuring the Remote Engine and Remote User” on page 77.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

routing-instance

Syntax routing-instance *routing-instance-name*;

Hierarchy Level [edit snmp v3 target-address *target-address-name*]

Release Information Statement introduced in JUNOS Release 8.3.

Description Specify a routing instance for an SNMPv3 trap target.

Options *routing-instance-name*—Name of the routing instance.

To configure a routing instance within a logical system, specify the logical system name followed by the routing instance name. Use a slash (/) to separate the two names (for example, test-ls/test-ri). To configure the default routing instance on a logical system, specify the logical system name followed by default (for example, test-ls/default).

Usage Guidelines See "Configuring the Trap Target Address" on page 70.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

security-level

See the following sections:

- security-level (Defining Access Privileges) on page 204
- security-level (Generating SNMP Notifications) on page 204

security-level (Defining Access Privileges)

Syntax security-level (authentication | none | privacy);

Hierarchy Level [edit snmp v3 vacm access group group-name default-context-prefix security-model (any | usm | v1 | v2c)]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define the security level used for access privileges.

Options none—No authentication and no encryption.

authentication—Provides authentication but no encryption.

privacy—Provides authentication and encryption.
Default: none

Usage Guidelines See "Configuring the Security Level" on page 63.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

security-level (Generating SNMP Notifications)

Syntax security-level (authentication | none | privacy);

Hierarchy Level [edit snmp v3 target-parameters *target-parameters-name* parameters]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the security level to use when generating SNMP notifications.

Options none—No authentication and no encryption.

authentication—Provides authentication but no encryption.

privacy—Provides authentication and encryption.
Default: none

Usage Guidelines See "Configuring the Security Level" on page 75.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

security-model

See the following sections:

- security-model (Access Privileges) on page 205
- security-model (Group) on page 205
- security-model (SNMP Notifications) on page 206

security-model (Access Privileges)

Syntax security-model (usm | v1 | v2c);

Hierarchy Level [edit snmp v3 vacm access group *group-name* default-context-prefix]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure a group's security model used for access privileges.

Options usm—SNMPv3 security model.

v1—SNMPv1 security model.

v2c—SNMPv2c security model.

Usage Guidelines See "Configuring the Security Model" on page 63.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

security-model (Group)

Syntax security-model (usm | v1 | v2c);

Hierarchy Level [edit snmp v3 vacm security-to-group]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define a security model for a group.

Options usm—SNMPv3 security model.

v1—SNMPv1 security model.

v2c—SNMPv2c security model.

Usage Guidelines See "Configuring the Security Model" on page 66.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

security-model (SNMP Notifications)

Syntax security-model (usm | v1 | v2c);

Hierarchy Level [edit snmp v3 target-parameters *target-parameters-name* parameters]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure a group's security model used with sending notifications.

Options usm—SNMPv3 security model.

v1—SNMPv1 security model.

v2c—SNMPv2c security model.

Usage Guidelines See "Configuring the Security Model" on page 75.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

security-name

See the following sections:

security-name (Community String)

Syntax security-name *security-name*;

Hierarchy Level [edit snmp v3 snmp-community *community-index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Associate the community string configured at the [edit snmp v3 snmp-community *community-index*] hierarchy level to a security name.

Options *security-name*—Name used when performing access control.

NOTE: The security name must match the configured security name at the [edit snmp v3 target-parameters *target-parameters-name* parameters] hierarchy level when you configure traps or informs.

Usage Guidelines See "Configuring the Security Names" on page 81.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

security-name (Security Group)

Syntax security-name *security-name*;

Hierarchy Level [edit snmp v3 vacm security-to-group security-model (usm | v1 | v2c)]

Release Information Statement introduced before JUNOS Release 7.4.

Description Associate a group or a community string with a configured security group.

Options *security-name*—Username configured at the [edit snmp v3 usm local-engine user *username*] hierarchy level. For SNMPv1 and SNMPv2c, the security name is the community string configured at the [edit snmp v3 snmp-community *community-index*] hierarchy level.

Usage Guidelines See "Configuring the Security Name" on page 67.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

security-name (SNMP Notifications)

Syntax security-name *security-name*;

Hierarchy Level [edit snmp v3 target-parameters *target-parameters-name* parameters]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the security name used when generating SNMP notifications.

Options *security-name*—Identifies the user that is used when generating the notification if the USM security model is used. Identifies the SNMP community used when generating the notification if the v1 or v2c security models are used.

NOTE: The access privileges for the group associated with this security name must allow this notification to be sent.

If you are using the v1 or v2 security models, the security name at the [edit snmp v3 vacm security-to-group] hierarchy level must match the security name at the [edit snmp v3 snmp-community *community-index*] hierarchy level.

Usage Guidelines See "Configuring the Security Name" on page 76.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

security-to-group

Syntax
```
security-to-group {
    security-model (usm | v1 | v2c) {
        security-name security-name;
        group group-name;
    }
}
```

Hierarchy Level [edit snmp v3 vacm]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the group to which a specific security name belongs.

The remaining statements are explained separately.

Usage Guidelines See "Assigning Security Names to Groups" on page 66.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

snmp-community

Syntax
```
snmp-community community-index {
    community-name community-name;
    security-name security-name;
    tag tag-name;
}
```

Hierarchy Level [edit snmp v3]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the SNMP community.

Options *community-index*—(Optional) String that identifies an SNMP community.

The remaining statements are explained separately.

Usage Guidelines See "Configuring the SNMPv3 Community" on page 80.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

tag

Syntax tag *tag-name*;

Hierarchy Level [edit snmp v3 notify *name*,
[edit snmp v3 snmp-community *community-index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure a set of targets to receive traps or informs (for IPv4 packets only).

Options *tag-name*—Identifies the address of managers that are allowed to use a community string.

Usage Guidelines See "Configuring the Tag" on page 82 and "Configuring the SNMPv3 Trap Notification" on page 69.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

tag-list

Syntax tag-list *tag-list*;

Hierarchy Level [edit snmp v3 target-address *target-address-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure an SNMP tag list used to select target addresses.

Options *tag-list*—Defines sets of target addresses. To specify more than one tag, specify the tag names as a space-separated list enclosed within double quotes.

Usage Guidelines See "Configuring the Tag List" on page 72.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

target-address

Syntax

```
target-address target-address-name {
    address address;
    address-mask address-mask;
    inform-retry-count number;
    inform-timeout seconds;
    port port-number;
    routing-instance instance;
    tag-list tag-list;
    target-parameters target-parameters-name;
}
```

Hierarchy Level [edit snmp v3]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure a management application's address and parameters to be used in sending notifications.

Options *target-address-name*—String that identifies the target address.

The remaining statements are explained separately.

NOTE: You must configure the address mask when you configure the SNMP community.

Usage Guidelines See "Configuring the Trap Target Address" on page 70.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

target-parameters

Syntax

```
target-parameters target-parameters-name {
    notify-filter profile-name;
    parameters {
        message-processing-model (v1 | v2c | V3);
        security-model ( usm | v1 | v2c);
        security-level (authentication | none | privacy);
        security-name security-name;
    }
}
```

Hierarchy Level [edit snmp v3]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure the message processing and security parameters to be used in sending notifications to a particular management target.

The remaining statements are explained separately.

Usage Guidelines See “Defining and Configuring the Trap Target Parameters” on page 74.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

type

Syntax type (trap | inform);

Hierarchy Level [edit snmp v3 notify *name*]

Release Information Statement introduced before JUNOS Release 7.4.
inform option added in JUNOS Release 7.4.

Description Configure the type of notification.

Options trap—Defines the type of notification as a trap. SNMP traps are unconfirmed notifications.

inform—Defines the type of notification as an inform. SNMP informs are confirmed notifications.

Usage Guidelines See “Configuring the SNMPv3 Trap Notification” on page 69 and “Configuring SNMP Informs” on page 76.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

user

Syntax user *username*;

Hierarchy Level [edit snmp v3 usm local-engine]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify a user associated with an SNMPv3 group.

Options *username*—SNMPv3 USM username.

Usage Guidelines See “Creating SNMPv3 Users” on page 57.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

usm

Syntax

```
usm {
    local-engine {
        user username {
            authentication-md5 {
                authentication-password authentication-password;
            }
            authentication-sha {
                authentication-password authentication-password;
            }
            authentication-none;
            privacy-aes128 {
                privacy-password privacy-password;
            }
            privacy-des {
                privacy-password privacy-password;
            }
            privacy-3des {
                privacy-password privacy-password;
            }
            privacy-none {
                privacy-password privacy-password;
                privacy-none;
            }
        }
        remote-engine engine-id {
            user username {
                authentication-md5 {
                    authentication-password authentication-password;
                }
                authentication-sha {
                    authentication-password authentication-password;
                }
                authentication-none;
                privacy-aes128 {
                    privacy-password privacy-password;
                }
                privacy-des {
                    privacy-password privacy-password;
                }
                privacy-3des {
                    privacy-password privacy-password;
                }
                privacy-none {
                    privacy-password privacy-password;
                }
            }
        }
    }
}
```

Hierarchy Level [edit snmp v3]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure user-based security model (USM) information.

The remaining statements are explained separately.

Usage Guidelines See “Creating SNMPv3 Users” on page 57.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

v3

Syntax

```
v3 {
    notify name {
        tag tag-name;
        type trap;
    }
    notify-filter profile-name {
        oid object-identifier (include | exclude);
    }
    snmp-community community-index {
        security-name community-name;
        security-name security-name;
        tag tag-name;
    }
    target-address target-address-name {
        address address;
        address-mask address-mask;
        inform-retry-count number;
        inform-timeout seconds;
        port port-number;
        routing-instance instance;
        tag-list tag-list;
        target-parameters target-parameters-name;
    }
    target-parameters target-parameters-name {
        notify-filter profile-name;
        parameters {
            message-processing-model (v1 | v2c | V3);
            security-model ( usm | v1 | v2c);
            security-level (authentication | none | privacy);
            security-name security-name;
        }
    }
    usm {
        local-engine {
            user username {
                authentication-md5 {
                    authentication-password authentication-password;
                }
                authentication-sha {
                    authentication-password authentication-password;
                }
                authentication-none;
                privacy-aes128 {
                    privacy-password privacy-password;
                }
                privacy-des {
                    privacy-password privacy-password;
                }
                privacy-des {
                    privacy-password privacy-password;
                }
```

```
            privacy-none;
        }
    }
    remote-engine engine-id {
        user username {
            authentication-md5 {
                authentication-password authentication-password;
            }
            authentication-sha {
                authentication-password authentication-password;
            }
            authentication-none;
            privacy-aes128 {
                privacy-password privacy-password;
            }
            privacy-des {
                privacy-password privacy-password;
            }
            privacy-3des {
                privacy-password privacy-password;
            }
            privacy-none {
                privacy-password privacy-password;
            }
        }
    }
}
vacm {
    access {
        group group-name {
            default-context-prefix {
                security-model (any | usm | v1 | v2c) {
                    security-level (authentication | none | privacy) {
                        notify-view view-name;
                        read-view view-name;
                        write-view view-name;
                    }
                }
            }
        }
    }
    security-to-group {
        security-model (usm | v1 | v2c) {
            security-name security-name {
                group group-name;
            }
        }
    }
}
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure SNMPv3.

The remaining statements are explained separately.

Usage Guidelines See "Configuring SNMPv3" on page 53.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

vacm

Syntax

```
vacm {
    access {
        group group-name {
            default-context-prefix {
                security-model (any | usm | v1 | v2c) {
                    security-level (authentication | none | privacy) {
                        notify-view view-name;
                        read-view view-name;
                        write-view view-name;
                    }
                }
            }
        }
    }
    security-to-group {
        security-model (usm | v1 | v2c);
        security-name security-name {
            group group-name;
        }
    }
}
```

Hierarchy Level [edit snmp v3]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure view-based access control model (VACM) information.

The remaining statements are explained separately.

Usage Guidelines See "Defining Access Privileges for an SNMP Group" on page 62.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

view

Syntax

```
view view-name {
    oid object-identifier (include | exclude);
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Define a MIB view. A MIB view identifies a group of MIB objects. Each MIB object in a view has a common OID prefix. Each object identifier represents a subtree of the MIB object hierarchy. The view statement uses a view to specify a group of MIB objects on which to define access. To enable a view, you must associate the view with a community by including the view statement at the [edit snmp community *community-name*] hierarchy level. For SNMPv3, you must associate the view with a group name configured at the [edit snmp v3 vacm] hierarchy level.

NOTE: To remove an OID completely, use the delete view all oid oid-number command but omit the include parameter.

Options *view-name*—Name of the view

The remaining statements are explained separately.

Usage Guidelines See “Configuring MIB Views” on page 45.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics Associating MIB Views with an SNMP User Group on page 64

write-view

Syntax write-view *view-name*;

Hierarchy Level [edit snmp v3 vacm access group *group-name* default-context-prefix security-model (any | usm | v1 | v2c) security-level (authentication | none | privacy)]

Release Information Statement introduced before JUNOS Release 7.4.

Description Associate the view with a community or a group name (SNMPv3).

Options *view-name*—The name of the view to which the SNMP user group has access.

Usage Guidelines See "Configuring MIB Views" on page 45.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics Configuring MIB Views on page 45

Part 4
RMON Alarms and Events

Chapter 15

Configuring RMON Alarms and Events

This chapter contains the following topics:

Understanding RMON Alarms and Events Configuration

The JUNOS software supports monitoring routers from remote devices. These values are measured against thresholds and trigger events when the thresholds are crossed. You configure remote monitoring (RMON) alarm and event entries to monitor the value of a Management Information Base (MIB) object.

For more information on configuring RMON alarm and event entries, see "Configuring RMON Alarms and Events" on page 223 and "Summary of RMON Alarm and Event Configuration Statements" on page 241.

For more information on monitoring integer-valued MIB objects, see "Monitoring RMON Alarms and Events" on page 231.

To configure RMON alarm and event entries, you include statements at the [edit snmp] hierarchy level of the configuration:

```
[edit snmp]
rmon {
    alarm index {
        description text-description;
        falling-event-index index;
        falling-threshold integer;
        falling-threshold-interval seconds;
        interval seconds;
        rising-event-index index;
        rising-threshold integer;
        request-type (get-next-request | get-request | walk-request);
        sample-type (absolute-value | delta-value);
        startup-alarm (falling-alarm | rising-alarm | rising-or-falling-alarm);
        syslog-subtag syslog-subtag;
        variable oid-variable;
        event index {
```

```
        community community-name;
        description description;
        type type;
      }
    }
  }
```

This topic also describes the minimum required RMON alarm and event configuration:

- Minimum RMON Alarm and Event Entry Configuration on page 224

Minimum RMON Alarm and Event Entry Configuration

To enable RMON on the router, you must configure an alarm entry and an event entry. To do this, include the following statements at the [edit snmp rmon] hierarchy level:

```
[edit snmp rmon]
alarm index {
  rising-event-index index;
  rising-threshold integer;
  sample-type type;
  variable oid-variable;
}
event index;
```

Configuring an Alarm Entry and Its Attributes

An alarm entry monitors the value of a MIB variable. You can configure how often the value is sampled, the type of sampling to perform, and what event to trigger if a threshold is crossed.

This section discusses the following topics:

- Configuring the Alarm Entry on page 225
- Configuring the Description on page 225
- Configuring the Falling Event Index or Rising Event Index on page 225
- Configuring the Falling Threshold or Rising Threshold on page 226
- Configuring the Interval on page 226
- Configuring the Falling Threshold Interval on page 226
- Configuring the Request Type on page 227
- Configuring the Sample Type on page 227
- Configuring the Startup Alarm on page 228
- Configuring the System Log Tag on page 228
- Configuring the Variable on page 228

Configuring the Alarm Entry

An alarm entry monitors the value of a MIB variable. The rising-event-index, rising-threshold, sample-type, and variable statements are mandatory. All other statements are optional.

To configure the alarm entry, include the alarm statement and specify an index at the [edit snmp rmon] hierarchy level:

```
[edit snmp rmon]
alarm index {
    description description;
    falling-event-index index;
    falling-threshold integer;
    falling-threshold-interval seconds;
    interval seconds;
    rising-event-index index;
    rising-threshold integer;
    sample-type (absolute-value | delta-value);
    startup-alarm (falling-alarm | rising alarm | rising-or-falling-alarm);
    variable oid-variable;
}
```

index is an integer that identifies an alarm or event entry.

Configuring the Description

The description is a text string that identifies the alarm entry.

To configure the description, include the description statement and a description of the alarm entry at the [edit snmp rmon alarm *index*] hierarchy level:

```
[edit snmp rmon alarm index]
description description;
```

Configuring the Falling Event Index or Rising Event Index

The falling event index identifies the event entry that is triggered when a falling threshold is crossed. The rising event index identifies the event entry that is triggered when a rising threshold is crossed.

To configure the falling event index or rising event index, include the falling-event-index or rising-event-index statement and specify an index at the [edit snmp rmon alarm *index*] hierarchy level:

```
[edit snmp rmon alarm index]
falling-event-index index;
rising-event-index index;
```

index can be from 0 through 65,535. The default for both the falling and rising event index is 0.

Configuring the Falling Threshold or Rising Threshold

The falling threshold is the lower threshold for the monitored variable. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval is greater than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is less than or equal to this threshold, and the associated startup alarm is equal to falling-alarm or rising-or-falling-alarm. After a falling event is generated, another falling event cannot be generated until the sampled value rises above this threshold and reaches the rising threshold. You must specify the falling threshold as an integer. Its default is 20 percent less than the rising threshold.

By default, the rising threshold is 0. The rising threshold is the upper threshold for the monitored variable. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval is less than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is greater than or equal to this threshold, and the associated startup-alarm is equal to rising-alarm or rising-or-falling-alarm. After a rising event is generated, another rising event cannot be generated until the sampled value falls below this threshold and reaches the falling threshold. You must specify the rising threshold as an integer.

To configure the falling threshold or rising threshold, include the falling-threshold or rising-threshold statement at the [edit snmp rmon alarm *index*] hierarchy level:

```
[edit snmp rmon alarm index]
falling-threshold integer;
rising-threshold integer;
```

integer can be a value from -2,147,483,647 through 2,147,483,647.

Configuring the Interval

The interval represents the period of time, in seconds, over which the monitored variable is sampled and compared with the rising and falling thresholds.

To configure the interval, include the interval statement and specify the number of seconds at the [edit snmp rmon alarm *index*] hierarchy level:

```
[edit snmp rmon alarm index]
interval seconds;
```

seconds can be a value from 1 through 2,147,483,647. The default is 60 seconds.

Configuring the Falling Threshold Interval

The falling threshold interval represents the interval between samples when the rising threshold is crossed. Once the alarm crosses the falling threshold, the regular sampling interval is used.

NOTE: You cannot configure the falling threshold interval for alarms that have the request type set to walk-request.

To configure the falling threshold interval, include the falling-threshold interval statement at the [edit snmp rmon alarm *index*] hierarchy level and specify the number of seconds:

```
[edit snmp rmon alarm index]
falling-threshold-interval seconds;
```

seconds can be a value from 1 through 2,147,483,647. The default is 60 seconds.

Configuring the Request Type

By default an RMON alarm can monitor only one object instance (as specified in the configuration). You can configure a request-type statement to extend the scope of the RMON alarm to include all object instances belonging to a MIB branch or to include the next object instance after the instance specified in the configuration.

To configure the request type, include the request-type statement at the [edit snmp rmon alarm *index*] hierarchy level and specify get-next-request, get-request, or walk-request:

```
[edit snmp rmon alarm index]
request-type (get-next-request | get-request | walk-request);
```

walk extends the RMON alarm configuration to all object instances belonging to a MIB branch. next extends the RMON alarm configuration to include the next object instance after the instance specified in the configuration.

Configuring the Sample Type

The sample type identifies the method of sampling the selected variable and calculating the value to be compared against the thresholds. If the value of this object is absolute-value, the value of the selected variable is compared directly with the thresholds at the end of the sampling interval. If the value of this object is delta-value, the value of the selected variable at the last sample is subtracted from the current value, and the difference is compared with the thresholds.

To configure the sample type, include the sample-type statement and specify the type of sample at the [edit snmp rmon alarm *index*] hierarchy level:

```
[edit snmp rmon alarm index]
sample-type (absolute-value | delta-value);
```

- absolute-value—Actual value of the selected variable is compared against the thresholds.
- delta-value—Difference between samples of the selected variable is compared against the thresholds.

Configuring the Startup Alarm

The startup alarm identifies the type of alarm that can be sent when this entry is first activated. You can specify it as falling-alarm, rising-alarm, or rising-or-falling-alarm.

To configure the startup alarm, include the startup-alarm statement and specify the type of alarm at the [edit snmp rmon alarm *index*] hierarchy level:

```
[edit snmp rmon alarm index]
startup-alarm (falling-alarm | rising-alarm | rising-or-falling-alarm);
```

- falling-alarm—Generated if the first sample after the alarm entry becomes active is less than or equal to the falling threshold.
- rising-alarm—Generated if the first sample after the alarm entry becomes active is greater than or equal to the rising threshold.
- rising-or-falling-alarm—Generated if the first sample after the alarm entry becomes active satisfies either of the corresponding thresholds.

The default is rising-or-falling-alarm.

Configuring the System Log Tag

The syslog-subtag statement specifies the tag to be added to the system log message. You can specify a string of not more than 80 uppercase characters as the system log tag.

To configure the system log tag, include the syslog-subtag statement at the [edit snmp rmon alarm *index*] hierarchy level:

```
[edit snmp rmon alarm index]
syslog-subtag syslog-subtag;
```

Configuring the Variable

The variable identifies the MIB object that is being monitored.

To configure the variable, include the variable statement and specify the object identifier or object name at the [edit snmp rmon alarm *index*] hierarchy level:

```
[edit snmp rmon alarm index]
variable oid-variable;
```

oid-variable is a dotted decimal (for example, 1.3.6.1.2.1.2.1.2.2.1.10.1) or MIB object name (for example, ifInOctets.1).

Configuring an Event Entry and Its Attributes

An event entry generates a notification for an alarm entry when its rising or falling threshold is crossed. You can configure the type of notification that is generated. To

configure the event entry, include the event statement at the [edit snmp rmon] hierarchy level. All statements except the event statement are optional.

```
[edit snmp rmon]
event index {
    community community-name;
    description description;
    type type;
}
```

index identifies an entry event.

community-name is the trap group that is used when generating a trap. If that trap group has the rmon-alarm trap category configured, a trap is sent to all the targets configured for that trap group. The community string in the trap matches the name of the trap group. If nothing is configured, all the trap groups are examined, and traps are sent using each group with the rmon-alarm category set.

description is a text string that identifies the entry.

The *type* variable of an event entry specifies where the event is to be logged. You can specify the type as one of the following:

- log—Adds the event entry to the logTable.
- log-and-trap—Sends an SNMP trap and creates a log entry.
- none—Sends no notification.
- snmptrap—Sends an SNMP trap.

The default for the event entry type is log-and-trap.

Example: Configuring an RMON Alarm and Event Entry

Configure an RMON alarm and event entry:

```
[edit snmp]
rmon {
    alarm 100 {
        description “input traffic on fxp0”;
        falling-event-index 100;
        falling-threshold 10000;
        interval 60;
        rising-event-index 100;
        rising-threshold 100000;
        sample-type delta-value;
        startup-alarm rising-or-falling-alarm;
        variable ifInOctets.1;
    }
    event 100 {
        community bedrock;
        description” emergency events”;
        type log-and-trap;
    }
```

```
}
```

Chapter 16

Monitoring RMON Alarms and Events

Use the remote monitoring (RMON) alarms and events feature to monitor integer-valued MIB objects, standard or enterprise-specific, on a Juniper Networks routing platform . Configuration and operational information are in the MIB objects defined in alarmTable, eventTable, and logTable in RFC 2819. Additional information is defined by the Juniper Networks enterprise-specific extension to alarmTable defined in jnxRmonMIB (jnx-rmon-mib.txt).

This chapter covers the following main topics:

RMON Alarms

An RMON alarm identifies:

- A specific MIB object that is monitored.
- The frequency at which it is sampled.
- The method of sampling.
- The thresholds against which the monitored values are compared.

An RMON alarm can also identify a specific eventTable entry to be triggered when a threshold is crossed.

Configuration and operational values are defined in alarmTable in RFC 2819. Additional operational values are defined in Juniper Networks enterprise-specific extensions to alarmTable (jnxRmonAlarmTable).

This topic covers the following sections:

alarmTable

alarmTable in the RMON MIB allows you to monitor and poll the following:

- alarmIndex—The index value for alarmTable that identifies a specific entry.
- alarmInterval—The interval, in seconds, over which data is sampled and compared with the rising and falling thresholds.
- alarmVariable—The MIB variable that is monitored by the alarm entry.
- alarmSampleType—The method of sampling the selected variable and calculating the value to be compared against the thresholds.
- alarmValue—The value of the variable during the last sampling period. This value is compared with the rising and falling thresholds.
- alarmStartupAlarm—The alarm sent when the entry is first activated.
- alarmRisingThreshold—The upper threshold for the sampled variable.
- alarmFallingThreshold—The lower threshold for the sampled variable.
- alarmRisingEventIndex—The eventTable entry used when a rising threshold is crossed.
- alarmFallingEventIndex—The eventTable entry used when a falling threshold is crossed.
- alarmStatus—Method for adding and removing entries from the table. It can also be used to change the state of an entry to allow modifications.

NOTE: If this object is not set to valid, no action will be taken by the associated event alarm.

jnxRmonAlarmTable

The jnxRmonAlarmTable is a Juniper Networks enterprise-specific extension to alarmTable. It provides additional operational information and includes the following objects:

- jnxRmonAlarmGetFailCnt—The number of times the internal Get request for the variable monitored by this entry has failed.
- jnxRmonAlarmGetFailTime—The value of sysUpTime when an internal Get request for the variable monitored by this entry last failed.
- jnxRmonAlarmGetFailReason—The reason an internal Get request for the variable monitored by this entry last failed.
- jnxRmonAlarmGetOkTime—The value of sysUpTime when an internal Get request for the variable monitored by this entry succeeded and the entry left the getFailure state.
- jnxRmonAlarmState—The current state of this RMON alarm entry.

To view the Juniper Networks enterprise-specific extensions to the RMON Events and Alarms and Event MIB, see www.juniper.net/techpubs/software/junos942/swconfig-net-mgmt/mib-jnx-rmon.txt.

For more information on the Juniper Networks enterprise-specific extensions to the RMON Events and Alarms MIB, see "Interpreting the Enterprise-Specific RMON Events and Alarms MIB" on page 413.

Using alarmTable to Monitor MIB Objects

To use alarmTable to monitor a MIB object, perform the following tasks:

Creating an Alarm Entry

To create an alarm entry, first create a new row in alarmTable using the alarmStatus object. For example, create alarm #1 using the UCD command-line utilities:

```
snmpset -Os -v2c router community alarmStatus.1 i createRequest
```

Configuring the Alarm MIB Objects

Once you have created the new row in alarmTable, configure the following Alarm MIB objects:

NOTE: Other than alarmStatus, you cannot modify any of the objects in the entry if the associated alarmStatus object is set to valid.

alarmInterval

The interval, in seconds, over which data is sampled and compared with the rising and falling thresholds. For example, to set alarmInterval for alarm #1 to 30 seconds, use the following SNMP Set request:

```
snmpset -Os -v2c router community alarmInterval.1 i 30
```

alarmVariable

The object identifier of the variable to be sampled. During a Set request, if the supplied variable name is not available in the selected MIB view, a badValue error is returned. If at any time the variable name of an established alarmEntry is no longer available in the selected MIB view, the probe changes the status of alarmVariable to invalid. For example, to identify ifInOctets.61 as the variable to be monitored, use the following SNMP Set request:

```
snmpset -Os -v2c router community alarmVariable.1 o .1.3.6.1.2.1.2.2.1.10.61
```

alarmSampleType

The method of sampling the selected variable and calculating the value to be compared against the thresholds. If the value of this object is absoluteValue, the value of the selected variable is compared directly with the thresholds at the end of the sampling interval. If the value of this object is deltaValue, the value of the selected variable at the last sample is subtracted from the current value, and the difference is compared with the thresholds. For example, to set alarmSampleType for alarm #1 to deltaValue, use the following SNMP Set request:

```
snmpset -Os -v2c router community alarmSampleType.1 i deltaValue
```

alarmValue

The value of the variable during the last sampling period. This value is compared with the rising and falling thresholds. If the sample type is deltaValue, this value equals the difference between the samples at the beginning and end of the period. If the sample type is absoluteValue, this value equals the sampled value at the end of the period.

alarmStartupAlarm

An alarm that is sent when this entry is first set to valid. If the first sample after this entry becomes valid is greater than or equal to risingThreshold, and alarmStartupAlarm is equal to risingAlarm or risingOrFallingAlarm, then a single rising alarm is generated. If the first sample after this entry becomes valid is less than or equal to fallingThreshold and alarmStartupAlarm is equal to fallingAlarm or risingOrFallingAlarm, then a single falling alarm is generated. For example, to set alarmStartupAlarm for alarm #1 to risingOrFallingAlarm, use the following SNMP Set request:

```
snmpset -Os -v2c router community alarmStartupAlarm.1 i risingOrFallingAlarm
```

alarmRisingThreshold

A threshold for the sampled variable. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval is less than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is greater than or equal to this threshold, and the associated alarmStartupAlarm is equal to risingAlarm or risingOrFallingAlarm. After a rising event is generated, another rising event cannot be generated until the sampled value falls below this threshold and reaches alarmFallingThreshold. For example, to set alarmRisingThreshold for alarm #1 to 100000, use the following SNMP Set request:

```
snmpset -Os -v2c router community alarmRisingThreshold.1 i 100000
```

alarmFallingThreshold

A threshold for the sampled variable. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval is greater than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is less than or equal to this threshold, and the associated alarmStartupAlarm is equal to fallingAlarm or risingOrFallingAlarm. After a falling event is generated, another falling event cannot be generated until the sampled value rises above this threshold and reaches alarmRisingThreshold. For example, to set alarmFallingThreshold for alarm #1 to 10000, use the following SNMP Set request:

```
snmpset -Os -v2c router community alarmFallingThreshold.1 i 10000
```

alarmOwner

Any text string specified by the creating management application or the CLI. Typically, it is used to identify a network manager (or application) and can be used for fine access control between participating management applications.

alarmRisingEventIndex

The index of the eventEntry object that is used when a rising threshold is crossed. If there is no corresponding entry in eventTable, then no association exists. If this value is zero, no associated event is generated because zero is not a valid event index. For example, to set alarmRisingEventIndex for alarm #1 to 10, use the following SNMP Set request:

```
snmpset -Os -v2c router community alarmRisingEventIndex.1 i 10
```

alarmFallingEventIndex

The index of the eventEntry object that is used when a falling threshold is crossed. If there is no corresponding entry in eventTable, then no association exists. If this value is zero, no associated event is generated because zero is not a valid event index. For example, to set alarmFallingEventIndex for alarm #1 to 10, use the following SNMP Set request:

```
snmpset -Os -v2c router community alarmFallingEventIndex.1 i 10
```

Activating a New Row in alarmTable

To activate a new row in alarmTable, set alarmStatus to valid using an SNMP Set request:

```
snmpset -Os -v2c router community alarmStatus.1 i valid
```

Modifying an Active Row in alarmTable

To modify an active row, first set alarmStatus to underCreation using an SNMP Set request:

```
snmpset -Os -v2c router community alarmStatus.1 i underCreation
```

Then change the row contents using an SNMP Set request:

```
snmpset -Os -v2c router community alarmFallingThreshold.1 i 1000
```

Finally, activate the row by setting alarmStatus to valid using an SNMP Set request:

```
snmpset -Os -v2c router community alarmStatus.1 i valid
```

Deactivating a Row in alarmTable

To deactivate a row in alarmTable, set alarmStatus to invalid using an SNMP Set request:

```
snmpset -Os -v2c router community alarmStatus.1 i invalid
```

RMON Events

An RMON event allows you to log the crossing of thresholds of other MIB objects. It is defined in eventTable for the RMON MIB.

This section covers the following topics:

eventTable

eventTable contains the following objects:

- eventIndex—An index that uniquely identifies an entry in eventTable. Each entry defines one event that will be generated when the appropriate conditions occur.
- eventDescription—A comment describing the event entry.

- eventType—Type of notification that the probe makes about this event.
- eventCommunity—Trap group used if an SNMP trap is to be sent. If eventCommunity is not configured, a trap is sent to each trap group configured with the rmon-alarm category.
- eventLastTimeSent—Value of sysUpTime when this event entry last generated an event.
- eventOwner—Any text string specified by the creating management application or the CLI. Typically, it is used to identify a network manager (or application) and can be used for fine access control between participating management applications.
- eventStatus—Status of this event entry.

NOTE: If this object is not set to valid, no action is taken by the associated event entry. When this object is set to valid, all previous log entries associated with this entry (if any) will be deleted.

Using eventTable to Log Alarms

To use eventTable to log alarms, perform the following tasks:

- Creating an Event Entry on page 237
- Configuring the MIB Objects on page 237
- Activating a New Row in eventTable on page 239
- Deactivating a Row in eventTable on page 239

Creating an Event Entry

The RMON eventTable controls the generation of notifications from the router. Notifications can be logs (entries to logTable and syslogs) or SNMP traps. Each event entry can be configured to generate any combination of these notifications (or no notification). When an event specifies that an SNMP trap is to be generated, the trap group that is used when sending the trap is specified by the value of the associated eventCommunity object. Consequently, the community in the trap message will match the value specified by eventCommunity. If nothing is configured for eventCommunity, a trap is sent using each trap group that has the rmon-alarm category configured.

Configuring the MIB Objects

Once you have created the new row in eventTable, set the following objects:

- eventType on page 238
- eventCommunity on page 238
- eventOwner on page 238
- eventDescription on page 239

The eventType object is required. All other objects are optional.

eventType

The type of notification that the router generates when the event is triggered.

This object can be set to the following values:

- log—Adds the event entry to logTable.
- log-and-trap—Sends an SNMP trap and creates a log entry.
- none—Sends no notification.
- snmptrap—Sends an SNMP trap.

For example, to set eventType for event #1 to log-and-trap, use the following SNMP Set request:

```
snmpset -Os -v2c router community eventType.1 i log-and-trap
```

eventCommunity

The trap group that is used when generating a trap (if eventType is configured to send traps). If that trap group has the rmon-alarm trap category configured, a trap is sent to all the targets configured for that trap group. The community string in the trap matches the name of the trap group (and hence, the value of eventCommunity). If nothing is configured, traps are sent to each group with the rmon-alarm category set. For example, to set eventCommunity for event #1 to boy-elroy, use the following SNMP Set request:

```
snmpset -Os -v2c router community eventCommunity.1 s "boy-elroy"
```

NOTE: The eventCommunity object is optional. If you do not set this object, then the field is left blank.

eventOwner

Any text string specified by the creating management application or the CLI. Typically, it is used to identify a network manager (or application) and can be used for fine access control between participating management applications.

For example, to set eventOwner for event #1 to george jetson, use the following SNMP Set request:

```
snmpset -Os -v2c router community eventOwner.1 s "george jetson"
```

NOTE: The eventOwner object is optional. If you do not set this object, then the field is left blank.

eventDescription

Any text string specified by the creating management application or the CLI. The use of this string is application dependent.

For example, to set eventDescription for event #1 to spacelys sprockets, use the following SNMP Set request:

```
snmpset -Os -v2c router community eventDescription.1 s "spacelys sprockets"
```

NOTE: The eventDescription object is optional. If you do not set this object, then the field is left blank.

Activating a New Row in eventTable

To activate the new row in eventTable, set eventStatus to valid using an SNMP Set request such as:

```
snmpset -Os -v2c router community eventStatus.1 i valid
```

Deactivating a Row in eventTable

To deactivate a row in eventTable, set eventStatus to invalid using an SNMP Set request such as:

```
snmpset -Os -v2c router community eventStatus.1 i invalid
```

Chapter 17

Summary of RMON Alarm and Event Configuration Statements

The following sections explain each of the remote monitoring (RMON) alarm and event configuration statements. The statements are organized alphabetically.

alarm

Syntax

```
alarm index {
    description description;
    falling-event-index index;
    falling-threshold integer;
    falling-threshold-interval seconds;
    interval seconds;
    rising-event-index index;
    rising-threshold integer;
    request-type (get-next-request | get-request | walk-request);
    sample-type (absolute-value | delta-value);
    startup-alarm (falling-alarm | rising-alarm | rising-or-falling alarm);
    syslog-subtag syslog-subtag;
    variable oid-variable;
}
```

Hierarchy Level [edit snmp rmon]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure RMON alarm entries.

Options *index*—Identifies this alarm entry as an integer.

The remaining statements are explained separately.

Usage Guidelines See "Configuring an Alarm Entry and Its Attributes" on page 224.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics event

community

Syntax community *community-name*;

Hierarchy Level [edit snmp rmon event *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description The trap group that is used when generating a trap (if eventType is configured to send traps). If that trap group has the rmon-alarm trap category configured, a trap is sent to all the targets configured for that trap group. The community string in the trap matches the name of the trap group (and hence, the value of eventCommunity). If nothing is configured, traps are sent to each group with the rmon-alarm category set.

Options *community-name*—Identifies the trap group that is used when generating a trap if the event is configured to send traps.

Usage Guidelines See "Configuring an Event Entry and Its Attributes" on page 228.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

description

Syntax description *description*;

Hierarchy Level [edit snmp rmon alarm *index*],
[edit snmp rmon event *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Text description of alarm or event.

Options *description*—Text description of an alarm or event entry. If the description includes spaces, enclose it in quotation marks (" ").

Usage Guidelines See "Configuring the Description" on page 225 and "Configuring an Event Entry and Its Attributes" on page 228.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

event

Syntax
```
event index {
    community community-name;
    description description;
    type type;
}
```

Hierarchy Level [edit snmp rmon]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure RMON event entries.

Options *index*—Identifier for a specific event entry.

The remaining statements are explained separately.

Usage Guidelines See "Configuring an Event Entry and Its Attributes" on page 228.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics alarm

falling-event-index

Syntax falling-event-index *index*;

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description The index of the event entry that is used when a falling threshold is crossed. If this value is zero, no event is triggered.

Options *index*—Index of the event entry that is used when a falling threshold is crossed.
Range: 0 through 65,535
Default: 0

Usage Guidelines See "Configuring the Falling Event Index or Rising Event Index" on page 225.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics rising-event-index

falling-threshold

Syntax falling-threshold *integer*;

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description The lower threshold for the sampled variable. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval is greater than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is less than or equal to this threshold, and the associated startup-alarm is equal to falling-alarm or rising-or-falling-alarm. After a falling event is generated, another falling event cannot be generated until the sampled value rises above this threshold and reaches the rising-threshold.

Options *integer*—The lower threshold for the alarm entry.
Range: -2,147,483,648 through 2,147,483,647
Default: 20 percent less than rising-threshold

Usage Guidelines See "Configuring the Falling Threshold or Rising Threshold" on page 226.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics rising-threshold

falling-threshold-interval

Syntax falling-threshold-interval *seconds*;

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced in JUNOS Release 8.3.

Description Interval between samples when the rising threshold is crossed. Once the alarm crosses the falling threshold, the regular sampling interval is used.

Options *interval*—Time between samples, in seconds.
Range: 1 through 2,147,483,647 seconds
Default: 60 seconds

Usage Guidelines See "Configuring the Falling Threshold Interval" on page 226.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics interval

interval

Syntax interval *seconds*;

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Interval between samples.

Options *interval*—Time between samples, in seconds.
Range: 1 through 2,147,483,647 seconds
Default: 60 seconds

Usage Guidelines See "Configuring the Interval" on page 226.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

request-type

Syntax request-type (get-next-request | get-request | walk-request);

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced in JUNOS Release 8.3.

Description Extends monitoring to a specific SNMP object instance (get-request), or extends monitoring to all object instances belonging to a MIB branch (walk-request), or extends monitoring to the next object instance after the instance specified in the configuration (get-next-request).

Options get-next-request—Performs an SNMP get next request.

get-request—Performs an SNMP get request.

walk-request—Performs an SNMP walk request.
Default: walk-request

Usage Guidelines See "Configuring the Request Type" on page 227.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics variable

rising-event-index

Syntax rising-event-index *index*;

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description The index of the event entry that is used when a rising threshold is crossed. If this value is zero, no event is triggered.

Options *index*—Index of the event entry that is used when a rising threshold is crossed.
Range: 0 through 65,535
Default: 0

Usage Guidelines See "Configuring the Falling Event Index or Rising Event Index" on page 225.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics falling-event-index

rising-threshold

Syntax rising-threshold *integer*;

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description The upper threshold for the sampled variable. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval is less than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is greater than or equal to this threshold, and the associated startup-alarm is equal to falling-alarm or rising-or-falling-alarm. After a rising event is generated, another rising event cannot be generated until the sampled value falls below this threshold and reaches the falling-threshold.

Options *integer*—The lower threshold for the alarm entry.
Range: –2,147,483,648 through 2,147,483,647

Usage Guidelines See "Configuring the Falling Threshold or Rising Threshold" on page 226.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics falling-threshold

rmon

Syntax rmon { ... }
}

Hierarchy Level [edit snmp]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure Remote Monitoring.

Usage Guidelines See "Configuring RMON Alarms and Events" on page 223.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

sample-type

Syntax sample-type (absolute-value | delta-value);

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Method of sampling the selected variable.

Options absolute-value—Actual value of the selected variable is used when comparing against the thresholds.

delta-value—Difference between samples of the selected variable is used when comparing against the thresholds.

Usage Guidelines See "Configuring the Sample Type" on page 227.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

startup-alarm

Syntax startup-alarm (falling-alarm | rising-alarm | rising-or-falling-alarm);

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description The alarm that can be sent upon entry startup.

Options falling-alarm—Generated if the first sample after the alarm entry becomes active is less than or equal to the falling threshold.

rising-alarm—Generated if the first sample after the alarm entry becomes active is greater than or equal to the rising threshold.

rising-or-falling-alarm—Generated if the first sample after the alarm entry becomes active satisfies either of the corresponding thresholds.
Default: rising-or-falling-alarm

Usage Guidelines See "Configuring the Startup Alarm" on page 228.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

syslog-subtag

Syntax syslog-subtag *syslog-subtag*;

Hierarchy Level [edit snmp rmon event *index*]

Release Information Statement introduced in JUNOS Release 8.5.

Description Tag to be added to the system log message. The syslog-subtag can be a string of not more than 80 uppercase characters.

Usage Guidelines See "Configuring the System Log Tag" on page 228.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

type

Syntax type *type*;

Hierarchy Level [edit snmp rmon event *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Type of notification generated when a threshold is crossed.

Options *type*—Type of notification. It can be one of the following:

- log—Add an entry to logTable.
- log-and-trap—Send an SNMP trap and make a log entry.
- none—No notifications are sent.
- snmptrap—Send an SNMP trap.

Default: log-and-trap

Usage Guidelines See "Configuring an Event Entry and Its Attributes" on page 228.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

variable

Syntax variable *oid-variable*;

Hierarchy Level [edit snmp rmon alarm *index*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Object identifier (OID) of MIB variable to be monitored.

Options *oid-variable*—OID of the MIB variable that is being monitored. The OID can be a dotted decimal (for example, 1.3.6.1.2.1.2.1.2.2.1.10.1) or use the MIB objects name (for example, ifInOctets.1).

Usage Guidelines See "Configuring the Variable" on page 228.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Part 5
Health Monitoring

Chapter 18

Configuring Health Monitoring

This chapter contains the following topics:

Configuring Health Monitoring on JUNOS Devices

As the number of devices managed by a typical network management system (NMS) grows and the complexity of the devices themselves increases, it becomes increasingly impractical for the NMS to use polling to monitor the devices. A more scalable approach is to rely on network devices to notify the NMS when something requires attention.

On Juniper Networks routing platforms, RMON alarms and events provide much of the infrastructure needed to reduce the polling overhead from the NMS. (For more information, see "Configuring RMON Alarms and Events" on page 223.) However, with this approach, you must set up the NMS to configure specific MIB objects into RMON alarms. This often requires device-specific expertise and customizing of the monitoring application. In addition, some MIB object instances that need monitoring are set only at initialization or change at runtime and cannot be configured in advance.

To address these issues, the health monitor extends the RMON alarm infrastructure to provide predefined monitoring for a selected set of object instances (for file system usage, CPU usage, and memory usage) and includes support for unknown or dynamic object instances (such as JUNOS processes).

Health monitoring is designed to minimize user configuration requirements. To configure health monitoring entries, you include statements at the [edit snmp] hierarchy level of the configuration:

```
[edit snmp]
health-monitor {
    falling-threshold percentage;
    interval seconds;
    rising-threshold percentage;
}
```

You can use the show snmp health-monitor operational command to view information about health monitor alarms and logs.

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```
[edit snmp]
health-monitor {
    falling-threshold percentage;
    interval seconds;
    rising-threshold percentage;
}
```

You can use the show snmp health-monitor operational command to view information about health monitor alarms and logs.

This topic describes the minimum required configuration and discusses the following tasks for configuring the health monitor:

Monitored Objects

When you configure the health monitor, monitoring information for certain object instances is available, as shown in Table 25 on page 255.

Table 25: Monitored Object Instances

Object	Description
jnxHrStoragePercentUsed.1	Monitors the following file system on the router: /dev/ad0s1a: This is the root file system mounted on /.
jnxHrStoragePercentUsed.2	Monitors the following file system on the router: /dev/ad0s1e: This is the configuration file system mounted on /config
jnxOperatingCPU (RE0) jnxOperatingCPU (RE1)	Monitors CPU usage for Routing Engines (RE0 and RE1). The index values assigned to Routing Engines depend on whether the Chassis MIB uses a zero-based or ones-based indexing scheme. Because the indexing scheme is configurable, the proper index is determined when the router is initialized and when there is a configuration change. If the router has only one Routing Engine, the alarm entry monitoring RE1 is removed after five failed attempts to obtain the CPU value.
jnxOperatingBuffer (RE0) jnxOperatingBuffer (RE1)	Monitors the amount of memory available on Routing Engines (RE0 and RE1). Because the indexing of this object is identical to that used for jnxOperatingCPU, index values are adjusted depending on the indexing scheme used in the Chassis MIB. As with jnxOperatingCPU, the alarm entry monitoring RE1 is removed if the router has only one Routing Engine.
sysApplElmtRunCPU	Monitors the CPU usage for each JUNOS process (also called daemon). Multiple instances of the same process are monitored and indexed separately.
sysApplElmtRunMemory	Monitors the memory usage for each JUNOS process. Multiple instances of the same process are monitored and indexed separately.

Minimum Health Monitoring Configuration

To enable health monitoring on the router, include the health-monitor statement at the [edit snmp] hierarchy level:

```
[edit snmp]
health-monitor;
```

Configuring the Falling Threshold or Rising Threshold

The falling threshold is the lower threshold (expressed as a percentage of the maximum possible value) for the monitored variable. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval is greater than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is less than or equal to

this threshold. After a falling event is generated, another falling event cannot be generated until the sampled value rises above this threshold and reaches the rising threshold. You must specify the falling threshold as a percentage of the maximum possible value. The default is 70 percent.

By default, the rising threshold is 80 percent of the maximum possible value for the monitored object instance. The rising threshold is the upper threshold for the monitored variable. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval is less than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is greater than or equal to this threshold. After a rising event is generated, another rising event cannot be generated until the sampled value falls below this threshold and reaches the falling threshold. You must specify the rising threshold as a percentage of the maximum possible value for the monitored variable.

To configure the falling threshold or rising threshold, include the falling-threshold or rising-threshold statement at the [edit snmp health-monitor] hierarchy level:

```
[edit snmp health-monitor]
falling-threshold percentage;
rising-threshold percentage;
```

percentage can be a value from 1 through 100.

The falling and rising thresholds apply to all object instances monitored by the health monitor.

Configuring the Interval

The interval represents the period of time, in seconds, over which the object instance is sampled and compared with the rising and falling thresholds.

To configure the interval, include the interval statement and specify the number of seconds at the [edit snmp health-monitor] hierarchy level:

```
[edit snmp health-monitor]
interval seconds;
```

seconds can be a value from 1 through 2147483647. The default is 300 seconds (5 minutes).

Log Entries and Traps

The system log entries generated for any health monitor events (thresholds crossed, errors, and so on) have a corresponding HEALTHMONITOR tag rather than a generic SNMPD_RMON_EVENTLOG tag. However, the health monitor sends generic RMON risingThreshold and fallingThreshold traps.

Example: Configuring Health Monitoring

Configure the health monitor:

```
[edit snmp]
health-monitor {
    falling-threshold 85;
    interval 600;
    rising-threshold 75;
}
```

In this example, the sampling interval is every 600 seconds (10 minutes), the falling threshold is 85 percent of the maximum possible value for each object instance monitored, and the rising threshold is 75 percent of the maximum possible value for each object instance monitored.

Chapter 19

Summary of Health Monitoring Configuration Statements

The following sections explain each of the health monitoring configuration statements. The statements are organized alphabetically.

falling-threshold

Syntax falling-threshold *percentage*;

Hierarchy Level [edit snmp health-monitor]

Release Information Statement introduced in JUNOS Release 8.0.

Description The lower threshold is expressed as a percentage of the maximum possible value for the sampled variable. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval is greater than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is less than or equal to this threshold. After a falling event is generated, another falling event cannot be generated until the sampled value rises above this threshold and reaches the rising-threshold.

Options *percentage*—The lower threshold for the alarm entry.
Range: 1 through 100
Default: 70 percent of the maximum possible value

Usage Guidelines See "Configuring the Falling Threshold or Rising Threshold" on page 255.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics rising-threshold

health-monitor

Syntax
```
health-monitor{
    falling-threshold percentage;
    interval seconds;
    rising-threshold percentage;
}
```

Hierarchy Level [edit snmp]

Release Information Statement introduced in JUNOS Release 8.0.

Description Configure health monitoring.

The remaining statements are explained separately.

Usage Guidelines See “Configuring Health Monitoring” on page 253.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

interval

Syntax interval *seconds*;

Hierarchy Level [edit snmp health-monitor]

Release Information Statement introduced in JUNOS Release 8.0.

Description Interval between samples.

Options *interval*—Time between samples, in seconds.
Range: 1 through 2147483647 seconds
Default: 300 seconds

Usage Guidelines See “Configuring the Interval” on page 256.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

rising-threshold

Syntax rising-threshold *percentage*;

Hierarchy Level [edit snmp health-monitor]

Release Information Statement introduced in JUNOS Release 8.0.

Description The upper threshold is expressed as a percentage of the maximum possible value for the sampled variable. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval is less than this threshold, a single event is generated. A single event is also generated if the first sample after this entry becomes valid is greater than or equal to this threshold. After a rising event is generated, another rising event cannot be generated until the sampled value falls below this threshold and reaches the falling-threshold.

Options *integer*—The lower threshold for the alarm entry.
Range: 1 through 100
Default: 80 percent of the maximum possible value

Usage Guidelines See "Configuring the Falling Threshold or Rising Threshold" on page 255.

Required Privilege Level snmp—To view this statement in the configuration.
snmp-control—To add this statement to the configuration.

Related Topics falling-threshold

Part 6
Monitoring Service Quality

Chapter 20

Monitoring Service Quality in Service Provider Networks

This chapter provides guidelines for monitoring the service quality of an IP network. It describes how service providers and network administrators can use information provided by Juniper Networks routers to monitor network performance and capacity. This chapter assumes you have a thorough understanding of the Simple Network Management Protocol (SNMP) and the associated Management Information Base (MIB) supported by the JUNOS software.

NOTE: For a good introduction to the process of monitoring an IP network, see RFC 2330, *Framework for IP Performance Metrics*.

This chapter includes the following topics:

Understanding Measurement Points, Key Performance Indicators, and Baseline Values

This topic contains the following sections:

Measurement Points

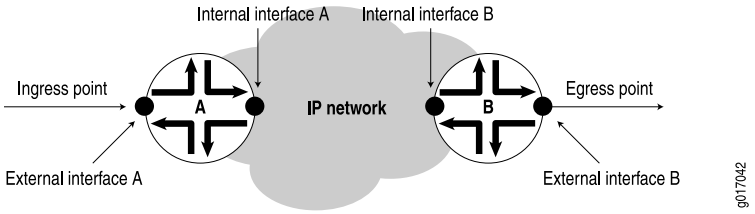
Defining the measurement points where metrics are measured is equally as important as defining the metrics themselves. This section describes measurement points within the context of this chapter and helps identify where measurements can be taken from a service provider network. It is important to understand exactly where a

measurement point is. Measurement points are vital to understanding the implication of what the actual measurement means.

An IP network consists of a collection of routers connected by physical links that are all running the Internet Protocol. You can view the network as a collection of routers with an ingress (entry) point and an egress (exit) point. See Figure 3 on page 266.

- Network-centric measurements are taken at measurement points that most closely map to the ingress and egress points for the network itself. For example, to measure delay across the provider network from Site A to Site B, the measurement points should be the ingress point to the provider network at Site A and the egress point at Site B.
- Router-centric measurements are taken directly from the routers themselves, but be careful to ensure that the correct router subcomponents have been identified in advance.

Figure 3: Network Entry Points



NOTE: Figure 3 on page 266 does not show the client networks at customer premises, but they would be located on either side of the ingress and egress points. Although this chapter does not discuss how to measure network services as perceived by these client networks, you can use measurements taken for the service provider network as input into such calculations.

This section includes the following topics:

Basic Key Performance Indicators

For example, you could monitor a service provider network for three basic key performance indicators (KPIs):

- *Availability* measures the "reachability" of one measurement point from another measurement point at the network layer (for example, using ICMP ping). The underlying routing and transport infrastructure of the provider network will support the availability measurements, with failures highlighted as unavailability.
- *Health* measures the number and type of errors that are occurring on the provider network, and can consist of both router-centric and network-centric measurements, such as hardware failures or packet loss.
- *Performance* of the provider network measures how well it can support IP services (for example, in terms of delay or utilization).

Setting Baselines

How well is the provider network performing? We recommend an initial three-month period of monitoring to identify a network's normal operational parameters. With this information, you can recognize exceptions and identify abnormal behavior. You should continue baseline monitoring for the lifetime of each measured metric. Over time, you will be able to recognize performance trends and growth patterns.

Within the context of this chapter, many of the metrics identified do not have an allowable operational range associated with them. In most cases, you cannot identify the allowable operational range until you have determined a baseline for the actual variable on a specific network.

Understanding RMON for Monitoring Service Quality

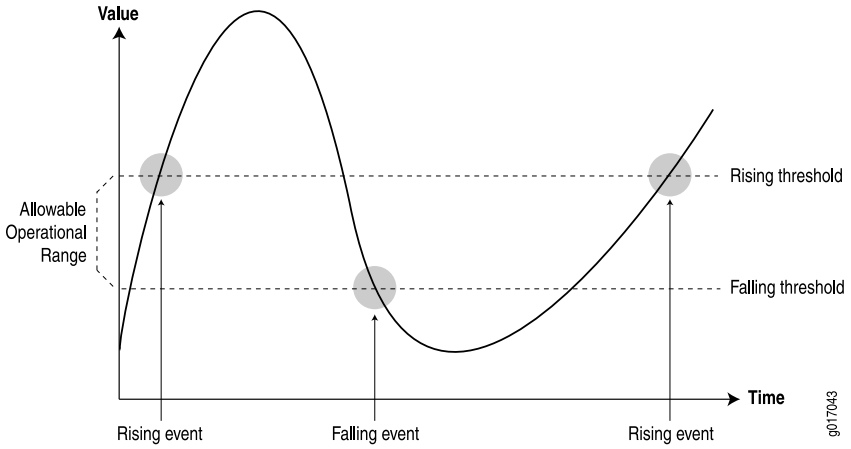
Health and performance monitoring can benefit from the remote monitoring of SNMP variables by the local SNMP agents running on each router. The SNMP agents compare MIB values against predefined thresholds and generate exception alarms without the need for polling by a central SNMP management platform. This is an effective mechanism for proactive management, as long as the thresholds have baselines determined and set correctly. For more information, see RFC 2819, *Remote Network Monitoring MIB*.

This topic includes the following sections:

Setting Thresholds

By setting a rising and a falling threshold for a monitored variable, you can be alerted whenever the value of the variable falls outside of the allowable operational range. (See Figure 4 on page 268.)

Figure 4: Setting Thresholds



Events are only generated when the threshold is first crossed in any one direction rather than after each sample period. For example, if a rising threshold crossing event is raised, no more threshold crossing events will occur until a corresponding falling event. This considerably reduces the quantity of alarms that are produced by the system, making it easier for operations staff to react when alarms do occur.

To configure remote monitoring, specify the following pieces of information:

- The variable to be monitored (by its SNMP object identifier)
- The frequency (in time) between each inspection
- A rising threshold
- A falling threshold
- A rising event
- A falling event

Before you can successfully configure remote monitoring, you should identify what variables need to be monitored and their allowable operational range. This requires some period of baselining to determine the allowable operational ranges. An initial baseline period of at least three months is not unusual when first identifying the operational ranges and defining thresholds, but baseline monitoring should continue over the life span of each monitored variable.

RMON Command-Line Interface

The JUNOS software provides two mechanisms you use to control the Remote Monitoring agent on the router: command-line interface (CLI) and SNMP. To configure an RMON entry using the CLI, include the following configuration statements at the [edit snmp] hierarchy level:

```
rmon {
    alarm index {
        description;
        falling-event-index;
```

```
        falling-threshold;
        intervals;
        rising-event-index;
        rising-threshold;
        sample-type (absolute-value | delta-value);
        startup-alarm (falling | rising | rising-or-falling);
        variable;
    }
    event index {
        community;
        description;
        type (log | trap | log-and-trap | none);
    }
}
```

If you do not have CLI access, you can configure remote monitoring using the SNMP Manager or management application, assuming SNMP access has been granted. (See Table 26 on page 269.) To configure RMON using SNMP, perform SNMP Set requests to the RMON event and alarm tables.

RMON Event Table

Set up an event for each type that you want to generate. For example, you could have two generic events, *rising* and *falling*, or many different events for each variable that is being monitored (for example, *temperature rising* event, *temperature falling* event, *firewall hit* event, *interface utilization* event, and so on). Once the events have been configured, you do not need to update them.

Table 26: RMON Event Table

Field	Description
eventDescription	Text description of this event
eventType	Type of event (for example, log, trap, or log and trap)
eventCommunity	Trap group to which to send this event (as defined in the JUNOS software configuration, which is not the same as the community)
eventOwner	Entity (for example, manager) that created this event
eventStatus	Status of this row (for example, valid, invalid, or createRequest)

RMON Alarm Table

The RMON alarm table stores the SNMP object identifiers (including their instances) of the variables that are being monitored, together with any rising and falling thresholds and their corresponding event indexes. To create an RMON request, specify the fields shown in Table 27 on page 270.

Table 27: RMON Alarm Table

Field	Description
alarmStatus	Status of this row (for example, valid, invalid, or createRequest)
alarmInterval	Sampling period (in seconds) of the monitored variable
alarmVariable	OID (and instance) of the variable to be monitored
alarmValue	Actual value of the sampled variable
alarmSampleType	Sample type (absolute or delta changes)
alarmStartupAlarm	Initial alarm (rising, falling, or either)
alarmRisingThreshold	Rising threshold against which to compare the value
alarmFallingThreshold	Falling threshold against which to compare the value
alarmRisingEventIndex	Index (row) of the rising event in the event table
alarmFallingEventIndex	Index (row) of the falling event in the event table

Both the alarmStatus and eventStatus fields are entryStatus primitives, as defined in RFC 2579, *Textual Conventions for SMIv2*.

Troubleshooting RMON

You troubleshoot the RMON agent, rmopd, that runs on the router by inspecting the contents of the Juniper Networks enterprise RMON MIB, jnxRmon, which provides the extensions listed in Table 28 on page 270 to the RFC 2819 alarmTable.

Table 28: jnxRmon Alarm Extensions

Field	Description
jnxRmonAlarmGetFailCnt	Number of times the internal Get request for the variable failed
jnxRmonAlarmGetFailTime	Value of sysUpTime when the last failure occurred
jnxRmonAlarmGetFailReason	Reason why the Get request failed
jnxRmonAlarmGetOkTime	Value of sysUpTime when the variable moved out of failure state
jnxRmonAlarmState	Status of this alarm entry

Monitoring the extensions in this table provides clues as to why remote alarms may be not behave as expected.

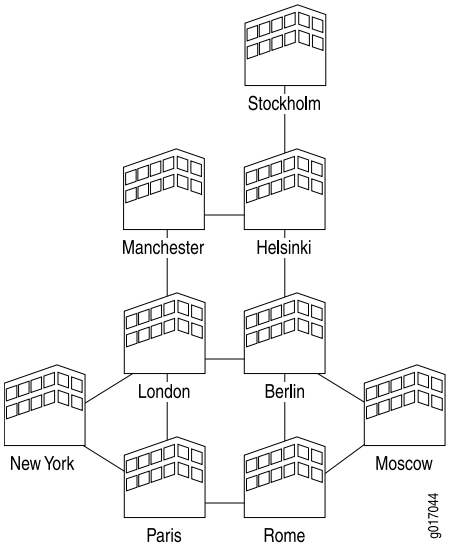
Defining and Measuring Network Availability

This topic covers the following sections:

Defining Network Availability

Availability of a service provider's IP network can be thought of as the reachability between the regional points of presence (POP), as shown in Figure 5 on page 271.

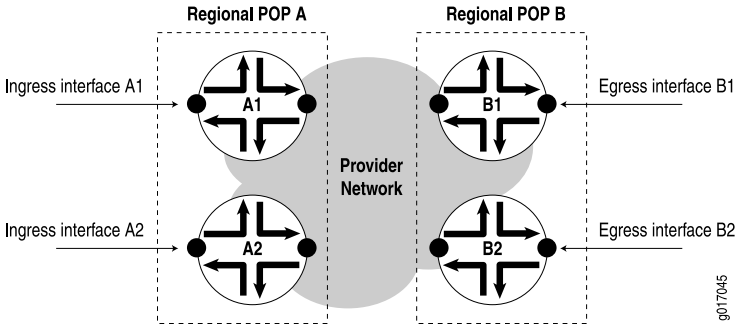
Figure 5: Regional Points of Presence



With the example above, when you use a full mesh of measurement points, where every POP measures the availability to every other POP, you can calculate the total availability of the service provider's network. This KPI can also be used to help monitor the service level of the network, and can be used by the service provider and its customers to determine if they are operating within the terms of their service-level agreement (SLA).

Where a POP may consist of multiple routers, take measurements to each router as shown in Figure 6 on page 272.

Figure 6: Measurements to Each Router



Measurements include:

- Path availability—Availability of an egress interface B1 as seen from an ingress interface A1.
- Router availability—Percentage of path availability of all measured paths terminating on the router.
- POP availability—Percentage of router availability between any two regional POPs, A and B.
- Network availability—Percentage of POP availability for all regional POPs in the service provider's network.

To measure POP availability of POP A to POP B in Figure 6 on page 272, you must measure the following four paths:

Path A1 => B1
Path A1 => B2
Path A2 => B1
Path A2 => B2

Measuring availability from POP B to POP A would require a further four measurements, and so on.

A full mesh of availability measurements can generate significant management traffic. From the sample diagram above:

- Each POP has two co-located provider edge (PE) routers, each with 2xSTM1 interfaces, for a total of 18 PE routers and 36xSTM1 interfaces.
- There are six core provider (P) routers, four with 2xSTM4 and 3xSTM1 interfaces each, and two with 3xSTM4 and 3xSTM1 interfaces each.

This makes a total of 68 interfaces. A full mesh of paths between every interface is:

[n x (n–1)] / 2 gives [68 x (68–1)] / 2 = 2278 paths

To reduce management traffic on the service provider's network, instead of generating a full mesh of interface availability tests (for example, from each interface to every other interface), you can measure from each router's loopback address. This reduces

the number of availability measurements required to a total of one for each router, or:

[n x (n–1)] / 2 gives [24 x (24–1)] / 2 = 276 measurements

This measures availability from each router to every other router.

Monitoring the SLA and the Required Bandwidth

A typical SLA between a service provider and a customer might state:

> A Point of Presence is the connection of two back-to-back provider edge routers to separate core provider routers using different links for resilience. The system is considered to be unavailable when either an entire POP becomes unavailable or for the duration of a Priority 1 fault.

An SLA availability figure of 99.999 percent for a provider's network would relate to a down time of approximately 5 minutes per year. Therefore, to measure this proactively, you would have to take availability measurements at a granularity of less than one every five minutes. With a standard size of 64 bytes per ICMP ping request, one ping test per minute would generate 7680 bytes of traffic per hour per destination, including ping responses. A full mesh of ping tests to 276 destinations would generate 2,119,680 bytes per hour, which represents the following:

- On an OC3/STM1 link of 155.52 Mpbs, a utilization of 1.362 percent
- On an OC12/STM4 link of 622.08 Mpbs, a utilization of 0.340 percent

With a size of 1500 bytes per ICMP ping request, one ping test per minute would generate 180,000 bytes per hour per destination, including ping responses. A full mesh of ping tests to 276 destinations would generate 49,680,000 bytes per hour, which represents the following:

- On an OC3/STM1 link, 31.94 percent utilization
- On an OC12/STM4 link, 7.986 percent utilization

Each router can record the results for every destination tested. With one test per minute to each destination, a total of 1 x 60 x 24 x 276 = 397,440 tests per day would be performed and recorded by each router. All ping results are stored in the pingProbeHistoryTable (see RFC 2925) and can be retrieved by an SNMP performance reporting application (for example, service performance management software from InfoVista, Inc., or Concord Communications, Inc.) for post processing. This table has a maximum size of 4,294,967,295 rows, which is more than adequate.

Measuring Availability

There are two methods you can use to measure availability:

- Proactive—Availability is automatically measured as often as possible by an operational support system.
- Reactive—Availability is recorded by a Help desk when a fault is first reported by a user or a fault monitoring system.

This section discusses real-time performance monitoring as a proactive monitoring solution.

Real-Time Performance Monitoring

Juniper Networks provides a real-time performance monitoring (RPM) service to monitor real-time network performance. Use the J-Web Quick Configuration feature to configure real-time performance monitoring parameters used in real-time performance monitoring tests. (J-Web Quick Configuration is a browser-based GUI that runs on Juniper Networks routers. For more information, see the *J-Web Interface User Guide*.)

Configuring Real-Time Performance Monitoring

Some of the most common options you can configure for real-time performance monitoring tests are shown in Table 29 on page 274.

Table 29: Real-Time Performance Monitoring Configuration Options

Field	Description
Request Information	
Probe Type	Type of probe to send as part of the test. Probe types can be: ■ http-get ■ http-get-metadata ■ icmp-ping ■ icmp-ping-timestamp ■ tcp-ping ■ udp-ping
Interval	Wait time (in seconds) between each probe transmission. The range is 1 to 255 seconds.
Test Interval	Wait time (in seconds) between tests. The range is 0 to 86400 seconds.
Probe Count	Total number of probes sent for each test. The range is 1 to 15 probes.
Destination Port	TCP or UDP port to which probes are sent. Use number 7—a standard TCP or UDP port number—or select a port number from 49152 through 65535.
DSCP Bits	Differentiated Services code point (DSCP) bits. This value must be a valid 6-bit pattern. The default is 000000.
Data Size	Size (in bytes) of the data portion of the ICMP probes. The range is 0 to 65507 bytes.
Data Fill	Contents of the data portion of the ICMP probes. Contents must be a hexadecimal value. The range is 1 to 800h.
Maximum Probe Thresholds	

Table 29: Real-Time Performance Monitoring Configuration Options *(continued)*

Field	Description
Successive Lost Probes	Total number of probes that must be lost successively to trigger a probe failure and generate a system log message. The range is 0 to 15 probes.
Lost Probes	Total number of probes that must be lost to trigger a probe failure and generate a system log message. The range is 0 to 15 probes.
Round Trip Time	Total round-trip time (in microseconds) from the Services Router to the remote server, which, if exceeded, triggers a probe failure and generates a system log message. The range is 0 to 60,000,000 microseconds.
Jitter	Total jitter (in microseconds) for a test, which, if exceeded, triggers a probe failure and generates a system log message. The range is 0 to 60,000,000 microseconds.
Standard Deviation	Maximum allowable standard deviation (in microseconds) for a test, which, if exceeded, triggers a probe failure and generates a system log message. The range is 0 to 60,000,000 microseconds.
Egress Time	Total one-way time (in microseconds) from the router to the remote server, which, if exceeded, triggers a probe failure and generates a system log message. The range is 0 to 60,000,000 microseconds.
Ingress Time	Total one-way time (in microseconds) from the remote server to the router, which, if exceeded, triggers a probe failure and generates a system log message. The range is 0 to 60,000,000 microseconds.
Jitter Engress Time	Total outbound-time jitter (in microseconds) for a test, which, if exceeded, triggers a probe failure and generates a system log message. The range is 0 to 60,000,000 microseconds.
Jitter Ingress Time	Total inbound-time jitter (in microseconds) for a test, which, if exceeded, triggers a probe failure and generates a system log message. The range is 0 to 60,000,000 microseconds.
Egress Standard Deviation	Maximum allowable standard deviation of outbound times (in microseconds) for a test, which, if exceeded, triggers a probe failure and generates a system log message. The range is 0 to 60,000,000 microseconds.
Ingress Standard Deviation	Maximum allowable standard deviation of inbound times (in microseconds) for a test, which, if exceeded, triggers a probe failure and generates a system log message. The range is 0 to 60,000,000 microseconds.

Displaying Real-Time Performance Monitoring Information

For each real-time performance monitoring test configured on the routing platform, monitoring information includes the round-trip time, jitter, and standard deviation. To view this information, select Monitor > RPM in the J-Web interface, or enter the show services rpm CLI command.

To display the results of the most recent real-time performance monitoring probes, enter the show services rpm probe-results CLI command:

```
user@host> show services rpm probe-results
Owner: p1, Test: t1
   Target address: 10.8.4.1, Source address: 10.8.4.2, Probe type: icmp-ping
   Destination interface name: lt-0/0/0.0
   Test size: 10 probes
   Probe results:
      Response received, Sun Jul 10 19:07:34 2005
      Rtt: 50302 usec
   Results over current test:
      Probes sent: 2, Probes received: 1, Loss percentage: 50
      Measurement: Round trip time
        Minimum: 50302 usec, Maximum: 50302 usec, Average: 50302 usec,
        Jitter: 0 usec, Stddev: 0 usec
   Results over all tests:
      Probes sent: 2, Probes received: 1, Loss percentage: 50
      Measurement: Round trip time
        Minimum: 50302 usec, Maximum: 50302 usec, Average: 50302 usec,
        Jitter: 0 usec, Stddev: 0 usec
```

Measuring Health

You can monitor health metrics reactively by using fault management software such as SMARTS InCharge, Micromuse Netcool Omnibus, or Concord Live Exceptions. We recommend that you monitor the health metrics shown in Table 30 on page 276.

Table 30: Health Metrics

Metric:	Errors in
Description	Number of inbound packets that contained errors, preventing them from being delivered
MIB name	IF-MIB (RFC 2233)
Variable name	ifInErrors
Variable OID	.1.3.6.1.31.2.2.1.14
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	Logical interfaces
Metric:	Errors out
Description	Number of outbound packets that contained errors, preventing them from being transmitted
MIB name	IF-MIB (RFC 2233)
Variable name	ifOutErrors

Table 30: Health Metrics *(continued)*

Variable OID	.1.3.6.1.31.2.2.1.20
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	Logical interfaces
Metric:	Discards in
Description	Number of inbound packets discarded, even though no errors were detected
MIB name	IF-MIB (RFC 2233)
Variable name	ifInDiscards
Variable OID	.1.3.6.1.31.2.2.1.13
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	Logical interfaces
Metric:	Unknown protocols
Description	Number of inbound packets discarded because they were of an unknown protocol
MIB name	IF-MIB (RFC 2233)
Variable name	ifInUnknownProtos
Variable OID	.1.3.6.1.31.2.2.1.15
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	Logical interfaces
Metric:	Interface operating status
Description	Operational status of an interface
MIB name	IF-MIB (RFC 2233)
Variable name	ifOperStatus
Variable OID	.1.3.6.1.31.2.2.1.8
Frequency (mins)	15
Allowable range	1 (up)

Table 30: Health Metrics *(continued)*

Managed objects	Logical interfaces
Metric:	Label Switched Path (LSP) state
Description	Operational state of an MPLS label-switched path
MIB name	MPLS-MIB
Variable name	mplsLspState
Variable OID	mplsLspEntry.2
Frequency (mins)	60
Allowable range	2 (up)
Managed objects	All label-switched paths in the network
Metric:	Component operating status
Description	Operational status of a router hardware component
MIB name	JUNIPER-MIB
Variable name	jnxOperatingState
Variable OID	.1.3.6.1.4.1.2636.1.13.1.6
Frequency (mins)	60
Allowable range	2 (running) or 3 (ready)
Managed objects	All components in each Juniper Networks router
Metric:	Component operating temperature
Description	Operational temperature of a hardware component, in Celsius
MIB name	JUNIPER-MIB
Variable name	jnxOperatingTemp
Variable OID	.1.3.6.1.4.1.2636.1.13.1.7
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	All components in a chassis
Metric:	System up time
Description	Time, in milliseconds, that the system has been operational.
MIB name	MIB-2 (RFC 1213)

Table 30: Health Metrics *(continued)*

Variable name	sysUpTime
Variable OID	.1.3.6.1.1.3
Frequency (mins)	60
Allowable range	Increasing only (decrement indicates a restart)
Managed objects	All routers
Metric:	No IP route errors
Description	Number of packets that could not be delivered because there was no IP route to their destination.
MIB name	MIB-2 (RFC 1213)
Variable name	ipOutNoRoutes
Variable OID	ip.12
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	Each router
Metric:	Wrong SNMP community names
Description	Number of incorrect SNMP community names received
MIB name	MIB-2 (RFC 1213)
Variable name	snmpInBadCommunityNames
Variable OID	snmp.4
Frequency (hours)	24
Allowable range	To be baselined
Managed objects	Each router
Metric:	SNMP community violations
Description	Number of valid SNMP communities used to attempt invalid operations (for example, attempting to perform SNMP Set requests)
MIB name	MIB-2 (RFC 1213)
Variable name	snmpInBadCommunityUses
Variable OID	snmp.5
Frequency (hours)	24

Table 30: Health Metrics *(continued)*

Allowable range	To be baselined
Managed objects	Each router
Metric:	Redundancy switchover
Description	Total number of redundancy switchovers reported by this entity
MIB name	JUNIPER-MIB
Variable name	jnxRedundancySwitchoverCount
Variable OID	jnxRedundancyEntry.8
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	All Juniper Networks routers with redundant Routing Engines
Metric:	FRU state
Description	Operational status of each field-replaceable unit (FRU)
MIB name	JUNIPER-MIB
Variable name	jnxFruState
Variable OID	jnxFruEntry.8
Frequency (mins)	15
Allowable range	2 through 6 for ready/online states. See jnxFruOfflineReason in the event of a FRU failure.
Managed objects	All FRUs in all Juniper Networks routers.
Metric:	Rate of tail-dropped packets
Description	Rate of tail-dropped packets per output queue, per forwarding class, per interface.
MIB name	JUNIPER-COS-MIB
Variable name	jnxCosIfqTailDropPktRate
Variable OID	jnxCosIfqStatsEntry.12
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	For each forwarding class per interface in the provider network, when CoS is enabled.
Metric:	Interface utilization: octets received

Table 30: Health Metrics *(continued)*

Description	Total number of octets received on the interface, including framing characters.
MIB name	IF-MIB
Variable name	ifInOctets
Variable OID	.1.3.6.1.2.1.2.2.1.10.x
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	All operational interfaces in the network
Metric:	Interface utilization: octets transmitted
Description	Total number of octets transmitted out of the interface, including framing characters.
MIB name	IF-MIB
Variable name	ifOutOctets
Variable OID	.1.3.6.1.2.1.2.2.1.16.x
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	All operational interfaces in the network

NOTE: Byte counts vary depending on interface type, encapsulation used and PIC supported. For example, with vlan-ccc encapsulation on a 4xFE, GE, or GE 1Q PIC, the byte count includes framing and control word overhead. (See Table 31 on page 281.)

Table 31: Counter Values for vlan-ccc Encapsulation

PIC Type	Encapsulation	input (Unit Level)	Output (Unit Level)	SNMP
4xFE	vlan-ccc	Frame (no frame check sequence [FCS])	Frame (including FCS and control word)	ifInOctets, ifOutOctets
GE	vlan-ccc	Frame (no FCS)	Frame (including FCS and control word)	ifInOctets, ifOutOctets

Table 31: Counter Values for vlan-ccc Encapsulation *(continued)*

PIC Type	Encapsulation	input (Unit Level)	Output (Unit Level)	SNMP
GE IQ	vlan-ccc	Frame (no FCS)	Frame (including FCS and control word)	ifInOctets, ifOutOctets

SNMP traps are also a good mechanism to use for health management. For more information, see "Standard SNMP Traps" on page 143 and "Juniper Networks Enterprise-Specific SNMP Traps" on page 131.

Measuring Performance

The performance of a service provider's network is usually defined as how well it can support services, and is measured with metrics such as delay and utilization. We suggest that you monitor the following performance metrics using applications such as InfoVista Service Performance Management or Concord Network Health (see Table 32 on page 282).

Table 32: Performance Metrics

Metric:	Average delay
Description	Average round-trip time (in milliseconds) between two measurement points.
MIB name	DISMAN-PING-MIB (RFC 2925)
Variable name	pingResultsAverageRtt
Variable OID	pingResultsEntry.6
Frequency (mins)	15 (or depending upon ping test frequency)
Allowable range	To be baselined
Managed objects	Each measured path in the network
Metric:	Interface utilization
Description	Utilization percentage of a logical connection.
MIB name	IF-MIB
Variable name	(ifInOctets & ifOutOctets) * 8 / ifSpeed
Variable OID	ifTable entries
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	All operational interfaces in the network

Table 32: Performance Metrics *(continued)*

Metric:	Disk utilization
Description	Utilization of disk space within the Juniper Networks router
MIB name	HOST-RESOURCES-MIB (RFC 2790)
Variable name	hrStorageSize – hrStorageUsed
Variable OID	hrStorageEntry.5 – hrStorageEntry.6
Frequency (mins)	1440
Allowable range	To be baselined
Managed objects	All Routing Engine hard disks
Metric:	Memory utilization
Description	Utilization of memory on the Routing Engine and FPC.
MIB name	JUNIPER-MIB (Juniper Networks enterprise Chassis MIB)
Variable name	jnxOperatingHeap
Variable OID	Table for each component
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	All Juniper Networks routers
Metric:	CPU load
Description	Average utilization over the past minute of a CPU.
MIB name	JUNIPER-MIB (Juniper Networks enterprise Chassis MIB)
Variable name	jnxOperatingCPU
Variable OID	Table for each component
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	All Juniper Networks routers
Metric:	LSP utilization
Description	Utilization of the MPLS label-switched path.
MIB name	MPLS-MIB
Variable name	mplsPathBandwidth / (mplsLspOctets * 8)

Table 32: Performance Metrics *(continued)*

Variable OID	mplsLspEntry.21 and mplsLspEntry.3
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	All label-switched paths in the network
Metric:	Output queue size
Description	Size, in packets, of each output queue per forwarding class, per interface.
MIB name	JUNIPER-COS-MIB
Variable name	jnxCosIfqQedPkts
Variable OID	jnxCosIfqStatsEntry.3
Frequency (mins)	60
Allowable range	To be baselined
Managed objects	For each forwarding class per interface in the network, once CoS is enabled.

This section includes the following topics:

Measuring Class of Service

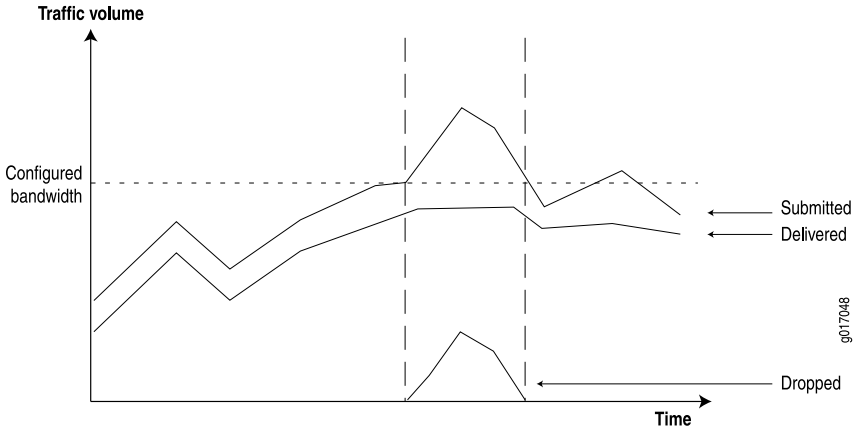
You can use class-of-service (CoS) mechanisms to regulate how certain classes of packets are handled within your network during times of peak congestion. Typically you must perform the following steps when implementing a class-of-service mechanism:

- Identify the type of packets that will be applied to this class. For example, include all customer traffic from a specific ingress edge interface within one class, or include all packets of a particular protocol such as voice over IP (VoIP).
- Identify the required deterministic behavior for each class. For example, if VoIP is important, give VoIP traffic the highest priority during times of network congestion. Conversely, you can downgrade the importance of Web traffic during congestion, as it may not impact customers too much.

With this information, you can configure mechanisms at the network ingress to monitor, mark, and police traffic classes. Marked traffic can then be handled in a

more deterministic way at egress interfaces, typically by applying different queuing mechanisms for each class during times of network congestion. You can collect information from the network to provide customers with reports showing how the network is behaving during times of congestion. (See Figure 7 on page 285.)

Figure 7: Network Behavior During Congestion



To generate these reports, routers must provide the following information:

- Submitted traffic—Amount of traffic received per class.
- Delivered traffic—Amount of traffic transmitted per class.
- Dropped traffic—Amount of traffic dropped because of CoS limits.

The following section outlines how this information is provided by Juniper Networks routers.

Inbound Firewall Filter Counters per Class

Firewall filter counters are a very flexible mechanism you can use to match and count inbound traffic per class, per interface. For example:

```
firewall {
    filter f1 {
        term t1 {
            from {
                dscp af11;
            }
            then {
                # Assured forwarding class 1 drop profile 1 count inbound-af11;
                accept;
            }
        }
    }
}
```

For example, Table 33 on page 286 shows additional filters used to match the other classes.

Table 33: Inbound Traffic Per Class

DSCP Value	Firewall Match Condition	Description
10	af11	Assured forwarding class 1 drop profile 1
12	af12	Assured forwarding class 1 drop profile 2
18	af21	Best effort class 2 drop profile 1
20	af22	Best effort class 2 drop profile 2
26	af31	Best effort class 3 drop profile 1

Any packet with a CoS DiffServ code point (DSCP) conforming to RFC 2474 can be counted in this way. The Juniper Networks enterprise-specific Firewall Filter MIB presents the counter information in the variables shown in Table 34 on page 286.

Table 34: Inbound Counters

Indicator Name	Inbound Counters
MIB	jnxFirewalls
Table	jnxFirewallCounterTable
Index	jnxFWFilter.jnxFWCounter
Variables	jnxFWCounterPacketCount jnxFWCounterByteCount
Description	Number of bytes being counted pertaining to the specified firewall filter counter
SNMP version	SNMPv2

This information can be collected by any SNMP management application that supports SNMPv2. Products from vendors such as Concord Communications, Inc., and InfoVista, Inc., provide support for the Juniper Networks Firewall MIB with their native Juniper Networks device drivers.

Monitoring Output Bytes per Queue

You can use the Juniper Networks enterprise ATM CoS MIB to monitor outbound traffic, per virtual circuit forwarding class, per interface. (See Table 35 on page 287.)

Table 35: Outbound Counters for ATM Interfaces

Indicator Name	Outbound Counters
MIB	JUNIPER-ATM-COS-MIB
Variable	jnxCosAtmVcQstatsOutBytes
Index	ifIndex.atmVclVpi.atmVclVci.jnxCosFcId
Description	Number of bytes belonging to the specified forwarding class that were transmitted on the specified virtual circuit.
SNMP version	SNMPv2

Non-ATM interface counters are provided by the Juniper Networks enterprise-specific CoS MIB, which provides information shown in Table 36 on page 287

Table 36: Outbound Counters for Non-ATM Interfaces

Indicator Name	Outbound Counters
MIB	JUNIPER-COS-MIB
Table	jnxCosIfqStatsTable
Index	jnxCosIfqIfIndex.jnxCosIfqFc
Variables	jnxCosIfqTxedBytes jnxCosIfqTxedPkts
Description	Number of transmitted bytes or packets per interface per forwarding class
SNMP version	SNMPv2

Dropped Traffic

You can calculate the amount of dropped traffic by subtracting the outbound traffic from the incoming traffic:

Dropped = Inbound Counter – Outbound Counter

You can also select counters from the CoS MIB, as shown in Table 37 on page 287.

Table 37: Dropped Traffic Counters

Indicator Name	Dropped Traffic
MIB	JUNIPER-COS-MIB

Table 37: Dropped Traffic Counters *(continued)*

Indicator Name	Dropped Traffic
Table	jnxCosIfqStatsTable
Index	jnxCosIfqIfIndex.jnxCosIfqFc
Variables	jnxCosIfqTailDropPkts jnxCosIfqTotalRedDropPkts
Description	The number of tail-dropped or RED-dropped packets per interface per forwarding class
SNMP version	SNMPv2

Part 7

Juniper Networks Enterprise-Specific MIBs

Chapter 21

Interpreting the Structure of Management Information MIB

The Structure of Management Information MIB defines the top-level structure of the Juniper Networks enterprise-specific MIB space. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-smi.txt.

The Structure of Management Information MIB space has five root branches:

jnxProducts

The object identifier for the jnxProducts root branch of the Structure of Management Information MIB is {juniperMIB 1}. This branch of the MIB describes the Juniper Networks routers and their components, such as product line, product name, model, number of slots, and media space for holding Physical Interface Cards (PICs). It also provides information on the system's power supply state, board voltages, fans, temperatures, and air flow. In general, this branch of the Structure of Management Information MIB is rarely polled for information because it is descriptive. However, you can poll this branch of the Structure of Management Information MIB to determine the sysObjectId of a router as defined by MIB-II.

jnxServices

The object identifier for the jnxServices root branch is {juniperMIB 2}. This MIB file added the nodes to create the Juniper Networks security tree structure under the object node jnxJsObjects. In general, the prefix jnxJs is used to name the object identifiers and to designate them. This branch of the network describes the Juniper Networks services objects that provide enhanced network security. This MIB is currently supported only by JUNOS software for J-series and SRX-series devices.

The jnxJsSecurity node is designed to provide a branch for the security-related MIB defintions specific to the Juniper Networks security products. The next level object identifiers under jnxJsSecurity are:

- jnxJsIf—Whose object identifier is {jnxJsSecurity 1}.
- jnxJsAuth—Whose object identifier is {jnxJsSecurity 2}.
- jnxJsCertificates—Whose object identifier is {jnxJsSecurity 3}.
- jnxJsPolicies—Whose object identifier is {jnxJsSecurity 4}.
- jnxJsIPSecVpn—Whose object identifier is {jnxJsSecurity 5}.
- jnxJsResources—Whose object identifier is {jnxJsSecurity 6}.
- jnxJsNAT—Whose object identifier is {jnxJsSecurity 7}.
- jnxJsScreening—Whose object identifier is {jnxJsSecurity 8}.
- jnxJsDhcp—Whose object identifier is {jnxJsSecurity 9}.
- jnxJsDnsRoot—Whose object identifier is {jnxJsSecurity 10}.

The Juniper Networks enterprise-specific security MIBs include:

- AAA Objects MIB—Whose object identifier is {jnxUserAAAMibRoot 1}.
- Access Authentication Objects MIB—Whose object identifier is {jnxJsAuth 1}.
- DNS Objects MIB—Whose object identifier is {jnxJsDns 1}.
- IPSec Generic Flow Monitoring Objects MIB—Whose object identifier is {jnxIpSecMibRoot 1}.
- IPSec VPN Objects MIB—Whose object identifier is {jnxJsIPSecVpn 1}.
- Network Address Translation Objects MIB—Whose object identifier is {jnxJsNAT 1}.
- Policy Objects MIB—Whose object identifier is {jnxJsPolicies 1}.
- Security Interface Extension Objects MIB—Whose object identifier is {jnxJsIf 1}.
- VPN Certificate Objects MIB—Whose object identifier is {jnxJsCertificates 1}.
- Security Screening Objects MIB—Whose object identifier is {jnxJsScreening 1}.

For more information on these MIBs, see “Juniper Networks Enterprise-Specific MIBs” on page 123.

jnxMibs

The object identifier for the jnxMibs root branch is {juniperMIB 3} and includes one main subbranch, jnxBoxAnatomy, whose object identifier is {jnxMibs 1}. The other Juniper Networks enterprise-specific MIBs are also branches of jnxMibs. These Juniper Networks enterprise-specific MIBs include:

- MPLS MIB—Whose object identifier is {jnxMibs 2}.
- Juniper Networks enterprise-specific extensions to the Interface MIB—Whose object identifier is {jnxMibs 3}.
- Alarm MIB—Whose object identifier is {jnxMibs 4}.
- Firewall MIB—Whose object identifier is {jnxMibs 5}.

- Destination Class Usage MIB—Whose object identifier is {jnxMibs 6}.
- Juniper Networks enterprise-specific extensions to the Ping MIB—Whose object identifier is {jnxMibs 7}.
- Juniper Networks enterprise-specific extensions to the Traceroute MIB—Whose object identifier is {jnxMibs 8}.
- ATM MIB—Whose object identifier is {jnxMibs 10}.
- IPv6 and ICMPv6 MIB—Whose object identifier is {jnxMibs 11}.
- IPv4 MIB—Whose object identifier is {jnxMibs 12}.
- Juniper Networks enterprise-specific extensions to the RMON Events and Alarms MIB—Whose object identifier is {jnxMIBs 13}.
- Juniper Networks enterprise-specific extensions to the LDP traps MIB—Whose object identifier is {jnxMibs 14}.
- Class-of-service MIB—Whose object identifier is {jnxMibs 15}.
- Source class usage MIB—Whose object identifier is {jnxMibs 16}.
- Reverse-path-forwarding MIB—Whose object identifier is {jnxMibs 17}.
- Configuration management MIB—Whose object identifier is {jnxMibs 18}.
- Passive monitoring MIB—Whose object identifier is {jnxMibs 19}.
- SONET/SDH Interface Management MIB—Whose object identifier is {jnxMibs 20}.
- ATM class-of-service MIB—Whose object identifier is {jnxMibs 21}.
- IPSec Monitoring MIB—Whose object identifier is {jnxMibs 22}.
- Ethernet MAC MIB—Whose object identifier is {jnxMibs 23}.
- SONET APS MIB—Whose object identifier is {jnxMibs 24}.
- Chassis Definitions for Router Model MIB—Whose object identifier is {jnxMibs 25}.
- VPN MIB—Whose object identifier is {jnxMibs 26}.
- Flow Collection Services MIB—Whose object identifier is {jnxMibs 28} .
- RSVP Traffic Engineering (TE) MIB—Whose object identifier is {jnxMibs 30}.
- Host Resources MIB—Whose object identifier is {jnxMibs 31}.
- Services PIC MIB—Whose object identifier is {jnxMibs 32}.
- Dynamic Flow Capture (DFC) MIB—Whose object identifier is {jnxMibs 33}.
- Chassis Forwarding MIB—Whose object identifier is {jnxMibs 34}.
- System Log MIB—Whose object identifier is {jnxMibs 35}.
- MPLS LDP MIB—Whose object identifier is {jnxMibs 36}.
- Event MIB—Whose object identifier is {jnxMibs 37}.
- IP Forward MIB—Whose object identifier is {jnxMibs 38}.
- Packet Forwarding Engine MIB—Whose object identifier is {jnxPfeMibRoot 1}.

- BFD MIB—Whose object identifier is {jnxBfdMibRoot 1}.
- Utility MIB—Whose object identifier is {jnxMibs 47}.
- L2ALD MIB—Whose object identifier is {jnxMibs 48}.
- L2TP MIB—Whose object identifier is {jnxMibs 49}.
- RPM MIB—Whose object identifier is {jnxMibs 50}.
- User AAA MIB—Whose object identifier is {jnxMibs 51}.

For more information on these MIBs, see "Juniper Networks Enterprise-Specific MIBs" on page 123.

jnxTraps

The object identifier for the jnxTraps root branch of the Structure of Management Information MIB is {juniperMIB 4}. The jnxTraps root branch contains the enterprise-specific SNMP traps supported by the JUNOS software. These Juniper Networks enterprise-specific SNMP traps include:

- jnxChassisTraps—Whose object identifier is {jnxTraps 1}.
- jnxChassisOKTraps—Whose object identifier is {jnxTraps 2}.
- jnxRmonTraps—Whose object identifier is {jnxTraps 3}.
- jnxLdpTraps—Whose object identifier is {jnxTraps 4}.
- jnxCmNotifications—Whose object identifier is {jnxTraps 5}.
- jnxSonetNotifications—Whose object identifier is {jnxTraps 6}.
- jnxPMonNotifications— Whose object identifier is {jnxTraps 7}
- jnxCollectorNotifications—Whose object identifier is {jnxTraps 8}.
- jnxPingNotificationPrefix—Whose object identifier is {jnxTraps 9}.
- jnxSpNotificationPrefix—Whose object identifier is {jnxTraps10}.

jnxExperiment

The object identifier for the jnxExperiment root branch of the Structure of Management Information MIB is {juniperMIB 5}. The jnxExperiment root branch contains experimental Juniper Networks enterprise-specific MIBs. This is the top-level object identifier registry used by Juniper Networks products for SNMP modules containing experimental MIB definitions.

jnxExperiment MIBs are defined as the following:

- IETF work-in-process MIBs that have not been assigned a permanent object identifier by the IANA.
- Juniper Networks work-in-process MIBs that have not achieved final production quality or field experience.

The following draft supports the jnxExperiment MIB space: Internet draft draft-ietf-idr-bgp4-mibv2-03.txt, *Definitions of Managed Objects for the Fourth Version of Border Gateway Protocol (BGP-4), Second Version* (only jnxBgpM2PrefixInPrefixes, jnxBgpM2PrefixInPrefixesAccepted, and jnxBgpM2PrefixInPrefixesRejected objects).

Chapter 22

Interpreting the Enterprise-Specific Chassis MIBs

The enterprise-specific Chassis MIB provides information on the router and its components. MIB objects represent each component and the status of the components. The enterprise-specific Chassis Definitions for Router Model MIB contains the object identifiers (OIDs) that are used by the Chassis MIB to identify platform and chassis components. The Chassis MIB provides information that changes often. The Chassis Definitions for Router Model MIB provides information that changes less often.

You can retrieve information from the MIB using any network management system (NMS). For a downloadable version of the Chassis Definitions for Router Model MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-chas-defines.txt.

This chapter contains the following topics:

Textual Convention for Chassis MIB

The enterprise-specific Chassis MIB uses JnxChassisId object to denote the router chassis type. JnxChassisId can be one of the following integer values:

- 1—Unknown
- 2—Single chassis
- 3—scc (TX Matrix platform)
- 4—lcc0 (T640 routing node)
- 5—lcc1 (T640 routing node)
- 6—lcc2 (T640 routing node)
- 7—lcc3 (T640 routing node)
- 8—jcs1
- 9—jcs2
- 10—jcs3
- 11—jcs4

jnxBoxAnatomy

The object identifier for the jnxMIBs root branch is {juniperMIB 3 and includes one main subbranch, jnxBoxAnatomy, whose object identifier is {jnxMibs 1}.

The jnxBoxAnatomy MIB has the following sections:

Top-Level Objects

The following branches of the jnxBoxAnatomy MIB are top-level objects:

- jnxBoxClass—The object identifier for the jnxBoxClass object is {jnxBoxAnatomy 1}. This object classifies the chassis product line.
- jnxBoxDescr—The object identifier for the jnxBoxDescr object is {jnxBoxAnatomy 2}. This object describes the chassis name and model.

- jnxBoxSerialNo—The object identifier for the jnxBoxSerialNo object is {jnxBoxAnatomy 3}. This object indicates the serial number of the chassis. jnxBoxSerialNo remains blank if the serial number is unknown or unavailable.
- jnxBoxRevision—The object identifier for the jnxBoxRevision object is {jnxBoxAnatomy 4}. This object indicates the last revision of the chassis.
- jnxBoxInstalled—The object identifier for the jnxBoxInstalled object is {jnxBoxAnatomy 5}. This object indicates the last time the box was installed and operational, represented by the sysUpTime value.

jnxContainersTable

The object identifier for the jnxContainersTable object is {jnxBoxAnatomy 6}. This object shows the structure of the chassis.

You can use the jnxContainersTable object to retrieve specific information on the router, such as how many of each component the router can contain. For example, the jnxContainersTable of an M20 router indicates that the router can accommodate four Flexible PIC Concentrators (FPCs); however, it does not describe how many FPCs the router actually has.

For more information on how many FPCs are actually on a router, see "jnxContentsTable" on page 308.

Entries within the jnxContainersTable object are represented by the jnxContainersEntry object, whose object identifier is {jnxContainersTable 1}. This jnxContainersEntry contains the following objects, which describe the contents of a particular router:

- jnxContainersIndex—The index value of an entry in the jnxContainersEntry object, whose object identifier is {jnxContainersEntry 1}, which corresponds to jnxContainersType and jnxContainersDescr.
- jnxContainersView—The orientation of a container from the front of the router, whose object identifier is {jnxContainersEntry 2}. This object also indicates that the container is embedded in the router and how it is accessible from corresponding views. The value of this object is a bitmap represented as a sum. If multiple bits are set, you can access the container from that set of views. The values represent the bit positions and their corresponding views as follows:
  - 1—Front
  - 2—Rear
  - 4—Top
  - 8—Bottom
  - 16—Left side
  - 32—Right side

    For each view plane, if specified counters are scattered in various views, the numbering sequence starts from left to right and then from top to bottom, as follows:

- Left side
- Right side
- Top
- Bottom
- Front
- Rear

NOTE: References to left and right sides are based on the view from the front of the chassis.

NOTE: In accordance with network management conventions, all indexes in the MIB begin with 1, not 0, although the slot number might be labeled 0.

- jnxContainersLevel—The abstraction level of the box or components for the jnxContainersEntry object, whose object identifier is {jnxContainersEntry 3}. The level is enumerated from the outside to the inside, and from the outer layer to the inner layer.

  For example, if the top level (level 0) of the box refers to the chassis frame, then the next level (level 1) refers to the FPC slot within the chassis frame. Finally, the Physical Interface Card (PIC) space within the FPC slot of the chassis corresponds to level 2.

- jnxContainersWithin—The container housing the entry at the next-higher level of the jnxContainersEntry object, whose object identifier is {jnxContainersEntry 4}.

  For example, the within value for jnxMediaCardSpacePIC.0 is 7. Because the jnxM20SlotFPC.0 retains an index value of 7, the FPC houses the PIC.

- jnxContainersType—The component of the Chassis MIB at a specific index, view, level, and within value for the jnxContainersEntry object, whose object identifier is {jnxContainersEntry 5}.

- jnxContainersDescr—The description of the component in the jnxContainersEntry object, whose object identifier is {jnxContainersEntry 6}.

- jnxContainersCount—The maximum number of a given component that the router can accommodate within the jnxContainersEntry object, whose object identifier is {jnxContainersEntry 7}.

  For example, the M20 router can house a specific maximum number of FPCs within the chassis frame. The maximum number is not necessarily the actual number of FPCs; this can change dynamically.

Table 38 on page 303 through Table 45 on page 307 provide examples of jnxContainersEntry objects in the jnxContainersTable. The following column headings for each table are abbreviated to correspond to the parts of the jnxContainersEntry objects:

- Index—jnxContainersIndex
- View—jnxContainersView
- Level—jnxContainersLevel
- Within—jnxContainersWithin
- Type—jnxContainersType
- Description—jnxContainersDescr
- Count—jnxContainersCount

Table 38 on page 303 describes objects contained in a jnxContainersEntry in the jnxContainersTable of an M40 router.

Table 38: jnxContainersEntry Objects in the jnxContainersTable of an M40 Router

Index	View	Level	Within	Type	Description	Count
1	1	0	0	jnxChassisM40.0	Chassis frame compartment	1
2	2	1	1	jnxSlotPowerSupply.0	Power supply compartment	2
3	3	1	1	jnxSlotCoolingImpeller.0	Impeller compartment	2
4	2	1	1	jnxSlotCoolingFan.0	Fan compartment	3
5	2	1	1	jnxSlotHostCtrl.0	Host controller compartment	1
6	1	1	1	jnxSlotSCB.0	SCB slot	1
7	1	1	1	jnxSlotFPC.0	FPC slot	8
8	1	2	7	jnxMediaSlotCardPIC.0	PIC space	4
9	2	1	1	jnxSlotRoutingEngine.0	Routing Engine compartment	1

Table 39 on page 303 describes objects in the jnxContainersTable of an M20 router.

Table 39: jnxContainersEntry Objects in the jnxContainersTable of an M20 Router

Index	View	Level	Within	Type	Description	Count
1	1	0	0	jnxChassisM20.0	Chassis frame compartment	1
2	2	1	1	jnxM20SlotPower.0	Power supply compartment	2

Table 39: jnxContainersEntry Objects in the jnxContainersTable of an M20 Router *(continued)*

Index	View	Level	Within	Type	Description	Count
4	3	1	1	jnxSlotFan.0	Fan compartment	4
6	2	1	1	jnxM20SlotSSB.0	SSB slot	2
7	1	1	1	jnxM20SlotFPC.0	FPC slot	4
8	1	2	7	jnxM20MediaCardSpacePIC.0	PIC space	4
9	2	1	1	jnxM20RE.0	Routing Engine compartment	2
10	1	1	1	JNXM20FrontPanel.0	Front display slot	1

Table 40 on page 304 describes objects contained in a jnxContainersEntry in the jnxContainersTable of an M160 router.

Table 40: jnxContainersEntry Objects in the jnxContainersTable of an M160 Router

Index	View	Level	Within	Type	Description	Count
1	1	0	0	jnxChassisM160.0	Chassis frame compartment	1
2	2	1	1	Jnx160SlotPower.0	Power supply compartment	2
4	3	1	1	jnxM160SlotFan.0	Fan compartment	4
6	2	1	1	jnxM160SlotSFM.0	SFM slot	4
7	1	1	1	jnxM160SlotFPC.0	FPC slot	8
8	1	2	7	jnxM160MediaCardSlotPIC.0	PIC space	4
9	2	1	1	jnxM160SlotHM.0	Host slot	2
10	1	1	1	jnxM160SlotFPM.0	FPM slot	1
11	2	1	1	jnxM160SlotPCG.0	PCG slot	2
12	2	1	1	jnxM160SlotMCS.0	MCS slot	2
13	1	1	1	jnxM160SlotCIP.0	CIP slot	1

Table 41 on page 305 describes objects contained in a jnxContainersEntry in the jnxContainersTable of an M10 router.

Table 41: jnxContainersEntry Objects in the jnxContainersTable of an M10 Router

Index	View	Level	Within	Type	Description	Count
1	1	0	0	jnxChassisM10.0	Chassis frame compartment	1
2	2	1	1	jnxM10SlotPower.0	Power supply compartment	2
4	2	1	1	jnxM10SlotFan.0	Fan compartment	1
6	2	1	1	jnxM10SlotFEB.0	FEB slot	1
7	1	1	1	jnxM10SlotFPC.0	FPC slot	2
8	1	2	7	jnxM10MediaCardSpacePIC.0	PIC space	4
9	2	1	1	jnxM10SlotRE.0	Routing Engine compartment	1

Table 42 on page 305 describes objects contained in a jnxContainersEntry in the jnxContainersTable of an M5 router.

Table 42: jnxContainersEntry Objects in the jnxContainersTable of an M5 Router

Index	View	Level	Within	Type	Description	Count
1	1	0	0	jnxChassisM5.0	Chassis frame compartment	1
2	2	1	1	jnxM5SlotPower.0	Power supply compartment	2
4	3	1	1	jnxM5SlotFan.0	Fan compartment	4
6	2	1	1	jnxM5SlotFEB.0	FEB slot	1
7	1	1	1	jnxM5SlotFPC.0	FPC slot	1
8	1	2	7	jnxM5MediaCardSlotPIC.0	PIC space	4
9	2	1	1	jnxM5SlotRE.0	Routing Engine compartment	1

Table 43 on page 306 describes objects contained in a jnxContainersEntry in the jnxContainersTable of a T640 routing node.

Table 43: jnxContainersEntry Objects in the jnxContainersTable of a T640 Routing Node

Index	View	Level	Within	Type	Description	Count
1	1	0	0	jnxChassisT640.0	Chassis frame	1
2	2	1	1	jnxT640SlotPower.0	PEM slot	2
4	3	1	1	jnxT640SlotFan.0	Fan slot	3
7	1	1	1	jnxT640SlotFPC.0	FPC slot	8
8	1	2	7	jnxT640MediaCardSpacePIC.0	PIC slot	4
9	2	1	1	jnxT640SlotHM.0	Host slot	2
10	1	1	1	jnxT640SlotFPB.0	FPM slot	1
11	2	1	1	jnxT640SlotSCG.0	SCG slot	2
12	2	1	1	jnxT640SlotCB.0	CG slot	2
13	1	1	1	jnxT640SlotCIP.0	CIP slot	1
14	2	1	1	jnxT640SlotSPMB.0	SPMB slot	2
15	2	1	1	jnxT640SlotSIB.0	SIB slot	5

Table 44 on page 306 describes objects contained in a jnxContainersEntry in the jnxContainersTable of a T320 router.

Table 44: jnxContainersEntry Objects in the jnxContainersTable of a T320 Router

Index	View	Level	Within	Type	Description	Count
1	1	0	0	jnxChassisT320.0	Chassis frame	1
2	2	1	1	jnxT320SlotPower.0	PEM slot	2
4	3	1	1	jnx320SlotFan.0	Fan slot	3
7	1	1	1	jnxT320SlotFPC.0	FPC slot	8
8	1	2	7	jnxT320MediaCardSpacePIC.0	PIC slot	2
9	2	1	1	jnxT320SlotHM.0	Host slot	2
10	1	1	1	jnxT320SlotFPB.0	FPM slot	1
11	2	1	1	jnxT320SlotSCG.0	SCG slot	2
12	2	1	1	jnxT320SlotCB.0	CB slot	2

Table 44: jnxContainersEntry Objects in the jnxContainersTable of a T320 Router *(continued)*

Index	View	Level	Within	Type	Description	Count
13	1	1	1	jnxT320SlotCIP.0	CIP slot	1
14	2	1	1	jnxT320SlotSPMB.0	SPMB slot	2
15	2	1	1	jnxT320SlotSIB.0	SIB slot	3

Table 45 on page 307 describes objects contained in a jnxContainersEntry in the jnxContainersTable of an M40e router.

Table 45: jnxContainersEntry Objects in the jnxContainersTable of an M40e Router

Index	View	Level	Within	Type	Description	Count
1	1	0	0	jnxChassisM40e.0	Chassis frame compartment	1
2	2	1	1	jnxM40eSlotPower.0	Power supply compartment	2
4	3	1	1	jnxM40eSlotFan.0	Fan compartment	4
6	2	1	1	jnxM40eSlotSFM.0	SFM slot	2
7	1	1	1	jnxM40eSlotFPC.0	FPC slot	8
8	1	2	7	jnxM40eMediaCardSpacePIC.0	PIC space	4
9	2	1	1	jnxM40eSlotHM.0	Host slot	2
10	1	1	1	jnxM40eSlotFPM.0	FPM slot	1
11	2	1	1	jnxM40eSlotPCG.0	PCG slot	2
12	2	1	1	jnxM40eSlotMCS.0	MCS slot	2
13	1	1	1	jnxM40eSlotCIP.0	CIP slot	1

jnxContentsLastChange

The object identifier for jnxContentsLastChange object is {jnxBoxAnatomy 7}. This object indicates the time at which the box contents last changed, represented by the sysUpTime value.

jnxContentsTable

The object identifier for jnxContentsTable object is {jnxBoxAnatomy 8}. This object specifies the contents of the chassis.

The jnxContentsTable lists the contents of an entry, which are defined as follows:

- jnxContentsContainerIndex—Associates the jnxContainersIndex with the jnxContainersTable, whose object identifier is {jnxContentsEntry 1}.
- jnxContentsL1Index—The level-one index of the container housing the component, whose object identifier is {jnxContentsEntry 2}. It indicates the position of the component within different levels of the containers. This value is 0 if the position is unavailable or not applicable.

NOTE: MIBs start with a value of 1, whereas the physical count on the router starts with a value of 0. To find the actual location of a component within a router, you must subtract 1 from the L1, L2, or L3 index.

- jnxContentsL2Index—The level-two index of the container housing the component, whose object identifier is {jnxContentsEntry 3}. It indicates the position of the component within different levels of the containers. This value is 0 if the position is unavailable or not applicable.
- jnxContentsL3Index—The level-three index of the container housing the component, whose object identifier is {jnxContentsEntry 4}. It indicates the position of the component within different levels of the containers. This value is 0 if the position is unavailable or not applicable.
- jnxContentsType—The component at a specific container index or L1, L2, or L3 index, whose object identifier is {jnxContentsEntry 5}.
- jnxContentsDescr—The type of component described in plain English, whose object identifier is {jnxContentsEntry 6}.
- jnxContentsSerialNo—The serial number of the component, whose object identifier is {jnxContentsEntry 7}.
- jnxContentsRevision—The revision level of the component, whose object identifier is {jnxContentsEntry 8}.
- jnxContentsInstalled—The time at which the component was last installed and operational, represented by the sysUpTime value, whose object identifier is {jnxContentsEntry 9}.
- jnxContentsPartNo—The part number of the component (blank if unknown or unavailable), whose object identifier is {jnxContentsEntry 10}.

Table 46 on page 309 through Table 48 on page 316 provide examples of jnxContentEntry objects. The following column headings for each table are abbreviated to correspond to the parts of the jnxContentsEntry objects:

- Container index— jnxContentsContainerIndex
- L1 Index—jnxContentsL1Index

- L2 Index—jnxContentsL2Index
- L3 Index—jnxContentsL3Index
- Type—jnxContentsType
- Description—jnxContentsDescr
- Serial Number—jnxContentsSerialNo
- Revision—jnxContentsRevision
- Installed—jnxContentsInstalled
- Part Number—jnxContentsPartNo

Table 46 on page 309 provides an example of jnxContentEntry objects in the jnxContentTableof an M20 router.

Table 46: jnxContentsEntry Objects in the jnxContentsTable of an M20 Router

Container Index	L1 Index	L2 Index	L3 Index	Type	Description	Serial Number	Revision	Installed	Part Number
1	1	1	0	jnxBackplaneM20.0	Midplane	AL3280	REV07	0:0:00:00.00	710-00157
2	1	0	0	jnxM20PowerDC.0	DC power supply A	001652	REV 05	0:0:00:00.00	740-00146
2	2	0	0	jnxM20PowerDC.0	DC power supply B	001652	REV 05	0:0:00:00.00	740-00146
4	1	0	0	jnxM20Fan.0	Front top fan	–	–	0:0:00:00.00	–
4	2	0	0	jnxM20Fan	Middle fan	–	–	0:0:00:00.00	–
4	3	0	0	jnxM20Fan	Bottom fan	–	–	0:0:00:00.00	–
4	4	4	0	jnxM20Fan	Rear fan	–	–	0:0:00:00.00	–
6	1	0	0	jnxM20SSB.0	SSB 0 Internet Processor II	AG0809	REV 01	0:0:00:35.17	710-001951
7	1	0	0	jnxM20FPC.0	FPC @ 0/*/*	AN1335	REV 01	0:0:01:01.80	710-001292
7	2	0	0	jnxM20FPC.0	FPC @ 1/*/*	AN1124	REV 01	0:0:01:07:96	710-001292
7	3	0	0	jnxM20FPC.0	FPC @ 2/*/*	AN1726	REV 01	0:0:01:14:12	710-001292
7	4	0	0	jnxM20FPC.0	FPC @ 3/*/*	AN1691	REV 01	0:0:01:20.28	710-001292

Table 46: jnxContentsEntry Objects in the jnxContentsTable of an M20 Router
(continued)

Container Index	L1 Index	L2 Index	L3 Index	Type	Description	Serial Number	Revision	Installed	Part Number
8	1	1	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 0/0/*	HD4313	REV 04	0:0:00:00.00	750-002992
8	1	2	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 0/1/*	AJ5844	REV 04	0:0:00:00.00	750-002992
8	1	3	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 0/2/*	HD4518	REV 04	0:0:00:00.00	750-002992
8	1	4	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 0/3/*	HD4515	REV 04	0:0:00:00.00	750-002992
8	2	1	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 1/0/*	HD4296	REV 04	0:0:00:00.00	750-002992
8	2	2	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 1/1/*	HD4323	REV 04	0:0:00:00.00	750-002992
8	2	3	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 1/2/*	HD4129	REV 04	0:0:00:00.00	750-002992
8	2	4	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 1/3/*	HD4341	REV 04	0:0:00:00.00	750-002992
8	3	1	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX@ 2/0/*	AH4147	REV 07	0:0:00:00.00	750-002303
8	3	2	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 2/1/*	AH4238	REV 07	0:0:00:00.00	750-002303
8	3	3	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 2/2/*	AH4116	REV 07	0:0:00:00.00	750-002303
8	3	4	0	jnxM20QuadEther.0	PIC: 4x, F/E, 100BASE-TX @ 2/3/*	AH4208	REV 07	0:0:00:00.00	750-002303
8	4	1	0	jnxM20GigEther.0	PIC: 1x G/E, 1000BASE-SX @ 3/0/*	AS3697	REV 07	0:0:00:00.00	750-001072

Table 46: jnxContentsEntry Objects in the jnxContentsTable of an M20 Router
(continued)

Container Index	L1 Index	L2 Index	L3 Index	Type	Description	Serial Number	Revision	Installed	Part Number
8	4	2	0	jnxM20ChOc12toDS3.0	PIC: 1x COC12SMIR @ 3/1/*	AE1110	REV 08	0:0:00:00.00	750-001190
8	4	4	0	jnxM20ChStml1.0	PIC: 1x CSTM1SMIR @ 3/3/*	AD9599	REV 04	0:0:00:00.00	750-003250
9	1	0	0	jnxM20RE.0	Routing Engine	–	–	3:16:16:53.21	–
10	1	0	0	jnxM20FrontPanel.0	Front panel display	–	–	0:0:00:00.00	–

To verify the L1, L2, and L3 indexes, use the show chassis hardware command. Sample command output from an M20 router is listed below.

```
user@host> show chassis hardware
Item    Version  Part number   Serial Number    Description
Chassis53711     M20
Backplane        REV 07   710-001517       AL3280
Power Supply A   REV 05   740-001466          001652      DC
Power Supply B   REV 05   740-001466          001632      DC
Display         REV 04   710-001519      AP9225
Host 0 c900000619e6ba01 teknor
SSB slot 0        REV 01  710-001951        AG0809      Internet Processor
II
FPC 0      REV 01  710-001292  AN1335
 PIC 0     REV 04  750-002992  HD4313      4x F/E, 100 BASE-TX
 PIC 1     REV 04  750-002992  AJ5844      4x F/E, 100 BASE-TX
 PIC 2     REV 04  750-002992  HD4518      4x F/E, 100 BASE-TX
 PIC 3     REV 04  750-002992  HD4515      4x F/E, 100 BASE-TX
FPC 1      REV 01  710-001292  AN1124
 PIC 0     REV 04  750-002992  HD4296      4x F/E, 100 BASE-TX
 PIC 1     REV 04  750-002992  HD4323      4x F/E, 100 BASE-TX
 PIC 2     REV 04  750-002992  HD4129      4x F/E, 100 BASE-TX
 PIC 3     REV 04  750-002992  HD4341      4x F/E, 100 BASE-TX
FPC 2      REV 01  710-001292  AN1726
 PIC 0     REV 07  750-002303  AH4147      4x F/E, 100 BASE-TX
 PIC 1     REV 07  750-002303  AH4238      4x F/E, 100 BASE-TX
 PIC 2     REV 07  750-002303  AH4116      4x F/E, 100 BASE-TX
 PIC 3     REV 07  750-002303  AH4208      4x F/E, 100 BASE-TX
FPC 3      REV 01  710-001292  AN1691
 PIC 0     REV 08  750-001072  AS3697      1x G/E, 1000
BASE-SX
 PIC 1     REV 03  750-001190  AE1110      1x COC12, SMIR
 PIC 3     REV 04  750-003250  AD9599      1x CSTM1, SMIR
```

Table 47 on page 312 provides an example of jnxContentEntry objects in the jnxContentTable of a T640 routing node.

Table 47: jnxContentsEntry Objects in the jnxContentsTable of a T640 Routing Node

Container Index	L1 Index	L2 Index	L3 Index	Type	Description	Serial Number	Revision	Installed	Part Number
1	1	0	0	jnxMidplaneT640.0	Midplane	AX5633	REV 04	0:0:00:00.00	710-002726
2	2	0	0	jnxT640Power.0	PEM 1	MD21815	RevX02	0:0:00:00.00	740-002595
4	1	1	0	jnxT640Fan.0	Top left front fan	–	–	0:0:00:00.00	–
4	1	2	0	jnxT640Fan.0	Top left middle fan	–	–	0:0:00:00.00	–
4	1	3	0	jnxT640Fan.0	Top left rear fan	–	–	0:0:00:00.00	–
4	1	4	0	jnxT640Fan.0	Top right front fan	–	–	0:0:00:00.00	–
4	1	5	0	jnxT640Fan.0	Top right middle fan	–	–	0:0:00:00.00	–
4	1	6	0	jnxT640Fan.0	Top right rear fan	–	–	0:0:00:00.00	–
4	2	1	0	jnxT640Fan.0	Bottom left front fan	–	–	0:0:00:00.00	–
4	2	2	0	jnxT640Fan.0	Bottom left middle fan	–	–	0:0:00:00.00	–
4	2	3	0	jnxT640Fan.0	Bottom left rear fan	–	–	0:0:00:00.00	–
4	2	4	0	jnxT640Fan.0	Bottom right front fan	–	–	0:0:00:00.00	–
4	2	5	0	jnxT640Fan.0	Bottom right middle fan	–	–	0:0:00:00.00	–
4	2	6	0	jnxT640Fan.0	Bottom right rear fan	–	–	0:0:00:00.00	–
4	3	1	0	jnxT640Fan.0	Fourth blower from top	–	–	0:0:00:00.00	–
4	3	2	0	jnxT640Fan.0	Bottom blower	–	–	0:0:00:00.00	–
4	3	3	0	jnxT640Fan.0	Middle blower	–	–	0:0:00:00.00	–
4	3	4	0	jnxT640Fan.0	Top blower	–	–	0:0:00:00.00	–
4	3	5	0	jnxT640Fan.0	Second blower from top	–	–	0:0:00:00.00	–
7	2	0	0	jnxT640FPC.0	FPC @ 1/*/*	HE3009	REV 01	0:18:56:48.81	710-002385

Table 47: jnxContentsEntry Objects in the jnxContentsTable of a T640 Routing Node *(continued)*

Container Index	L1 Index	L2 Index	L3 Index	Type	Description	Serial Number	Revision	Installed	Part Number
7	2	1	0	jnxT640FPC.0	FPC @ 1/0/* top temp. sensor	HE3009	REV 01	0:18:56:48.81	710-002385
7	2	2	0	jnxT640FPC.0	FPC @ 1/1/* bottom temp. sensor	HE3009	REV 01	0:18:56:48.81	710-002385
7	6	0	0	jnxT640FPC.0	FPC @ 5/*/*	HD5001	REV 03	0:18:57:02.71	710-001721
7	6	1	0	jnxT640FPC.0	FPC @ 5/0/* top temp. sensor	HD5001	REV 03	0:18:57:02.71	710-001721
7	6	2	0	jnxT640FPC.0	FPC @ 5/1/* bottom temp. sensor	HD5001	REV 03	0:18:57:02.71	710-001721
7	8	0	0	jnxT640FPC.0	FPC @ 7/*/*	HE3179	REV 01	0:18:56:52.85	710-002385
7	8	1	0	jnxT640FPC.0	FPC @ 7/0/* top temp. sensor	HE3179	REV 01	0:18:56:52.85	710-002385
7	8	2	0	jnxT640FPC.0	FPC @ 7/1/* bottom temp. sensor	HE3179	REV 01	0:18:56:52.85	710-002385
8	2	1	0	jnxT640PIC3.0	PIC: 1x G/E, 1000 BASE-SX @ 1/0/*	AP5542	REV 08	0:18:56:50.91	750-001072
8	2	2	0	jnxT640PIC3.0	PIC: 1x OC-12 ATM, SMIR @ 1/1/*	AK6894	REV 02	0:18:56:55.24	750-002983
8	2	3	0	jnxT640PIC3.0	PIC: 1x G/E, 1000 BASE-SX @ 1/2/*	HD4968	REV 04	0:18:56:55.64	750-001894
8	6	1	0	jnxT640PIC3.0	PIC: 1x OC-192 SM SR1 @ 5/0/*	HC0273	REV 01	0:18:57:04.47	750-004535
8	6	2	0	jnxT640PIC3.0	PIC: 1x OC-192 SM SR1 @ 5/1/*	HC0271	REV 01	0:18:57:04.55	750-004535
8	6	3	0	jnxT640PIC3.0	PIC: 1x OC-192 SM SR1 @ 5/2/*	HC0254	REV 01	0:18:57:04.64	750-004535

Table 47: jnxContentsEntry Objects in the jnxContentsTable of a T640 Routing Node *(continued)*

Container Index	L1 Index	L2 Index	L3 Index	Type	Description	Serial Number	Revision	Installed	Part Number
8	8	1	0	jnxT640PIC3.0	PIC: 2x G/E, 1000 BASE-SX @ 7/0/*	AD3632	REV 01	0:18:56:55.16	710-002381
8	8	2	0	jnxT640PIC3.0	PIC: 4x OC-12 SONET, SMIR @ 7/1/*	AD3831	REV 05	0:18:56:55.18	750-001901
8	8	3	0	jnxT640PIC3.0	PIC: 1x OC-48 SONET, SMIR @ 7/2/*	AA9603	REV 01	0:18:56:55.21	750-001900
8	8	4	0	jnxT640PIC3.0	PIC: 1x OC-48 SONET, SMSR @ 7/3/*	AD5724	REV 05	0:18:56:55.24	750-001900
9	1	0	0	jnxT640HM.0	Host 0	–	–	0:19:19:30.95	–
9	2	0	0	jnxT640HM.0	Host 1	2108 6570 0292	REV 01	2:19:45:51.00	740-005022
10	1	0	0	jnxT640FPB.0	FPM	HE3245	REV 02	0:0:00:00.00	710-002901
11	1	0	0	jnxT640SCG.0	SCG 0	HF6023	REV 04	0:0:00:00.00	710-003423
11	2	0	0	jnxT640SCG.0	SCG 1	HF6061	REV 04	0:0:00:00.00	710-003423
12	2	0	0	jnxT640CB.0	CB 0	HE3614	REV 06	0:0:00:00.00	710-002728
12	2	0	0	jnxT640CB.0	CB 1	HE3627	REV 06	0:0:00:00.00	710-002728
13	1	0	0	jnxT640CIP.0	CIP	HA4729	REV 05	0:0:00:00.00	710-002895
14	1	0	0	jnxT640SPMB.0	SPMB 0	HF6876	REV 02	0:18:56:06.72	710-003229
14	2	0	0	jnxT640SPMB.0	SPMB 1	HG6237	REV 02	0:18:56:08.01	710-003229
15	1	0	0	jnxT640SIB.0	SIB 0	HJ9669	REV 02	0:0:00:00.00	710-005157
15	2	0	0	jnxT640SIB.0	SIB 1	HJ9668	REV 02	0:0:00:00.00	710-005157
15	3	0	0	jnxT640SIB.0	SIB 2	HH3039	REV 02	0:0:00:00.00	710-005157
15	4	0	0	jnxT640SIB.0	SIB 3	HH3041	REV 02	0:0:00:00.00	710-005157
15	5	0	0	jnxT640SIB.0	SIB 4	HJ9657	REV 02	0:0:00:00.00	710-005157

To verify the L1, L2, and L3 indexes, use the show chassis hardware command. Sample command output from a T640 routing node is listed below.

```
user@host> show chassis hardware
Hardware inventory:
Item       Version Part number Serial number   Description
Chassis    T640
Midplane    REV 04  710-002726  AX5633
FPM GBUS    REV 02  710-002901  HE3245
FPM Display    REV 02  710-002897  HA4873
CIP          REV 05  710-002895  HA4729
PEM 1         RevX02  740-002595  MD21815         Power Entry Module
SCG 0         REV 04  710-003423  HF6023
SCG 1         REV 04  710-003423  HF6061
Host 0    unknown
Host 1    REV 01  740-005022  210865700292   RE-3.0
CB 0          REV 06  710-002728  HE3614
CB 1          REV 06  710-002728  HE3627
FPC 1         REV 01  710-002385  HE3009      FPC Type 1
 CPU          REV 06  710-001726  HC0010
 PIC 0        REV 08  750-001072  AP5542      1x G/E, 1000 BASE-SX
 PIC 1        REV 02  750-002983  AK6894      1x OC-12 ATM, SMIR
 PIC 2        REV 04  750-001894  HD4968      1x G/E, 1000 BASE-SX
 MMB 1        REV 03  710-001723  HE7264      MMB-144mbit
 ICBM         REV 01  710-003384  HE3042
 PPB 0        REV 01  710-003758  HE7173      PPB Type 2
 PPB 1        REV 01  710-003758  HE7170      PPB Type 2
FPC 5         REV 03  710-001721  HD5001      FPC Type 3
 CPU         REV 06  710-001726          HA5080
 PIC 0        REV 01  750-004535  HC0273      1x OC-192 SM SR1
 PIC 1        REV 01  750-004535  HC0271      1x OC-192 SM SR1
 PIC 2        REV 01  750-004535  HC0254      1x OC-192 SM SR1
 MMB 0        REV 03  710-001723  HE7263      MMB-144mbit
 MMB 1        REV 03  710-001723  HE7266      MMB-144mbit
 ICBM         REV 01  710-003384  HE3044
 PPB 0        REV 02  710-002845  HD6027      PPB Type 3
 PPB 1        REV 02  710-002845  HD6039      PPB Type 3
FPC 7         REV 01  710-002385  HE3179      FPC Type 2
 CPU         REV 06  710-001726          HE7915
 PIC 0        REV 01  710-002381  AD3632      2x G/E, 1000 BASE-SX
 PIC 1        REV 05  750-001901  AD3831      4x OC-12 SONET, SMIR
 PIC 2        REV 01  750-001900  AA9603      1x OC-48 SONET, SMIR
 PIC 3        REV 05  750-001900  AD5724      1x OC-48 SONET, SMSR
 MMB 1        REV 02  710-004047  HE3424      MMB-288mbit
 ICBM         REV 04  710-003384  HA4480
 PPB 0        REV 02  710-003758  HE3169      PPB Type 2
 PPB 1        REV 02  710-003758  HA4535      PPB Type 2
SPMB 0       REV 02  710-003229 HF6876
SPMB 1       REV 02  710-003229 HG6237
SIB 0         REV 02  710-005157  HJ9669      SIB-I8-F16
SIB 1         REV 02  710-005157  HJ9668      SIB-I8-F16
SIB 2         REV 02  710-005157  HH3039      SIB-I8-F16
SIB 3         REV 02  710-005157  HH3041      SIB-I8-F16
SIB 4         REV 02  710-005157  HJ9657      SIB-I8-F16
```

Table 48 on page 316 provides an example of jnxContentEntry objects in the jnxContentTable of a T320 router.

Table 48: jnxContentsEntry Objects in the jnxContentsTable of a T320 Router

Container Index	L1 Index	L2 Index	L3 Index	Type	Description	Serial Number	Revision	Installed	Part Number
1	1	0	0	jnxMidplaneT320.0	Midplane	AY4527	Rev 01	(0) 0:00:00.00	710-004339
2	1	0	0	jnxT320Power.0	PEM 0	ML14099	Rev 01	(0) 0:00:00.00	–
4	1	1	0	jnxT320Fan.0	Top left front fan	–	–	(0) 0:00:00.00	–
4	1	2	0	jnxT320Fan.0	Top left middle fan	–	–	(0) 0:00:00.00	–
4	1	3	0	jnxT320Fan.0	Top left rear fan	–	–	(0) 0:00:00.00	–
4	1	4	0	jnxT320Fan.0	Top right front fan	–	–	(0) 0:00:00.00	–
4	1	5	0	jnxT320Fan.0	Top right middle fan	–	–	(0) 0:00:00.00	–
4	1	6	0	jnxT320Fan.0	Top right rear fan	–	–	(0) 0:00:00.00	–
4	2	1	0	jnxT320Fan.0	Bottom left front fan	–	–	(0) 0:00:00.00	–
4	2	2	0	jnxT320Fan.0	Bottom left middle fan	–	–	(0) 0:00:00.00	–
4	2	3	0	jnxT320Fan.0	Bottom left rear fan	–	–	(0) 0:00:00.00	–
4	2	4	0	jnxT320Fan.0	Bottom right front fan	–	–	(0) 0:00:00.00	–
4	2	5	0	jnxT320Fan.0	Bottom right middle fan	–	–	(0) 0:00:00.00	–
4	2	6	0	jnxT320Fan.0	Bottom right rear fan	–	–	(0) 0:00:00.00	–
4	3	1	0	jnxT320Fan.0	Rear tray top fan	–	–	(0) 0:00:00.00	–
4	3	2	0	jnxT320Fan.0	Rear tray second fan	–	–	(0) 0:00:00.00	–
4	3	3	0	jnxT320Fan.0	Rear tray middle fan	–	–	(0) 0:00:00.00	–
4	3	4	0	jnxT320Fan.0	Rear tray fourth fan	–	–	(0) 0:00:00.00	–

Table 48: jnxContentsEntry Objects in the jnxContentsTable of a T320 Router *(continued)*

Container Index	L1 Index	L2 Index	L3 Index	Type	Description	Serial Number	Revision	Installed	Part Number
4	3	5	0	jnxT320Fan.0	Rear tray bottom fan	–	–	(0) 0:00:00.00	–
7	4	0	0	jnxT320FPC.0	FPC @ 3/*/*	AY4706	REV 01	(26190949) 3 days, 0:45:09.49	710-004333
7	4	1	0	jnxT320FPC.0	FPC @ 3/0/* top temp. sensor	AY4706	REV 01	(26190949) 3 days, 0:45:09.49	710-004333
7	4	2	0	jnxT320FPC.0	FPC @ 3/1/* bottom temp. sensor	AY4706	REV 01	(26190949) 3 days, 0:45:09.49	710-004333
8	1	1	0	jnxT320PIC3	PIC: 1x OC-192 SM SR2 @ 0/0/*	HJ9283	REV 06	(6378) 0:01:03.78	750-004535
8	1	2	0	jnxT320PIC3	PIC: 1x OC-192 SM SR2 @ 0/1/*	HJ9298	REV 06	(6434) 0:01:04.34	750-004535
9	1	0	0	jnxT320HM.0	Host 0	2108 6570 0286	REV 01	(32762924) 3 days, 19:00:29.24	740-005022
9	2	0	0	jnxT320HM.0	Host 1	2109 2900 0186	REV 01	(110269900) 12 days, 18:18:19.00	740-005022
10	1	0	0	jnxT320FPB.0	FPM	AY4514	REV 02	(0) 0:00:00.00	710-004461
11	1	0	0	jnxT320SCG.0	SCG 0	AY4520	REV 06	(0) 0:00:00.00	710-004455
11	2	0	0	jnxT320SCG.0	SCG 1	AY4526	REV 06	(0) 0:00:00.00	710-004455
12	1	0	0	jnxT320CB.0	CB 0	AY4765	REV 11	(0) 0:00:00.00	710-002728
12	2	0	0	jnxT320CB.0	CB 1	HG6051	REV 06	(0) 0:00:00.00	710-002728
13	1	0	0	jnxT320CIP.0	CIP	HC0476	REV 05	(0) 0:00:00.00	710-002895
14	1	0	0	jnxT320SPMB.0	SPMB 0	HB1893	REV 02	(26186997) 3 days, 0:44:29.97	710-003229

Table 48: jnxContentsEntry Objects in the jnxContentsTable of a T320 Router *(continued)*

Container Index	L1 Index	L2 Index	L3 Index	Type	Description	Serial Number	Revision	Installed	Part Number
14	2	0	0	jnxT320SPMB.0	SPMB 1	HD5520	REV 02	(26186913) 3 days, 0:44:29.13	710-003229
15	1	0	0	jnxT320SIB.0	SIB 0	BC1509	REV 02	(0) 0:00:00.00	710-005157
15	2	0	0	jnxT320SIB.0	SIB 1	BC1512	REV 02	(0) 0:00:00.00	710-005157
15	3	0	0	jnxT320SIB.0	SIB 2	BC1494	REV 02	(0) 0:00:00.00	710-005157

To verify the L1, L2, and L3 indexes, use the show chassis hardware command. Sample command output from a T320 router is listed below.

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis  T320
Midplane         REV 01   710-004339   AY4527
FPM GBUS         REV 02   710-004461   AY4514
FPM Display      REV 02   710-002897   HF6097
CIP              REV 05   710-002895   HC0476
PEM 0            Rev 01   740-004359   ML14099           Power Entry
Module
SCG 0            REV 06   710-004455   AY4520
SCG 1            REV 06   710-004455   AY4526
RE 0               REV 01   740-005022   210865700286      RE-3.0
RE 1               REV 01   740-005022   210929000186      RE-3.0
CB 0             REV 11   710-002728   AY4765
CB 1             REV 06   710-002728   HG6051
FPC 1            REV 01   710-004333   AY4507           FPC Type 3
  CPU            REV 06   710-001726   HA4719
  MMB 1          REV 03   710-004047   HD5738           MMB-288mbit
  PPB 0          REV 02   710-002845   HC0988           PPB Type 3
FPC 3            REV 01   710-004333   AY4706           FPC Type 3
  CPU            REV 06   710-001726   HE7916
  MMB 1          REV 03   710-004047   HG6326           MMB-288mbit
  PPB 0          REV 02   710-002845   HC0958           PPB Type 3
SPMB 0           REV 02   710-003229   HB1893
SPMB 1           REV 02   710-003229   HD5520
SIB 0            REV 02   710-005157   BC1509           SIB-I8-F16
SIB 1            REV 02   710-005157   BC1512           SIB-I8-F16
SIB 2            REV 02   710-005157   BC1494           SIB-I8-F16
```

jnxLEDLastChange

The object identifier for the jnxLEDLastChange object is {jnxBoxAnatomy 9}. This object indicates when the LED last changed state. Its value is 0 if the sysUpTime value is unknown, or if it already existed when the agent was active.

jnxLEDTable

The object identifier for the jnxLEDTable object is {jnxBoxAnatomy 10}. This object indicates the LED status of the router and lists the contents of an entry. Entries in the jnxLEDTable are represented by the jnxLEDEntry object, whose object identifier is {jnxLEDTable 1}.

The jnxLEDTable describes the components of the LED Box Indicators, whose elements are described as follows:

- jnxLEDAssociateTable—The associate table to which the entry is related, whose object identifier is {jnxLEDEntry 1}.
- jnxLEDAssociateIndex—The index of the subject in the associated table to which the entry is related, whose object identifier is {jnxLEDEntry 2}. The associate index is the index of the subject in the associated table, which returns you to the jnxContainersTable.
- jnxLEDL1Index—The level-one index of the associate table to which an entry is related, whose object identifier is {jnxLEDEntry 3}. It indicates the position of the component within the different levels of the containers. This value is 0 if the position is unavailable or not applicable.

NOTE: MIBs start with a value of 1, while the physical count on the router starts with a value of 0. To find the actual location of a component within a router, you must subtract 1 from the L1, L2, or L3 index.

- jnxLEDL2Index—The level-two index of the associate table to which an entry is related, whose object identifier is {jnxLEDEntry 4}. It indicates the position of the component within the different levels of the containers. This value is 0 if the position is unavailable or not applicable.
- jnxLEDL3Index—The level-three index of the associate table to which an entry is related, whose object identifier is {jnxLEDEntry 5}. It indicates the position of the component within the different levels of the containers. This value is 0 if the position is unavailable or not applicable.
- jnxLEDOriginator—The chassis component that originated the update, whose object identifier is {jnxLEDEntry 6}.
- jnxLEDDescr—The name or detailed description of the entry, whose object identifier is {jnxLEDEntry 7}.
- jnxLEDState—The state of the LED indicator, whose object identifier is {jnxLEDEntry 8}. The state can be any of the following:

  - Amber—Alarm, offline, not working
  - Blue—Online as the active primary
  - Green—Working normally online as a standby backup if there is an active primary
  - Other—Unknown or unavailable
  - Red—Alert, component failed
  - Yellow—Alarm, warning
- jnxLEDStateOrdered—The state of the LED indicator, whose object identifier is {jnxLEDEntry 9}. jnxLEDStateOrdered provides the same information as jnxLEDState but lists the states in a different order. The state can be any of the following:
  - Blue—Online as the active primary
  - Green—Working normally online as a standby backup if there is an active primary
  - Amber—Alarm, offline, not working
  - Yellow—Alarm, warning
  - Red—Alert, component failed
  - Other—Unknown or unavailable

Table 49 on page 320 through Table 51 on page 322 provide examples of jnxLEDEntry objects. The following column headings for each table are abbreviated to correspond to the parts of the jnxLEDEntry objects:

- Associate table—jnxLEDAssociateTable
- Associate index—jnxLEDAssociateIndex
- L1 Index—jnxLEDL1Index
- L2 Index—jnxLEDL2Index
- L3 Index—jnxLEDL3Index
- Originator—jnxLEDOriginator
- Description—jnxLEDDescr
- State—jnxLEDState

Table 49 on page 320 provides an example of jnxLEDEntry objects in the jnxLEDTable of an M20 router.

Table 49: jnxLEDEntry Objects in the jnxLEDTable of an M20 Router

Associate Table	Associate Index	L1 Index	L2 Index	L3 Index	Originator	Description	State
jnxContentsTable	1	1	0	0	jnxChassisM20.0	Chassis alarm LED	Other

Table 49: jnxLEDEntry Objects in the jnxLEDTable of an M20 Router *(continued)*

Associate Table	Associate Index	L1 Index	L2 Index	L3 Index	Originator	Description	State
jnxContentsTable	6	1	0	0	jnxM20SSB.0	SSB 1 LED	Blue
jnxContentsTable	6	2	0	0	jnxM20SSB.0	SSB 2 LED	Green
jnxContentsTable	7	1	0	0	jnxM20FPC.0	FPC 1 LED	Amber
jnxContentsTable	7	2	0	0	jnxM20FPC.0	FPC 2 LED	Blue
jnxContentsTable	7	3	0	0	jnxM20FPC.0	FPC 3 LED	Blue
jnxContentsTable	7	4	0	0	jnxM20FPC.0	FPC 4 LED	Amber
jnxContentsTable	9	1	0	0	jnxM20RE.0	Routing Engine 1 LED	Blue
jnxContentsTable	9	2	0	0	jnxM20RE.0	Routing Engine 2 LED	Other

Table 50 on page 321 provides an example of jnxLEDEntry objects in the jnxLEDTable of a T640 routing node.

Table 50: jnxLEDEntry Objects in the jnxLEDTable of a T640 Routing Node

Associate Table	Associate Index	L1 Index	L2 Index	L3 Index	Originator	Description	State
jnxContentsTable	1	1	0	0	jnxChassisT640.0	Chassis alarm LED	Other
jnxContentsTable	7	1	0	0	jnxT640FPC.0	FPC slot 0 LED	Other
jnxContentsTable	7	2	0	0	jnxT640FPC.0	FPC slot 1 LED	Green
jnxContentsTable	7	3	0	0	jnxT640FPC.0	FPC slot 2 LED	Other
jnxContentsTable	7	4	0	0	jnxT640FPC.0	FPC slot 3 LED	Other
jnxContentsTable	7	5	0	0	jnxT640FPC.0	FPC slot 4 LED	Other
jnxContentsTable	7	6	0	0	jnxT640FPC.0	FPC slot 5 LED	Green
jnxContentsTable	7	7	0	0	jnxT640FPC.0	FPC slot 6 LED	Other
jnxContentsTable	7	8	0	0	jnxT640FPC.0	FPC slot 7 LED	Green
jnxContentsTable	9	1	0	0	jnxT640HM.0	Host 0 LED	Blue
jnxContentsTable	9	2	0	0	jnxT640HM.0	Host 1 LED	Green

Table 51 on page 322 provides an example of jnxLEDEntry objects in the jnxLEDTable of a T320 router.

Table 51: jnxLEDEntry Objects in the jnxLEDTable of a T320 Router

Associate Table	Associate Index	L1 Index	L2 Index	L3 Index	Originator	Description	State
jnxContentsTable(3)	1	1	0	0	jnxChassisT320.0	Chassis alarm LED	Other
jnxContentsTable(3)	7	1	0	0	jnxT320FPC.0	FPC slot 0 LED	Other
jnxContentsTable(3)	7	2	0	0	jnxT320FPC.0	FPC slot 1 LED	Other
jnxContentsTable(3)	7	3	0	0	jnxT320FPC.0	FPC slot 2 LED	Other
jnxContentsTable(3)	7	4	0	0	jnxT320FPC.0	FPC slot 3 LED	Other
jnxContentsTable(3)	7	5	0	0	jnxT320FPC.0	FPC slot 4 LED	Other
jnxContentsTable(3)	7	6	0	0	jnxT320FPC.0	FPC slot 5 LED	Other
jnxContentsTable(3)	7	7	0	0	jnxT320FPC.0	FPC slot 6 LED	Other
jnxContentsTable(3)	7	8	0	0	jnxT320FPC.0	FPC slot 7 LED	Other
jnxContentsTable(3)	9	1	0	0	jnxT320HM.0	Host 0 LED	Blue
jnxContentsTable(3)	9	2	0	0	jnxT320HM.0	Host 1 LED	Green

jnxFilledLastChange

The object identifier for the jnxFilledLastChange object is {jnxBoxAnatomy 11}. This object indicates when the box filled status last changed. This variable is 0 if the sysUpTime value is unknown or it already existed when the agent was active.

jnxFilledTable

The object identifier for the jnxFilledTable object is {jnxBoxAnatomy 12}. This object indicates whether a specific container in the router is used (filled) or empty. This table is used for inventory and capacity planning.

Entries in the jnxFilledTable are represented by the jnxFilledEntry object, whose object identifier is {jnxFilledTable 1}.

The jnxFilledTable describes the status of specific containers whose component objects are described as follows:

- jnxFilledContainerIndex—The associated jnxContainersIndex in the jnxContainersTable, whose object identifier is {jnxFilledEntry 1}.
- jnxFilledL1Index—The level-one index of the container housing the entry, whose object identifier is {jnxFilledEntry 2}.

- jnxFilledL2Index—The level-two index of the container housing the entry, whose object identifier is {jnxFilledEntry 3}.
- jnxFilledL3Index—The level-three index of the container housing the entry, whose object identifier is {jnxFilledEntry 4}.
- jnxFilledDescr—The entry's name or detailed description of the entry, whose object identifier is {jnxFilledEntry 5}.
- jnxFilledState—The entry's state (filled or empty), whose object identifier is {jnxFilledEntry 6}.

Table 52 on page 323 through Table 54 on page 329 provide examples of jnxFilledEntry objects in the jnxFilledTable. The following column headings for each table are abbreviated to correspond to the parts of the jnxFilledEntry objects:

- Container index—jnxFilledContainerIndex
- L1—jnxFilledL1Index
- L2—jnxFilledL2Index
- L3—jnxFilledL3Index
- Description—jnxFilledDescr
- State—jnxFilledState

Table 52 on page 323 provides an example of jnxFilledEntry objects in the jnxFilledTable of an M20 router.

Table 52: jnxFilledEntry Objects in the jnxFilledTable of an M20 Router

Container Index	L1	L2	L3	Description	State
1	1	0	0	Chassis frame compartment	Filled
1	1	1	0	Temperature sensor space 0	Filled
1	1	2	0	Temperature sensor space 1	Filled
2	1	0	0	Power supply compartment A	Filled
2	2	0	0	Power supply compartment B	Empty
3	1	0	0	Rear top impeller compartment	Filled
3	2	0	0	Front bottom impeller compartment	Filled
4	1	0	0	Rear left fan compartment	Filled
4	2	0	0	Right center fan compartment	Filled
4	3	0	0	Rear right fan compartment	Filled
5	1	0	0	Host controller compartment	Filled

Table 52: jnxFilledEntry Objects in the jnxFilledTable of an M20 Router *(continued)*

Container Index	L1	L2	L3	Description	State
6	1	0	0	SCB slot	Filled
7	1	0	0	FPC slot 0	Empty
7	2	0	0	FPC slot 1	Empty
7	3	0	0	FPC slot 2	Filled
7	4	0	0	FPC slot 3	Filled
7	5	0	0	FPC slot 4	Empty
7	6	0	0	FPC slot 5	Filled
7	7	0	0	FPC slot 6	Empty
7	8	0	0	FPC slot 7	Empty
8	1	1	0	PIC space @ 0/0/*	Empty
8	1	2	0	PIC space @ 0/1/*	Empty
8	1	3	0	PIC space @ 0/2/*	Empty
8	1	4	0	PIC space @ 0/3/*	Empty
8	2	1	0	PIC space @ 1/0/*	Empty
8	2	2	0	PIC space @ 1/1/*	Empty
8	2	3	0	PIC space @ 1/2/*	Empty
8	2	4	0	PIC space @ 1/3/*	Empty
8	3	1	0	PIC space @ 2/0/*	Filled
8	3	2	0	PIC space @ 2/1/*	Filled
8	3	3	0	PIC space @ 2/2/*	Filled
8	3	4	0	PIC space @ 2/3/*	Filled
8	4	1	0	PIC space @ 3/0/*	Filled
8	4	2	0	PIC space @ 3/1/*	Filled
8	4	3	0	PIC space @ 3/2/*	Filled
8	4	4	0	PIC space @ 3/3/*	Filled
8	5	1	0	PIC space @ 4/0/*	Empty
8	5	2	0	PIC space @ 4/1/*	Empty

Table 52: jnxFilledEntry Objects in the jnxFilledTable of an M20 Router *(continued)*

Container Index	L1	L2	L3	Description	State
8	5	3	0	PIC space @ 4/2/*	Empty
8	5	4	0	PIC space @ 4/3/*	Empty
8	6	1	0	PIC space @ 5/0/*	Filled
8	6	2	0	PIC space @ 5/1/*	Filled
8	6	3	0	PIC space @ 5/2/*	Filled
8	6	4	0	PIC space @ 5/3/*	Filled
8	7	1	0	PIC space @ 6/0/*	Empty
8	7	2	0	PIC space @ 6/1/*	Empty
8	7	3	0	PIC space @ 6/2/*	Empty
8	7	4	0	PIC space @ 6/3/*	Empty
8	8	1	0	PIC space @ 7/0/*	Empty
8	8	2	0	PIC space @ 7/1/*	Empty
8	8	3	0	PIC space @ 7/2/*	Empty
8	8	4	0	PIC space @ 7/3/*	Empty
9	1	0	0	Routing Engine compartment	Filled

Table 53 on page 325 provides an example of jnxFilledEntry objects in the jnxFilledTable of a T640 routing node.

Table 53: jnxFilledEntry Objects in the jnxFilledTable of a T640 Routing Node

Container Index	L1	L2	L3	Description	State
1	1	0	0	Chassis frame	Filled
2	1	0	0	PEM slot 0	Empty
2	2	0	0	PEM slot 1	Filled
4	1	1	0	Top left front fan slot	Filled
4	1	2	0	Top left middle fan slot	Filled
4	1	3	0	Top left rear fan slot	Filled

Table 53: jnxFilledEntry Objects in the jnxFilledTable of a T640 Routing Node *(continued)*

Container Index	L1	L2	L3	Description	State
4	1	4	0	Top right front fan slot	Filled
4	1	5	0	Top right middle fan slot	Filled
4	1	6	0	Top right rear fan slot	Filled
4	2	1	0	Bottom left front fan slot	Filled
4	2	2	0	Bottom left middle fan slot	Filled
4	2	3	0	Bottom left rear fan slot	Filled
4	2	4	0	Bottom right front fan slot	Filled
4	2	5	0	Bottom right middle fan slot	Filled
4	2	6	0	Bottom right rear fan slot	Filled
4	3	1	0	Fourth blower from top slot	Filled
4	3	2	0	Bottom blower slot	Filled
4	3	3	0	Middle blower slot	Filled
4	3	4	0	Top blower slot	Filled
4	3	5	0	Second blower from top slot	Filled
7	3	2	0	FPC slot 0	Empty
7	3	3	0	FPC slot 0 top temp. sensor	Empty
7	3	4	0	FPC slot 0 bottom temp. sensor	Empty
7	3	5	0	FPC slot 1	Filled
7	3	6	0	FPC slot 1 top temp. sensor	Filled
7	1	0	0	FPC slot 1 bottom temp. sensor	Filled
7	1	1	0	FPC slot 2	Empty
7	1	2	0	FPC slot 2 top temp. sensor	Empty
7	2	0	0	FPC slot 2 bottom temp. sensor	Empty
7	2	1	0	FPC slot 3	Empty
7	2	2	0	FPC slot 3 top temp. sensor	Empty
7	3	0	0	FPC slot 3 bottom temp. sensor	Empty

Table 53: jnxFilledEntry Objects in the jnxFilledTable of a T640 Routing Node *(continued)*

Container Index	L1	L2	L3	Description	State
7	3	1	0	FPC slot 4	Empty
7	3	2	0	FPC slot 4 top temp. sensor	Empty
7	4	0	0	FPC slot 4 bottom temp. sensor	Empty
7	4	1	0	FPC slot 5	Filled
7	4	2	0	FPC slot 5 top temp. sensor	Filled
7	5	0	0	FPC slot 5 bottom temp. sensor	Filled
7	5	1	0	FPC slot 6	Empty
7	5	2	0	FPC slot 6 top temp. sensor	Empty
7	6	0	0	FPC slot 6 bottom temp. sensor	Empty
7	6	1	0	FPC slot 7	Filled
7	6	2	0	FPC slot 7 top temp. sensor	Filled
7	7	0	0	FPC slot 7 bottom temp. sensor	Filled
8	1	1	0	PIC slot @ 0/0/*	Empty
8	1	2	0	PIC slot @ 0/1/*	Empty
8	1	3	0	PIC slot @ 0/2/*	Empty
8	1	4	0	PIC slot @ 0/3/*	Empty
8	2	1	0	PIC slot @ 1/0/*	Filled
8	2	2	0	PIC slot @ 1/1/*	Filled
8	2	3	0	PIC slot @ 1/2/*	Filled
8	2	4	0	PIC slot @ 1/3/*	Empty
8	3	1	0	PIC slot @ 2/0/*	Empty
8	3	2	0	PIC slot @ 2/1/*	Empty
8	3	3	0	PIC slot @ 2/2/*	Empty
8	3	4	0	PIC slot @ 2/3/*	Empty
8	4	1	0	PIC slot @ 3/0/*	Empty
8	4	2	0	PIC slot @ 3/1/*	Empty

Table 53: jnxFilledEntry Objects in the jnxFilledTable of a T640 Routing Node *(continued)*

Container Index	L1	L2	L3	Description	State
8	4	3	0	PIC slot @ 3/2/*	Empty
8	4	4	0	PIC slot @ 3/3/*	Empty
8	5	1	0	PIC slot @ 4/0/*	Empty
8	5	2	0	PIC slot @ 4/1/*	Empty
8	5	3	0	PIC slot @ 4/2/*	Empty
8	5	4	0	PIC slot @ 4/3/*	Empty
8	6	1	0	PIC slot @ 5/0/*	Filled
8	6	2	0	PIC slot @ 5/1/*	Filled
8	6	3	0	PIC slot @ 5/2/*	Filled
8	6	4	0	PIC slot @ 5/3/*	Empty
8	7	1	0	PIC slot @ 6/0/*	Empty
8	7	2	0	PIC slot @ 6/1/*	Empty
8	7	3	0	PIC slot @ 6/2/*	Empty
8	7	4	0	PIC slot @ 6/3/*	Empty
8	8	1	0	PIC slot @ 7/0/*	Filled
8	8	2	0	PIC slot @ 7/1/*	Filled
8	8	3	0	PIC slot @ 7/2/*	Filled
8	8	4	0	PIC slot @ 7/3/*	Filled
9	1	0	0	Host 0 slot	Filled
9	2	0	0	Host 1 slot	Filled
10	1	0	0	FPM slot	Filled
11	1	0	0	SCG slot 0	Filled
11	2	0	0	SCG slot 1	Filled
12	1	0	0	CB slot 0	Filled
12	2	0	0	CB slot 1	Filled
13	1	0	0	CIP slot	Filled

Table 53: jnxFilledEntry Objects in the jnxFilledTable of a T640 Routing Node *(continued)*

Container Index	L1	L2	L3	Description	State
14	1	0	0	SPMB slot 0	Filled
14	2	0	0	SPMB slot 1	Filled
15	1	0	0	SIB slot 0	Filled
15	2	0	0	SIB slot 1	Filled
15	3	0	0	SIB slot 2	Filled
15	4	0	0	SIB slot 3	Filled
15	5	0	0	SIB slot 4	Filled

Table 54 on page 329 provides an example of jnxFilledEntry objects in the jnxFilledTable of a T320 router.

Table 54: jnxFilledEntry Objects in the jnxFilledTable of a T320 Router

Container Index	L1	L2	L3	Description	State
1	1	0	0	Chassis frame	Filled
2	1	0	0	PEM slot 0	Filled
2	2	0	0	PEM slot 1	Empty
4	1	1	0	Top left front fan slot	Filled
4	1	2	0	Top left middle fan slot	Filled
4	1	3	0	Top left rear fan slot	Filled
4	1	4	0	Top right front fan slot	Filled
4	1	5	0	Top right middle fan slot	Filled
4	1	6	0	Top right rear fan slot	Filled
4	2	1	0	Bottom left front fan slot	Filled
4	2	2	0	Bottom left middle fan slot	Filled
4	2	3	0	Bottom left rear fan slot	Filled
4	2	4	0	Bottom right front fan slot	Filled
4	2	5	0	Bottom right middle fan slot	Filled

Table 54: jnxFilledEntry Objects in the jnxFilledTable of a T320 Router *(continued)*

Container Index	L1	L2	L3	Description	State
4	2	6	0	Bottom right rear fan slot	Filled
4	3	1	0	Rear tray top fan slot	Filled
4	3	2	0	Rear tray second fan slot	Filled
4	3	3	0	Rear tray middle fan slot	Filled
4	3	4	0	Rear tray fourth fan slot	Filled
4	3	5	0	Rear tray bottom fan slot	Filled
7	1	0	0	FPC slot 0	Empty
7	1	1	0	FPC slot top temp. sensor	Empty
7	1	2	0	FPC slot 0 bottom temp. sensor	Empty
7	2	0	0	FPC slot 1	Empty
7	2	1	0	FPC slot 1 top temp. sensor	Empty
7	2	2	0	FPC slot 1 bottom temp. sensor	Empty
7	3	0	0	FPC slot 2	Empty
7	3	1	0	FPC slot 2 top temp. sensor	Empty
7	3	2	0	FPC slot 2 bottom temp. sensor	Empty
7	4	0	0	FPC slot 3	Filled
7	4	1	0	FPC slot 3 top temp. sensor	Filled
7	4	2	0	FPC slot 3 bottom temp. sensor	Filled
7	5	1	0	FPC slot 4	Empty
7	5	2	0	FPC slot 4 top temp. sensor	Empty
7	5	0	0	FPC slot 4 bottom temp. sensor	Empty
7	6	1	0	FPC slot 5	Empty
7	6	2	0	FPC slot 5 top temp. sensor	Empty
7	6	0	0	FPC slot 5 bottom temp. sensor	Empty
7	7	1	0	FPC slot 6	Empty
7	7	2	0	FPC slot 6 top temp. sensor	Empty
7	7	0	0	FPC slot 6 bottom temp. sensor	Empty

Table 54: jnxFilledEntry Objects in the jnxFilledTable of a T320 Router *(continued)*

Container Index	L1	L2	L3	Description	State
7	8	1	0	FPC slot 7	Empty
7	8	2	0	FPC slot 7 top temp. sensor	Empty
7	8	0	0	FPC slot 7 bottom temp. sensor	Empty
8	1	1	0	PIC slot @ 0/0/*	Empty
8	1	2	0	PIC slot @ 0/1/*	Empty
8	2	1	0	PIC slot @ 1/0/*	Empty
8	2	2	0	PIC slot @ 1/1/*	Empty
8	3	1	0	PIC slot @ 2/0/*	Empty
8	3	2	0	PIC slot @ 2/1/*	Empty
8	4	1	0	PIC slot @ 3/0/*	Filled
8	4	2	0	PIC slot @ 3/1/*	Filled
8	5	1	0	PIC slot @ 4/0/*	Empty
8	5	2	0	PIC slot @ 4/1/*	Empty
8	6	1	0	PIC slot @ 5/0/*	Empty
8	6	2	0	PIC slot @ 5/1/*	Empty
8	7	1	0	PIC slot @ 6/0/*	Empty
8	7	2	0	PIC slot @ 6/1/*	Empty
8	8	1	0	PIC slot @ 7/0/*	Empty
8	8	2	0	PIC slot @ 7/1/*	Empty
9	1	0	0	Host 0 slot	Filled
9	2	0	0	Host 1 slot	Filled
10	1	0	0	FPM slot	Filled
11	1	0	0	SCG slot 0	Filled
11	2	0	0	SCG slot 1	Filled
12	1	0	0	CB slot 0	Filled
12	2	0	0	CB slot 1	Filled
13	1	0	0	CIP slot	Filled

Table 54: jnxFilledEntry Objects in the jnxFilledTable of a T320 Router *(continued)*

Container Index	L1	L2	L3	Description	State
14	1	0	0	SPMB slot 0	Filled
14	2	0	0	SPMB slot 1	Filled
15	1	0	0	SIB slot 0	Filled
15	2	0	0	SIB slot 1	Filled
15	3	0	0	SIB slot 2	Filled

jnxOperatingTable

The object identifier for jnxOperatingTable object is {jnxBoxAnatomy 13}. This object reports the operating status of various components such as CPU, buffers, and memory.

Juniper Networks routers implement packet forwarding and routing functions with two separate components, the Packet Forwarding Engine and the Routing Engine, to ensure stability. The clean separation of these two functions permits superior forwarding performance and a highly reliable operating system. Therefore, it is not necessary to monitor CPU, memory, and buffer utilization, as is the case with traditional, monolithic code base routers. The Routing Engine has its own CPU, memory, and buffers—separate from those of the Packet Forwarding Engine. The ASIC-based Packet Forwarding Engine forwards packets on all interfaces at wire speed, eliminating the need to monitor packet buffers being exhausted. As a result, CPU utilization under 2 percent is normal.

Entries in the jnxOperatingTable are represented by the jnxOperatingEntry object, whose object identifier is {jnxOperatingTable 1}.

The jnxOperatingTable describes the status of specific objects, which are described as follows:

- jnxOperatingContents—The associated jnxContentsIndex in the jnxContentsTable, whose object identifier is {jnxOperatingEntry 1}.
- jnxOperatingL1Index—The level-one index of the container housing the entry, whose object identifier is {jnxOperatingEntry 2}.
- jnxOperatingL2Index—The level-two index of the container housing the entry, whose object identifier is {jnxOperatingEntry 3}.
- jnxOperatingL3Index—The level-three index of the container housing the entry, whose object identifier is {jnxOperatingEntry 4}.
- jnxOperatingDescr—The name or detailed description of the entry, whose object identifier is {jnxOperatingEntry 5}.
- jnxOperatingState—The operating state of the entry, whose object identifier is {jnxOperatingEntry 6}. The state can be any of the following:

  - Unknown(1)—State of the component is unknown or unavailable
  - Running(2)—Up and running as an active primary
  - Ready(3)—Ready to run; not running yet
  - Reset(4)—Held in reset; not ready yet
  - RunningAtFullSpeed(5)—Valid for fans only
  - Down(6)—Power supply is down or off
  - Standby(7)—Running as a standby backup
- jnxOperatingTemp—The entry's temperature, in degrees Celsius (°C), whose object identifier is {jnxOperatingEntry 7}.
- jnxOperatingCPU—The CPU utilization percentage of the entry, whose object identifier is {jnxOperatingEntry 8}. It is valid for the Control Board, the FPC, and the Routing Engine. It is a 5-second rolling weighted average calculated every second for each of the CPUs. The value is sent to the Routing Engine every 10 seconds. The value for the Routing Engine is an average of samples taken every 30 seconds over a 5-minute period. jnxOperatingCPU.9.1.0.0. is for the Routing Engine CPU. The Routing Engine is the only object of interest; the rest are most likely zero because CPUs on those cards are only used for management purposes.
- jnxOperatingISR—The CPU utilization percentage of the entry in relation to the interrupt service routing (ISR), whose object identifier is {jnxOperatingEntry 9}.
- jnxOperatingDRAMSize—The DRAM size of the entry, in bytes, whose object identifier is {jnxOperatingEntry 10}. It is valid for the FPC, Routing Engine, and Control Board.
- jnxOperatingBuffer—The buffer pool utilization of the entry (a percentage), whose object identifier is {jnxOperatingEntry 11}. It is valid for the FPC and Control Board as a percentage of utilization. Buffers are normally fixed-length memory preallocated for read/write, input/output, or reception/transmission. A measurement against these buffers gives some indication of how busy the system is. The larger the percentage utilization, the busier the system. In terms of absolute numbers, the bigger the buffer size, the better the system can handle bursty traffic patterns.
- jnxOperatingHeap—The heap utilization of the entry, whose object identifier is {jnxOperatingEntry 12}.
- jnxOperatingUpTime—The time interval, in 10-millisecond periods, that the entry has been up and running, whose object identifier is {jnxOperatingEntry 13}.
- jnxOperatingLastRestart—The value of sysUpTime when the entry was last restarted, whose object identifier is {jnxOperatingEntry 14}.
- jnxOperatingMemory—The entry's installed memory size, in megabytes (MB), whose object identifier is {jnxOperatingEntry 15}.
- jnxOperatingStateOrdered—The operating state of the entry, whose object identifier is {jnxOperatingEntry 16}. The state can be any of the following
  - Running(1)—Up and running as an active primary
  - Standby(2)—Running as a standby backup

- Ready(3)—Ready to run; not running yet
- RunningAtFullSpeed(4)—Valid for fans only
- Reset(5)—Held in reset; not ready yet
- Down(6)—Power supply is down or off
- Unknown(7)—State of the component is unknown or unavailable

Table 55 on page 334 through Table 57 on page 338 provide examples of jnxOperatingEntry objects. The following column headings for each table are abbreviated to correspond to the parts of the jnxOperatingEntry objects:

- Contents index—jnxOperatingContents
- L1—jnxOperatingL1Index
- L2—jnxOperatingL2Index
- L3—jnxOperatingL3Index
- Description—jnxOperatingDescr
- State—jnxOperatingState
- Temp—jnxOperatingTemp
- CPU—jnxOperatingCPU
- ISR—jnxOperatingISR
- DRAM—jnxOperatingDRAMSize
- Buffer—jnxOperatingBuffer
- Heap—jnxOperatingHeap
- UpTime—jnxOperatingUpTime
- Last Restart—jnxOperatingLastRestart
- Memory—jnxOperatingMemory

Table 55 on page 334 provides an example of jnxOperatingEntry objects in the jnxOperatingTable of an M20 router.

Table 55: jnxOperatingEntry Objects in the jnxOperatingTable of an M20 Router

Index	L1	L2	L3	Description	State	Temp	CPU	ISR	DRAM	Buffer	Heap	UpTime	LastRestart	Memory
1	1	0	0	Midplane	Running	26	0	0	0	0	0	0	0:0:00:00.0	0
2	1	0	0	Power supply A	Running	28	0	0	0	0	0	0	0:0:00:00.0	0
2	2	0	0	Power supply B	Running	29	0	0	0	0	0	0	0:0:00:00.0	0

Table 55: jnxOperatingEntry Objects in the jnxOperatingTable of an M20 Router *(continued)*

Index	L1	L2	L3	Description	State	Temp	CPU	ISR	DRAM	Buffer	Heap	UpTime	LastRestart	Memory
4	1	0	0	Front top fan	Running	0	0	0	0	0	0	0	0:0:00:00.0	0
4	2	0	0	Front middle fan	Running	0	0	0	0	0	0	0	0:0:00:00.0	0
4	3	0	0	Front bottom fan	Running	0	0	0	0	0	0	0	0:0:00:00.0	0
4	4	0	0	Rear fan	Running	0	0	0	0	0	0	0	0:0:00:00.0	0
6	1	0	0	SSB 0	Running	30	0	0	671088	6	0	67038195	0:0:00:35.41	64
7	1	0	0	FPC @ 0/*/*	Running	31	0	0	83886	3	0	67035034	0:0:01:06.91	8
7	2	0	0	FPC @ 1/*/*	Running	33	0	0	83886	4	0	67034422	0:0:01:13.04	8
7	3	0	0	FPC @ 2/*/*	Running	31	0	0	83886	3	0	67033809	0:0:01:19.18	8
9	1	0	0	Routing Engine 0	Running	29	4	0	802738	0	0	67046146	0:0:00:00.00	765

To verify the size of the memory, use the show chassis fpc, show chassis routing-engine, and show chassis ssb commands. For more information on the output of these commands, see the *JUNOS System Basics and Services Command Reference*.

Table 56 on page 335 provides an example of jnxOperatingEntry objects in the jnxOperatingTable of a T640 routing node.

Table 56: jnxOperatingEntry Objects in the jnxOperatingTable of a T640 Routing Node

Index	L1	L2	L3	Description	State	Temp	CPU	ISR	DRAM	Buffer	Heap	UpTime	LastRestart	Memory
1	1	0	0	Midplane	Running	0	–	–	–	–	–	–	–	–
2	2	0	0	PEM 1	Running	29	–	–	–	–	–	–	–	–
4	1	1	0	Top left front fan	Running	0	–	–	–	–	–	–	–	–
4	1	2	0	Top left middle fan	Running	0	–	–	–	–	–	–	–	–
4	1	3	0	Top left rear fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0

Table 56: jnxOperatingEntry Objects in the jnxOperatingTable of a T640 Routing Node *(continued)*

Index	L1	L2	B	Description	State	Temp	CPU	ISR	DRAM	Buffer	Heap	UpTime	LastRestart	Memory
4	1	4	0	Top right front fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	1	5	0	Top right middle fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	1	6	0	Top right rear fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	2	1	0	Bottom left front fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	2	2	0	Bottom left middle fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	2	3	0	Bottom left rear fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	2	4	0	Bottom right front fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	2	5	0	Bottom right middle fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	3	1	0	Bottom right rear fan	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	3	1	0	Bottom blower	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	3	2	0	Bottom blower	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	3	3	0	Middle blower	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	3	4	0	Top blower	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
4	3	5	0	Second blower from top	Running	0	0	0	0	0	0	0	0:0:00:00.00	0
7	2	0	0	FPC @ 1/*/*	Running	0	1	0	512	41	3	138367	0:18:56:48.81	512
7	2	1	0	FPC @ 1/0/* top temp. sensor	Running	35	0	0	0	0	0	0	0:18:56:48.81	0

Table 56: jnxOperatingEntry Objects in the jnxOperatingTable of a T640 Routing Node *(continued)*

Index	L1	L2	B	Description	State	Temp	CPU	ISR	DRAM	Buffer	Heap	UpTime	LastRestart	Memory
7	2	2	0	FPC @ 1/1/* bottom temp. sensor	Running	32	0	0	0	0	0	0	0:18:56:48.81	0
7	6	0	0	FPC @ 5/*/*	Running	0	3	0	256	41	14	136976	0:18:57:02.71	256
7	6	1	0	FPC @ 5/0/* top temp. sensor	Running	44	0	0	0	0	0	0	0:18:57:02.71	0
7	6	2	0	FPC @ 5/1/* bottom temp. sensor	Running	33	0	0	0	0	0	0	0:18:57:02.71	0
7	8	0	0	FPC @ 7/*/*	Running	0	2	0	256	41	7	137963	0:18:56:52.85	256
7	8	1	0	FPC @ 7/0/* top temp. sensor	Running	38	0	0	0	0	0	0	0:18:56:52.85	0
7	8	2	0	FPC @ 7/1/* bottom temp. sensor	Running	33	0	0	0	0	0	0	0:18:56:52.85	0
9	1	0	0	Host 0	Running	35	0	0	2048	0	0	6963005	0:19:20:30.07	2048
9	2	0	0	Host 1	Standby	32	2	0	2048	0	0	24401100	2:19:46:51.00	2048
10	1	0	0	FPM	Running	30	0	0	0	0	0	0	0:0:00:00.00	0
11	1	0	0	SCG 0	Running	36	0	0	0	0	0	0	0:0:00:00.00	0
11	2	0	0	SCG 1	Standby	35	0	0	0	0	0	0	0:0:00:00.00	0
12	1	0	0	CB 0	Running	36	0	0	0	0	0	0	0:0:00:00.00	0
12	2	0	0	CB 1	Standby	39	0	0	0	0	0	0	0:0:00:00.00	0
14	1	0	0	SPMB 0	Running	36	1	0	128	40	0	142576	0:18:56:06.72	128
14	2	0	0	SPMB 1	Standby	39	0	0	128	40	0	142447	0:18:56:08.01	128
15	1	0	0	SIB 0	Unknown	40	0	0	0	0	0	0	0:0:00:00.00	0

Table 56: jnxOperatingEntry Objects in the jnxOperatingTable of a T640 Routing Node *(continued)*

Index	L1	L2	B	Description	State	Temp	CPU	ISR	DRAM	Buffer	Heap	UpTime	LastRestart	Memory
15	2	0	0	SIB 1	Unknown	39	0	0	0	0	0	0	0:0:00:00.00	0
15	3	0	0	SIB 2	Unknown	39	0	0	0	0	0	0	0:0:00:00.00	0
15	4	0	0	SIB 3	Unknown	40	0	0	0	0	0	0	0:0:00:00.00	0
15	5	0	0	SIB 4	Unknown	40	0	0	0	0	0	0	0:0:00:00.00	0

Table 57 on page 338 provides an example of jnxOperatingEntry objects in the jnxOperatingTable of a T320 router.

Table 57: jnxOperatingEntry Objects in the jnxOperatingTable of a T320 Router

Index	L1	L2	L3	Description	State	Temp	CPU	ISR	DRAM	Buffer	Heap	UpTime	LastRestart	Memory
1	1	0	0	Midplane	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
2	1	0	0	PEM 0	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	1	1	0	Top left front fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	1	2	0	Top left middle fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	1	3	0	Top left rear fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	1	4	0	Top right front fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	1	5	0	Top right middle fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	2	6	0	Top right rear fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	2	1	0	Bottom left front fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	2	2	0	Bottom left middle fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	2	3	0	Bottom left rear fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	2	4	0	Bottom right front fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0

Table 57: jnxOperatingEntry Objects in the jnxOperatingTable of a T320 Router *(continued)*

Index	L1	L2	L3	Description	State	Temp	CPU	ISR	DRAM	Buffer	Heap	UpTime	LastRestart	Memory
4	2	5	0	Bottom right middle fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	2	6	0	Bottom right rear fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	3	1	0	Rear tray top fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	3	2	0	Rear tray second fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	3	3	0	Rear tray middle fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	3	4	0	Rear tray fourth fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
4	3	5	0	Rear tray bottom fan	Running	0	0	0	0	0	0	0	(0) 0:00:00.00	0
7	4	0	0	FPC @ 3/*/*	Running	0	1	0	256	41	7	6568428	(26190949) 3 days, 0:45:09.49	256
7	4	1	0	FPC @ 3/0/* top temp. sensor	Running	41	0	0	0	0	0	0	(26190949) 3 days, 0:45:09.49	0
7	4	2	0	FPC @ 3/1/* bottom temp. sensor	Running	37	0	0	0	0	0	0	(26190949) 3 days, 0:45:09.49	0
9	1	0	0	Host 0	Running	34	1	0	2048	0	0	32763001	(32763004) 3 days, 19:00:30.04	2048
9	2	0	0	Host 1	Standby	32	1	0	2048	0	0	110271900	(110271900) 12 days, 18:18:39.00	2048
10	1	0	0	FPM	Running	30	0	0	0	0	0	0	(0) 0:00:00.00	0
11	1	0	0	SCG 0	Running	33	0	0	0	0	0	0	(0) 0:00:00.00	0
11	2	0	0	SCG 1	Standby	31	0	0	0	0	0	0	(0) 0:00:00.00	0

Table 57: jnxOperatingEntry Objects in the jnxOperatingTable of a T320 Router
(continued)

Index	L1	L2	L3	Description	State	Temp	CPU	ISR	DRAM	Buffer	Heap	UpTime	LastRestart	Memory
12	1	0	0	CB 0	Running	37	0	0	0	0	0	0	(0) 0:00:00.00	0
12	2	0	0	CB 1	Standby	34	0	0	0	0	0	0	(0) 0:00:00.00	0
14	1	0	0	SPMB 0	Running	36	0	0	128	40	0	6572381	(26186997) 3 days, 0:44:29.97	128
14	2	0	0	SPMB 1	Standby	36	1	0	128	40	0	6572465	(26186913) 3 days, 0:44:29.13	128
15	1	0	0	SIB 0	Standby	36	0	0	0	0	0	0	(0) 0:00:00.00	0
15	2	0	0	SIB 1	Running	36	0	0	0	0	0	0	(0) 0:00:00.00	0
15	3	0	0	SIB 2	Running	38	0	0	0	0	0	0	(0) 0:00:00.00	0

jnxRedundancyTable

The object identifier for the jnxRedundancyTable is {jnxBoxAnatomy 14}. This object shows the internal configuration settings for the redundant subsystems or components in the chassis.

Entries within the jnxRedundancyTable are represented by the jnxRedundancyEntry object, whose object identifier is {jnxRedundancyEntry 1}. This jnxRedundancyEntry contains the following objects, which describe the internal configuration settings for the redundant subsystems or components in the chassis:

- jnxRedundancyContentsIndex—The index value of an entry in jnxRedundancyEntry, whose object identifier is {jnxContainersEntry 1}.
- jnxRedundancyL1Index—The level-one index associated with the redundant component, whose object identifier is {jnxContainersEntry 2}.
- jnxRedundancyL2Index—The level-two index associated with the redundant component, whose object identifier is {jnxContainersEntry 3}.
- jnxRedundancyL3Index—The level-three index associated with the redundant component, whose object identifier is {jnxContainersEntry 4}.
- jnxRedundancyDescr—The description of the redundant component, whose object identifier is {jnxContainersEntry 5}.

- jnxRedundancyConfig—The election priority of redundancy configuration, whose object identifier is {jnxContainersEntry 6}.
- jnxRedundancyState—The current running state of the redundant component, whose object identifier is {jnxContainersEntry 7}.
- jnxRedundancySwitchoverCount—The total number of switchovers, defined as a change in the jnxRedundancyState from master to backup or vice versa, as perceived by the redundant component since the Routing Engine is up and running, whose object identifier is {jnxContainersEntry 8}.
- jnxRedundancySwitchoverTime—The value of sysUpTime when the jnxRedundancyState was last switched over from master to backup or vice versa, whose object identifier is {jnxContainersEntry 9}.
- jnxRedundancySwitchoverReason—The reason for the last switchover to the redundant component, whose object identifier is {jnxContainersEntry 10}.
- jnxKeepaliveHeartbeat—The period of sending keepalive messages between the master and the backup subsystem, which is a system-wide preset value in seconds used by internal mastership resolution, whose object identifier is {jnxContainersEntry 11}.
- jnxRedundancyKeepaliveTimeout—The timeout period in seconds used by the watchdog timer before it initiates a switchover to the backup subsystem, whose object identifier is {jnxContainersEntry 12}.
- jnxRedundancyKeepaliveElapsed—The elapsed time since the redundant component received the last keepalive message from the outer subsystems, whose object identifier is {jnxContainersEntry 13}.
- jnxRedundancyKeepaliveLoss—The total number of keepalive messages lost between the master and the backup subsystems as perceived by the redundant component since the Routing Engine is up and running, whose object identifier is {jnxContainersEntry 14}.

Table 58 on page 342 through Table 60 on page 344 provide examples of jnxRedundancyEntry objects. The following column headings for each table are abbreviated to correspond to the parts of the jnxOperatingTable objects:

- Contents index—jnxRedundancyContentsIndex
- L1—jnxRedundancyL1Index
- L2—jnxRedundancyL2Index
- L3—jnxRedundancyL3Index
- Description—jnxRedundancyDescr
- Config—jnxRedundancyConfig
- State—jnxRedundancyState
- Count—jnxRedundancySwitchoverCount
- Time—jnxRedundancySwitchoverTime
- Reason—jnxRedundancySwitchoverReason
- Heartbeat—jnxKeepaliveHeartbeat

- Timeout—jnxRedundancyKeepaliveTimeout
- Elapsed—jnxRedundancyKeepaliveElapsed
- Loss—jnxRedundancyKeepaliveLoss

Table 58 on page 342 provides an example of jnxRedundancyEntry objects in the jnxRedundancyTable of an M20 router.

Table 58: jnxRedundancyEntry Objects in the jnxRedundancyTable of an M20 Router

Index	L1	L2	L3	Description	Config	State	Count	Time	Reason	Heart beat	Time out	Elapsed	Loss
6	1	0	0	SSB 0 Internet Processor II	Master	Master	0	3383	Never switched	0	0	0	0
6	2	0	0	SSB 1	Disabled	Disabled	0	0	Never switched	0	0	0	0
9	1	0	0	Routing Engine 0	Master	Master	1	421	User switched	3	300	1	0
9	2	0	0	Routing Engine 1	Backup	Backup	0	0	Other	0	0	0	0

To verify Routing Engine status, use the show chassis routing-engine command. Sample command output from an M20 router is listed below.

```
user@host> show chassis routing-engine
Routing Engine status:
 Slot 0:
  Current state      Master
  Election priority      Master (default)
  Temperature      26 degrees C / 78 degrees F
  DRAM                768 Mbytes
  CPU utilization:
   User                 2 percent
   Background      0 percent
   Kernel             0 percent
   Interrupt          0 percent
   Idle                 98 percent
  Model               teknor
  Serial ID      32000004f8ff1201
  Start time      2002-01-29 12:30:42 PST
  Uptime             21 hours, 17 minutes, 14 seconds
  Load averages:      1 minute  5 minute 15 minute
    0.03    0.02    0.00
Routing Engine status:
 Slot 1:
  Current state      Backup
  Election priority  Backup (default)
  DRAM                805306368 Mbytes
  CPU utilization:
   User                 0 percent
```

```
  Background      0 percent
  Kernel            1 percent
  Interrupt         0 percent
  Idle                99 percent
 Model              teknor
 Serial ID      100000078c10df01
 Start time      2002-01-24 16:47:39 PST
 Uptime             5 days, 17 hours, 14 seconds
```

To verify SSB status, use the show chassis ssb command. Sample command output from an M20 router is listed below.

```
user@host> show chassis ssb
SSB status:
Slot 0 information:
 State                    Master
 Temperature                24 degrees C / 75 degrees F
 CPU utilization              2 percent
 Interrupt utilization           0 percent
 Heap utilization             16 percent
 Buffer utilization           43 percent
 Total CPU DRAM              64 Mbytes
 Internet Processor II            Version 1, Foundry IBM, Part number 9
 Start time:                 2002-01-29 12:32:24 PST
 Uptime:                    21 hours, 30 minutes, 53 seconds
Slot 1 information:
 State                    Backup
```

Table 59 on page 343 provides an example of jnxRedundancyEntry objects in the jnxRedundancyTable of a T640 routing node.

Table 59: jnxRedundancyEntry Objects in the jnxRedundancyTable of a T640 Routing Node

Index	L1	L2	L3	Description	Config	State	Count	Time	Reason	Heart beat	Time out	Elapsed	Loss
9	1	0	0	Host 0	Master	Master	3	0:18:55:49.42	User switched	20	300	1	0
9	2	0	0	Host 1	Backup	Backup	0	0:0:00:00.00	Other	0	0	0	0
15	1	0	0	SIB 0	Unknown	Backup	1	0:0:00:00.00	0	0	0	0	0
15	2	0	0	SIB 1	Unknown	Master	1	0:0:00:00.00	0	0	0	0	0
15	3	0	0	SIB 2	Unknown	Master	1	0:0:00:00.00	0	0	0	0	0
15	4	0	0	SIB 3	Unknown	Master	1	0:0:00:00.00	0	0	0	0	0
15	5	0	0	SIB 4	Unknown	Master	1	0:0:00:00.00	0	0	0	0	0

To verify Routing Engine status, use the show chassis routing-engine command. Sample command output from a T640 routing node is listed below.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state        Master
    Election priority       Master (default)
    Temperature       35 degrees C / 95 degrees F
    DRAM            2048 MB
    CPU utilization:
      User             1 percent
      Background       0 percent
      Kernel           5 percent
      Interrupt        0 percent
      Idle            94 percent
    Model               unknown
    Start time     2002-03-31 14:26:49 PST
    Uptime         19 hours, 22 minutes, 13 seconds
    Load averages: 1 minute   5 minute  15 minute
       0.00       0.00       0.00
Routing Engine status:
  Slot 1:
    Current state  Backup
    Election priority              Backup (default)
    Temperature 32 degrees C / 89 degrees F
    DRAM      2048 MB
    CPU utilization:
      User       0 percent
      Background 0 percent
      Kernel     0 percent
      Interrupt  0 percent
      Idle     100 percent
    Model          RE-3.0
    Start time     2002-03-29 14:00:18 PST
    Uptime         2 days, 19 hours, 48 minutes, 32 seconds
```

Table 60 on page 344 provides an example of jnxRedundancyEntry objects in the jnxRedundancyTable of a T320 router.

Table 60: jnxRedundancyEntry Objects in the jnxRedundancyTable of a T320 Router

Index	I1	I2	I3	Description	Config	State	Count	Time	Reason	Heart beat	Timeout	Elapsed	Loss
9	1	0	0	Host 0	Master	Master	6	(26185188)3 days, 0:44:11.88	User switched	20	300	1	0
9	2	0	0	Host 1	Backup	Backup	0	(0) 0:00:00.00	Other	0	0	0	0
15	1	0	0	SIB 0	Backup	Backup	1	(0) 0:00:00.00	0	0	0	0	0
15	2	0	0	SIB 1	Master	Master	1	(0) 0:00:00.00	0	0	0	0	0
15	3	0	0	SIB 2	Master	Master	1	(0) 0:00:00.00	0	0	0	0	0

To verify Routing Engine status, use the show chassis routing-engine command. Sample command output from a T320 router is listed below.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state  Master
    Election priority             Master (default)
    Temperature 34 degrees C / 93 degrees F
    DRAM      2048 MB
    CPU utilization:
      User       0 percent
      Background 0 percent
      Kernel     1 percent
      Interrupt  0 percent
      Idle      98 percent
    Model          RE-3.0
    Start time     2002-04-05 14:43:16 PST
    Uptime         17 days, 23 hours, 3 minutes, 47
seconds
    Load averages: 1 minute   5 minute  15 minute
       0.00       0.00       0.00
Routing Engine status:
  Slot 1:
    Current state  Backup
    Election priority             Backup (default)
    Temperature 32 degrees C / 89 degrees F
    DRAM      2048 MB
    CPU utilization:
      User       0 percent
      Background 0 percent
      Kernel     0 percent
      Interrupt  0 percent
      Idle     100 percent
    Model          RE-3.0
    Start time     2002-03-27 15:25:07 PST
    Uptime         26 days, 22 hours, 21 minutes, 44 seconds
```

jnxFruTable

The object identifier for the jnxFruTable is {jnxBoxAnatomy 15}. This object shows the status of field-replaceable units (FRUs) in the chassis.

Entries within the jnxFruTable are represented by the jnxFruEntry object, whose object identifier is {jnxFruEntry 1}. This jnxFruEntry object contains the following objects, which describe the FRUs in the chassis:

- jnxFruContentsIndex—The index value of an entry in jnxFruEntry, whose object identifier is {jnxFruEntry 1}.
- jnxFruL1Index—The level-one index associated with the FRU, whose object identifier is {jnxFruEntry 2}.
- jnxFruL2Index—The level-two index associated with the FRU, whose object identifier is {jnxFruEntry 3}.
- jnxFruL3Index—The level-three index associated with the FRU, whose object identifier is {jnxFruEntry 4}.

- jnxFruName—The name or detailed description of the FRU, whose object identifier is {jnxFruEntry 5}.
- jnxFruType—The FRU type, whose object identifier is {jnxFruEntry 6}. The FRU type can be any of the following:
  - other(1)
  - clockGenerator(2)
  - flexiblePicConcentrator(3)
  - switchingAndForwardingModule(4)
  - controlBoard(5)
  - routingEngine(6)
  - powerEntryModule(7)
  - frontPanelModule(8)
  - switchInterfaceBoard(9)
  - processorMezzanineBoardForSIB(10)
  - portInterfaceCard(11)
  - craftInterfacePanel(12)
  - fan(13)
  - lineCardChassis(14)
  - forwardingEngineBoard(13)
  - protectedSystemDomain(13)
- jnxFruSlot—The slot number of the FRU, whose object identifier is {jnxFruEntry 7}. This is equivalent to jnxFruL1Index. The slot number is zero if unavailable or inapplicable.
- jnxFruState—The current state of the FRU, whose object identifier is {jnxFruEntry 8}. The FRU state can be any of the following:
  - unknown(1)
  - empty(2)
  - present(3)
  - ready(4)
  - announceOnline(5)
  - online(6)
  - announceOffline(7)
  - offline(8)

  - diagnostic(9)
  - standby(10)
- jnxFruTemp—The temperature of the FRU, in degrees Celsius, whose object identifier is {jnxFruEntry 9}. The value is zero if unavailable or inapplicable.
- jnxFruOfflineReason—The reason the FRU is offline, whose object identifier is {jnxFruEntry 10}. The reason can be any of the following:
  - unknown(1)—Unknown or other
  - none(2)—None
  - error(3)—Error
  - noPower(4)—No power
  - configPowerOff(5)—Configured to power off
  - configHoldInReset(6)—Configured to hold in reset
  - cliCommand(7)—Brought offline by CLI command
  - buttonPress(8)—Brought offline by button press
  - cliRestart(9)—Restarted by CLI command
  - overtempShutdown(10)—Overtemperature shutdown
  - masterClockDown(11)—Master clock down
  - singleSfmModeChange(12)—Single SFM mode change
  - packetSchedulingModeChange(13)—Packet scheduling mode change
  - physicalRemoval(14)—Physical removal
  - unresponsiveRestart(15)—Restarting unresponsive board
  - sonetClockAbsent(16)—SONET out clock absent
- jnxFruLastPowerOff—The value of sysUpTime when this subject was last powered off, whose object identifier is {jnxFruEntry 11}. The value is zero if unavailable or inapplicable.
- jnxFruLastPowerOn—The value of sysUpTime when this subject was last powered on, whose object identifier is {jnxFruEntry 12}. The value is zero if unavailable or inapplicable.
- jnxFruPowerUpTime—The time interval in 10-millisecond periods that this subject has been up and running since the last power-on time, whose object identifier is {jnxFruEntry 13}. The value is zero if unavailable or inapplicable.
- jnxFruChassisId—The chassis type of this subject. The object identifier for this object is {jnxFruEntry 14}.

- jnxFruChassisDescr—The textual description for the chassis type of this subject. The object identifier is {jnxFruEntry 15}.
- jnxFruPsdAssignment—The protected system domain (PSD) assignment for this subject. The object identifier is {jnxFruEntry 16}

Table 61 on page 348 through Table 66 on page 371 provide examples of jnxFruEntry objects. The following column headings for each table are abbreviated to correspond to the parts of the jnxFruEntry objects:

- Contents Index—jnxFruContentsIndex
- L1—jnxFruL1Index
- L2—jnxFruL2Index
- L3—jnxFruL3Index
- Name—jnxFruName
- Type—jnxFruType
- Slot—jnxFruSlot
- State—jnxFruState
- Temp—jnxFruTemp
- Offline—jnxFruOffline
- PowerOff—jnxFruPowerOff
- PowerOn—jnxFruPowerOn
- Uptime—jnxFruPowerUpTime

Table 61 on page 348 provides an example of jnxFruContent objects in the jnxFruTable for an M10 router.

Table 61: jnxFruContents Objects in the jnxFruTable of an M10 Router

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
2	1	0	0	Power supply A	powerEntryModule	1	Online	0	None	0:0:00:00.00	0:0:11:08.73	264319
2	2	0	0	Power supply B	powerEntryModule	2	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
4	1	1	0	Left fan 1	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	1	2	0	Left fan 2	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	1	3	0	Left fan 3	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	1	4	0	Left fan 4	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0

Table 61: jnxFruContents Objects in the jnxFruTable of an M10 Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
6	1	0	0	FEB Internet Processor II	controlBoard	1	Online	24	None	0:0:00:00.00	0:0:00:00.00	0
7	1	0	0	FPC @ 0/*/*	flexiblePicConcentrator	1	Online	24	None	0:0:00:00.00	0:0:00:00.00	0
7	2	0	0	FPC @ 1/*/*	flexiblePicConcentrator	2	Online	24	None	0:0:00:00.00	0:0:00:00.00	0
8	1	1	0	PIC: @ 0/0/*	portInterfaceCard	1	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	1	2	0	PIC: 1x Monitor @ 0/1/*	portInterfaceCard	1	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	1	3	0	PIC: 1x OC-12 ATM, MM @ 0/2/*	portInterfaceCard	1	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	1	4	0	PIC: 4x T3 @ 0/3/*	portInterfaceCard	1	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	2	1	0	PIC: 4x OC-3 SONET, SMIR @ 1/0/*	portInterfaceCard	2	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	2	2	0	PIC: 4x OC-3 SONET, MM @ 1/1/*	portInterfaceCard	2	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	2	3	0	PIC: 2x OC-3 ATM, MM @ 1/2/*	portInterfaceCard	2	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	2	4	0	PIC: 2x OC-3 ATM, MM @ 1/3/*	portInterfaceCard	2	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
9	1	0	0	Routing Engine	routingEngine	1	Online	27	None	0:0:00:00.00	0:0:00:00.00	0

To verify the L1, L2, and L3 indexes, use the show chassis hardware command. Sample command output from an M10 router is listed below.

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                58974             M10
Midplane         REV 03   710-001950   HB1590
Power Supply A   Rev 03   740-002498   LK33505           DC
Display          REV 04   710-001995   HE8442
Routing Engine   REV 01   740-003239   9001025728        RE-2.0
FEB              REV 12   710-001948   HA4221            Internet Processor II
FPC 0
  PIC 1          REV 01   750-004188   AR2912            1x Monitor
  PIC 2          REV 04   750-001551   AN7869            1x OC-12 ATM, MM
  PIC 3          REV 02   750-002485   AN2803            4x T3
FPC 1
  PIC 0          REV 03   750-002970   HF2293            4x OC-3 SONET, SMIR
  PIC 1          REV 03   750-002971   HA8094            4x OC-3 SONET, MM
  PIC 2          REV 03   750-002977   HD9352            2x OC-3 ATM, MM
  PIC 3          REV 03   750-002977   HD9393            2x OC-3 ATM, MM
```

To verify FPC status, use the show chassis fpc command. Sample command output from an M10 router is listed below.

```
user@host> show chassis fpc
Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Online            24      3          1        64        44         17
  1  Online            24      3          1        64        44         17
```

To verify Routing Engine status, use the show chassis routing-engine command. Sample command output from an M10 router is listed below.

```
user@host> show chassis routing-engine
Routing Engine status:
    Temperature                 26 degrees C / 78 degrees F
    DRAM                       768 MB
    Memory utilization           9 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     0 percent
      Interrupt                  0 percent
      Idle                     100 percent
    Model                        RE-2.0
    Serial ID                    b7000007c81ce801
    Start time                   2002-06-21 09:33:45 PDT
    Uptime                       3 days, 1 hour, 23 minutes, 27 seconds
    Load averages:               1 minute   5 minute  15 minute
                                     0.07       0.03       0.01
```

To verify FEB status, use the show chassis feb command. Sample command output from an M10 router is listed below.

```
user@host> show chassis feb
FEB status:
  Temperature                24 degrees C / 75 degrees F
  CPU utilization             3 percent
  Interrupt utilization       1 percent
```

```
Heap utilization            17 percent
Buffer utilization          44 percent
Total CPU DRAM              64 MB
Internet Processor II        Version 1, Foundry IBM, Part number 9
Start time:       2002-06-21 09:45:46 PDT
Uptime:       3 days, 1 hour, 11 minutes, 33 seconds
```

Table 62 on page 351 provides an example of jnxFruContent objects in the jnxFruTable for an M20 router.

Table 62: JnxFruContents Objects in the jnxFruTable of an M20 Router

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
2	1	0	0	Power supply A	powerEntryModule	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
2	2	0	0	Power supply B	powerEntryModule	2	Online	25	None	0:0:00:00.00	0:0:00:43.45	24993357
4	1	0	0	Rear fan	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	0	0	Front upper fan	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	3	0	0	Front middle fan	fan	3	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	4	0	0	Front bottom fan	fan	4	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
6	1	0	0	SSB 0	controlBoard	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
6	2	0	0	SSB 1 Internet Processor I	controlBoard	2	Online	29	None	0:0:00:00.00	0:0:00:00.00	0
7	1	0	0	FPC @ 0/*/*	flexible PicConcen-trator	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	2	0	0	FPC @ 1/*/*	flexible PicConcentrator-	2	Online	27	None	0:0:00:00.00	0:0:00:00.00	0
7	3	0	0	FPC @ 2/*/*	flexible PicConcentrator	3	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	4	0	0	FPC @ 3/*/*	flexible PicConcentrator-	4	Online	27	None	0:0:00:00.00	0:0:00:00.00	0
8	1	1	0	PIC: @ 0/0/*	portInterfaceCard	1	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	1	2	0	PIC: @ 0/1/*	portInterfaceCard	1	Offline	28	None	0:0:00:00.00	0:0:00:00.00	0
8	1	3	0	PIC: @ 0/2/*	portInterfaceCard	1	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0

Table 62: JnxFruContents Objects in the jnxFruTable of an M20 Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
8	1	4	0	PIC: @ 0/3/*	portInterfaceCard	1	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	2	1	0	PIC: 1x Tunnel @ 1/0/*	portInterfaceCard	2	Ready	0	None	0:0:00:00.00	0:0:00:00.00	0
8	2	2	0	PIC: 4x T3 @ 1/1/*	portInterfaceCard	2	Ready	0	None	0:0:00:00.00	0:0:00:00.00	0
8	2	3	0	PIC: 2x OC-3 ATM, MM @ 1/2/*	portInterfaceCard	2	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	2	4	0	PIC: 1x G/E, 1000 BASE-SX @ 1/3/*	portInterfaceCard	2	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	3	1	0	PIC: @ 2/0/*	portInterfaceCard	3	Offline	27	None	0:0:00:00.00	0:0:00:00.00	0
8	3	2	0	PIC: @ 2/1/*	portInterfaceCard	3	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	3	3	0	PIC: @ 2/2/*	portInterfaceCard	3	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	3	4	0	PIC: @ 2/3/*	portInterfaceCard	3	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	4	1	0	PIC: @ 3/0/*	portInterfaceCard	4	Ready	0	None	0:0:00:00.00	0:0:00:00.00	0
8	4	2	0	PIC: @ 3/1/*	portInterfaceCard	4	Ready	28	None	0:0:00:00.00	0:0:00:00.00	0
8	4	3	0	PIC: 2x OC-3 SONET, SMIR @ 3/2/*	portInterfaceCard	4	Ready	28	None	0:0:00:00.00	0:0:00:00.00	0
8	4	4	0	PIC: @ 3/3/*	portInterfaceCard	4	Ready	28	None	0:0:00:00.00	0:0:00:00.00	0
9	1	0	0	Routing Engine 0	routingEngine	1	Online	25	None	0:0:00:00.00	0:0:00:00.00	0
9	2	0	0	Routing Engine 1	routingEngine	2	Online	24	None	0:0:00:00.00	0:0:00:00.00	0
10	1	0	0	Front panel display	frontPanelModule	1	Online	0	None	0:0:00:00.00	0:0:00:00.00	0

To verify the L1, L2, and L3 indexes, use the show chassis hardware command. Sample command output from an M20 router is listed below.

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                20200             M20
Backplane        REV 07   710-001517   AB5911
Power Supply B   Rev 02   7            000240            AC
Display          REV 04   710-001519   AD1903
Routing Engine 0 REV01    740          umeshk            RE-2.0
Routing Engine 1                       270000078ba48501  RE-2.0
SSB slot 0       N/A      N/A          N/A               backup
SSB slot 1       REV 04   710-001411   AD0281            Internet Processor I
FPC 1            REV 01   710-001292   AC9230
  PIC 0          REV 01   750-001323   AA2812            1x Tunnel
  PIC 1          REV 01   750-002963   AK8586            4x T3
  PIC 2          REV 03   750-000612   AM8116            2x OC-3 ATM, MM
  PIC 3          REV 08   750-001072   AB9884            1x G/E, 1000 BASE-SX
FPC 3            REV 01   710-001197   AA8661
  PIC 2          REV 01   750-003748   HE9734            2x OC-3 SONET, SMIR
user@host> show chassis environment
Class Item                 Status     Measurement
Power Power Supply A       Absent
      Power Supply B       OK         25 degrees C / 77 degrees F
Temp  FPC 1                OK         27 degrees C / 80 degrees F
      FPC 3                OK         28 degrees C / 82 degrees F
      SSB 1                OK         29 degrees C / 84 degrees F
      Backplane            OK         23 degrees C / 73 degrees F
      Routing Engine 0     OK         25 degrees C / 77 degrees F
      Routing Engine 1     OK         24 degrees C / 75 degrees F
Fans  Rear Fan             OK         Spinning at normal speed
      Front Upper Fan      OK         Spinning at normal speed
      Front Middle Fan     OK         Spinning at normal speed
      Front Bottom Fan     OK         Spinning at normal speed
Misc  Craft Interface      OK
user@host> show chassis fpc
                    Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State           (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Empty             0      0          0         0         0          0
  1  Online           27      8          7         8         9         14
  2  Empty             0      0          0         0         0          0
  3  Online           28      0          0         8         8         14
```

To verify Routing Engine status, use the show chassis routing-engine command. Sample command output from an M10 router is listed below.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 25 degrees C / 77 degrees F
    DRAM                       768 MB
    Memory utilization           8 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     1 percent
```

```
      Interrupt                0 percent
      Idle                    99 percent
    Model                     RE-2.0
    Serial ID                 ba0000061779d601
    Start time                2002-06-21 15:37:36 PDT
    Uptime                    2 days, 21 hours, 27 minutes, 25 seconds
    Load averages:            1 minute   5 minute  15 minute
                                  0.00       0.00       0.00
Routing Engine status:
  Slot 1:
    Current state             Backup
    Election priority         Backup (default)
    Temperature              24 degrees C / 75 degrees F
    DRAM                    768 MB
    Memory utilization        9 percent
    CPU utilization:
      User                    0 percent
      Background              0 percent
      Kernel                  0 percent
      Interrupt               0 percent
      Idle                   99 percent
    Model                     RE-2.0
    Serial ID                 270000078ba48501
    Start time                2002-06-17 14:30:21 PDT
    Uptime                    6 days, 22 hours, 34 minutes, 28 seconds
```

To verify SSB status, use the show chassis SSB command. Sample command output from an M10 router is listed below.

```
user@host> show chassis ssb
SSB status:
Slot 0 information:
  State                       Backup
Slot 1 information:
  State                       Master
  Temperature                29 degrees C / 84 degrees F
  CPU utilization             1 percent
  Interrupt utilization       0 percent
  Heap utilization            8 percent
  Buffer utilization         43 percent
  Total CPU DRAM             64 MB
  Internet Processor I        Version 1, Foundry IBM, Part number 3
  Start time:                 2002-06-21 15:38:53 PDT
  Uptime:                     2 days, 21 hours, 26 minutes, 26 seconds
```

Table 63 on page 354 provides an example of jnxFruContent objects in the jnxFruTable for an M160 router.

Table 63: jnxFruContents Objects in the jnxFruTable of an M160 Router

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
2	1	0	0	PEM 0	powerEntryModule	1	Online	0	None	0:00:00.00	0:00:12.83	6906955
2	2	0	0	PEM 1	powerEntryModule	2	Online	0	None	0:00:00.00	0:00:12.83	6906955
4	1	0	0	Front top blower	fan	1	Present	0	None	0:00:00.00	0:00:00.00	0

Table 63: jnxFruContents Objects in the jnxFruTable of an M160 Router *(continued)*

Index	L1	L2	B	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
4	2	1	0	Fan tray front left	fan	2	Present	0	None	0:00:00.00	0:00:00.00	0
4	2	2	0	Fan tray front right	fan	2	Present	0	None	0:00:00.00	0:00:00.00	0
4	2	3	0	Fan tray rear left	fan	2	Present	0	None	0:00:00.00	0:00:00.00	0
4	2	4	0	Fan tray rear right	fan	2	Present	0	None	0:00:00.00	0:00:00.00	0
4	3	0	0	Rear top blower	fan	3	Present	0	None	0:00:00.00	0:00:00.00	0
4	4	0	0	Rear bottom blower	fan	4	Present	0	None	0:00:00.00	0:00:00.00	0
6	1	1	0	SFM 0 SPP	switchingAnd-ForwardingMode	1	Online	35	None	0:00:03.13	0:00:00.00	0
6	1	2	0	SFM 0 SPR Internet Processor II	switchingAnd ForwardingMode	1	Online	35	None	0:00:03.13	0:00:00.00	0
6	2	1	0	SFM 1 SPP	switchingAnd ForwardingMode	2	Empty	0	None	0:00:00.00	0:00:00.00	0
6	2	2	0	SFM 1 SPR	switchingAndForwardingMode	2	Empty	0	None	0:00:00.00	0:00:00.00	0
6	3	1	0	SFM 2 SPP	switchingAnd ForwardingMode	3	Online	44	None	0:00:03.20	0:00:00.00	0
6	3	2	0	SFM 2 SPR Internet Processor II	switchingAnd ForwardingMode	3	Online	44	None	0:00:03.20	0:00:00.00	0
6	4	1	0	SFM 3 SPP	switchingAnd ForwardingMode	4	Offline	0	Configured to power off	0:00:03.22	0:00:00.00	0
6	4	2	0	SFM 3 SPR	switchingAnd ForwardingMode	4	Offline	0	Configured to power off	0:00:03.22	0:00:00.00	0

Table 63: jnxFruContents Objects in the jnxFruTable of an M160 Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
7	1	0	0	FPC @ 0/*/*	flexiblePic Concentrator	1	Offline	0	Configured to power off	0:00:02.28	0:00:00.00	0
7	2	0	0	FPC @ 1/*/*	flexiblePic Concentrator	2	Offline	0	Error	0:13:08.12	0:00:00.00	0
7	3	0	0	FPC @ 2/*/*	flexiblePicConcentrator	3	Online	30	None	0:00:02.32	0:00:00.00	0
7	4	0	0	FPC: 1x OC-192 SM LR @ 3/*/*	flexiblePicConcentrator	4	Online	41	None	0:00:02.34	0:00:00.00	0
7	5	0	0	FPC @ 4/*/*	flexiblePicConcentrator	5	Empty	0	None	0:00:00.00	0:00:00.00	0
7	6	0	0	FPC @ 5/*/*	flexiblePicConcentrator	6	Offline	0	Configured to power off	0:00:02.37	0:00:00.00	0
7	7	0	0	FPC @ 6/*/*	flexiblePicConcentrator	7	Empty	0	None	0:00:00.00	0:00:00.00	0
7	8	0	0	FPC @ 7/*/*	flexiblePicConcentrator	8	Online	41	None	0:00:03.11	0:00:00.00	0
8	1	1	0	PIC: @ 0/0/*	portInterface Card	1	Online	40	None	0:00:00.00	0:00:00.00	0
8	1	2	0	PIC: @ 0/1/*	portInterface Card	1	Online	40	None	0:00:00.00	0:00:00.00	0
8	1	3	0	PIC: @ 0/2/*	portInterfaceCard	1	Online	40	None	0:00:00.00	0:00:00.00	0
8	1	4	0	PIC: @ 0/3/*	portInterfaceCard	1	Online	40	None	0:00:00.00	0:00:00.00	0
8	2	1	0	PIC: @ 1/0/*	portInterfaceCard	2	Online	46	None	0:00:00.00	0:00:00.00	0
8	2	2	0	PIC: @ 1/1/*	portInterfaceCard	2	Online	46	None	0:00:00.00	0:00:00.00	0
8	2	3	0	PIC: @ 1/2/*	portInterfaceCard	2	Online	46	None	0:00:00.00	0:00:00.00	0
8	2	4	0	PIC: @ 1/3/*	portInterfaceCard	2	Online	46	None	0:00:00.00	0:00:00.00	0

Table 63: jnxFruContents Objects in the jnxFruTable of an M160 Router *(continued)*

Index	L1	L2	B	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
8	3	1	0	PIC: @ 2/0/*	portInterfaceCard	3	Offline	0	Configured to power off	0:00:02.28	0:00:00.00	0
8	3	2	0	PIC: @ 2/1/*	portInterfaceCard	3	Offline	0	Configured to power off	0:00:02.28	0:00:00.00	0
8	3	3	0	PIC: @ 2/2/*	portInterfaceCard	3	Offline	0	Configured to power off	0:00:02.28	0:00:00.00	0
8	3	4	0	PIC: @ 2/3/*	portInterfaceCard	3	Offline	0	Configured to power off	0:00:02.28	0:00:00.00	0
8	4	1	0	PIC: 1x OC-192 SM LR @ 3/0/*	portInterfaceCard	4	Offline	0	Error	0:13:08.12	0:00:00.00	0
8	4	2	0	PIC continued	portInterfaceCard	4	Offline	0	Error	0:13:08.12	0:00:00.00	0
8	4	3	0	PIC continued	portInterfaceCard	4	Offline	0	Error	0:13:08.12	0:00:00.00	0
8	4	4	0	PIC continued	portInterfaceCard	4	Offline	0	Error	0:13:08.12	0:00:00.00	0
8	5	1	0	PIC: @ 4/0/*	portInterfaceCard	5	Online	30	None	0:00:02.32	0:00:00.00	0
8	5	2	0	PIC: @ 4/1/*	portInterfaceCard	5	Online	30	None	0:00:02.32	0:00:00.00	0
8	5	3	0	PIC: @ 4/2/*	portInterfaceCard	5	Online	30	None	0:00:02.32	0:00:00.00	0
8	5	4	0	PIC: @ 4/3/*	portInterfaceCard	5	Online	30	None	0:00:02.32	0:00:00.00	0
8	6	1	0	PIC: @ 5/0/*	portInterfaceCard	6	Online	41	None	0:00:02.34	0:00:00.00	0
8	6	2	0	PIC: @ 5/1/*	portInterfaceCard	6	Online	41	None	0:00:02.34	0:00:00.00	0

Table 63: jnxFruContents Objects in the jnxFruTable of an M160 Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
8	6	3	0	PIC: @ 5/2/*	portInterfaceCard	6	Online	41	None	0:00:02.34	0:00:00.00	0
8	6	4	0	PIC: @ 5/3/*	portInterfaceCard	6	Online	41	None	0:00:02.34	0:00:00.00	0
8	7	1	0	PIC: @ 6/0/*	portInterfaceCard	7	Empty	0	None	0:00:00.00	0:00:00.00	0
8	7	2	0	PIC: @ 6/1/*	portInterfaceCard	7	Empty	0	None	0:00:00.00	0:00:00.00	0
8	7	3	0	PIC: @ 6/2/*	portInterfaceCard (11)	7	Empty	0	None	0:00:00.00	0:00:00.00	0
8	7	4	0	PIC: @ 6/3/*	portInterfaceCard (11)	7	Empty	0	None	0:00:00.00	0:00:00.00	0
8	8	1	0	PIC: 1x OC-12 SONET, SMIR @ 7/0/*	portInterfaceCard	8	Offline	0	Configured to power off	0:00:02.37	0:00:00.00	0
8	8	2	0	PIC: 4x E3 @ 7/1/*	portInterfaceCard	8	Offline	0	Configured to power off	0:00:02.37	0:00:00.00	0
8	8	3	0	PIC: 1x OC-12 SONET, MM @ 7/2/* jnxFruName	portInterfaceCard	8	Offline	0	Configured to power off	0:00:02.37	0:00:00.00	0
8	8	4	0	PIC: @ 7/3/*	portInterfaceCard	8	Offline	0	Configured to power off	0:00:02.37	0:00:00.00	0
9	1	0	0	Routing Engine 0	routingEngine	1	Online	31	None	0:00:00.00	0:00:00.00	0
9	2	0	0	Routing Engine 1	routingEngine	2	Present	0	None	0:00:00.00	0:00:00.00	0
10	1	1	0	FPM CMB	frontPanelModule	1	Online	28	None	0:00:00.00	0:00:00.00	0
10	1	2	0	FPM Display	frontPanelModule	1	Online	28	None	0:00:00.00	0:00:00.00	0

Table 63: jnxFruContents Objects in the jnxFruTable of an M160 Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
11	1	0	0	PCG 0	clockGenerator	1	Online	40	None	0:00:00.00	0:00:00.00	0
11	2	0	0	PCG 1	clockGenerator	2	Online	46	None	0:00:00.00	0:00:00.00	0
12	1	0	0	MCS 0	controlBoard	1	Online	47	None	0:00:00.00	0:00:00.00	0
12	2	0	0	MCS 1	controlBoard	2	Empty	0	None	0:00:00.00	0:00:00.00	0
13	1	0	0	CIP	craftInterfacePanel-	1	Present	0	None	0:00:00.00	0:00:00.00	0

To verify the L1, L2, and L3 indexes, use the show chassis hardware command. Sample command output from an M160 router is listed below.

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                47                M160
Midplane         REV 02   710-001245   AB4113
FPM CMB          REV 01   710-001642   AA9721
FPM Display      REV 01   710-001647   AA2995
CIP              REV 02   710-001593   AA9886
PEM 0            Rev 01   740-001243   KJ35782           DC
PEM 1            Rev 01   740-001243   kj35756           DC
PCG 0            REV 01   710-001568   AA9796
PCG 1            REV 01   710-001568   AA9895
Routing Engine 0 REV01    740-003239   AARCHOO           RE-2.0
Routing Engine 1
MCS 0            REV 03   710-001226   AA9779
SFM 0 SPP        REV 07   710-001228   AE5504
SFM 0 SPR        REV 03   710-002189   AE4707            Internet Processor II
SFM 2 SPP        REV 06   710-001228   AB3133
SFM 2 SPR        REV 01   710-002189   AB2941            Internet Processor II
SFM 3 SPP        REV 07   710-001228   AV3167
SFM 3 SPR        REV 04   710-002189   AV3439            Internet Processor II
FPC 0            REV 02   710-001611   AA9518            FPC Type 2
  CPU            REV 02   710-001217   AA9572
FPC 1            REV 03   710-001255   AA9812            FPC Type 1
  CPU
FPC 2            REV 02   710-001611   AA9527            FPC Type 2
  CPU            REV 02   710-001217   AA9592
FPC 3            REV 01   710-003061   HB2029            FPC Type OC192
  CPU            REV 05   710-001217   AF5950
  PIC 0          REV 01   750-003063   HB2029            1x OC-192 SM LR
FPC 5            REV 01   710-001255   AA2914            FPC Type 1
  CPU            REV 02   710-001217   AA2893
FPC 7            REV 03   710-001255   AA9809            FPC Type 1
  CPU            REV 02   710-001217   AA9573
  PIC 0          REV 04   750-000613   AA0374            1x OC-12 SONET, SMIR
  PIC 1          REV 02   750-E3-PIC   AC1903            4x E3
  PIC 2          REV 02   750-001020   AA8944            1x OC-12 SONET, MM
```

To verify FPC status, use the show chassis fpc command. Sample command output from an M160 router is listed below.

```
user@host> show chassis fpc
Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Announce offline   0      0          0         0         0          0
  1  Present            0      0          0         0         0          0
  2  Online            32      4          0        32         1         39
  3  Online            44      1          0        32         1         40
  4  Empty              0      0          0         0         0          0
  5  Offline         --- Chassis connection dropped ---
  6  Empty              0      0          0         0         0          0
  7  Online            42      4          0        32         1         40
```

To verify Routing Engine status, use the show chassis routing-engine command. Sample command output from an M160 router is listed below.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 35 degrees C / 95 degrees F
    DRAM                       768 MB
    Memory utilization          10 percent
    CPU utilization:
      User                       1 percent
      Background                 0 percent
      Kernel                    10 percent
      Interrupt                  3 percent
      Idle                      87 percent
    Model                          RE-2.0
    Serial ID                      0c000004f8d26401
    Start time                     2002-06-14 14:39:03 PDT
    Uptime                         11 minutes, 46 seconds
    Load averages:                 1 minute   5 minute  15 minute
                                       0.18       0.19       0.14
Routing Engine status:
  Slot 1:
    Current state                  Present
```

To verify SFM status, use the show chassis sfm command. Sample command output from an M160 router is listed below.

```
user@host> show chassis sfm
Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Online            35      1          0        64        16         46
  1  Empty              0      0          0         0         0          0
  2  Online            47      1          0        64        16         45
  3  Online            50      1          0        64        16         45
Packet scheduling mode : Disabled
```

Table 64 on page 361 provides an example of jnxFruContent objects in the jnxFruTable for an M40 router.

Table 64: jnxFruContents Objects in the jnxFruTable of an M40 Router

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
2	1	0	0	Power supply A	powerEntryModule	1	Online	0	None	0:0:00:00.00	0:0:00:00.00	101974
2	2	0	0	Power supply B	powerEntryModule	2	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
3	1	0	0	Top impeller	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
3	2	0	0	Bottom impeller	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	1	0	0	Rear left fan	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	0	0	Rear center fan	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	3	0	0	Rear right fan	fan	3	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
5	1	0	0	Host controller	routingEngine	1	Online	37	None	0:0:00:00.00	0:0:00:00.00	0
6	1	0	0	SCB Internet Processor I	controlBoard	1	Online	27	None	0:0:00:00.00	0:0:00:00.00	0
7	1	0	0	FPC @ 0/*/*	flexiblePic Concentrator	1	Online	28	None	0:0:00:00.00	0:0:00:00.00	0
7	2	0	0	FPC @ 1/*/*	flexible PicConcentrator	2	Online	29	None	0:0:00:00.00	0:0:00:00.00	0
7	3	0	0	FPC @ 2/*/*	flexible PicConcentrator	3	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	4	0	0	FPC @ 3/*/*	flexiblePic Concentrator	4	Online	24	None	0:0:00:00.00	0:0:00:00.00	0
7	5	0	0	FPC @ 4/*/*	flexiblePic Concentrator	5	Online	27	None	0:0:00:00.00	0:0:00:00.00	0
7	6	0	0	FPC @ 5/*/*	flexiblePic Concentrator	6	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	7	0	0	FPC: 1x OC-48 SONET, SMIR @ 6/*/*	flexiblePic Concentrator	7	Online	28	None	0:0:00:00.00	0:0:00:00.00	0

Table 64: jnxFruContents Objects in the jnxFruTable of an M40 Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
7	8	0	0	FPC @ 7/*/*	flexible PicConcentrator	8	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	1	1	0	PIC: 1x G/E, 1000 BASE-SX @ 0/0/*	portInterfaceCard	1	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	1	2	0	PIC: 1x Tunnel @ 0/1/*	portInterfaceCard	1	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	1	3	0	PIC: 4x T1, RJ48 @ 0/2/*	portInterfaceCard	1	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	1	4	0	PIC: 1x COC12, SMIR @ 0/3/*	portIntefaceCard	1	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	2	1	0	PIC: 2x OC-3 ATM, MM @ 1/0/*	portInterfaceCard	2	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	2	2	0	PIC: 4x OC-3 SONET, MM @ 1/1/*	portInterfaceCard	2	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	2	3	0	PIC: 2x T3 @ 1/2/*	portInterfaceCard	2	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	2	4	0	PIC: 1x CSTM1, SMIR @ 1/3/*	portInterfaceCard	2	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	3	1	0	PIC: @ 2/0/*	portInterfaceCard	3	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	3	2	0	PIC: @ 2/1/*	portInterfaceCard	3	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	3	3	0	PIC: @ 2/2/*	portInterfaceCard	3	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	3	4	0	PIC: @ 2/3/*	portInterfaceCard	3	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	4	1	0	PIC: @ 3/0/*	portInterfaceCard	4	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0

Table 64: jnxFruContents Objects in the jnxFruTable of an M40 Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
8	4	2	0	PIC: 4x F/E, 100 BASE-TX @ 3/1/*	portInterfaceCard	4	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	4	3	0	PIC: 1x 800M Crypto @ 3/2/*	portInterfaceCard	4	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	4	4	0	PIC: 1x CT3-NxDS0 @ 3/3/*	portInterfaceCard	4	Ready	24	None	0:0:00:00.00	0:0:00:00.00	0
8	5	1	0	PIC: @ 4/0/*	portInterfaceCard	5	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	5	2	0	PIC: @ 4/1/*	portInterfaceCard	5	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	5	3	0	PIC: @ 4/2/*	portInterfaceCard	5	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	5	4	0	PIC: @ 4/3/*	portInterfaceCard	5	Ready	27	None	0:0:00:00.00	0:0:00:00.00	0
8	6	1	0	PIC: @ 5/0/*	portInterfaceCard	6	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	6	2	0	PIC: @ 5/1/*	portInterfaceCard	6	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	6	3	0	PIC: @ 5/2/*	portInterfaceCard	6	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	6	4	0	PIC: @ 5/3/*	portInterfaceCard	6	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	7	1	0	PIC: 1x OC-48 SONET, SMIR @ 6/0/*	portInterfaceCard	7	Ready	28	None	0:0:00:00.00	0:0:00:00.00	0
8	7	2	0	PIC continued	portInterfaceCard	7	Ready	28	None	0:0:00:00.00	0:0:00:00.00	0
8	7	3	0	PIC continued	portInterfaceCard	7	Ready	28	None	0:0:00:00.00	0:0:00:00.00	0
8	7	4	0	PIC continued	portInterfaceCard	7	Ready	28	None	0:0:00:00.00	0:0:00:00.00	0
8	8	1	0	PIC: @ 7/0/*	portInterfaceCard	8	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0

Table 64: jnxFruContents Objects in the jnxFruTable of an M40 Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
8	8	2	0	PIC: @ 7/1/*	portInterfaceCard	8	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	8	3	0	PIC: @ 7/2/*	portInterfaceCard	8	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
8	8	4	0	PIC: @ 7/3/*	portInterfaceCard	8	Offline	0	None	0:0:00:00.00	0:0:00:00.00	0
9	1	0	0	Routing Engine	routingEngine	1	Online	0	None	0:0:00:00.00	0:0:00:00.00	0

To verify the L1, L2, and L3 indexes, use the show chassis hardware command. Sample command output from an M40 router is listed below.

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis
Backplane        REV 03   710-000073   AA2005
Power Supply A   Rev A    740-000235   000119            DC
Maxicab          REV 04   710-000229   AA0691
Minicab          REV 02   710-000482   AA0270
Display          REV 06   710-000150   AA1042
Routing Engine                                          RE-1.0
SCB              REV 07   710-000075   AA1033            Internet Processor I
FPC 0            REV 01   710-001292   AB8159
  PIC 0          REV 08   750-001072   AP5525            1x G/E, 1000 BASE-SX
  PIC 1          REV 01   750-001323   AB1645            1x Tunnel
  PIC 2          REV 01   750-002953   AD9083            4x T1, RJ48
  PIC 3          REV 03   750-001190   AE2907            1x COC12, SMIR
FPC 1            REV 10   710-000175   AA7219
  PIC 0          REV 03   750-002977   HD9331            2x OC-3 ATM, MM
  PIC 1          REV 04   750-002971   HC8020            4x OC-3 SONET, MM
  PIC 2          REV 02.1 710-000608   AA1592            2x T3
  PIC 3          REV 05   750-003248   AD9648            1x CSTM1, SMIR
FPC 3            REV 10   710-000175   AA4782
  PIC 1          REV 04   750-002992   HC3974            4x F/E, 100 BASE-TX
  PIC 2          REV 03   750-003844   AY4806            1x 800M Crypto
  PIC 3          REV 03   750-004743   BD9433            1x CT3-NxDS0
FPC 4            REV 01   710-001292   AC5265
FPC 6            REV 01   710-001292   AB7485
  PIC 0          REV 03   750-000617   AA4566            1x OC-48 SONET, SMIR
user@host> show chassis environment
Class Item                 Status     Measurement
Power Power Supply A       OK
      Power Supply B       Absent
Temp  FPC 0                OK         28 degrees C / 82 degrees F
      FPC 1                OK         29 degrees C / 84 degrees F
      FPC 3                OK         24 degrees C / 75 degrees F
      FPC 4                OK         27 degrees C / 80 degrees F
      FPC 6                OK         28 degrees C / 82 degrees F
      SCB                  OK         27 degrees C / 80 degrees F
      Backplane @ A1       OK         30 degrees C / 86 degrees F
```

```
      Backplane @ A2          OK         26 degrees C / 78 degrees F
      Routing Engine          OK         37 degrees C / 98 degrees F
Fans  Top Impeller            OK         Spinning at normal speed
      Bottom impeller         OK         Spinning at normal speed
      Rear Left Fan           OK         Spinning at normal speed
      Rear Center Fan         OK         Spinning at normal speed
      Rear Right Fan          OK         Spinning at normal speed
Misc  Craft Interface         OK
```

To verify FPC status, use the show chassis fpc command. Sample command output from an M40 router is listed below.

```
user@host> show chassis fpc
Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Online            28      2          0         8        11         14
  1  Online            29      7          0         8        21         14
  2  Empty              0      0          0         0         0          0
  3  Online            24     17          0         8        22         15
  4  Online            27      1          0         8         6         13
  5  Empty              0      0          0         0         0          0
  6  Online            28      1          0         8         7         15
  7  Empty              0      0          0         0         0          0
```

To verify Routing Engine status, use the show chassis routing-engine command. Sample command output from an M40 router is listed below.

```
user@host> show chassis routing-engine
Routing Engine status:
    Temperature                37 degrees C / 98 degrees F
    DRAM                             256 MB
    Memory utilization         19 percent
    CPU utilization:
      User                      1 percent
      Background                0 percent
      Kernel                    3 percent
      Interrupt                 1 percent
      Idle                        96 percent
    Model         RE-1.0
    Start time                  2002-06-24 17:28:30 UTC
    Uptime                      20 minutes, 30 seconds
    Load averages:              1 minute   5 minute  15 minute
                                    0.00       0.04       0.11
```

To verify SCB status, use the show chassis scb command. Sample command output from an M40 router is listed below.

```
user@host> show chassis scb
SCB status:
  Temperature                       27 degrees C / 80 degrees F
  CPU utilization                   3 percent
  Interrupt utilization               0 percent
  Heap utilization          9 percent
  Buffer utilization          44 percent
  Total CPU DRAM                        64 MB
  Internet Processor I          Version 1, Foundry IBM, Part number 3
  Start time:                   2002-06-24 17:30:10 UTC
  Uptime:                       19 minutes, 8 seconds
```

Table 65 on page 366 provides an example of jnxFruContent objects in the jnxFruTable for an M40e router.

Table 65: JnxFruContents Objects in the jnxFruTable of an M40e Router

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
2	1	0	0	PEM 0	powerEntryModule	1	Present	0	None	0:0:00:00.00	0:0:00:25.99	208927
2	2		0	PEM 1	powerEntryModule	2	Online	0	None	0:0:00:00.00	0:0:00:25.99	208928
4	1	0	0	Front top blower	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	1	0	Fan tray front left	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	2	0	Fan tray front right	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	3	0	Fan tray rear left	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	4	0	Fan tray rear right	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	3	0	0	Rear top blower	fan	3	Present		None	0:0:00:00.00	0:0:00:00.00	0
4	4	0	0	Rear bottom blower	fan	4	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
6	1	1	0	SFM 0 SPP	switchingAnd ForwardingModule-	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
6	1	2	0	SFM 0 SPR	switchingAnd ForwardingModule	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
6	2	1	0	SFM 1 SPP	switchingAnd ForwardingModule-	2	Online	42	None	0:0:00:21.95	0:0:00:00.00	0
6	2	2	0	SFM 1 SPR Internet Processor II	switchingAnd ForwardingModule-	2	Online	42	None	0:0:00:21.95	0:0:00:00.00	0
7	1	0	0	FPC @ 0/*/*	flexiblePic Concentrator	1	Online	41	None	0:0:00:21.85	0:0:00:00.00	0
7	2	0	0	FPC @ 1/*/*	flexible PicConcentrator	2	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	3	0	0	FPC @ 2/*/*	flexible PicConcentrator	3	Online	43	None	0:0:00:21.87	0:0:00:00.00	0

Table 65: JnxFruContents Objects in the jnxFruTable of an M40e Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
7	4	0	0	FPC @ 3/*/*	flexible PicConcentrator	4	Online	38	None	0:0:00:21.89	0:0:00:00.00	0
7	5	0	0	FPC @ 4/*/*	flexiblePic Concentrator	5	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	6	0	0	FPC @ 5/*/*	flexiblePic Concentrator	6	Online	46	None	0:0:00:21.91	0:0:00:00.00	0
7	7	0	0	FPC @ 6/*/*	flexiblePic Concentrator	7	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	8	0	0	FPC @ 7/*/*	flexiblePic Concentrator	8	Online	44	None	0:0:00:21.93	0:0:00:00.00	0
8	1	1	0	PIC: @ 0/0/*	portInterfaceCard	1	Online	45	None	0:0:00:00.00	0:0:00:00.00	0
8	1	2	0	PIC: 1x OC-12 SONET, MM @ 0/1/*	portInterfaceCard	1	Online	45	None	0:0:00:00.00	0:0:00:00.00	0
8	1	3	0	PIC: 4x CT3 @ 0/2/*	portInterfaceCard	1	Online	45	None	0:0:00:00.00	0:0:00:00.00	0
8	1	4	0	PIC: 1x Multi Link(32) @ 0/3/*	portInterfaceCard	1	Online	45	None	0:0:00:00.00	0:0:00:00.00	0
8	2	1	0	PIC: @ 1/0/*	portInterfaceCard	2	Online	50	None	0:0:00:00.00	0:0:00:00.00	0
8	2	2	0	PIC: @ 1/1/*	portInterfaceCard	2	Online	50	None	0:0:00:00.00	0:0:00:00.00	0
8	2	3	0	PIC: @ 1/2/*	portInterfaceCard	2	Online	50	None	0:0:00:00.00	0:0:00:00.00	0
8	2	4	0	PIC: @ 1/3/*	portInterfaceCard	2	Online	50	None	0:0:00:00.00	0:0:00:00.00	0
8	3	1	0	PIC: 1x OC-12 SONET, MM @ 2/0/*	portInterfaceCard	3	Online	41	None	0:0:00:00.00	0:0:00:00.00	0

Table 65: JnxFruContents Objects in the jnxFruTable of an M40e Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
8	3	2	0	PIC: 1x OC-12 SONET, MM @ 2/1/*	portInterfaceCard	3	Online	41	None	0:0:00:21.85	0:0:00:00.00	0
8	3	3	0	PIC: 1x OC-12 SONET, MM @ 2/2/*	portInterfaceCard	3	Online	41	–	0:0:00:21.85	0:0:00:00.00	–
8	3	4	0	PIC: @ 2/3/*	portInterfaceCard	3	Online	41	–	0:0:00:21.85	0:0:00:00.00	–
8	4	1	0	PIC: 1x OC-48 SONET, SMIR @ 3/0/*	portInterfaceCard	4	Empty	0	–	0:0:00:00.00	0:0:00:00.00	0
8	4	2	0	PIC: @ 3/1/*	portInterfaceCard	4	Empty	0	–	0:0:00:00.00	0:0:00:00.00	0
8	4	3	0	PIC: @ 3/2/*	portInterfaceCard	4	Empty	0	–	0:0:00:00.00	0:0:00:00.00	0
8	4	4	0	PIC: @ 3/3/*	portInterfaceCard	4	Empty	0	–	0:0:00:00.00	0:0:00:00.00	0
8	5	1	0	PIC: @ 4/0/*	portInterfaceCard	5	Online	43	–	0:0:00:21.87	0:0:00:00.00	0
8	5	2	0	PIC: @ 4/1/*	portInterfaceCard	5	Online	43	–	0:0:00:21.87	0:0:00:00.00	0
8	5	3	0	PIC: @ 4/2/*	portInterfaceCard	5	Online	43	–	0:0:00:21.87	0:0:00:00.00	0
8	5	4	0	PIC: @ 4/3/*	portInterfaceCard	5	Online	43	–	0:0:00:21.87	0:0:00:00.00	0
8	6	1	0	PIC: @ 5/0/*	portInterfaceCard	6	Online	38	–	0:0:00:21.89	0:0:00:00.00	0
8	6	2	0	PIC: @ 5/1/*	portInterfaceCard	6	Online	38	–	0:0:00:21.89	0:0:00:00.00	0
8	6	3	0	PIC: 1x OC-12 SONET, SMIR @ 5/2/*	portInterfaceCard	6	Online	38	–	0:0:00:21.89	0:0:00:00.00	0

Table 65: JnxFruContents Objects in the jnxFruTable of an M40e Router *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
8	6	4	0	PIC: 1x OC-12 SONET, MM @ 5/3/*	portInterfaceCard	6	Online	38	–	0:0:00:21.89	0:0:00:00.00	0
8	7	1	0	PIC: @ 6/0/*	portInterfaceCard	7	Empty	0	–	0:0:00:00.00	0:0:00:00.00	0
8	7	2	0	PIC: @ 6/1/*	portInterfaceCard	7	Empty	0	–	0:0:00:00.00	0:0:00:00.00	0
8	7	3	0	PIC: @ 6/2/*	portInterfaceCard	7	Empty	0	–	0:0:00:00.00	0:0:00:00.00	0
8	7	4	0	PIC: @ 6/3/*	portInterfaceCard	7	Empty	0	–	0:0:00:00.00	0:0:00:00.00	0
8	8	1	0	PIC: 8x FE-FX, 100 BASE-FX @ 7/0/*	portInterfaceCard	8	Online	46	–	0:0:00:21.91	0:0:00:00.00	0
8	8	2	0	PIC: @ 7/1/*	portInterface-Card	8	Online	46	–	0:0:00:21.91	0:0:00:00.00	0
8	8	3	0	PIC: 1x Link Service(4) @ 7/2/*	portInterfaceCard	8	Online	46	–	0:0:00:21.91	0:0:00:00.00	0
8	8	4	0	PIC: @ 7/3/*	portInterfaceCard	1	Online	46	–	0:0:00:00.00	0:0:00:00.00	0
9	1	0	0	Routing Engine 0	routingEngine	2	Online	46	–	0:0:00:00.00	0:0:00:00.00	0
9	2	0	0	Routing Engine 1	routingEngine	1	Present	34	–	0:0:00:00.00	0:0:00:00.00	0
10	1	1	0	FPM CMB	frontPanelModule	1	Online	28	–	0:0:00:00.00	0:0:00:00.00	0
10	1	2	0	FPM Display	frontPanelModule	1	Online	28	–	0:0:00:00.00	0:0:00:00.00	0
11	1	0	0	PCG 0	clockGenerator	1	Online	45	–	0:0:00:00.00	0:0:00:00.00	0
11	2	0	0	PCG 1	clockGenerator	2	Online	50	–	0:0:00:00.00	0:0:00:00.00	0
12	1	0	0	MCS 0	controlBoard	1	Online	46	–	0:0:00:00.00	0:0:00:00.00	0
12	2	0	0	MCS 1	controlBoard	2	Online	0	–	0:0:00:00.00	0:0:00:00.00	0
13	1	0	0	CIP	craftInterfacePanel	1	Present	0	–	0:0:00:00.00	0:0:00:00.00	0

To verify L1, L2, and L3 indexes, use the following commands (M40e example):

```
user@host> show chassis hardware
Item             Version  Part number  Serial number     Description
Chassis                                19084             M40e
Midplane         REV 01   710-005071   AX3654
FPM CMB          REV 03   710-001642   AR9037
FPM Display      REV 03   710-001647   AP1334
CIP              REV 08   710-001593   AE8486
PEM 0            Rev 01   740-003787   ME13120           Power Entry Module
PEM 1            Rev 01   740-003787   MC25354           Power Entry Module
PCG 0            REV 07   710-001568   AG1377
PCG 1            REV 07   710-001568   AR3806
Routing Engine 0 REV 04   740-003239   9001026568        RE-2.0
Routing Engine 1
MCS 0            REV 11   710-001226   AN5810
MCS 1            REV 11   710-001226   AR0109
SFM 1 SPP        REV 07   710-001228   BE0106
SFM 1 SPR        REV 05   710-002189   BE0062            Internet Processor II
FPC 0            REV 01   710-005078   BE0642            M40e-FPC Type 1
  CPU            REV 01   710-004600   BD2496
  PIC 1          REV 04   750-001895   HE0885            1x OC-12 SONET, MM
  PIC 2          REV 06   750-003009   HE1422            4x CT3
  PIC 3          REV 03   750-003837   AP7134            1x Multi Link(32)
FPC 2            REV 01   710-005078   BE0647            M40e-FPC Type 1
  CPU            REV 01   710-004600   AN4299
  PIC 0          REV 04   750-001895   HD2623            1x OC-12 SONET, MM
  PIC 1          REV 04   750-001895   HE0609            1x OC-12 SONET, MM
  PIC 2          REV 04   750-001895   HE0871            1x OC-12 SONET, MM
FPC 3            REV 01   710-005197   BD9846            M40e-FPC Type 2
  CPU            REV 01   710-004600   BD2364
  PIC 0          REV 01   750-001900   AA9649            1x OC-48 SONET, SMIR
FPC 5            REV 01   710-005078   BE0639            M40e-FPC Type 1
  CPU            REV 01   710-004600   BD2587
  PIC 2          REV 04   750-001896   AV4480            1x OC-12 SONET, SMIR
  PIC 3          REV 04   750-001895   HE1000            1x OC-12 SONET, MM
FPC 7            REV 01   710-005196   BD9456            M40e-FPC
  CPU            REV 01   710-004600   AN4323
  PIC 0          REV 01   750-004944   AY4645            8x FE-FX, 100 BASE-FX
  PIC 2          REV 01   750-007927   AP1919            1x Link Service(4)
```

To verify Routing Engine status, use the show chassis routing-engine command. Sample command output from an M40e router is listed below.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state          Master
    Election priority          Master (default)
    Temperature                      34 degrees C / 93 degrees F
    DRAM                            768 MB
    Memory utilization               9 percent
    CPU utilization:
      User                        0 percent
      Background                         0 percent
      Kernel                      2 percent
      Interrupt                   0 percent
      Idle                               97 percent
    Model                         RE-2.0
    Serial ID                     9c000007c8644701
```

```
    Start time                     2002-06-24 10:33:41 PDT
    Uptime                         31 minutes, 7 seconds
    Load averages:                 1 minute   5 minute  15 minute
                                       0.01       0.02       0.00
Routing Engine status:
  Slot 1:
    Current state                  Present
```

To verify FPC status, use the show chassis fpc command. Sample command output from an M40e router is listed below.

```
user@host> show chassis fpc
Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Online            41      4          0        32         3         40
  1  Empty              0      0          0         0         0          0
  2  Online            43      4          0        32         1         40
  3  Online            38      1          0        32         1         40
  4  Empty              0      0          0         0         0          0
  5  Online            46      4          0        32         1         40
  6  Empty              0      0          0         0         0          0
  7  Online            44      4          0        32         2         39
```

Table 66 on page 371 provides an example of jnxFruContent objects in the jnxFruTable for a T640 routing node.

Table 66: jnxFruContents Objects in the jnxFruTable of a T640 Routing Node

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
2	1	0	0	PEM 0	power EntryModule	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
2	2	0	0	PEM 1	power EntryModule-	2	Online	27	None	0:0:00:00.00	0:0:00:00.00	217044
4	1	1	0	Top left front fan	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	1	2	0	Top left middle fan	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	1	3	0	Top left rear fan	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	1	4	0	Top right front fan	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	1	5	0	Top right middle fan	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0

Table 66: jnxFruContents Objects in the jnxFruTable of a T640 Routing Node
(continued)

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
4	1	6	0	Top right rear fan	fan	1	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	1	0	Bottom left front fan	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	2	0	Bottom left middle fan	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	3	0	Bottom left rear fan	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	4	0	Bottom right front fan	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	5	0	Bottom right middle fan	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	2	6	0	Bottom right rear fan	fan	2	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	3	1	0	Fourth blower from top	fan	3	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	3	2	0	Bottom blower	fan	3	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	3	3	0	Middle blower	fan	3	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	3	4	0	Top blower	fan	3	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
4	3	5	0	Second blower from top	fan	3	Present	0	None	0:0:00:00.00	0:0:00:00.00	0
7	1	0	0	FPC @ 0/*/*	flexiblePic Concentrator	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0

Table 66: jnxFruContents Objects in the jnxFruTable of a T640 Routing Node *(continued)*

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
7	1	1	0	FPC @ 0/0/* top temp. sensor	flexiblePic Concentrator	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	1	2	0	FPC @ 0/1/* bottom temp. sensor	flexiblePic Concentrator	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	2	0	0	FPC @ 1/*/*	flexiblePic Concentrator	2	Online	30	None	0:0:00:01.94	0:0:00:00.00	0
7	2	1	0	FPC @ 1/0/* top temp. sensor	flexiblePic Concentrator	2	Online	30	None	0:0:00:01.94	0:0:00:00.00	0
7	2	2	0	FPC @ 1/1/* bottom temp. sensor	flexiblePic Concentrator	2	Online	30	None	0:0:00:01.94	0:0:00:00.00	0
7	3	0	0	FPC @ 2/*/*	flexiblePic Concentrator	3	Online	30	None	0:0:00:01.96	0:0:00:00.00	0
7	3	1	0	FPC @ 2/0/* top temp sensor	flexiblePic Concentrator	3	Online	30	None	0:0:00:01.96	0:0:00:00.00	0
7	3	2	0	FPC @ 2/1/* bottom temp. sensor	flexiblePic Concentrator	3	Online	30	None	0:0:00:01.96	0:0:00:00.00	0
7	4	0	0	FPC @ 3/*/*	flexiblePic Concentrator	4	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	4	1	0	FPC @ 3/0/* top temp. sensor	flexiblePic Concentrator	4	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0

Table 66: jnxFruContents Objects in the jnxFruTable of a T640 Routing Node
(continued)

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
7	4	2	0	FPC @ 3/1/* bottom temp. sensor	flexiblePic Concentrator	4	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	5	9	0	FPC @ 4/*/*	flexiblePicConcentrator	5	Online	36	None	0:0:00:01.98	0:0:00:00.00	0
7	5	1	0	FPC @ 4/0/* top temp. sensor	flexiblePicConcentrator	5	Online	36	None	0:0:00:01.98	0:0:00:00.00	0
7	5	2	0	FPC @ 4/1/* bottom temp. sensor	flexiblePicConcentrator	5	Online	36	None	0:0:00:01.98	0:0:00:00.00	0
7	6	0	0	FPC @ 5/*/*	flexiblePicConcentrator	6	Offline	0	Error	0:0:12:51.28	0:0:00:00.00	0
7	6	1	0	FPC @ 5/0/* top temp. sensor	flexiblePicConcentrator	6	Offline	0	Error	0:0:12:51.28	0:0:00:00.00	0
7	6	2	0	FPC @ 5/1/* bottom temp. sensor	flexiblePicConcentrator	6	Offline	0	Error	0:0:12:51.28	0:0:00:00.00	0
7	7	0	0	FPC @ 6/*/*	flexiblePicConcentrator	7	Online	30	None	0:0:00:02.05	0:0:00:00.00	0
7	7	1	0	FPC @ 6/0/* top temp. sensor	flexiblePicConcentrator	7	Online	30	None	0:0:00:02.05	0:0:00:00.00	0
7	7	2	0	FPC @ 6/1/* bottom temp. sensor	flexiblePicConcentrator	7	Online	30	None	0:0:00:02.05	0:0:00:00.00	0
7	8	0	0	FPC @ 7/*/*	flexiblePicConcentrator	8	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0

Table 66: jnxFruContents Objects in the jnxFruTable of a T640 Routing Node
(continued)

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
7	8	1	0	FPC @ 7/0/* top temp. sensor	flexiblePic Concentrator	8	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
7	8	2	0	FPC @ 7/1/* bottom temp. sensor	flexiblePicConcentrator	8	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	1	1	0	PIC: @ 0/0/*	portInterfaceCard	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	1	2	0	PIC: @ 0/1/*	portInterfaceCard	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	1	3	0	PIC: @ 0/2/*	portInterfaceCard	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	1	4	0	PIC: @ 0/3/*	portInterfaceCard	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	2	1	0	PIC: 1x OC-48 SONET, SMIR @ 1/0/*	portInterfaceCard	2	Online		None	0:0:00:00.00	0:0:00:00.00	0
8	2	2	0	PIC: 1x OC-48 SONET, SMSR @ 1/1/*	portInterface-Card	2	Online	36	None	0:0:00:00.00	0:0:00:00.00	0
8	2	3	0	PIC: 1x OC-48 SONET, SMIR @ 1/2/*	portInterface - Card	2	Online	36	None	0:0:00:00.00	0:0:00:00.00	0
8	2	4	0	PIC: 1x OC-48 SONET, SMIR @ 1/3/*	portInterface-Card	2	Online	36	None	0:0:00:00.00	0:0:00:00.00	0
8	3	1	0	PIC: @ 2/0/*	portInterface-Card	3	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	3	2	0	PIC: @ 2/1/*	portInterface-Card	3	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0

Table 66: jnxFruContents Objects in the jnxFruTable of a T640 Routing Node
(continued)

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
8	3	3	0	PIC: @ 2/2/*	portInterface-Card	3	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	3	4	0	PIC: @ 2/3/*	portInterface-Card	3	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	4	1	0	PIC: @ 3/0/*	portInterface-Card	4	Online		None	0:0:00:01.00	0:0:00:00.00	0
8	4	2	0	PIC: @ 3/1/*	portInterfaceCard	4	Online	30	None	0:0:00:01.94	0:0:00:00.00	0
8	4	3	0	PIC: @ 3/2/*	portInterface-Card	4	Online	30	None	0:0:00:01.94	0:0:00:00.00	0
8	4	4	0	PIC: @ 3/3/*	portInterface-Card	4	Online	30	None	0:0:00:01.94	0:0:00:00.00	0
8	5	1	0	PIC: 1x Tunnel @ 4/0/*	portInterfaceCard	5	Online	30	None	0:0:00:01.94	0:0:00:00.00	0
8	5	2	0	PIC: 1x OC-192 SM SR2 @ 4/1/*	portInterface-Card	5	Online	30	None	0:0:00:01.96	0:0:00:00.00	0
8	5	3	0	PIC: 4x OC-48 SONET, SMSR @ 4/2/*	portInterface-Card	5	Online	30	None	0:0:00:01.96	0:0:00:00.00	0
8	5	4	0	PIC: 1x OC-192 SM SR1 @ 4/3/*	portInterfaceCard	5	Online	30	None	0:0:00:01.96	0:0:00:00.00	0
8	6	1	0	PIC: @ 5/0/*	portInterface - Card	6	Empty	0	None	0:0:00:01.00	0:0:00:00.00	0
8	6	2	0	PIC: @ 5/1/*	portInterfaceCard	6	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	6	3	0	PIC: @ 5/2/*	portInterfaceCard	6	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	6	4	0	PIC: @ 5/3/*	portInterfaceCard	6	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
8	7	1	0	PIC: @ 6/0/*	portInterfaceCard	7	Online	30	None	0:0:00:00.00	0:0:00:00.00	0

Table 66: jnxFruContents Objects in the jnxFruTable of a T640 Routing Node
(continued)

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
8	7	2	0	PIC: @ 6/1/*	portInterfaceCard	7	Online	30	None	0:0:00:01.98	0:0:00:00.00	0
8	7	3	0	PIC: @ 6/2/*	portInterfaceCard	7	Online	30	None	0:0:00:01.98	0:0:00:00.00	0
8	7	4	0	PIC: @ 6/3/*	portInterfaceCard	7	Online	30	None	0:0:00:01.98	0:0:00:00.00	0
8	8	1	0	PIC: @ 7/0/*	portInterfaceCard	8	Offline	0	Error	0:0:12:51.28	0:0:00:00.00	0
8	8	2	0	PIC: @ 7/1/*	portInterfaceCard	8	Offline	0	Error	0:0:12:51.28	0:0:00:00.00	0
8	8	3	0	PIC: @ 7/2/*	portInterfaceCard	8	Offline	0	Error	0:0:12:51.28	0:0:00:00.00	0
8	8	4	0	PIC: @ 7/3/*	portInterfaceCard	8	Offline	0	Error	0:0:12:51.28	0:0:00:00.00	0
9	1	0	0	Routing Engine 0	routing-Engine	1	Online	34	None	0:0:00:00.00	0:0:00:00.00	0
9	2	0	0	Routing Engine 1	routing-Engine	2	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
10	1	1	0	FPM GBUS	frontPanel-Module	1	Online	27	None	0:0:00:00.00	0:0:00:00.00	0
10	1	2	0	FPM Display	frontPanel-Module	1	Online	27	None	0:0:00:00.00	0:0:00:00.00	0
11	1	0	0	SCG 0	clockGener-ator	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
11	2	0	0	SCG 1	clockGenerator	2	Online	27	None	0:0:00:00.00	0:0:00:00.00	0
12	1	0	0	CB 0	control-Board	1	Online	27	None	0:0:00:01.94	0:0:00:00.00	0
12	2	0	0	CB 1	control-Board	2	Unknown	0	None	0:0:00:01.96	0:0:00:00.00	0
13	1	0	0	CIP	craftInter-facePanel	1	Present	36	None	0:0:00:00.00	0:0:00:00.00	0
14	1	0	0	SPMB 0	processor-Mezzanine-BoardForSIB	1	Online	34	None	0:0:00:00.00	0:0:00:00.00	0

Table 66: jnxFruContents Objects in the jnxFruTable of a T640 Routing Node
(continued)

Index	L1	L2	L3	Name	Type	Slot	State	Temp	Offline	PowerOff	PowerOn	Uptime
14	2	0	0	SPMB 1	processor-Mezzanine-BoardForSIB	2	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
15	1	0	0	SIB 0	switchInter-faceBoard	1	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
15	2	0	0	SIB 1	switchInter-faceBoard	2	Online	36	None	0:0:00:00.00	0:0:00:00.00	0
15	3	0	0	SIB 2	switchInter-faceBoard	3	Empty	0	None	0:0:00:00.00	0:0:00:00.00	0
15	4	0	0	SIB 3	switchInter-faceBoard	4	Online	30	None	0:0:00:01.94	0:0:00:00.00	0
15	5	0	0	SIB 4	switchInter-faceBoard	5	Online	30	None	0:0:00:01.96	0:0:00:00.00	0

To verify the L1, L2, and L3 indexes, use the show chassis hardware command. Sample command output from a T640 routing node is listed below.

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                1234              T640
Midplane         REV 04   710-002726   AX5603
FPM GBUS         REV 02   710-002901   HE3062
FPM Display      REV 01   710-002897   HD3033
CIP              REV 05   710-002895   HA5022
PEM 1            RevX02   740-002595   MD21812           Power Entry Module
SCG 1            REV 01   710-003423   HD3025
Routing Engine 0 REV 01   740-005022   210865700336      RE-3.0
CB 0             REV 02   710-002728   HE3025
CB 1
FPC 1            REV 01   710-002385   HE3173            FPC Type 2
  CPU            REV 06   710-001726   HC0042
  PIC 0          REV 03   750-001900   AD5737            1x OC-48 SONET, SMIR
  PIC 1          REV 07   750-001900   AR3613            1x OC-48 SONET, SMSR
  PIC 2          REV 01   750-001900   AA9604            1x OC-48 SONET, SMIR
  PIC 3          REV 01   750-001900   AA9602            1x OC-48 SONET, SMIR
  MMB 1          REV 03   710-001723   HC0111            MMB-144mbit
  ICBM           REV 04   710-003384   HA4497
  PPB 0          REV 02   710-003758   HA4543            PPB Type 2
  PPB 1          REV 02   710-003758   HA4540            PPB Type 2
FPC 2            REV 01   710-002385   HE3180            FPC Type 2
  CPU            REV 06   710-001726   HE7904
  MMB 1          REV 03   710-001723   HC0120            MMB-144mbit
  ICBM           REV 01   710-003384   HE3046
  PPB 0          REV 02   710-003758   HA4564            PPB Type 2
  PPB 1          REV 02   710-003758   HA4554            PPB Type 2
FPC 4            REV 04   710-001721   HE3145            FPC Type 3
```

```
  CPU            REV 06   710-001726   HC0034
  PIC 0                                                 1x Tunnel
  PIC 1          REV 01   750-003824   HE7803           1x OC-192 SM SR2
  PIC 2          REV 01   750-003336   HE3420           4x OC-48 SONET, SMSR
  PIC 3          REV 01   750-003824   HE7802           1x OC-192 SM SR1
  MMB 0          REV 03   710-001723   HE7230           MMB-144mbit
  MMB 1          REV 03   710-001723   HE7267           MMB-144mbit
  ICBM           REV 04   710-003384   HA4485
  PPB 0          REV 02   710-002845   HA4550           PPB Type 3
  PPB 1          REV 02   710-002845   HA4525           PPB Type 3
FPC 5            REV 04   710-001721   HE3175           FPC Type 3
  CPU
FPC 6            REV 01   710-002385   HD5027           FPC Type 2
  CPU            REV 06   710-001726   HC0033
  MMB 1          REV 03   710-001723   HC0080           MMB-144mbit
  ICBM           REV 04   710-003384   HA4486
  PPB 0          REV 02   710-003758   HA4541           PPB Type 2
  PPB 1          REV 02   710-003758   HA4539           PPB Type 2
SPMB 0           REV 01   710-003229   HA5999
SIB 0            REV 01   710-003980   HD5054           SIB-I8
SIB 2            REV 01   710-003980   HC0035           SIB-I8
SIB 3            REV 01   710-003980   HA5065           SIB-I8
SIB 4            REV 01   710-003980   HE3016           SIB-I8
```

To verify FPC status, use the show chassis fpc command. Sample command output from a T640 routing node is listed below.

```
user@host> show chassis fpc
Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Empty              0      0          0         0         0          0
  1  Online            30      2          0       512         3         41
  2  Online            30      2          0       256         7         41
  3  Empty              0      0          0         0         0          0
  4  Online            30      4          0       512         6         41
  5  Offline         --- Unresponsive ---
  6  Online            30      2          0       256         7         41
  7  Empty              0      0          0         0         0          0
```

To verify Routing Engine status, use the show chassis routing-engine command. Sample command output from a T640 routing node is listed below.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 35 degrees C / 95 degrees F
    DRAM                      2048 MB
    Memory utilization           4 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     2 percent
      Interrupt                  0 percent
      Idle                      97 percent
    Model                          RE-3.0
    Start time                     2002-06-24 10:33:34 PDT
    Uptime                         33 minutes, 38 seconds
```

```
    Load averages:                 1 minute   5 minute  15 minute
                                       0.08       0.03       0.01
```

To verify SPMB status, use the show chassis spmb command. Sample command output from a T640 routing node is listed below.

```
user@host> show chassis spmb
Slot 0 information:
  State                          Online
  Total CPU Utilization             2%
  Interrupt CPU Utilization         0%
  Memory Heap Utilization           0%
  Buffer Utilization               40%
  Start time:                    2002-06-24 10:34:22 PDT
  Uptime:                         33 minutes, 3 seconds
```

jnxBoxKernelMemoryUsedPercent

The object identifier for jnxBoxKernelMemoryUsedPercent is jnxBoxAnatomy 16. This object represents the amount of the kernel memory used, expressed as a percentage of the total available memory. The object shows 0 if the kernel memory usage is unavailable or inapplicable. When the kernel memory usage exceeds 80 percent, a system log message is logged and an RMON rising threshold trap is generated if RMON health monitoring is enabled for the device.

jnxBoxSystemDomainType

The object identifier for jnxBoxSystemDomainType is jnxBoxAnatomy 17. This object indicates the domain type of the device, that is whether it is a root system domain (RSD; represented by integer 2) or a protected system domain (PSD; represented by integer 3). This object returns an integer value of 1, denoting not applicable, if the system domain type feature is not supported on the device.

Chassis Traps

The chassis-related traps are defined under the jnxTraps and jnxChassisOKtraps branches. For the system logging severity levels for these traps, see “Juniper Networks Enterprise-Specific SNMP Traps” on page 131.

These traps are defined as follows:

- Power failure (jnxPowerSupplyFailure)—Sent when the power supply, router circuit breaker, or power circuit fails, or when there is a power outage. When only one of the power supplies has failed, the service impact is minimal. One power supply can provide the necessary power for a fully loaded router. To determine the source of the failure, you must physically inspect the router. This trap is repeated every hour until the power supply is restored.
- Fan failure (jnxFanFailure)—Sent when the fan fuse blows or when the fan wiring shorts out. When only one fan has failed, there is no service impact. The remaining fans increase speed to compensate. However, you must resolve the problem before another fan fails. This trap is repeated every hour until the fan failure is fixed. To determine the source of the failure, you must physically inspect

the router, taking care to check the fuses. See the hardware installation guide for your router model for more information.

- Overtemperature (jnxOverTemperature)—Sent when several fans fail or the room temperature increases significantly. The service impact of this trap depends on the temperature of the router. In general, the router increases the speed of the fans when any component exceeds a temperature of 55 °C. The fans remain at the higher speed until the temperature decreases below the threshold. In this case, there is no service impact. However, if the temperature exceeds 75 °C, the router transmits a warning and automatically shuts down. This scenario creates a significant service impact because the shutdown affects additional routers and equipment. This trap is repeated every minute until the temperature is brought down to normal. To determine the source of the overtemperature problem, you must physically inspect the router to determine whether any fans have failed in the router.
- Power Supply OK (jnxPowerSupplyOK)—Sent when a power supply recovers from failure.
- Fan OK (jnxFanOK)—Sent when a fan recovers from failure.
- Temperature OK (jnxTemperatureOK)—Sent when a chassis component recovers from an overtemperature condition.
- Redundancy Switchover (jnxRedundancySwitchover)—For certain platforms, such as the M20 or M160, some subsystems, such as the Routing Engine, have a redundant backup unit that can be brought online, manually or automatically, if the main unit malfunctions. The redundancy switchover trap indicates such a change.
- Field Replaceable Unit Removal (jnxFruRemoval)—Sent when the specified FRU has been removed from the chassis.
- Field Replaceable Unit Insertion (jnxFruInsertion)—Sent when the specified FRU has been inserted into the chassis.
- Field Replaceable Unit Power Off (jnxFruPowerOff)—Sent when the specified FRU has been powered off in the chassis.

  The jnxFruPowerOff trap is also sent in the following scenarios:

  - When an FRU that is controlled using inter-process communication (IPC) goes offline or is removed from the chassis. For example, a switch interface board (SIB).
  - When an FRU that does not have a backup unit goes offline or is removed from the chassis. For example, a Flexible PIC Concentrator (FPC).

NOTE: When a SONET Clock Generator (SCG) is taken offline, the unit is not powered down. Therefore, jnxFruPowerOff or jnxFruPowerOn traps are not sent when the unit is taken online or offline.

- Field Replaceable Unit Power On (jnxFruPowerOn)—Sent when the specified FRU has been powered on in the chassis.

- Field Replaceable Unit Failed (jnxFruFailed)—Sent when the specified FRU has failed in the chassis. Typically, this is due to the FRU not powering up or being unable to load software. FRU replacement may be required.
- Field Replaceable Unit Offline (jnxFruOffline)—Sent when the specified FRU goes offline. However, when an FRU that does not have a backup unit goes offline, JUNOS software generates the jnxFruPowerOff trap instead of the jnxFruOffline trap. Typically, a jnxFruOffline trap is generated to inform the backup FRU about the status of the primary FRU so that the backup FRU can take over when the primary FRU goes offline.

  The following are some scenarios when jnxFruOffline traps are generated:

  - When a PFE Clock Generator (PCG) goes offline (M40e)
  - When a Sonnet Clock Generator goes offline (T series)
  - When a Line Card Chassis goes offline (TX4 internet routing node)
  - When a Routing Engine goes offline.
- Field Replaceable Unit Online (jnxFruOnline)—Sent when the specified FRU goes online.
- Field Replaceable Unit Check (jnxFruCheck)—Sent when the specified FRU has encountered operational errors. On M120 and M320 routers, this trap is sent if the revision number for the ATM2 PIC FPGA is less than 8B44(4).

For more information on Chassis MIB traps, see “Standard SNMP Traps” on page 143 and “Juniper Networks Enterprise-Specific SNMP Traps” on page 131.

This section contains the following topics:

SNMPv1 Trap Format

The SNMPv1 trap format for the chassis-related traps is described in Table 67 on page 383. To view the SNMPv1 chassis-related traps, see “Standard SNMP Traps” on page 143 and “Juniper Networks Enterprise-Specific SNMP Traps” on page 131.

The column headings describe the SNMPv1 traps format:

- Trap Name—The name of the trap.
- Enterprise ID—The identification number of the enterprise-specific trap.
- Generic Trap Number—The generic trap number field of the SNMP trap PDU. This field is enterpriseSpecific(6) for enterprise-specific traps, other predefined values for standard traps.
- Specific Trap Number— The specific trap number field of the SNMP trap PDU. For standard traps, this field is zero; for enterprise-specific traps, this field is nonzero as defined in the enterprise-specific MIBs.

Table 67: SNMP Version 1 Trap Format

Trap Name	Enterprise ID	Generic Trap Number	Specific Trap Number
jnxFanFailure	1.3.6.1.4.1.2636.4.1	6	2
jnxFanOK	1.3.6.1.4.1.2636.4.2	6	2
jnxFruCheck	1.3.6.1.4.1.2636.4.1	6	12
jnxFruFailed	1.3.6.1.4.1.2636.4.1	6	9
jnxFruInsertion	1.3.6.1.4.1.2636.4.1	6	6
jnxFruOffline	1.3.6.1.4.1.2636.4.1	6	10
jnxFruOnline	1.3.6.1.4.1.2636.4.1	6	11
jnxFruPowerOff	1.3.6.1.4.1.2636.4.1	6	7
jnxFruPowerOn	1.3.6.1.4.1.2636.4.1	6	8
jnxFruRemoval	1.3.6.1.4.1.2636.4.1	6	5
jnxOverTemperature	1.3.6.1.4.1.2636.4.1	6	3
jnxPowerSupplyFailure	1.3.6.1.4.1.2636.4.1	6	1
jnxPowerSupplyOK	1.3.6.1.4.1.2636.4.2	6	1
jnxRedundancySwitchover	1.3.6.1.4.1.2636.4.1	6	4
jnxTemperatureOK	1.3.6.1.4.1.2636.4.2	6	3

SNMPv2 Trap Format

The SNMPv2 trap format for the Chassis MIB traps is described in Table 68 on page 384.

The column headings describe the SNMPv2 traps format:

- Trap Name—The name of the trap.
- snmpTrapOID—The authoritative identification of the notification currently being sent. This variable occurs as the second varbind in every SNMPv2 trap PDU and InformRequest PDU.
- Description—The JUNOS enterprise-specific name of the trap.

Table 68: SNMP Version 2 Trap Format

Trap Name	snmpTrapOID	Description
jnxFanFailure	1.3.6.1.4.1.2636.4.1.2	The fan fuse has blown or the fan wiring has shorted out. This trap is generated every hour until the fan failure is fixed.
jnxFanOK	1.3.6.1.4.1.2636.4.2.2	The fan has recovered from a failure state.
jnxFruCheck	1.3.6.1.4.1.2636.4.1.12	The FRU has operational errors and has gone into a self-check diagnostic state. The revision number for the ATM2 PIC FPGA on an M120 or M320 router is less than 8B44(4).
jnxFruInsertion	1.3.6.1.4.1.2636.4.1.6	The FRU has been inserted into the chassis.
jnxFruFailed	1.3.6.1.4.1.2636.4.1.9	The FRU has failed in the chassis.
jnxFruOffline	1.3.6.1.4.1.2636.4.1.10	The FRU has gone offline.
jnxFruOnline	1.3.6.1.4.1.2636.4.1.11	The FRU has gone back online.
jnxFruPowerOff	1.3.6.1.4.1.2636.4.1.7	The FRU has been powered off in the chassis.
jnxFruPowerOn	1.3.6.1.4.1.2636.4.1.8	The FRU has been powered on in the chassis.
jnxFruRemoval	1.3.6.1.4.1.2636.4.1.5	The FRU has been removed from the chassis.
jnxOverTemperature	1.3.6.1.4.1.2636.4.1.3	Several fans have failed or the room temperature has increased significantly. This trap is repeated every minute until the temperature is brought down to normal.
jnxPowerSupplyFailure	1.3.6.1.4.1.2636.4.1.1	The power supply, router circuit breaker, or power circuit failed, or there has been a power outage. This trap is generated every hour until the power supply is restored.
jnxPowerSupplyOK	1.3.6.1.4.1.2636.4.2.1	The power supply has recovered from a failure.
jnxRedundancySwitchover	1.3.6.1.4.1.2636.4.1.4	A redundant backup unit that can be brought online, manually or automatically, if the main unit malfunctions.
jnxTemperatureOK	1.3.6.1.4.1.2636.4.2.3	The component sensor has detected an overtemperature condition.

Chassis Definitions for Router Model MIB

The enterprise-specific Chassis Definitions for Router Model MIB contain the OIDs that are used by the Chassis MIB to identify platform and chassis components. The Chassis MIB provides information that changes often. The Chassis Definitions for Router Model MIB provide information that changes less often.

The last number in each sysObjectId, shown in Table 69 on page 385, corresponds to the router model and therefore does not change.

Table 69: Router Models and Their sysObjectIds

Model	SysObjectID	jnxProductName
J2300	1.3.6.1.4.1.2636.1.1.1.2.13	jnxProductNameJ2300
J4300	1.3.6.1.4.1.2636.1.1.1.2.14	jnxProductNameJ4300
J6300	1.3.6.1.4.1.2636.1.1.1.2.15	jnxProductNameJ6300
M5	1.3.6.1.4.1.2636.1.1.1.2.5	jnxProductNameM5
M7i	1.3.6.1.4.1.2636.1.1.1.2.10	jnxProductNameM7i
M10	1.3.6.1.4.1.2636.1.1.1.2.4	jnxProductNameM10
M10i	1.3.6.1.4.1.2636.1.1.1.2.11	jnxProductNameM10i
M20	1.3.6.1.4.1.2636.1.1.1.2.2	jnxProductNameM20
M40	1.3.6.1.4.1.2636.1.1.1.2.1	jnxProductNameM40
M40e	1.3.6.1.4.1.2636.1.1.1.2.8	jnxProductNameM40e
M120	1.3.6.1.4.1.2636.1.1.1.2.18	jnxProductNameM120
M160	1.3.6.1.4.1.2636.1.1.1.2.3	jnxProductNameM160
M320	1.3.6.1.4.1.2636.1.1.1.2.9	jnxProductNameM320
MX960	1.3.6.1.4.1.2636.1.1.1.2.21	jnxProductNameMX960
MX480	1.3.6.1.4.1.2636.1.1.1.1.25	jnxProductNameMX480
MX240	1.3.6.1.4.1.2636.1.1.1.1.29	jnxProductNameMX240
EX3200	1.3.6.1.4.1.2636.1.1.1.1.30	jnxProductNameEX3200
EX4200	1.3.6.1.4.1.2636.1.1.1.1.31	jnxProductNameEX4200
EX8208	1.3.6.1.4.1.2636.1.1.1.1.32	jnxProductNameEX8208
EX8216	1.3.6.1.4.1.2636.1.1.1.1.33	jnxProductNameEX8216
SRX 3400	1.3.6.1.4.1.2636.1.1.1.2.35	jnxProductNameSRX3400

Table 69: Router Models and Their sysObjectIds *(continued)*

Model	SysObjectID	jnxProductName
SRX 3600	1.3.6.1.4.1.2636.1.1.1.2.34	jnxProductNameSRX3600
SRX 5600	1.3.6.1.4.1.2636.1.1.1.2.28	jnxProductNameSRX5600
SRX 5800	1.3.6.1.4.1.2636.1.1.1.2.26	jnxProductNameSRX5800
TX	1.3.6.1.4.1.2636.1.1.1.2.17	jnxProductNameTX
T320	1.3.6.1.4.1.2636.1.1.1.2.7	jnxProductNameT320
T640	1.3.6.1.4.1.2636.1.1.1.2.6	jnxProductNameT640

For a downloadable version of the Chassis Definitions for Router Model MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-chas-defines.txt.

MIB Objects for the M120 Router

New Chassis Management Information Base (MIB) objects for the M120 router include:

```
jnxProductLineM120      OBJECT IDENTIFIER ::= { jnxProductLine      18 }
jnxProductNameM120      OBJECT IDENTIFIER ::= { jnxProductName      18 }
jnxProductModelM120     OBJECT IDENTIFIER ::= { jnxProductModel     18 }
jnxProductVariationM120 OBJECT IDENTIFIER ::= { jnxProductVariation 18 }
jnxChassisM120          OBJECT IDENTIFIER ::= { jnxChassis          18 }
jnxSlotM120             OBJECT IDENTIFIER ::= { jnxSlot             18 }
  jnxM120SlotFPC        OBJECT IDENTIFIER ::= { jnxSlotM120 1  }
  jnxM120SlotFEB        OBJECT IDENTIFIER ::= { jnxSlotM120 2  }
  jnxM120SlotHM         OBJECT IDENTIFIER ::= { jnxSlotM120 3  }
  jnxM120SlotPower      OBJECT IDENTIFIER ::= { jnxSlotM120 4  }
  jnxM120SlotFan        OBJECT IDENTIFIER ::= { jnxSlotM120 5  }
  jnxM120SlotCB         OBJECT IDENTIFIER ::= { jnxSlotM120 6  }
  jnxM120SlotFPB        OBJECT IDENTIFIER ::= { jnxSlotM120 7  }

jnxMediaCardSpaceM120      OBJECT IDENTIFIER ::= { jnxMediaCardSpace    18 }
  jnxM120MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceM120 1 }

jnxMidplaneM120         OBJECT IDENTIFIER ::= { jnxBackplane        18 }
jnxModuleM120           OBJECT IDENTIFIER ::= { jnxModule           18 }
  jnxM120FEB            OBJECT IDENTIFIER ::= { jnxModuleM120   1 }
```

NOTE: The M120 router does not support the enterprise-specific Dynamic Flow Capture MIB.

Sample command output from the show chassis hardware command for the M120 router is listed below.

```
user@host> show chassis hardware
```

```
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN000019AC        M120
Midplane         REV 01   710-011382   RB3003            M120 Midplane
FPM Board        REV 01   710-011407   CK9165            M120 FPM Board
FPM Display      REV 01   710-011405   CE0032            M120 FPM Display
FPM CIP          REV 01   710-011410   CE0058            M120 FPM CIP
PEM 1            Rev 01   740-011935   RG10165           DC Power Entry Module
Routing Engine 0 REV 00   740-014082   1000604605        RE-A-2000
Routing Engine 1 REV 00   740-014082   1000604601        RE-A-2000
CB 0             REV 03   710-011403   CM8335            M120 Control Board
CB 1             REV 03   710-011403   CM8340            M120 Control Board
FPC 0            REV 01   710-012879   CH1622            M120 CFPC OC192
  PIC 0                   BUILTIN      BUILTIN           1x OC-192 SONET XFP
    Xcvr 0                NON-JNPR     T05J32698         XFP-OC192-SR
FPC 1            REV 01   710-012882   CE0062            M120 CFPC 10GE
  PIC 0                   BUILTIN      BUILTIN           1x 10GE(LAN/WAN) XFP
    Xcvr 0                NON-JNPR     T05A02227         XFP-10G-ER
FPC 2            REV 01   710-011388   CJ9092            M120 FPC Type 1
  PIC 0          REV 16   750-007444   HS1526            1x CHOC3 IQ SONET, SMIR

  PIC 1          REV 12   750-005637   HT0533            4x CHDS3 IQ
  PIC 2          REV 15   750-005634   HN1903           1x CHOC12 IQ SONET, SMIR

  PIC 3          REV 15   750-007631   NB5006            10x CHE1 IQ
  Board B        REV 01   710-011390   CJ9109            M120 FPC Mezz Board
FPC 3            REV 03   710-011393   CJ9231            M120 FPC Type 2
  PIC 0          REV 05   750-010472   JE3146            1x OC-48 ATM-II IQ
    Xcvr 0       REV 01   740-009028   P5F05WU           SFP-SR
  PIC 1          REV 13   750-001901   HB4231            4x OC-12 SONET, SMIR
  PIC 2          REV 15   750-008155   HX5442            2x G/E IQ, 1000 BASE
    Xcvr 0       REV      740-007326   P11E5RR           SFP-SX
    Xcvr 1       REV 01   740-009029   4C81050           UNKNOWN
  PIC 3          REV 16   750-008155   HZ8871            2x G/E IQ, 1000 BASE
    Xcvr 0       REV 01   740-011613   P8E2KGF           SFP-SX
    Xcvr 1       REV 01   740-011782   P6M1E5X           SFP-SX
  Board B        REV 02   710-011395   CN3750            M120 FPC Mezz
FPC 4            REV 01   710-011388   CJ9089            M120 FPC Type 1
  PIC 0          REV 03   750-002911   AJ2279            4x F/E, 100 BASE-TX
  PIC 1          REV 15   750-005634   HN0435           1x CHOC12 IQ SONET, SMIR

  PIC 2          REV 02   750-003064   HD4548            4x T1, RJ48
  PIC 3          REV 04   750-011209   JC8254            Adaptive Services-II
  Board B        REV 01   710-011390   CJ9111            M120 FPC Mezz Board
FPC 5            REV 01   710-011388   CJ9360            M120 FPC Type 1
  PIC 0          REV 08   750-007631   HK0212            10x CHE1 IQ
  PIC 1          REV 05   750-003034   BD8705            4x OC-3 SONET, SMIR
  PIC 2          REV 11   750-007643   NA5967            1x G/E IQ, 1000 BASE
    Xcvr 0       REV 01   740-007326   P4R0PNZ           SFP-SX
  PIC 3          REV 16   750-007444   HS1501            1x CHSTM1 IQ SDH, SMIR
  Board B        REV 01   710-011390   CJ9099            M120 FPC Mezz Board
FEB 0            REV 04   710-011663   CJ9364            M120 FEB
FEB 1            REV 04   710-011663   CJ9385            M120 FEB
FEB 2            REV 02   710-015795   CP6830            M120 FEB
FEB 3            REV 01   710-011663   CM2585            M120 FEB
FEB 4            REV 04   710-011663   CJ9416            M120 FEB
FEB 5            REV 01   710-011663   CM2600            M120 FEB
```

MIB Objects for the MX960 Ethernet Services Router

The Chassis MIB objects for the MX960 Ethernet Services Router include:

```
  jnxProductLineX960      OBJECT IDENTIFIER ::= { jnxProductLine      21 }
  jnxProductNameX960      OBJECT IDENTIFIER ::= { jnxProductName      21 }
  jnxProductModelX960     OBJECT IDENTIFIER ::= { jnxProductModel     21 }
  jnxProductVariationX960 OBJECT IDENTIFIER ::= { jnxProductVariation 21 }
  jnxChassisX960          OBJECT IDENTIFIER ::= { jnxChassis          21 }
  jnxSlotX960             OBJECT IDENTIFIER ::= { jnxSlot             21 }
    jnxX960SlotFPC        OBJECT IDENTIFIER ::= { jnxSlotX960 1  }
    jnxX960SlotHM         OBJECT IDENTIFIER ::= { jnxSlotX960 2  }
    jnxX960SlotPower      OBJECT IDENTIFIER ::= { jnxSlotX960 3  }
    jnxX960SlotFan        OBJECT IDENTIFIER ::= { jnxSlotX960 4  }
    jnxX960SlotCB         OBJECT IDENTIFIER ::= { jnxSlotX960 5  }
    jnxX960SlotFPB        OBJECT IDENTIFIER ::= { jnxSlotX960 6  }
  jnxMediaCardSpaceX960      OBJECT IDENTIFIER ::= { jnxMediaCardSpace 21 }
    jnxX960MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceX960 1 }
  jnxMidplaneX960         OBJECT IDENTIFIER ::= { jnxBackplane        21 }
```

MIB Objects for the MX480 Ethernet Services Router

The Chassis MIB objects for the MX480 Ethernet Services Router include:

```
jnxProductLineMX480      OBJECT IDENTIFIER ::= { jnxProductLine      25 }
  jnxProductNameMX480      OBJECT IDENTIFIER ::= { jnxProductName      25 }
  jnxProductModelMX480     OBJECT IDENTIFIER ::= { jnxProductModel     25 }
  jnxProductVariationMX480 OBJECT IDENTIFIER ::= { jnxProductVariation 25 }
  jnxChassisMX480          OBJECT IDENTIFIER ::= { jnxChassis          25 }

  jnxSlotMX480             OBJECT IDENTIFIER ::= { jnxSlot             25 }
    jnxMX480SlotFPC        OBJECT IDENTIFIER ::= { jnxSlotMX480 1  }
    jnxMX480SlotHM         OBJECT IDENTIFIER ::= { jnxSlotMX480 2  }
    jnxMX480SlotPower      OBJECT IDENTIFIER ::= { jnxSlotMX480 3  }
    jnxMX480SlotFan        OBJECT IDENTIFIER ::= { jnxSlotMX480 4  }
    jnxMX480SlotCB         OBJECT IDENTIFIER ::= { jnxSlotMX480 5  }
    jnxMX480SlotFPB        OBJECT IDENTIFIER ::= { jnxSlotMX480 6  }

  jnxMediaCardSpaceMX480      OBJECT IDENTIFIER ::= { jnxMediaCardSpace    25 }
  jnxMX480MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceMX480 1 }


  jnxMidplaneMX480         OBJECT IDENTIFIER ::= { jnxBackplane        25 }
```

MIB Objects for the MX240 Ethernet Services Router

The Chassis MIB objects for the MX240 Ethernet Services Router include:

```
jnxProductLineMX240      OBJECT IDENTIFIER ::= { jnxProductLine      29 }
  jnxProductNameMX240      OBJECT IDENTIFIER ::= { jnxProductName      29 }
  jnxProductModelMX240     OBJECT IDENTIFIER ::= { jnxProductModel     29 }
  jnxProductVariationMX240 OBJECT IDENTIFIER ::= { jnxProductVariation 29 }
  jnxChassisMX240          OBJECT IDENTIFIER ::= { jnxChassis          29 }

  jnxSlotMX240             OBJECT IDENTIFIER ::= { jnxSlot             29 }
```

```
  jnxMX240SlotFPC          OBJECT IDENTIFIER ::= { jnxSlotMX240 1  }
  jnxMX240SlotHM           OBJECT IDENTIFIER ::= { jnxSlotMX240 2  }
  jnxMX240SlotPower        OBJECT IDENTIFIER ::= { jnxSlotMX240 3  }
  jnxMX240SlotFan          OBJECT IDENTIFIER ::= { jnxSlotMX240 4  }
  jnxMX240SlotCB           OBJECT IDENTIFIER ::= { jnxSlotMX240 5  }
  jnxMX240SlotFPB          OBJECT IDENTIFIER ::= { jnxSlotMX240 6  }

  jnxMediaCardSpaceMX240   OBJECT IDENTIFIER ::= { jnxMediaCardSpace    29 }
  jnxMX240MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceMX240 1 }

  jnxMidplaneMX240         OBJECT IDENTIFIER ::= { jnxBackplane         29 }
```

MIB Objects for the EX-Series Ethernet Switches

The Chassis MIB objects for the EX-series Ethernet switches include:

```
jnxProductLineEX3200      OBJECT IDENTIFIER ::= { jnxProductLine      30 }
jnxProductNameEX3200    OBJECT IDENTIFIER ::= { jnxProductName      30 }
jnxProductModelEX3200   OBJECT IDENTIFIER ::= { jnxProductModel     30 }
jnxProductVariationEX3200 OBJECT IDENTIFIER ::= { jnxProductVariation 30 }
  jnxProductEX3200port24T  OBJECT IDENTIFIER ::= { jnxProductVariationEX3200 1 }

  jnxProductEX3200port24P  OBJECT IDENTIFIER ::= { jnxProductVariationEX3200 2 }

  jnxProductEX3200port48T  OBJECT IDENTIFIER ::= { jnxProductVariationEX3200 3 }

  jnxProductEX3200port48P  OBJECT IDENTIFIER ::= { jnxProductVariationEX3200 4 }


  jnxChassisEX3200          OBJECT IDENTIFIER ::= { jnxChassis          30 }

  jnxSlotEX3200             OBJECT IDENTIFIER ::= { jnxSlot             30 }
    jnxEX3200SlotFPC        OBJECT IDENTIFIER ::= { jnxSlotEX3200 1 }
      jnxEX3200SlotPower    OBJECT IDENTIFIER ::= { jnxEX3200SlotFPC 1 }
      jnxEX3200SlotFan      OBJECT IDENTIFIER ::= { jnxEX3200SlotFPC 2 }
      jnxEX3200SlotRE       OBJECT IDENTIFIER ::= { jnxEX3200SlotFPC 3 }

  jnxMediaCardSpaceEX3200      OBJECT IDENTIFIER ::= { jnxMediaCardSpace    30 }

    jnxEX3200MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceEX3200 1
 }

  jnxModuleEX3200            OBJECT IDENTIFIER ::= { jnxModule    30 }
    jnxEX3200FPC             OBJECT IDENTIFIER ::= { jnxModuleEX3200 1 }
      jnxEX3200Power         OBJECT IDENTIFIER ::= { jnxEX3200FPC 1 }
      jnxEX3200Fan           OBJECT IDENTIFIER ::= { jnxEX3200FPC 2 }
      jnxEX3200RE            OBJECT IDENTIFIER ::= { jnxEX3200FPC 3 }

jnxProductLineEX4200      OBJECT IDENTIFIER ::= { jnxProductLine      31 }
jnxProductNameEX4200      OBJECT IDENTIFIER ::= { jnxProductName      31 }
jnxProductModelEX4200     OBJECT IDENTIFIER ::= { jnxProductModel     31 }
jnxProductVariationEX4200 OBJECT IDENTIFIER ::= { jnxProductVariation 31 }
  jnxProductEX4200port24T  OBJECT IDENTIFIER ::= { jnxProductVariationEX4200 1 }

  jnxProductEX4200port24P  OBJECT IDENTIFIER ::= { jnxProductVariationEX4200 2 }

  jnxProductEX4200port48T  OBJECT IDENTIFIER ::= { jnxProductVariationEX4200 3 }
```

```
 jnxProductEX4200port48P  OBJECT IDENTIFIER ::= { jnxProductVariationEX4200 4 }

 jnxProductEX4200port24F  OBJECT IDENTIFIER ::= { jnxProductVariationEX4200 5 }


 jnxChassisEX4200          OBJECT IDENTIFIER ::= { jnxChassis          31 }
   jnxEX4200RE0            OBJECT IDENTIFIER ::= { jnxChassisEX4200 1  }
   jnxEX4200RE1            OBJECT IDENTIFIER ::= { jnxChassisEX4200 2  }
 jnxSlotEX4200             OBJECT IDENTIFIER ::= { jnxSlot             31 }
   jnxEX4200SlotFPC        OBJECT IDENTIFIER ::= { jnxSlotEX4200 1 }
     jnxEX4200SlotPower    OBJECT IDENTIFIER ::= { jnxEX4200SlotFPC 1 }
     jnxEX4200SlotFan      OBJECT IDENTIFIER ::= { jnxEX4200SlotFPC 2 }

 jnxMediaCardSpaceEX4200      OBJECT IDENTIFIER ::= { jnxMediaCardSpace    31 }

   jnxEX4200MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceEX4200 1
}

jnxModuleEX4200            OBJECT IDENTIFIER ::= { jnxModule    31 }
   jnxEX4200FPC            OBJECT IDENTIFIER ::= { jnxModuleEX4200 1 }
     jnxEX4200Power        OBJECT IDENTIFIER ::= { jnxEX4200FPC 1 }
     jnxEX4200Fan          OBJECT IDENTIFIER ::= { jnxEX4200FPC 2 }
```

MIB Objects for the SRX 3400 Services Gateway

The chassis MIB objects for the SRX 3400 Services Gateway include:

```
 jnxProductLineSRX3400      OBJECT IDENTIFIER ::= { jnxProductLine  35 }
 jnxProductNameSRX3400      OBJECT IDENTIFIER ::= { jnxProductName  35 }
 jnxProductModelSRX3400     OBJECT IDENTIFIER ::= { jnxProductModel  35 }
 jnxProductVariationSRX3400 OBJECT IDENTIFIER ::= { jnxProductVariation 35 }
 jnxChassisSRX3400          OBJECT IDENTIFIER ::= { jnxChassis  35 }

 jnxSlotSRX3400             OBJECT IDENTIFIER ::= { jnxSlot 35 }

   jnxSRX3400SlotFPC        OBJECT IDENTIFIER ::= { jnxSlotSRX3400 1  }
   jnxSRX3400SlotHM         OBJECT IDENTIFIER ::= { jnxSlotSRX3400 2  }
   jnxSRX3400SlotPower      OBJECT IDENTIFIER ::= { jnxSlotSRX3400 3  }
   jnxSRX3400SlotFan        OBJECT IDENTIFIER ::= { jnxSlotSRX3400 4  }
   jnxSRX3400SlotCB         OBJECT IDENTIFIER ::= { jnxSlotSRX3400 5  }
   jnxSRX3400SlotFPB        OBJECT IDENTIFIER ::= { jnxSlotSRX3400 6  }

jnxMediaCardSpaceSRX3400    OBJECT IDENTIFIER ::= { jnxMediaCardSpace  35 }
jnxSRX3400MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceSRX3400 1}


jnxMidplaneSRX3400          OBJECT IDENTIFIER ::= { jnxBackplane 35 }
```

MIB Objects for the SRX 3600 Services Gateway

The chassis MIB objects for the SRX 3600 Services Gateway include:

```
 jnxProductLineSRX3600       OBJECT IDENTIFIER ::= { jnxProductLine  34 }
```

```
  jnxProductNameSRX3600       OBJECT IDENTIFIER ::= { jnxProductName  34 }
  jnxProductModelSRX3600      OBJECT IDENTIFIER ::= { jnxProductModel  34 }
  jnxProductVariationSRX3600  OBJECT IDENTIFIER ::= { jnxProductVariation 34 }
  jnxChassisSRX3600           OBJECT IDENTIFIER ::= { jnxChassis  34 }

   jnxSlotSRX3600             OBJECT IDENTIFIER ::= { jnxSlot 34 }
    jnxSRX3600SlotFPC         OBJECT IDENTIFIER ::= { jnxSlotSRX3600 1 }
    jnxSRX3600SlotHM          OBJECT IDENTIFIER ::= { jnxSlotSRX3600 2 }
    jnxSRX3600SlotPower       OBJECT IDENTIFIER ::= { jnxSlotSRX3600 3 }
    jnxSRX3600SlotFan         OBJECT IDENTIFIER ::= { jnxSlotSRX3600 4 }
    jnxSRX3600SlotCB          OBJECT IDENTIFIER ::= { jnxSlotSRX3600 5 }
    jnxSRX3600SlotFPB         OBJECT IDENTIFIER ::= { jnxSlotSRX3600 6 }

  jnxMediaCardSpaceSRX3600    OBJECT IDENTIFIER ::= { jnxMediaCardSpace  34 }
  jnxSRX3600MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceSRX3600
1}

  jnxMidplaneSRX3600          OBJECT IDENTIFIER ::= { jnxBackplane  34 }
```

MIB Objects for the SRX 5600 Services Gateway

The Chassis MIB objects for the SRX 5600 Services Gateway include:

```
jnxProductLineSRX5600      OBJECT IDENTIFIER ::= { jnxProductLine      28 }
  jnxProductNameSRX5600      OBJECT IDENTIFIER ::= { jnxProductName      28 }
  jnxProductModelSRX5600     OBJECT IDENTIFIER ::= { jnxProductModel     28 }
  jnxProductVariationSRX5600 OBJECT IDENTIFIER ::= { jnxProductVariation 28 }
  jnxChassisSRX5600          OBJECT IDENTIFIER ::= { jnxChassis          28 }

  jnxSlotSRX5600             OBJECT IDENTIFIER ::= { jnxSlot             28 }
    jnxSRX5600SlotFPC        OBJECT IDENTIFIER ::= { jnxSlotSRX5600 1  }
    jnxSRX5600SlotHM         OBJECT IDENTIFIER ::= { jnxSlotSRX5600 2  }
    jnxSRX5600SlotPower      OBJECT IDENTIFIER ::= { jnxSlotSRX5600 3  }
    jnxSRX5600SlotFan        OBJECT IDENTIFIER ::= { jnxSlotSRX5600 4  }
    jnxSRX5600SlotCB         OBJECT IDENTIFIER ::= { jnxSlotSRX5600 5  }
    jnxSRX5600SlotFPB        OBJECT IDENTIFIER ::= { jnxSlotSRX5600 6  }

  jnxMediaCardSpaceSRX5600      OBJECT IDENTIFIER ::= { jnxMediaCardSpace    28
}
  jnxSRX5600MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceSRX5600 1
 }


  jnxMidplaneSRX5600         OBJECT IDENTIFIER ::= { jnxBackplane        28 }
```

MIB Objects for the SRX 5800 Services Gateway

The Chassis MIB objects for the SRX 5800 Services Gateway include:

```
jnxProductLineSRX5800      OBJECT IDENTIFIER ::= { jnxProductLine      26 }
  jnxProductNameSRX5800      OBJECT IDENTIFIER ::= { jnxProductName      26 }
  jnxProductModelSRX5800     OBJECT IDENTIFIER ::= { jnxProductModel     26 }
  jnxProductVariationSRX5800 OBJECT IDENTIFIER ::= { jnxProductVariation 26 }
  jnxChassisSRX5800          OBJECT IDENTIFIER ::= { jnxChassis          26 }
```

```
  jnxSlotSRX5800             OBJECT IDENTIFIER ::= { jnxSlot             26 }
    jnxSRX5800SlotFPC        OBJECT IDENTIFIER ::= { jnxSlotSRX5800 1  }
    jnxSRX5800SlotHM         OBJECT IDENTIFIER ::= { jnxSlotSRX5800 2  }
    jnxSRX5800SlotPower      OBJECT IDENTIFIER ::= { jnxSlotSRX5800 3  }
    jnxSRX5800SlotFan        OBJECT IDENTIFIER ::= { jnxSlotSRX5800 4  }
    jnxSRX5800SlotCB         OBJECT IDENTIFIER ::= { jnxSlotSRX5800 5  }
    jnxSRX5800SlotFPB        OBJECT IDENTIFIER ::= { jnxSlotSRX5800 6  }

  jnxMediaCardSpaceSRX5800      OBJECT IDENTIFIER ::= { jnxMediaCardSpace    26
}
    jnxSRX5800MediaCardSpacePIC OBJECT IDENTIFIER ::= { jnxMediaCardSpaceSRX5800
 1 }

  jnxMidplaneSRX5800         OBJECT IDENTIFIER ::= { jnxBackplane        26 }
```

Chapter 23

Interpreting the Enterprise-Specific Destination Class Usage MIB

The enterprise-specific Destination Class Usage (DCU) Management Information Base (MIB) counts packets from customers by performing a lookup of the IP destination address. DCU makes it possible to track traffic originating from the customer edge and destined for specific prefixes on the provider core router.

The DCU MIB is a subbranch of the jnxMibs branch of the enterprise-specific MIB {enterprise 2636} and has an object identifier of {jnxMIB 6}. The DCU MIB has one branch, jnxDCUs, which contains two tables: jnxDCUsTable and jnxDcuStatsTable. For information about configuring source and destination class usage, see the *JUNOS Policy Framework Configuration Guide* and *JUNOS Network Interfaces Configuration Guide*. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-dcu.txt.

NOTE: Class-based filter match conditions are not supported on J-series Services Routers.

This chapter contains the following topics:

jnxDCUsTable

The entries in the jnxDCUsTable, whose object identifier is {jnxDCUTable 1}, are represented by jnxDCUsEntry and are listed in Table 70 on page 393.

Table 70: jnxDCUsEntry

Object	Object Identifier	Description
jnxDCUSrcIfIndex	jnxDUCsEntry 1	The interface index of the ingress interface
jnxDCUDstClassName	jnxDCUsEntry 2	The destination class name specified in a routing policy and applied to the forwarding table.

Table 70: jnxDCUsEntry *(continued)*

Object	Object Identifier	Description
jnxDCUPackets	jnxDCUsEntry3	The number of packets passing through the network.
jnxDCUBytes	jnxDCUsEntry 4	The number of bytes passing through the network.

jnxDcuStatsTable

jnxDcuStatsTable contains statistics for traffic that satisfies the rules in each configured destination class. A separate set of statistics is kept for each destination class on each interface and address family on which this feature is enabled. This is essentially a replacement for jnxDCUsTable.

The entries in the jnxDcuStatsTable, whose object identifier is {jnxDCUs 2}, are represented by jnxDCUsStatusEntry and are listed in Table 71 on page 394.

Table 71: jnxDCUsStatusEntry

Ojbect	Object Identifier	Description
jnxDcuStatsSrcIfIndex	jnxDcuStatsEntry 1	The interface index of the ingress interface for traffic counted in each entry.
jnxDcuStatsAddrFamily	jnxDcuStatsEntry 2	The address family of the entry's traffic.
nxDcuStatsClassName	jnxDcuStatsEntry 3	The name of the destination class that applies to the entry's traffic.
jnxDcuStatsPackets	jnxDcuStatsEntry 4	The number of packets received on this interface and belonging to this address family that match this destination class.
jnxDcuStatsBytes	jnxDcuStatsEntry 5	The number of bytes received on this interface and belonging to this address family that match this destination class.
jnxDcuStatsClName	jnxDcuStatsEntry 6	The name of the destination class. This object is a duplicate of jnxDcuStatsClassName and is included to satisfy those network management applications that cannot extract the destination class name from the instance portion of the OID.

Chapter 24

Interpreting the Enterprise-Specific BGP4 V2 MIB

The enterprise-specific Border Gateway Protocol version 4 (BGP4) V2 MIB, whose object identifier is {jnxBgpM2Experiment 1}, contains objects used to monitor BGP peer-received prefix counters. It is based upon similar objects in the MIB documented in Internet draft draft-ietf-idr-bgp4-mibv2-03.txt, *Definitions of Managed Objects for the Fourth Version of Border Gateway Protocol (BGP-4), Second Version*. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-bgpmib2.txt.

NOTE: For the BGP4 V2 MIB, the JUNOS software supports only the following objects: jnxBgpM2PrefixInPrefixes, jnxBgpM2PrefixInPrefixesAccepted, and jnxBgpM2PrefixInPrefixesRejected.

This chapter discusses the following topic:

jnxBgpM2PrefixCountersTable

jnxBgpM2PrefixCountersTable contains counters associated with a BGP peer.

JnxBgpM2PrefixCountersEntry

jnxBgpM2PrefixCountersEntry contains information about the prefix counters of a BGP peer, and the objects listed in Table 72 on page 395.

Table 72: jnxBgpM2PrefixCountersEntry

Object	Object Identifier	Description
jnxBgpM2PrefixInPrefixes	jnxBgpM2PrefixCountersEntry7	The total number of prefixes received from a peer.

Table 72: jnxBgpM2PrefixCountersEntry *(continued)*

Object	Object Identifier	Description
jnxBgpM2PrefixInPrefixesAccepted	jnxBgpM2PrefixCountersEntry 8	The total number of prefixes received from a peer that are eligible to be active in the routing table.
jnxBgpM2PrefixInPrefixesRejected	jnxBgpM2PrefixCountersEntry 9	The total number of prefixes received from a peer that are not eligible to be active in the routing table.

Chapter 25

Interpreting the Enterprise-Specific Ping MIB

The enterprise-specific Ping MIB extends the standard Ping MIB control table (RFC 2925). The Ping MIB, whose object identifier is {jnxMIbs 7}, allows you to monitor network delay (latency), packet loss, network delay variation (jitter), one-way latency, and other network statistics.

Items in this MIB are created when entries are created in the pingCtlTable of the Ping MIB. Each item is indexed exactly as in the Ping MIB.

To view a complete copy of the enterprise-specific extensions to the Ping MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ping.txt.

For more information on using the Ping MIB and enterprise-specific Ping MIB, see "SNMP Remote Operations" on page 87. For information about how to configure thresholds at the [edit services rpm] hierarchy level, see the *JUNOS Services Interfaces Configuration Guide*.

This section includes the following topics:

jnxPingCtlTable

The enterprise-specific Ping MIB structure includes one main object, jnxPingCtlTable, whose object identifier is jnxPingObjects 2, and defines the jnxPing control table for providing enterprise-specific options to the corresponding pingCtlEntry. jnxpingCtTable monitors thresholds; for example, the maximum allowed jitter in the trip time during a text.

jnxPingCtlEntry

Each jnxPingCtlEntry has two indexes identical to those of the corresponding pingCtlEntry. Entries created in pingCtlTable are mirrored here. jnxPingCtlEntry objects are listed in the Table 73 on page 398.

Table 73: jnxPingCtlEntry

Object	Object Identifier	Description
jnxCtlOwnerIndex	jnxPingCtlEntry 1	The first index. It is identical to the pingCtlOwnerIndex of the corresponding pingCtlEntry in the pingCtlTable.
jnxPingCtlTestName	jnxPingCtlEntry 2	The other index and is identical to the pingCtlTestName of the corresponding pingCtlEntry in the pingCtlTable.
jnxPingCtlIfName	jnxPingCtlEntry 3	Specifies the name of the outgoing interface for ping probes. This is the name-based complement to pingCtlIfIndex. A zero-length string value for this object means that this option is not enabled. The following values can be set simultaneously, but only one value is used. The precedence order is as follows: ■ pingCtlIfIndex (see pingCtlTable in the Ping MIB) ■ jnxPingCtlIfName ■ jnxPingCtlRoutingInstanceName
jnxPingCtlRoutingInstanceName	jnxPingCtlEntry 6	Specifies the name of the routing instance used when directing outgoing ping packets. The instance name specified must be configured at the [edit routing-instances] hierarchy level of the JUNOS configuration. The instance-type must be vrf.
jnxPingCtlRttThreshold	jnxPingCtlEntry 7	The maximum round-trip time allowed. If this threshold is crossed by any probe, a jnxPingRttThresholdExceeded trap will be sent.
jnxPingCtlRttStdDevThreshold	jnxPingCtlEntry 8	The maximum round-trip time standard deviation allowed over the course of any test. If the calculated standard deviation of the round-trip time at the end of any test exceeds this threshold, a jnxPingRttStdDevThresholdExceeded trap will be sent.

Table 73: jnxPingCtlEntry *(continued)*

Object	Object Identifier	Description
jnxPingCtlRttJitterThreshold	jnxPingCtlEntry 9	The maximum allowed jitter in the round-trip time over the course of any test. Jitter is the difference between the maximum and minimum round-trip times measured over the course of a single test (jnxPingResultsMaxRttUs minus jnxPingResultsMinRttUs). If the measured jitter exceeds this threshold, a jnxPingRttJitterThresholdExceeded trap is sent.
jnxPingCtlEgressTimeThreshold	jnxPingCtlEntry 10	Maximum egress trip time allowed. If this threshold is crossed by any probe, a jnxPingEgressThresholdExceeded trap will be sent. This applies only if the probe type (pingCtlType) provides one-way delay measurements. Currently jnxPingIcmpTimeStamp is the only supported probe type with this property.
jnxPingCtlEgressStdDevThreshold	jnxPingCtlEntry 11	The maximum egress trip time standard deviation allowed over the course of any test. If the calculated standard deviation of the egress trip time at the end of any test exceeds this threshold, a jnxPingEgressStdDevThresholdExceeded trap will be sent. This applies only if the probe type (pingCtlType) provides one-way delay measurements. The jnxPingIcmpTimeStamp is the only supported probe type with this property.
jnxPingCtlEgressJitterThreshold	jnxPingCtlEntry 12	The maximum allowed jitter in the egress trip time over the course of any test. Jitter is defined as the difference between the maximum and minimum egress trip times measured over the course of a single test (jnxPingResultsMaxSrcDstt minus jnxPingResultsMinSrcDstt). If the measured jitter exceeds this threshold, a jnxPingEgressJitterThresholdExceeded trap will be sent. This applies only if the probe type (pingCtlType) provides one-way delay measurements. The jnxPingIcmpTimeStamp is the only supported probe type with this property.
jnxPingCtlIngressTimeThreshold	jnxPingCtlEntry 13	The maximum ingress trip time allowed. If this threshold is crossed by any probe, a jnxPingIngressThresholdExceeded trap will be sent. This applies only if the probe type (pingCtlType) provides one-way delay measurements. The jnxPingIcmpTimeStamp is the only supported probe type with this property.

Table 73: jnxPingCtlEntry *(continued)*

Object	Object Identifier	Description
jnxPingCtlIngressStddevThreshold	jnxPingCtlEntry 14	The maximum ingress trip time standard deviation allowed over the course of any test. If the calculated standard deviation of the ingress trip time at the end of any test exceeds this threshold, a jnxPingIngressStddevThresholdExceeded trap will be sent. This applies only if the probe type (pingCtlType) provides one-way delay measurements. Currently jnxPingIcmpTimeStamp is the only supported probe type with this property.
jnxPingCtlIngressJitterThreshold	jnxPingCtlEntry 15	The maximum allowed jitter in the ingress trip time over the course of any test. Jitter is defined as the difference between the maximum and minimum ingress trip times measured over the course of a single test (jnxPingResultsMaxDstSrct minus jnxPingResultsMinDstSrct). If the measured jitter exceeds this threshold, a jnxPingIngressJitterThresholdExceeded trap will be sent. This applies only if the probe type (pingCtlType) provides one-way delay measurements. The jnxPingIcmpTimeStamp is the only supported probe type with this property.
jnxPingCtlTrapGeneration	jnxPingCtlEntry 16	The value of this object determines when and if to generate a notification for this entry. rttThreshold(0)—Generate a jnxPingRttThresholdExceeded notification when the configured RTT threshold is exceeded. rttStdDevThreshold(1)—Generate a jnxPingRttStdDevThresholdExceeded notification when the configured RTT standard deviation threshold is exceeded. rttJitterThreshold(2)—Generate a jnxPingRttJitterThresholdExceeded notification when the configured RTT jitter threshold is exceeded. egressThreshold(3)—Generate a jnxPingEgressThresholdExceeded notification when the configured egress threshold is exceeded. This applies only if the probe type supports one-way measurements.

Table 73: jnxPingCtlEntry *(continued)*

Object	Object Identifier	Description
		egressStdDevThreshold(4)—Generate a jnxPingEgressStdDevThresholdExceeded notification when the configured egress standard deviation threshold is exceeded. This applies only if the probe type supports one-way measurements. egressJitterThreshold(5)—Generate a jnxPingEgressJitterThresholdExceeded notification when the configured egress jitter threshold is exceeded. This applies only if the probe type supports one-way measurements. ingressThreshold(6)—Generate a jnxPingIngressThresholdExceeded notification when the configured ingress threshold is exceeded. This applies only if the probe type supports one-way measurements. ingressStdDevThreshold(7)—Generate a jnxPingIngressStdDevThresholdExceeded notification when the configured ingress standard deviation threshold is exceeded. This applies only if the probe type supports one way measurements. ingressJitterThreshold(8)—Generate a jnxPingIngressJitterThresholdExceeded notification when the configured ingress jitter threshold is exceeded. This applies only if the probe type supports one-way measurements. The value of this object defaults to zero, indicating that none of the above options have been selected.

jnxPingResultsTable

jnxPingResultsTable, whose object identifier is jnxPingObjects 3, gathers ping test results on traffic on round-trip, ingress, and egress trip delays. This useful when you want to measure the performance of your network and verify service-level agreements with your vendors.

■ jnxpingResultsEntry on page 401

jnxpingResultsEntry

The jnxPingResultsEntry objects are listed in Table 74 on page 402.

Table 74: jnxPingsResultsEntry

Object	Object Identifier	Description
jnxPingResultsRttUs	jnxPingResultsEntry 1	The round-trip delays measured for the most recent successful probe during this test, in microseconds.
jnxPingResultsSumRttUs	jnxPingResultsEntry 2	The sum of the round-trip delays measured for all the probes during this test, in microseconds.
jnxPingResultsMinRttUs	jnxPingResultsEntry 3	The minimum of the round-trip delays measured for all the probes during this test, in microseconds.
jnxPingResultsMaxRttUs	jnxPingResultsEntry 4	The maximum of the round-trip delays measured for all the probes during this test, in microseconds.
jnxPingResultsAvgRttUs	jnxPingResultsEntry 5	The average of the round-trip delays measured for all the probes during this test, in microseconds.
jnxPingResultsStdDevRttUs	jnxPingResultsEntry 6	The standard deviation of the round-trip delays measured during this test, in microseconds.
jnxPingResultsEgressUs	jnxPingResultsEntry 7	The egress trip delays measured for the most recent successful probe during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsMinEgressUs	jnxPingResultsEntry 8	The minimum of the egress trip delays measured over all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsMaxEgressUs	jnxPingResultsEntry 9	The maximum of the egress trip delays measured over all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsAvgEgressUs	jnxPingResultsEntry 10	The average of the egress trip delays measured over all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.

Table 74: jnxPingsResultsEntry *(continued)*

Object	Object Identifier	Description
jnxPingResultsStddevEgressUs	jnxPingResultsEntry 11	The standard deviation of the egress trip delays measured over all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsIngressUs	jnxPingResultsEntry 12	The ingress trip delays measured for the most recent successful probe during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsMinIngressUs	jnxPingResultsEntry 13	The minimum of the ingress trip delays measured over all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsMaxIngressUs	jnxPingResultsEntry 14	The maximum of the ingress trip delays measured over all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsAvgIngressUs	jnxPingResultsEntry 15	The average of the ingress trip delays measured over all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsStddevIngressUs	jnxPingResultsEntry 16	The standard deviation of the ingress trip delays measured over all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsJitterRttUs	jnxPingResultsEntry 17	The jitter of the round-trip delays measured for all probes during this test, in microseconds.

Table 74: jnxPingsResultsEntry *(continued)*

Object	Object Identifier	Description
jnxPingResultsJitterEngressUs	jnxPingResultsEntry 18	The jitter of the engress trip delays measured for all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsJitterIngressUs	jnxPingResultsEntry 19	The jitter of the ingress trip delays measured for all probes during this test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingResultsStatus	jnxPingResultsEntry 20	The result of the most recent probe.
jnxPingResultsTime	jnxPingResultsEntry 21	The date and time of the most recent probe result.
jnxPingResultsOwnerIndex	jnxPingResultsEntry 22	The first index. It has the same value as pingCtlOwnerIndex and is provided for applications that are unable to obtain the value of pingCtlOwnerIndex from the instance portion of the object identifiers belonging to this table.
jnxPingResultsTestName	jnxPingResultsEntry 23	The other index. It has the same value as pingCtlTestName and is provided for applications that are unable to obtain the value of pingCtlTestName from the instance portion of the object identifiers belonging to this table.

jnxPingProbeHistoryTable

jnxpingProbeHistoryTable, whose object identifier is jnxPingObjects 4, contains the history of all ping tests.

■ jnxPingProbeHistoryEntry on page 404

jnxPingProbeHistoryEntry

The jnxPingProbeHistoryEntry objects are listed in Table 75 on page 405.

Table 75: jnxPingProbeHistoryEntry

Object	Object Identifier	Description
jnxPingProbeHistoryResponseUs	jnxPingProbeHistoryEntry 1	The amount of time, in microseconds, from when a probe was sent to when its response was received or when it timed out. The value of this object is reported as 0 when it is not possible to transmit a probe.
jnxPingProbeHistoryJitterUs	jnxPingProbeHistoryEntry 2	The time difference, in microseconds, between the maximum and minimum round-trip times. Each history entry provides a running calculation of the jitter (calculated over the current test) at the time a probe was completed.
jnxPingProbeHistoryResponseEgressUs	jnxPingProbeHistoryEntry 3	The amount of time, in microseconds, from when a probe was sent to when it was received by destination. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, the value is irrelevant and will return 0.
jnxPingProbeHistoryResponseIngressUs	jnxPingProbeHistoryEntry 4	The amount of time, in microseconds, from when a probe was sent from the destination to when it was received. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, the value is irrelevant and will return 0.

Table 75: jnxPingProbeHistoryEntry *(continued)*

Object	Object Identifier	Description
jnxPingProbeHistoryEgressJitterUs	jnxPingProbeHistoryEntry 5	The time difference, in microseconds, between the maximum and minimum egress trip times. Each history entry provides a running calculation of the jitter (calculated over the current test) at the time a probe was completed. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, the value is irrelevant and will return 0.
jnxPingProbeHistoryIngressJitterUs	jnxPingProbeHistoryEntry 6	The time difference, in microseconds, between the maximum and minimum ingress trip times. Each history entry provides a running calculation of the jitter (calculated over the current test) at the time a probe was completed. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, the value is irrelevant and will return 0.

jnxPingLastTestResultTable

jnxPingLastTestResultTable, whose object identifier is jnxPingObjects 5, contains the results of the last completed ping tests. Entries corresponding to a test are created only after completion of the first test. This is useful when you want to ensure that a test has been completed before collecting test results.

■ jnxPingLastTestResultEntry on page 406

jnxPingLastTestResultEntry

The jnxPingLastTestResultEntry objects are listed in Table 76 on page 407.

Table 76: jnxPingLastTestResultEntry

Object	Object Identifier	Description
jnxPingLastTestResultProbeResponses	jnxPingLastTestResultEntry 1	The number of responses received in the most recently completed test.
jnxPingLastTestResultSentProbes	jnxPingLastTestResultEntry 2	The number of probes sent in the most recently completed test.
jnxPingLastTestResultSumRttUs	jnxPingLastTestResultEntry 3	The sum of the round-trip delays measured for all the probes during the most recently completed test, in microseconds.
jnxPingLastTestResultMinRttUs	jnxPingLastTestResultEntry 4	The minimum of the round-trip delays measured for all the probes during the most recently completed test, in microseconds.
jnxPingLastTestResultMaxRttUs	jnxPingLastTestResultEntry 5	The maximum of the round-trip delays measured for all the probes during the most recently completed test, in microseconds.
jnxPingLastTestResultAvgRttUs	jnxPingLastTestResultEntry 6	The average of the round-trip delays measured for all the probes during the most recently completed test, in microseconds.
jnxPingLastTestResultStdDevRttUs	jnxPingLastTestResultEntry 7	The standard deviation of the round-trip delays measured for all the probes during the most recently completed test, in microseconds.
jnxPingLastTestResultMinEgressUs	jnxPingLastTestResultEntry 8	The minimum of the egress trip delays measured over all probes during the most recently completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.

Table 76: jnxPingLastTestResultEntry *(continued)*

Object	Object Identifier	Description
jnxPingLastTestResultMaxEgressUs	jnxPingLastTestResultEntry 9	The maximum of the egress trip delays measured over all probes during the most recently completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingLastTestResultAvgEgressUs	jnxPingLastTestResultEntry 10	The average of the egress trip delays measured over all probes during the most recently completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingLastTestResultStddevEgressUs	jnxPingLastTestResultEntry 11	The standard deviation of the egress trip delays measured over all probes during the most recently completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingLastTestResultMinIngressUs	jnxPingLastTestResultEntry 12	The minimum of the ingress trip delays measured over all probes during the most recently completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.

Table 76: jnxPingLastTestResultEntry *(continued)*

Object	Object Identifier	Description
jnxPingLastTestResultMaxIngressUs	jnxPingLastTestResultEntry 13	The maximum of the ingress trip delays measured over all probes during the most recently completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingLastTestResultAvgIngressUs	jnxPingLastTestResultEntry 14	The average of the ingress trip delays measured over all probes during the most recently completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingLastTestResultStddevIngressUs	jnxPingLastTestResultEntry 15	The standard deviation of the ingress trip delays measured over all probes during the most recently completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingLastTestResultPeakToPeakJitterRttUs	jnxPingLastTestResultEntry 16	The difference between the minimum and maximum delays over the course of the last completed test, in microseconds.

Table 76: jnxPingLastTestResultEntry *(continued)*

Object	Object Identifier	Description
jnxPingLastTestResultPeakToPeakJitterEgressUs	jnxPingLastTestResultEntry 17	The difference between the minimum and maximum egress trip delays over the course of the last completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingLastTestResultPeakToPeakJitterIngressUs	jnxPingLastTestResultEntry 18	The difference between the minimum and maximum ingress trip delays over the course of the last completed test, in microseconds. This applies only if the probe type (pingCtlType) provides one-way delay measurements. For all other probe types, their values are irrelevant and will return 0.
jnxPingLastTestResultTime	jnxPingLastTestResultEntry 19	The time the last test was completed.

Chapter 26

Interpreting the Enterprise-Specific Traceroute MIB

The enterprise-specific Traceroute MIB supports the JUNOS software extensions of traceroutes and remote operations. Items in this MIB are created when entries are created in the traceRouteCtlTable of the Traceroute MIB. Each item is indexed exactly the same way as it is in the enterprise-specific Traceroute MIB. For a downloadable version of the Traceroute MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-traceroute.txt.

For more information on using the Traceroute MIB and enterprise-specific Traceroute MIB, see "SNMP Remote Operations" on page 87.

This chapter contains the following topic:

jnxTraceRouteCtlTable

The jnxTraceRouteCtlTable, whose object identifier is {jnxTraceRouteObjects 2}, defines the jnxTraceRoute control table for providing enterprise-specific options to the corresponding traceRouteCtlEntry.

jnxTraceRouteCtlEntry

Each jnxTraceRouteCtlEntry has two indexes that are identical to those of the corresponding TraceRouteCtlEntry. Entries created in TraceRouteCtlTable are mirrored here and are listed in Table 77 on page 411.

Table 77: jnxTraceRouteCtlTable

Object	Object Identifier	Description
jnxTRCtlOwnerIndex	jnxTraceRouteCtlEntry 1	The first index. It is identical to the jnxTraceRouteCtlOwnerIndex of the corresponding jnxTraceRouteCtlEntry in the jnxTraceRouteCtlTable.

Table 77: jnxTraceRouteCtlTable *(continued)*

Object	Object Identifier	Description
jnxTRCtlTestName	jnxTraceRouteCtlEntry 2	The other index. It is identical to the jnxTraceRouteCtlTestName of the corresponding jnxTraceRouteCtlEntry in the jnxTraceRouteCtlTable.
jnxTRCtlIfName	jnxTraceRouteCtlEntry 3	Specifies the name of the outgoing interface for traceroute probes. This is the name-based complement to traceRouteCtlIfIndex. A zero-length string value for this object means that this option is not enabled. The following values can be set simultaneously, but only one value is used. The precedence order is as follows: ■ traceRouteCtlIfIndex (see traceRouteCtlTable in the Traceroute MIB) ■ jnxTRCtlIfName ■ jnxTRCRoutingInstanceName
jnxTRCtlRoutingInstanceName	jnxTraceRouteCtlEntry 4	Specifies the name of the routing instance used when directing outgoing traceroute packets. The instance name specified must be configured at the [edit routing-instances] hierarchy level of the JUNOS configuration.

Chapter 27

Interpreting the Enterprise-Specific RMON Events and Alarms MIB

The enterprise-specific Remote Monitoring (RMON) Events and Alarms MIB monitors objects on a device and warns the network system administrator if one of those values exceeds the defined range. The alarm monitors objects in this MIB and triggers an event when the condition (falling or rising threshold) is reached.

The Juniper Networks enterprise-specific extension to the standard RMON MIB augments the alarmTable with additional information about each alarm. Two new traps, jnxRmonAlarmGetFailure and jnxRmonGetOk, are also defined to indicate when problems are encountered with an alarm.

To view a complete copy of the enterprise-specific extensions to the RMON MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-rmon.txt.

For more information on RMON alarms and events, see "Configuring RMON Alarms and Events" on page 223.

This chapter contains the following topics:

jnxRmonAlarmTable

The entries in the jnxRmonAlarmTable, whose object identifier is {jnxMibs 13}, are represented by jnxRmonAlarmEntry, whose object identifier is {jnxRmonAlarmTable1} and are listed in Table 78 on page 413.

Table 78: jnxRmonAlarmEntry

Object	Object Identifier	Description
jnxRmonAlarmGetFailCnt	jnxRmonAlarmEntry 1	Represents the number of times the internal Get request for the variable monitored by this entry has failed.
jnxRmonAlarmGetFailTime	jnxRmonAlarmEntry 2	Represents the value of sysUpTime when an internal Get request for the variable monitored by this entry last failed.

Table 78: jnxRmonAlarmEntry *(continued)*

Object	Object Identifier	Description
jnxRmonAlarmGetFailReason	jnxRmonAlarmEntry 3	■ Represents the reason an internal Get request for the variable monitored by this entry last failed. This object contains the following values: ■ other (1)—An error was encountered that does not fit into one of the currently defined categories. ■ noError (2)—Get request processed successfully. ■ noSuchObject (3)—Requested object not available. ■ outOfView (4)—Requested object instance out of MIB view. ■ noSuchInstance (5)—Requested object instance not available. ■ badReqId (6)—Unexpected request ID encountered while processing Get request. ■ oidMatchErr (7)—Unexpected object ID encountered while processing Get request. ■ oidBindErr (8)—Unable to bind object ID to Get request PDU. ■ createPktErr (9)—Unable to create Get request PDU. ■ badObjType (10)—Unexpected object type encountered while processing Get request.
jnxRmonAlarmGetOkTime	jnxRmonAlarmEntry 4	Represents the value of sysUpTime when an internal Get request for the variable monitored by this entry succeeded and the entry left the getFailure state.
jnxRmonAlarmState	jnxRmonAlarmEntry 5	Represents the current state of this RMON alarm entry. This object contains the following values: ■ unknown (1)—Alarm entry unknown ■ underCreation (2)—Alarm entry not activated ■ active (3)—Alarm entry active and within thresholds ■ startup (4)—Alarm entry still waiting for first value ■ risingThreshold (5)—Alarm entry has crossed the rising threshold. ■ fallingThreshold (6)—Alarm entry has crossed the falling threshold ■ getFailure (7)—Alarm entry internal Get request failed.

RMON Event and Alarm Traps

The following traps send notifications when there is a problem with RMON alarm processing and are listed in Table 79 on page 415.

Table 79: RMON Event and Alarm Traps

Trap	Object Identifier	Description
jnxRmonAlarmGetFailure	jnxRmonTrapPrefix 1	Generated when the Get request for an alarm variable returns an error. The specific error is identified by jnxRmonAlarmGetFailReason.
jnxRmonGetOk	jnxRmonTrapPrefix 2	Generated when the Get request for an alarm variable is successful. This trap is only sent after previous attempts are unsuccessful.

Chapter 28

Interpreting the Enterprise-Specific Reverse-Path-Forwarding MIB

The enterprise-specific Reverse-Path-Forwarding MIB monitors statistics for traffic that is rejected because of reverse-path-forwarding (RPF) processing. The Reverse-Path-Forwarding MIB includes one main object, jnxRpfStats, with an object identifier of {jnxRpf 1}. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-rpf.txt.

This chapter discusses the following topic:

jnxRpfStatsTable

The jnxRpfStatsTable, whose object identifier is {jnxRpfStats 1}, provides a list of RPF entries in table format.

jnxRpfStatsEntry

The jnxRpfStatsEntry, whose object identifier is {jnxRpfStatsTable 1}, has four objects, which are listed in Table 80 on page 417.

Table 80: jnxRpfStatsEntry

Object	Object Identifier	Description
jnxRpfStatsIfIndex	jnxRpfStatsEntry 1	The ingress interface for traffic that is counted in an RpfStats entry.
jnxRpfStatsAddrFamily	jnxRpfStatsEntry 2	The address family of an entry's traffic, which can be in IPv4 or IPv6 format.
jnxRpfStatsPackets	jnxRpfStatsEntry 3	The number of packets received on this interface, belonging to this address family, that have been rejected due to RPF processing.
jnxRpfStatsBytes	jnxRpfStatsEntry 4	The number of bytes received on this interface, belonging to this address family, that have been rejected due to RPF processing.

Chapter 29

Interpreting the Enterprise-Specific Source Class Usage MIB

The enterprise-specific Source Class Usage (SCU) MIB counts packets sent to customers by performing a lookup on the IP source address and the IP destination address. SCU makes it possible to track traffic originating from specific prefixes on the provider core and destined for specific prefixes on the customer edge.

The enterprise-specific SCU MIB is an object of the jnxMibs branch of the enterprise-specific MIB {enterprise 2636} and has an object identifier of {jnxMIB 16}. The enterprise-specific SCU MIB includes one object, jnxScuStats, which has an object identifier of {jnxScu 1}. For information about configuring source and destination class usage, see the *JUNOS Policy Framework Configuration Guide* and the *JUNOS Network Interfaces Configuration Guide*. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-scu.txt.

NOTE: Class-based filter match conditions are not supported on J-series Services Routers.

This chapter discusses the following topic:

jnxScuStatsTable

The jnxRpfStatsTable, whose object identifier is {jnxRpfStats 1}, provides a list of RPF entries in table format.

jnxRpfStatsEntry

The jnxRpfStatsEntry, whose object identifier is {jnxRpfStatsTable 1}, has four objects, which are listed in Table 81 on page 420.

Table 81: jnxRpfStatsEntry

Object	Object Identifier	Description
jnxRpfStatsIfIndex	jnxRpfStatsEntry 1	The ingress interface for traffic that is counted in an RpfStats entry.
jnxRpfStatsAddrFamily	jnxRpfStatsEntry 2	The address family of an entry's traffic, which can be in IPv4 or IPv6 format.
jnxRpfStatsPackets	jnxRpfStatsEntry 3	The number of packets received on this interface, belonging to this address family, that have been rejected due to RPF processing.
jnxRpfStatsBytes	jnxRpfStatsEntry 4	The number of bytes received on this interface, belonging to this address family, that have been rejected due to RPF processing.

Chapter 30

Interpreting the Enterprise-Specific Passive Monitoring MIB

The enterprise-specific Passive Monitoring MIB, whose object identifier is {jnxMibs 19}, performs traffic flow monitoring and lawful interception of packets transiting between two routers. This MIB allows you to do the following:

- Gather and export detailed information about Internet Protocol version 4 (IPv4) traffic flows between source and destination nodes in your network.
- Sample all incoming IPv4 traffic on the monitoring interface and present the data in cflowd record format.
- Encrypt or tunnel outgoing cflowd records, intercepted IPv4 traffic, or both.
- Direct filtered traffic to different packet analyzers and present the data in its original format.

The Passive Monitoring MIB has three tables: jnxPMonFlowTable, JnxPMonErrorTable, and jnxPMonMemoryTable. jnxPMonFlowTable monitors and collects statistics on the flow of traffic on a Passive Monitoring Physical Interface Card (PIC). jnxPMonErrorTable monitors and collects statistics on packet and memory errors on a Passive Monitoring PIC. jnxPMonMemoryTable monitors and collects statistics on memory usage on a Passive Monitoring PIC. For information about system requirements, see the *JUNOS Feature Guide*. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-pmon.txt.

This chapter documents only jnxPMonFlowTable.

This chapter contains the following topic:

jnxPMonFlowTable

jnxPMonFlowTable has an object identifier of {jnxPMon 1}. Its entries are represented by JnxPMonFlowEntry, which contains the objects listed in Table 82 on page 422.

Table 82: jnxPMFlowEntry

Object	Object Identifier	Description
jnxPMonCurrentActiveFlows	jnxPMonFlowEntry 1	Monitors the number of currently active flows on a Passive Monitoring PIC.
jnxPMonTotalFlows	jnxPMonFlowEntry 2	Monitors the total flows on a Passive Monitoring PIC.
jnxPMonTotalFlowsPackets	jnxPMonFlowEntry 3	Monitors the total packet flows on a Passive Monitoring PIC.
jnxPMonTenSecondAverageFlowsPackes	jnxPMonFlowEntry 4	Monitors the number of packets in all flows in a 10-second average on a Passive Monitoring PIC.
jnxPMonTotalFlowsBytes	jnxPMonFlowEntry 5	Monitors the number of total of bytes in all flows on a Passive Monitoring PIC.
jnxPMonTenSecondAverageFlowBytes	jnxPMonFlowEntry 6	Monitors the number of bytes in all flows in a 10-second average on a Passive Monitoring PIC.
jnxPMonTotalFlowsExpired	jnxPMonFlowEntry 7	Monitors the number of total flows expired on a Passive Monitoring PIC.
jnxPMonTotalFlowsAged	jnxPMonFlowEntry 8	Monitors the number of total flows aged on a Passive Monitoring PIC.
jnxPMonTotalFlowsExported	jnxPMonFlowEntry 9	Monitors the number of total flows exported on a Passive Monitoring PIC.
jnxPMonTotalFlowsPacketsExported	jnxPMonFlowEntry 10	Monitors the number of total flow packets exported on a Passive Monitoring PIC.

Chapter 31

Interpreting the Enterprise-Specific SONET/SDH Interface Management MIB

The enterprise-specific SONET/SDH Interface Management MIB sends the current alarm state for each SONET/SDH interface. When the alarm state changes on an interface, the MIB updates its alarm status. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-sonet.txt.

This chapter discusses the following topic:

jnxSonetAlarmsTable

The jnxSonetAlarmsTable, whose object identifier is {jnxSonetAlarm 1}, provides information about alarm status on SONET/SDH physical interfaces.

jnxSonetAlarmEntry

The jnxSonetAlarmEntry, whose object identifier is {jnxSonetAlarmTable 1}, has five objects, which are listed in Table 83 on page 423.

Table 83: jnxSonetAlarmTable

Object	Object Identifier	Description
jnxSonetCurrentAlarms	jnxSonetAlarmEntry 1	Identifies all the active SONET/SDH alarms on this interface.
jnxSonetLastAlarmId	jnxSonetAlarmEntry 2	Identifies the SONET/SDH alarm that most recently was set or cleared.
jnxSonetLastAlarmTime	jnxSonetAlarmEntry 3	The value of sysUpTime when the management subsystem learned of the last alarm event.
jnxSonetLastAlarmDate	jnxSonetAlarmEntry 4	The system date and time when the management subsystem learned of the last alarm event.
jnxSonetLastAlarmEvent	jnxSonetAlarmEntry 5	Indicates whether the last alarm event set a new alarm or cleared an existing alarm.

Table 84 on page 424 provides an example of jnxSonetAlarmInterface objects on an M20 router.

Table 84: jnxSonetAlarmInterface Objects in the jnxSonetAlarmTable of an M20 Router

Alarm Interface	CurrentAlarms	Last Alarm ID	Last Alarm Time (System Up Time)	Last Alarm Date and Time	Last Alarm Event
14	sonetLolAlarm(0) sonetLosAlarm(3)	sonetLosAlarm(3)	0:01:37.15	2002-10-15, 10:21:14.0,-7:0	set(2)
15	sonetLosAlarm(3)	sonetLosAlarm(3)	8 days, 4:09:46.22	2002-10-23,14:29:23.0,-7:0	set(2)
16	sonetLolAlarm(0) sonetLosAlarm(3)	sonetBerrSdAlarm(8)	8 days, 4:09:46.21	2002-10-23,14:29:23.0,-7:0	cleared(3)
17	sonetLofAlarm(2)	sonetLaisAlarm(5)	8 days, 4:09:47.21	2002-10-23,14:29:24.0,-7:0	cleared(3)
18	–	sonetLosAlarm(3)	7 days, 4:31:27.53	2002-10-22,14:51:4.0,-7:0	cleared(3)
19	sonetLolAlarm(0) sonetLosAlarm(3)	sonetLosAlarm(3)	0:01:37.16	2002-10-15,10:21:14.0,-7:0	set(2)
20	sonetLolAlarm(0) sonetLosAlarm(3)	sonetLosAlarm(3)	0:01:37.17	2002-10-15,10:21:14.0,-7:0	set(2)
21	–	sonetLofAlarm(2)	7 days, 11:15:00.15	2002-10-22,21:34:37.0,-7:0	cleared(3)
22	sonetLolAlarm(0) sonetLosAlarm(3)	sonetLolAlarm(0)	7 days, 6:33:32.02	2002-10-22,16:53:8.0,-7:0	set(2)
23	–	sonetLosAlarm(3)	7 days, 6:33:45.02	2002-10-22,16:53:21.0,-7:0	cleared(3)
24	sonetLolAlarm(0) sonetLosAlarm(3)	sonetLosAlarm(3)	0:01:37.07	2002-10-15,10:21:14.0,-7:0	set(2)
25	sonetLolAlarm(0) sonetLosAlarm(3)	sonetLosAlarm(3)	0:01:37.08	2002-10-15,10:21:14.0,-7:0	set(2)
26	–	–	0:00:00.00	0-0-0,0:0:0.0,	none(1)
27	sonetLolAlarm(0) sonetLosAlarm(3)	sonetLosAlarm(3)	0:01:38.04	2002-10-15,10:21:14.0,-7:0	set(2)
28	sonetLolAlarm(0) sonetLosAlarm(3)	sonetLosAlarm(3)	0:01:38.04	2002-10-15,10:21:14.0,-7:0	set(2)
29	sonetLolAlarm(0) sonetLosAlarm(3)	sonetLosAlarm(3)	0:01:38.04	2002-10-15,10:21:14.0,-7:0	set(2)

Chapter 32

Interpreting the Enterprise-Specific SONET APS MIB

The enterprise-specific SONET Automatic Protection Switching (APS) MIB monitors any SONET interface that participates in APS. APS is used by SONET add/drop multiplexers (ADMs) to protect against circuit failures. The JUNOS implementation of APS allows you to protect against circuit failures between an ADM and one or more routers, and between multiple interfaces in the same router. When a circuit or router fails, a backup immediately takes over. For more information about APS, see the *JUNOS Network Interfaces Configuration Guide*.

NOTE: The JUNOS software supports only read access, 1 + 1 architecture, bidirectional, revertive, and nonrevertive mode.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-sonetaps.txt.

This chapter discusses the following topics:

apsConfigTable

apsConfigTable lists the APS groups that are configured on the system.

apsConfigEntry

apsConfigEntry objects have read access only and are listed in Table 85 on page 426.

Table 85: apsConfigTable

Object	Object Identifier	Description
apsConfigName	apsConfigEntry 1	A text name for the APS group. An entry cannot exist in the active state unless all objects in the entry have an appropriate value. Also, all associated apsChanConfigEntry rows must represent a set of consecutive channel numbers beginning with 0 or 1, depending on the selected architecture.
apsConfigRowStatus	apsConfigEntry 2	The status of a APS group entry.
apsConfigMode	apsConfigEntry 3	The architecture of the APS group. The JUNOS software supports only the 1 + 1 architecture.
apsConfigRevert	apsConfigEntry 4	The revertive mode of the APS group. ■ Revertive mode—When the condition that caused a switch to the protection line has been cleared, the signal is switched back to the working line. Switching can optionally be revertive with 1 + 1 architecture. ■ Nonrevertive mode—Traffic remains on the protection line until another switch request is received.
apsConfigDirection	apsConfigEntry 5	The directional mode of the APS group. The JUNOS software supports only bidirectional mode. Bidirectional mode provides protection in both directions.
apsConfigExtraTraffic	apsConfigEntry 6	This object always returns the value disabled.
apsConfigSdBerThreshold	apsConfigEntry 7	The signal degrade bit error rate (BER). The negative value of this number is used as the exponent of 10 for computing the threshold value for the BER. For example, a value of 5 indicates a BER threshold of 10^-5.
apsConfigSfBerThreshold	apsConfigEntry 8	The signal failure bit error rate. The negative value of this number is used as the exponent of 10 for computing the threshold value for the BER. For example, a value of 5 indicates a BER threshold of 10^-5.
apsConfigWaitToRestore	apsConfigEntry 9	The wait to restore period, in seconds. After a condition that necessitated an automatic switch is cleared, the wait to restore period must elapse before reverting. This avoids rapid switch oscillations. GR-253-CORE specifies a range of 5 to 12 minutes. G.783 defines a 5 to 12 minute range in section 5.4.1.1.3, but also allows a shorter period in Table 2-1, WaitToRestore value (MI_WTRtime: 0..(5)..12 minutes).

Table 85: apsConfigTable *(continued)*

Object	Object Identifier	Description
apsConfigCreationTime	apsConfigEntry 10	The value of sysUpTime at the time the row was created.
apsConfigStorageType	apsConfigEntry 11	The storage type for this conceptual row. For information about conceptual rows, see RFC 2579, *Textual Conventions for SMIv2*.

apsStatusTable

apsStatusTable provides status information about configured APS groups.

■ apsStatusEntry on page 427

apsStatusEntry

apsStatusEntry objects have read access only and are listed in Table 86 on page 427.

Table 86: apsStatusTable

Object	Object Identifier	Description
apsStatusK1K2Rcv	apsStatusEntry 1	The current value of the K1 and K2 bytes received on the protection channel.
apsStatusK1K2Trans	apsStatusEntry 2	The current value of the K1 and K2 bytes transmitted on the protection channel.
apsStatusCurrent	apsStatusEntry 3	The current status of the APS group. This object has the following values: ■ modeMismatch—Modes other than 1 + 1 unidirectional monitor protection line K2 bit 5, which indicates the architecture, and K2 bits 6 through 8, which indicate whether the mode is unidirectional or bidirectional. A conflict between the current local mode and the received K2 mode information constitutes a mode mismatch. The JUNOS software supports only bidirectional mode. ■ channelMismatch—A mismatch between the transmitted K1 channel and the received K2 channel has been detected.

Table 86: apsStatusTable *(continued)*

Object	Object Identifier	Description
apsStatusCurrent (cont.)	apsStatusEntry 3	■ psbf—A protection switch byte failure (PSBF) is in effect. This condition occurs when either an inconsistent APS byte or an invalid code is detected. An inconsistent APS byte occurs when no 3 consecutive K1 bytes of the last 12 successive frames are identical, starting with the last frame containing a previously consistent byte. An invalid code occurs when the incoming K1 byte contains an unused code or a code irrelevant for the specific switching operation (for example, reverse request while no switching request is outstanding) in three consecutive frames. An invalid code also occurs when the incoming K1 byte contains an invalid channel number in three consecutive frames. ■ feplf—Modes other than 1 + 1 unidirectional monitor the K1 byte for far-end protection-line failures. A far-end protection-line defect is declared based on receiving a signal failure (SF) on the protection line. ■ extraTraffic—Indicates whether extra traffic is currently being accepted on the protection line. ■ extraTraffic—Indicates whether extra traffic is currently being accepted on the protection line.
apsStatusModeMismatches	apsStatusEntry 4	Counts mode mismatch conditions. Discontinuities in the value of this counter can occur when the management system is reinitialized, and at other times as indicated by the value of apsStatusDiscontinuityTime.
apsStatusChannelMis-matches	apsStatusEntry 5	Counts channel mismatch conditions. Discontinuities in the value of this counter can occur when the management system is reinitialized, and at other times as indicated by the value of apsStatusDiscontinuityTime.

Table 86: apsStatusTable *(continued)*

Object	Object Identifier	Description
apsStatusPSBFs	apsStatusEntry 6	Counts protection switch byte failure conditions. This condition occurs when either an inconsistent APS byte or an invalid code is detected. An inconsistent APS byte occurs when no 3 consecutive K1 bytes of the last 12 successive frames are identical, starting with the last frame containing a previously consistent byte. An invalid code occurs when the incoming K1 byte contains an unused code or a code irrelevant for the specific switching operation (for example, reverse request while no switching request is outstanding) in three consecutive frames. An invalid code also occurs when the incoming K1 byte contains an invalid channel number in three consecutive frames. Discontinuities in the value of this counter can occur when the management system is reinitialized, and at other times as indicated by the value of apsStatusDiscontinuityTime.
apsStatusFEPLFs	apsStatusEntry 7	Counts far-end protection-line failure conditions. This condition is declared based on receiving a signal failure (SF) on the protection line in the K1 byte. Discontinuities in the value of this counter can occur when the management system is reinitialized, and at other times as indicated by the value of apsStatusDiscontinuityTime.
apsStatusSwitchedChannel	apsStatusEntry 8	This field is set to the number of the channel that is currently switched to protection. The value 0 indicates that no channel is switched to protection. The values 1 through 14 indicate that the working channel is switched to protection.
apsStatusDiscontinuity-Time	apsStatusEntry 9	The value of sysUpTime when the last one or more of this APS group's counters experienced a discontinuity. The relevant counters are the specific instances associated with this APS group of any Counter32 object contained in apsStatusTable. If no such discontinuities have occurred since the last reinitialization of the local management subsystem, then this object contains a zero value.

apsChanConfigTable

apsChanConfigTable lists the APS channels that have been configured in APS groups.

■ apsChanConfigEntry on page 430

apsChanConfigEntry

apsChanConfigEntry objects have read access only and are listed in Table 87 on page 430.

Table 87: apsChanConfigTable

Object	Object Identifier	Description
apsChanConfigGroupName	apsChanConfigEntry 1	A text name for the APS group in which this channel is included.
apsChanConfigNumber	apsChanConfigEntry 2	A unique channel number within an APS group. The value 0 indicates the null channel. The values 1 through 14 define a working channel.
apsChanConfigRowStatus	apsChanConfigEntry 3	The status of this APS channel entry. An entry cannot exist in the active state unless all objects in the entry have an appropriate value. The JUNOS software supports only 1 + 1 architecture. The values 1 through 14 define a working channel. When an attempt is made to set the corresponding apsConfigRowStatus field to active, the apsChanConfigNumber values of all entries with equal apsChanConfigGroupName fields must be a set of consecutive integer values beginning with 0 or 1, depending on the architecture of the group, and ending with n, where n is greater than or equal to 1 and less than or equal to 14. Otherwise, the error inconsistentValue is returned to the apsConfigRowStatus set attempt.

Table 87: apsChanConfigTable *(continued)*

Object	Object Identifier	Description
apsChanConfigIfIndex	apsChanConfigEntry 4	The interface index assigned to a SONET LTE. This is an interface with ifType sonet(39). The value of this object must be unique among all instances of apsChanConfigIfIndex. In other words, a particular SONET LTE can only be configured in one APS group. This object cannot be set if the apsChanConfigGroupName instance associated with this row is equal to an instance of apsConfigName and the corresponding apsConfigRowStatus object is set to active. In other words, this value cannot be changed if the APS group is active. However, this value can be changed if the apsConfigRowStatus value is equal to notInService. The JUNOS software supports only read access.
apsChanConfigPriority	apsChanConfigEntry 5	The priority of the channel. This field returns the value low priority. The JUNOS software supports only 1 + 1 architecture.
apsChanConfigStorageType	apsChanConfigEntry 6	The storage type for this conceptual row. Conceptual rows having the value permanent need not allow write access to any columnar objects in the row. For information about conceptual rows, see RFC 2579, *Textual Conventions for SMIv2*.

apsChanStatusTable

apasChanStatusTable provides APS channel statistics.

- apsChanStatusEntry on page 431

apsChanStatusEntry

apsChanStatusEntry objects have read access only and are listed in Table 88 on page 432.

Table 88: apsChanStatusTable

Object	Object Identifier	Description
apsChanStatusCurrent	apsChanStatusEntry 1	The current state of the port. This object has the following values: lockedOut—This bit, when applied to a working channel, indicates that the channel is prevented from switching to the protection line. When applied to the null channel, this bit indicates that no working channel can switch to the protection line. sd—A signal degrade condition is in effect. sf—A signal failure condition is in effect switched. The switched bit is applied to a working channel if that channel is currently switched to the protection line. wtr—A wait-to-restore state is in effect.
apsChanStatusSignalDegrades	apsChanStatusEntry 2	A count of signal degrade conditions. A signal degrade condition occurs when the line bit error rate exceeds the currently configured value of the relevant instance of apsConfigSdBerThreshold. Discontinuities in the value of this counter can occur when the management system is reinitialized, and at other times as indicated by the value of apsChanStatusDiscontinuityTime.
apsChanStatusSignalFailures	apsChanStatusEntry 3	A count of signal failure conditions that have been detected on the incoming signal. A signal failure condition occurs when a loss of signal, loss of frame, AIS-L or line bit error rate exceeds the currently configured value of the relevant instance of apsConfigSfBerThreshold. Discontinuities in the value of this counter can occur when the management system is reinitialized, and at other times as indicated by the value of apsChanStatusDiscontinuityTime.

Table 88: apsChanStatusTable *(continued)*

Object	Object Identifier	Description
apsChanStatusSwitchovers	apsChanStatusEntry 4	When queried with index value apsChanConfigNumber other than 0, this object returns the number of times this channel has switched to the protection line. When queried with index value s set to 0, which is the protection line, this object returns the number of times that any working channel has switched back to the working line from this protection line. Discontinuities in the value of this counter can occur when the management system is reinitialized, and at other times as indicated by the value of apsChanStatusDiscontinuityTime.
apsChanStatusLastSwitchover	apsChanStatusEntry 5	When queried with index value apsChanConfigNumber other than 0, this object returns the value of sysUpTime when this channel last completed a switch to the protection line. If this channel has never switched to the protection line, the value 0 is returned. When queried with index value apsChanConfigNumber set to 0, which is the protection line, this object will return the value of sysUpTime the last time that a working channel was switched back to the working line from this protection line. If no working channel has ever switched back to the working line from this protection line, the value 0 is returned.

Table 88: apsChanStatusTable *(continued)*

Object	Object Identifier	Description
apsChanStatusSwitchoverSeconds	apsChanStatusEntry 6	The cumulative Protection Switching Duration (PSD) time, in seconds. For a working channel, this is the cumulative number of seconds that service was carried on the protection line. For the protection line, this is the cumulative number of seconds that the protection line has been used to carry any working channel traffic. This information is only valid if revertive switching is enabled. The value 0 will be returned. Otherwise, discontinuities in the value of this counter can occur at reinitialization of the management system, and at other times as indicated by the value of apsChanStatusDiscontinuityTime. For example, if the value of an instance of apsChanStatusSwitchoverSeconds changes from a non-zero value to zero due to revertive switching being disabled. It is expected that the corresponding value of apsChanStatusDiscontinuityTime is updated to reflect the time of the configuration change.
apsChanStatusDiscontinuityTime	apsChanStatusEntry 7	The value of sysUpTime on the most recent occasion at which any one or more of this channel's counters suffered a discontinuity. The relevant counters are the specific instances associated with this channel of any Counter32 object contained in apsChanStatusTable. If no such discontinuities have occurred since the last reinitialization of the local management subsystem, then this object contains a zero value for apsChanStatusEntry.

Chapter 33

Interpreting the Enterprise-Specific IPSec Monitoring MIB

The enterprise-specific IPSec Monitoring MIB, whose object identifier is {jnxMibs 22}, provides operational and statistical information related to the IPSec and IKE tunnels on Juniper Networks routing platforms. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ipsec-monitor-asp.txt.

This chapter discusses the following topics:

jnxIkeTunnelTable

The IKE tunnel table (jnxIkeTunnelTable), whose object identifier is {jnxIPSecPhaseOne 1}, is used to monitor the IKE security associations established with the remote peers. The MIB variables in this table are used to display the IKE SA attributes and the SA statistics. There is one entry for each IKE SA present.

The key for this table is the combination of a service set name, remote gateway address, and the IKE tunnel index. The service set name is used from the jnxSpSvcSetTable which is implemented as part of the Services PIC MIB. The SNMP manager uses the jnxSpSvcSetTable to get the service set name and this information can then be used to query the jnxIkeTunnelTable for the given service set.

To get only IKE tunnels specific to a particular remote gateway in a service set, the SNMP manager can specify the corresponding service set name and the remote gateway address in the query.

jnxIkeTunnelEntry

The jnxIkeTunnelEntry, whose object identifier is {jnxIkeTunnelTable 1}, has 25 objects, which are listed in Table 89 on page 436. Each entry contains attributes associated with an active IPSec phase 1 IKE tunnel.

Table 89: jnxIkeTunnelTable

Object	Object Identifier	Description
jnxIkeTunIndex	jnxIkeTunnelEntry 1	Index for the table. The value of the index is a number that begins at 1 and is incremented with each tunnel that is created. When the index number reaches 2,147,483,647 the value wraps back to 1.
jnxIkeTunLocalRole	jnxIkeTunnelEntry 2	The role of the local peer identity. The role can be initiator or responder.
jnxIkeTunNegState	jnxIkeTunnelEntry 3	The state of the current negotiation. The state can be matured or non matured.
jnxIkeTunInitiatorCookie	jnxIkeTunnelEntry 4	Cookie generated by the peer that initiated the IKE phase 1 negotiation. This cookie is carried in the ISAKMP header.
jnxIkeTunResponderCookie	jnxIkeTunnelEntry 5	Cookie generated by the peer responding to the IKE phase 1 negotiation. This cookie is carried in the ISAKMP header.
jnxIkeTunLocalIdType	jnxIkeTunnelEntry 6	The type of local peer identity. A local peer can be identified by an IP address, a fully-qualified domain name, or a distinguished name.
jnxIkeTunLocalIdValue	jnxIkeTunnelEntry 7	The value of the local peer identity. ■ If the local peer type is an IP address, then this is the IP address used to identify the local peer. ■ If the local peer type is a fully-qualified domain name (if_fqdn), then this is the fully-qualified domain name (FQDN) of the remote peer. ■ If the local peer type is a distinguished name (id_dn), then this is the distinguished name of the local peer.
jnxIkeTunLocalGwAddrType	jnxIkeTunnelEntry 8	The IP address type of the local endpoint (gateway) for the IPSec phase 1 IKE tunnel.
jnxIkeTunLocalGwAddr	jnxIkeTunnelEntry 9	The IP address of the local endpoint (gateway) for the IPSec phase 1 IKE tunnel.
jnxIkeTunLocalCertName	jnxIkeTunnelEntry 10	The name of the certificate used for authentication of the local tunnel endpoint. This object has a valid value only if the negotiated IKE authentication method is something other than a pre-shared key. If the IKE negotiation does not use certificates for authentication, the value is NULL.

Table 89: jnxIkeTunnelTable *(continued)*

Object	Object Identifier	Description
jnxIkeTunRemoteIdType	jnxIkeTunnelEntry 11	The type of remote peer identity. A remote peer can be identified by an IP address, a fully-qualified domain name, or a distinguished name.
jnxIkeTunRemoteIdValue	jnxIkeTunnelEntry 12	The value of the remote peer identity. ■ If the remote peer type is an IP address, then this is the IP address used to identify the remote peer. ■ If the remote peer type is a fully-qualified domain name (if_fqdn), then this is the fully-qualified domain name (FQDN) of the remote peer. ■ If the remote peer type is a distinguished name (id_dn), then this is the distinguished name of the remote peer.
jnxIkeTunRemoteGwAddrType	jnxIkeTunnelEntry 13	The IP address type of the remote gateway (endpoint) for the IPSec phase 1 IKE tunnel.
jnxIkeTunRemoteGwAddr	jnxIkeTunnelEntry 14	The IP address of the remote gateway (endpoint) for the IPSec phase 1 IKE tunnel.
jnxIkeTunNegoMode	jnxIkeTunnelEntry 15	The negotiation mode of the IPSec phase 1 IKE tunnel.
jnxIkeTunDiffHellmanGrp	jnxIkeTunnelEntry 16	The Diffie Hellman Group used in IPSec phase 1 IKE negotiations.
jnxIkeTunEncryptAlgo	jnxIkeTunnelEntry 17	The encryption algorithm used in IPSec phase 1 IKE negotiations.
jnxIkeTunHashAlgo	jnxIkeTunnelEntry 18	The hash algorithm used in IPSec phase 1 IKE negotiations.
jnxIkeTunAuthMethod	jnxIkeTunnelEntry 19	The authentication method used in IPSec phase 1 IKE negotiations.
jnxIkeTunLifeTime	jnxIkeTunnelEntry 20	The negotiated lifetime (in seconds) of the IPSec phase 1 IKE tunnel.
jnxIkeTunActiveTime	jnxIkeTunnelEntry 21	The length of time (in hundredths of seconds) that the IPSec phase 1 IKE tunnel has been active.
jnxIkeTunInOctets	jnxIkeTunnelEntry 22	The total number of octets received by this IPSec phase 1 IKE security association.
jnxIkeTunInPkts	jnxIkeTunnelEntry 23	The total number of packets received by this IPSec phase 1 IKE security association.
jnxIkeTunOutOcets	jnxIkeTunnelEntry 24	The total number of octets sent by this IPSec phase 1 IKE security association.

Table 89: jnxIkeTunnelTable *(continued)*

Object	Object Identifier	Description
jnxIkeTunOutPkts	jnxIkeTunnelEntry 25	The total number of octets sent by this IPSec phase 1 IKE security association.

jnxIPSecTunnelTable

The IPSec phase 2 tunnel table (jnxIPSecTunnelTable), whose object identifier is {jnxIPSecPhaseTwo 1}, is used to monitor the IPSec phase 2 tunnel attributes along with the statistics fro the tunnel. There is one entry for each tunnel to the peer security gateway. This table does not contain information on IPSec security associations (SAs) because multiple SAs can be present for each tunnel.

Similar to the IKE tunnel table (jnxIkeTunnelTable), the key of this table is a combination of the service set name, remote gateway address, and the IPSec tunnel index. This table can be queried just like the IKE tunnel table.

To get only IPSec tunnels specific to a particular remote gateway in a service set, the SNMP manager can specify the corresponding service set name and the remote gateway address in the query.

■ jnxIPSecTunnelEntry on page 438

jnxIPSecTunnelEntry

The jnxIPSecTunnelEntry, whose object identifier is {jnxIPSecTunnelTable 1}, has 27 objects, which are listed in Table 90 on page 438. Each entry contains attributes associated with an active IPSec phase 2 tunnel.

Table 90: jnxIPSecTunnelTable

Object	Object Identifier	Description
jnxIPSecTunIndex	jnxIPSecTunnelEntry 1	Index for the table. The value of the index is a number that begins at 1 and is incremented with each tunnel that is created. When the index number reaches 2,147,483,647 the value wraps back to 1.
jnxIPSecRuleName	jnxIPSecTunnelEntry 2	The name of the rule defined in the IPSec configuration.
jnxIPSecTermName	jnxIPSecTunnelEntry 3	The name of the term configured under the IPSec rule.
jnxIPSecTunLocalGwAddrType	jnxIPSecTunnelEntry 4	The IP address type of the local gateway (endpoint) for the IPSec phase 2 tunnel.
jnxIPSecTunLocalGwAddr	jnxIPSecTunnelEntry 5	The IP address of the local gateway (endpoint) for the IPSec phase 2 tunnel.

Table 90: jnxIPSecTunnelTable *(continued)*

Object	Object Identifier	Description
jnxIPSecTunRemoteGwAddrType	jnxIPSecTunnelEntry 6	The IP address type of the remote gateway (endpoint) for the IPSec phase 2 tunnel.
jnxIPSecTunRemoteGwAddr	jnxIPSecTunnelEntry 7	The IP address of the remote gateway (endpoint) for the IPSec phase 2 tunnel.
jnxIPSecTunLocalProxyId	jnxIPSecTunnelEntry 8	The identifier for the local endpoint.
jnxIPSecTunRemoteProxyId	jnxIPSecTunnelEntry 9	The identifier for the remote endpoint.
jnxIPSecTunKeyType	jnxIPSecTunnelEntry 10	The type of key used by the IPSec phase 2 tunnel. The key type can be IKE negotiated or Manually installed.
jnxIPSecRemotePeerType	jnxIPSecTunnelEntry 11	The type of the remote peer gateway (endpoint). If the remote peer's IP address is known beforehand, the type is static. If the IP address is not known beforehand, the type is dynamic.
jnxIPSecTunMtu	jnxIPSecTunnelEntry 12	The maximum transmission unit (MTU) value of the IPSec phase 2 tunnel.
jnxIPSecTunOutEncryptedBytes	jnxIPSecTunnelEntry 13	The number of bytes encrypted by the IPSec phase 2 tunnel.
jnxIPSecTunOutEncryptedPkts	jnxIPSecTunnelEntry 14	The number of packets encrypted by the IPSec phase 2 tunnel
jnxIPSecTunInDecryptedBytes	jnxIPSecTunnelEntry 15	The number of bytes decrypted by the IPSec phase 2 tunnel.
jnxIPSecTunInDecryptedPkts	jnxIPSecTunnelEntry 16	The number of packets decrypted by the IPSec phase 2 tunnel.
jnxIPSecTunAHInBytes	jnxIPSecTunnelEntry 17	The number of incoming bytes authenticated using the authentication header (AH) by the IPSec phase 2 tunnel.
jnxIPSecTunAHInPkts	jnxIPSecTunnelEntry 18	The number of incoming packets authenticated using the authentication header (AH) by the IPSec phase 2 tunnel.
jnxIPSecTunAHOutBytes	jnxIPSecTunnelEntry 19	The number of outgoing bytes on the IPSec phase 2 tunnel where the AH is applied.
jnxIPSecTunHAOutPkts	jnxIPSecTunnelEntry 20	The number of outgoing packets on the IPSec phase 2 tunnel where the AH is applied.
jnxIPSecTunReplayDropPkts	jnxIPSecTunnelEntry 21	The number of packets dropped by the IPSec phase 2 tunnel because of an anti-replay check failure.

Table 90: jnxIPSecTunnelTable *(continued)*

Object	Object Identifier	Description
jnxIPSecTunAhAuthFails	jnxIPSecTunnelEntry 22	The number of packets received by the IPSec phase 2 tunnel that failed AH authentication.
jnxIPSecTunEspAuthFails	jnxIPSecTunnelEntry 23	The number of packets received by this IPSec phase 2 tunnel that failed ESP authentication.
jnxIPSecTunDecryptFails	jnxIPSecTunnelEntry 24	The number of packets received by this IPSec phase 2 tunnel that failed decryption.
jnxIPSecTunBadHeaders	jnxIPSecTunnelEntry 25	The number of packets received by this IPSec phase 2 tunnel that failed because of bad headers.
jnxIPSecTunBadTrailers	jnxIPSecTunnelEntry 26	The number of packets received by this IPSec phase 2 tunnel that failed because of bad ESP trailers.
jnxIPSecTunDroppedPkts	jnxIPSecTunnelEntry 27	The total number of packets dropped from this IPSec phase 2 tunnel.

jnxIPSecSaTable

The IPSec phase 2 security association table (jnxIPSecSaTable), whose object identifier is {jnxIPSecPhaseTwo 2}, is used to monitor the IPSec SAs present for each tunnel in the IPSec tunnel table (jnxIPSecTunnelTable). More than one pair of SAs can be present for each of the IPSec tunnels.

The key for this table is a combination of a service set name, remote gateway address, IPSec tunnel index, and the SA index. While the IPSec tunnel table is queried using the service set name, the SA table can be queried for the IPSec tunnel using the service set name, remote gateway address, and the IPSec tunnel index.

■ jnxIPSecSaEntry on page 440

jnxIPSecSaEntry

The jnxIPSecSaEntry, whose object identifier is {jnxIPSecSaTable 1}, has 16 objects, which are listed in Table 91 on page 440. Each entry contains SA components for an active IPSec phase 2 tunnel.

Table 91: jnxIPSecSaTable

Object	Object Identifier	Description
jnxIpSecSaProtocol	jnxIpSecSaEntry 1	The index represents the security protocol (AH, ESP, or IPComp) for which the SA was created.

Table 91: jnxIPSecSaTable *(continued)*

Object	Object Identifier	Description
jnxIpSecSaIndex	jnxIpSecSaEntry 2	The index (in the context of the IPSec tunnel) for the SA. The value of the index is a number that begins at 1 and is incremented with each security parameter index (SPI) associated with an IPSec phase 2 tunnel. When the index number reaches 2,147,483,647 the value wraps back to 1.
jnxIpSecSaInSpi	jnxIpSecSaEntry 3	The value of the incoming SPI.
jnxIpSecSaOutSpi	jnxIpSecSaEntry 4	The value of the outgoing SPI.
jnxIpSecSaInAuxSpi	jnxIpSecSaEntry 5	The value of the incoming auxiliary SPI. This object is valid for AH and ESP bundles.
jnxIpSecSaOutAuxSpi	jnxIpSecSaEntry 6	The value of the outgoing auxiliary SPI. This object is valid for AH and ESP bundles.
jnxIpSecSaType	jnxIpSecSaEntry 7	The type of SA (manual or dynamic).
jnxIpSecSaEncapMode	jnxIpSecSaEntry 8	The encapsulation mode used by the IPSec phase 2 tunnel.
jnxIpSecSaLifeSize	jnxIpSecSaEntry 9	The negotiated size (in kilobytes) of the IPSec phase 2 tunnel.
jnxIpSecSaLifeTime	jnxIpSecSaEntry 10	The negotiated lifetime (in seconds) of the IPSec phase 2 tunnel.
jnxIpSecSaActiveTime	jnxIpSecSaEntry 11	The number of seconds the IPSec phase 2 tunnel has been active.
jnxIpSecSaLifeSizeThreshold	jnxIpSecSaEntry 12	The refresh threshold (in kilobytes) of the SA size.
jnxIpSecSaLifeTimeThreshold	jnxIpSecSaEntry 13	The refresh threshold (in seconds) of the SA lifetime.
jnxIpSecSaEncryptAlgo	jnxIpSecSaEntry 14	The algorithm used to encrypt the packets (es-cbc or 3des-cbc).
jnxIpSecSaAuthAlgo	jnxIpSecSaEntry 15	The algorithm used to authenticate the packets (hmac-md5-96 or hmac-sha1-96).
jnxIpSecSaState	jnxIpSecSaEntry 16	The status of the SA. Status can be active (ready for active use) or expiring (any state an SA goes through before being purged).

Chapter 34

Interpreting the Enterprise-Specific Ethernet MAC MIB

The enterprise-specific Ethernet Media Access Control (MAC) MIB, whose object identifier is {jnxMibs 23}, monitors media access control statistics on Gigabit Ethernet intelligent queuing (IQ) interfaces. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-mac.txt.

This chapter discusses the following topic:

jnxMacStatsTable

The jnxMacStatsTable contains a list of MAC statistics for Gigabit Ethernet interfaces.

jnxMacStatsEntry

jnxMacStatsEntry has six objects, which are listed in Table 92 on page 443.

Table 92: jnxMacStatsTable

Object	Object Identifier	Description
jnxVlanIndex	jnxMacStatsEntry 1	The virtual LAN (VLAN) ID of a VLAN.
jnxSourceMacAddress	jnxMacStatsEntry 2	The source MAC address.
jnxMacHCInOctets	jnxMacStatsEntry 3	The number of total octets received in this VLAN/MAC address.
jnxMacHCInFrames	jnxMacStatsEntry 4	The number of total frames received in this VLAN/MAC address
jnxMacHCOutOctets	jnxMacStatsEntry 5	The number of total octets transmitted in this VLAN/MAC address.
jnxMacHCOutFrames	jnxMacStatsEntry 6	The number of total frames transmitted in this VLAN/MAC address.

Chapter 35

Interpreting the Enterprise-Specific Interface MIB

The enterprise-specific Interface MIB extends the standard ifTable (RFC 2863) with additional statistics and Juniper Networks enterprise-specific chassis information. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-if-extensions.txt.

This chapter discusses the following topics:

jnxIfTable

jnxIfTable lists traffic statistics, input errors, and output errors for an interface.

jnxIfEntry

jnxIfEntry objects are listed in Table 93 on page 445.

Table 93: jnxIfTable

Object	Object Identifier	Description
ifIn1SecRates	ifJnxEntry 1	The number of bits per second delivered by this sublayer to its next higher sublayer.
ifIn1SecOctets	ifJnxEntry 2	The number of octets per second delivered by this sublayer to its next higher sublayer.
ifIn1SecPkts	ifJnxEntry 3	The number of packets per second delivered by this sublayer to its next higher sublayer.
ifOut1SecRate	ifJnxEntry 4	The number of bits per second delivered by this sublayer to its next lower sublayer.
ifOut1SecOctets	ifJnxEntry 5	The number of octets per second delivered by this sublayer to its next lower sublayer.

Table 93: jnxIfTable *(continued)*

Object	Object Identifier	Description
ifOut1SecPkts	ifJnxEntry 6	The number of packets per second delivered by this sublayer to its next lower sublayer.
ifHCIn1SecRate	ifJnxEntry 7	The number of bits per second delivered by this sublayer to its next higher sublayer. This object is a 64-bit version of ifIn1SecRate.
ifHCOut1SecRate	ifJnxEntry 8	The number of bits per second delivered by this sublayer to its next lower sublayers. This object is a 64-bit version of ifOut1SecRate.
ifJnxInErrors	ifJnxEntry 9	Errors: The sum of the incoming frame aborts and FCS errors.
ifJnxInFrameErrors	ifJnxEntry 10	Framing Errors: The number of input packets that were misaligned.
ifJnxInQDrops	ifJnxEntry 11	Drops: The number of packets dropped by the input queue of the I/O Manager ASIC.
ifJnxInRunts	ifJnxEntry 12	Runts: Frames received that are smaller than the runt threshold.
ifJnxInGiants	ifJnxEntry 13	Giants: Frames received that are larger than the giant threshold.
ifJnxInDiscards	ifJnxEntry 14	Policed discards: Frames that the incoming packet match code discarded because they were not recognized or of interest.
ifJnxInHslCrcErrors	ifJnxEntry 15	HS link CRC errors: The number of CRC errors on the high-speed links between the ASICs responsible for handling the router interfaces while receiving packets.
ifJnxInHslFifoOverFlows	ifJnxEntry 16	HS link FIFO overflows: The number of FIFO overflows on the high-speed links between the ASICs responsible for handling the router interfaces.
ifJnxInL3Incompletes	ifJnxEntry 17	L3 incompletes: The number of incoming packets that fail Layer 3 sanity checks of the header.
ifJnxInL2ChanErrors	ifJnxEntry 18	L2 channel errors: The number of incoming packets for which the software could not find a valid logical interface.
ifJnxInL2MismatchTimeouts	ifJnxEntry 19	L2 mismatch timeouts: The count of malformed or short packets that cause the incoming packet handler to discard the frame as unreadable.
ifJnxInInvalidVCs	ifJnxEntry 20	Invalid VCs: The number of cells that arrived for a nonexistent virtual circuit

Table 93: jnxIfTable *(continued)*

Object	Object Identifier	Description
ifJnxInFifoErrors	ifJnxEntry 21	FIFO errors: The number of FIFO errors in the received direction as reported by the ASIC on the PIC.
ifJnxBucketDrops	ifJnxEntry 22	Bucket drops: Drops because traffic load exceeded the interface transmit and receive leaky bucket configuration.
ifJnxSramErrors	ifJnxEntry 23	SRAM errors: This counter increments when a hardware error has occurred in the SRAM on the PIC.
ifJnxOutErrors	ifJnxEntry 24	Errors: The sum of the outgoing frame aborts and FCS errors.
ifJnxCollisions	ifJnxEntry 25	Collisions: The number of output collisions detected on this interface.
ifJnxCarrierTrans	ifJnxEntry 26	Carrier transitions: The number of times the interface saw the carrier signal transition.
ifJnxOutQDrops	ifJnxEntry 27	Drops: The number of packets dropped by the output queue of the I/O Manager ASIC.
ifJnxOutAgedErrors	ifJnxEntry 28	Aged packets: The number of packets that remained in shared packet SDRAM for so long that the system automatically purged them.
ifJnxOutFifoErrors	ifJnxEntry 29	FIFO errors: The number of FIFO errors in the transmit direction as reported by the ASIC on the PIC.
ifJnxOutHslFifoUnderFlows	ifJnxEntry 30	HS link FIFO underflows: The number of FIFO underflows on the high-speed links between the ASICs responsible for handling the router interfaces.
ifJnxOutHslCrcErrors	ifJnxEntry 31	HS link CRC errors: The number of CRC errors on the high-speed links between the ASICs responsible for handling the router interfaces while transmitting packets.

ifChassisTable

ifChassisTable provides additional interface and chassis information.

■ ifChassisEntry on page 447

ifChassisEntry

ifChassisEntry objects are listed in Table 94 on page 448.

Table 94: ifChassisTable

Object	Object Identifier	Description
ifChassisFpc	ifChassisEntry 1	The number of the FPC card on which the interface is located in the chassis. It is the chassis slot in which the FPC card is installed for the specified interface. Although the number is labeled from 0 and up in the chassis, the return value for this object always starts from 1 according to network management convention. Therefore, a value of zero means there is no real or physical FPC associated with the specified interface.
ifChassisPic	ifChassisEntry 2	The number of the PIC card on which the interface is located in the chassis. It is the PIC location on the FPC card for the specified interface. Although the number is labeled from 0 and up in the chassis, the return value for this object always starts from 1 according to network management convention. Therefore, a value of zero means there is no real or physical PIC associated with the specified interface.
ifChassisPort	ifChassisEntry 3	The number of the port on the PIC card on which the interface is located in the chassis. It is the port number on the PIC card for the specified interface. Although the number is labeled from 0 and up in the chassis, the return value for this object always starts from 1 according to network management convention. Therefore, a value of zero means there is no real or physical port associated with the specified interface.
ifChassisChannel	ifChassisEntry 4	The channel identifier for the specified interface if it is part of a channelized interface. Although the channel is numbered from 0 and up in the interface naming, the return value for this object always starts from 1 according to network management convention. For an interface that could not be channelized, this object returns zero.
ifChassisLogicalUnit	ifChassisEntry 5	The logical unit number of the specified interface. It is the logical part of the interface that is configured on the physical or channel part, if any. Although the logical unit number is numbered from 0 and up in the interface naming, the return value for this object always starts from 1 according to network management convention. For an interface that is really a physical device, this value returns zero.

Table 94: ifChassisTable *(continued)*

Object	Object Identifier	Description
ifChassisPicIndex	ifChassisEntry 6	The indexes for the Chassis MIB tables. This is the instance index that keys into jnxContentsTable in the Chassis MIB. For example, the octet string of 8.1.2.0 means a PIC (“ 8&” first digit) at FPC slot 0 (“1–1” , second digit minus one if nonzero) PIC number 1 (“2–1” , third digit) minus one if nonzero port number, whatever (fourth digit currently unused). In turn, this PIC index can be plugged in by the NMS directly after any MIB objects in the jnxContentsTable obtain that PIC object for the specified interface. This object is valid only for interfaces having real and physical PIC cards. Otherwise, it returns an octet string “0.0.0.0.”

Chapter 36

Interpreting the Enterprise-Specific VPN MIB

The enterprise-specific Virtual Private Network (VPN) MIB, whose object identifier is {jnxMibs 26}, provides monitoring for the following type of VPNs:

- Layer 2 based on Internet draft draft-kompella-l2ppvpn-version.txt, *MPLS-based Layer 2 VPNs*.
- Layer 3 based on Internet draft draft-ietf-l3vpn-rfc2547bis-03.txt, *BGP and MPLS IP VPNs.*
- VPLS based on Internet draft draft-ietf-ppvpn-vpls-bgp-00.txt, *Virtual Private LAN Service*.

NOTE: The Simple Network Management Protocol (SNMP) cannot be associated with any routing instances other than the master routing instance.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-vpn.txt.

This chapter discusses the following topics:

jnxVpnInfo

jnxVpnInfo, whose object identifier is {jnxVpnMibObjects 1}, contains information about the number of configured VPNs and active VPNs.

Table 95 on page 452 lists the supported jnxVpnInfo objects, VPNs, and circuit connection services.

Table 95: Supported jnxVpnInfo Objects, VPNs, and Circuit Connection Services

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	Circuit Cross-Connect	L2 Circuit	Optical VPN	Description
jnxVpnConfiguredVpns	jnxVpnInfo 1	Yes	Yes	Yes	No	Yes	–	Number of configured VPNs.
jnxVpnActiveVpns	jnxVpnInfo 2	Yes	Yes	Yes	No	Yes	–	Number of active VPNs.
jnxVpnNextIfIndex	jnxVpnInfo 3	–	–	–	–	–	–	Next free VPN interface index.
jnxVpnNextPwIndex	jnxVpnInfo 4	–	–	–	–	–	–	Next free pseudowire index.
jnxVpnNextRTIndex	jnxVpnInfo 5	–	–	–	–	–	–	Next free route target index.

jnxVpnTable

jnxVpnTable, whose object identifier is jnxVpnMibobjects 2, lists configured VPNs.

■ jnxVpnEntry on page 452

jnxVpnEntry

JnxVpnEntry contains information about a configured VPN with the objects listed in Table 96 on page 452 and their supported VPNs and circuit connection services. The first two objects in jnxVpnEntry (JnxVpnType and JnxVpnname) are indexes and are not included in this table.

Table 96: Supported jnxVpnEntry Objects, VPNs, and Circuit Connection Services

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnRowStatus	jnxVpnEntry 3	–	–	–	–	–	–	Creates, modifies, or deletes a row in this table.
JnxVpnStorageType	jnxVpnEntry 4	–	–	–	–	–	–	The storage type.
jnxVpnDescription	jnxVpnEntry 5	Yes	Yes	Yes	Yes	No	–	VPN description.
jnxVpnIdentifierType	jnxVpnEntry 6	Yes	Yes	Yes	Yes	No	–	Type of jnxVpnIdentifer.

Table 96: Supported jnxVpnEntry Objects, VPNs, and Circuit Connection Services *(continued)*

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnIdentifier	jnxVpnEntry 7	Yes	Yes	Yes	Yes	No	–	For Border Gateway Protocol (BGP) VPNs, the route distinguisher for the VPN. For Label Distribution Protocol (LDP) VPNs, the virtual circuit (VC) ID for the circuit. A value of all zeros indicates that a route distinguisher and a VC ID are not configured for the VPN.
jnxVpnConfiguredSites	jnxVpnEntry 8	–	No	No	No	No	–	The number of sites configured in the VPN.
jnxVpnActiveSites	jnxVpnEntry 9	–	No	No	No	No	–	The number of active sites in the VPN.
jnxVpnLocalAddresses	jnxVpnEntry 10	No	No	No	No	No	–	The number of addresses learned from the CE device.
jnxVpnTotalAddresses	jnxVpnEntry 11	No	No	No	No	No	–	The total number of addresses in the VPN routing table.
jnxVpnVpnAge	jnxVpnEntry 12	Yes	Yes	Yes	Yes	No	–	The age of the VPN, in hundredths of a second.

jnxVpnIfTable

The jnxVpnIfTable, whose object identifier is jnxVpnMibObjects 3, lists VPN interfaces.

■ jnxVpnIfEntry on page 453

jnxVpnIfEntry

jnxVpnIfEntry contains information about VPN interfaces, and has the objects listed in Table 97 on page 454. The first three objects (jnxVpnIfVpnType, jnxVpnIfVpnName, and jnxVpnIfIndex) are indexes and are not included in this table.

Table 97: Supported jnxVpnIfEntry Objects, VPNs, and Circuit Connection Services

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnIfRowStatus	jnxVpnifEntry 4	–	–	–	–	–	–	Creates, modifies, or deletes a row in this table.
jnxVpnIfStorageType	jnxVpnifEntry 5	–	–	–	–	–	–	Identifies the storage type for an object.
jnxVpnIfAssociationPw	jnxVpnifEntry 6	–	Yes	Yes	Yes	No	–	The index of the associated pseudowire. If no index is associated with a pseudowire, the index is 0. A pseudowire is a mechanism that carries essential elements of an emulated circuit from one provider edge (PE) device to one or more other PEs over a PSN.

Table 97: Supported jnxVpnIfEntry Objects, VPNs, and Circuit Connection Services *(continued)*

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnIfProtocol	jnxVpnifEntry 7	No	Yes	Yes	Yes	No	–	Indicates the protocol running over a VPN interface. This object contains the following values: ■ other(0) ■ frameRelay(1) ■ atmAal5(2) ■ atmCell(3) ■ ethernetVlan(4) ■ ethernet(5) ■ ciscoHdlc(6) ■ ppp(7) ■ cem(8) ■ atmVcc(9) ■ atmVpc(10) ■ vpls(11) ■ ipInter-working(12) ■ snapInter-working(13) ■ static(20) ■ rip(21) ■ ospf(22) ■ bgp(23) ■ atmTrunkNNI (129) ■ atmTrunkUNI (130)
jnxVpnIfInBandwidth	jnxVpnifEntry 8	No	No	No	No	No	–	The maximum bandwidth that the customer edge (CE) device connected over a VPN can send to the PE device, in kilobytes per second. A value of 0 indicates that there is no configured maximum.

Table 97: Supported jnxVpnIfEntry Objects, VPNs, and Circuit Connection Services *(continued)*

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnIfOutBandwidth	jnxVpnifEntry 9	No	No	No	No	No	–	The maximum bandwidth that the PE device can send to the CE device over a VPN interface, in kilobytes per second. A value of 0 indicates that there is no configured maximum.
jnxVpnIfStatus	jnxVpnifEntry 10	Yes	Yes	Yes	Yes	No	–	Status of a monitored VPN interface. This object contains the following values: ■ unknown(0) ■ noLocal-Interface(1) ■ disabled(2) ■ encapsulationMismatch(3) ■ down(4) ■ up(5)

jnxVpnPwTable

jnxVpnPwTable, whose object identifier is jnxVpnMibObjects 4, lists pseudowire connections.

■ jnxVpnPwEntry on page 456

jnxVpnPwEntry

jnxVpnPwEntry contains pseudowire information about a VPN that is being monitored, and has the objects listed in Table 98 on page 457. The first three objects (jnxVpnPwVpnType, jnxVpnPwVpnName, and jnxVpnPwIndex) are indexes and are not listed in this table.

Table 98: Supported jnxVpnEntry Objects, VPNs, and Connection Circuit Services

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnPwRowStatus	jnxVpnPwEntry 4	–	–	–	–	–	–	Creates, modifies, and deletes a row in this table.
jnxVpnPwStorageType	jnxVpnPwEntry 5	–	–	–	–	–	–	The storage type.
jnxVpnPwAssociatedInterface	jnxVpnPwEntry 6	–	Yes	Yes	Yes	No	–	The VPN index of the interface associated with a pseudowire. If no interface is associated with a pseudowire, 0 is returned.
jnxVpnPwLocalSiteId	jnxVpnPwEntry 7	–	Yes	Yes	Yes	No	–	The local site identifier for a pseudowire. When there is no local site identifier, 0 is returned.
jnxVpnPwRemoteSiteId	jnxVpnPwEntry 8	–	Yes	Yes	Yes	No	–	The remote site identifier. For example, the site at the end of the pseudowire. When there is no remote site identifier, 0 is returned.
jnxVpnRemotetPeIdAddrType	jnxVpnPwEntry 9	–	Yes	Yes	Yes	No	–	The remote PE address. For example, the router at the end of the pseudowire.

Table 98: Supported jnxVpnEntry Objects, VPNs, and Connection Circuit Services *(continued)*

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnRemotePeIdAddress	jnxVpnPwEntry 10	–	Yes	Yes	Yes	No	–	The type of tunnel over which the pseudowire is carried. If several pseudowires can be carried in one tunnel, each pseudowire is identified by the multiplexer or demultiplexer within a tunnel. This object can contain the following values: ■ static(1) ■ gre(2) ■ l2tpv3(3) ■ ipSec(4) ■ ldp(5) ■ rsvpTe(6) ■ crLdp(7)
jnxVpnPwTunnelType	jnxVpnPwEntry 11	–	Yes	Yes	Yes	No	–	The type of tunnel over which the pseudowire is carried.
jnxVpnPwTunnelName	jnxVpnPwEntry 12	–	Yes	Yes	Yes	No	–	The name of the tunnel over which a pseudowire is carried.
jnxVpnPwReceiveDemux	jnxVpnPwEntry 13	–	Yes	Yes	Yes	No	–	The demultiplexer value that identifies received packets associated with this pseudowire.

Table 98: Supported jnxVpnEntry Objects, VPNs, and Connection Circuit Services *(continued)*

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnPwTransmitDemux	jnxVpnPwEntry 14	–	Yes	Yes	Yes	No	–	The demultiplexer value that identifies the transmitted packets associated with this pseudowire.
jnxVpnPwStatus	jnxVpnPwEntry 15	–	Yes	Yes	Yes	No	–	The status of the pseudowire. This object can have the following values: ■ unknown(0) ■ down(1) ■ up(2)
jnxVpnPwTunnelStatus	jnxVpnPwEntry 16	–	No	No	No	No	–	The status of the PE-to-PE tunnel over which the pseudowire is carried.
jnxVpnPwRemoteSiteStatus	jnxVpnPwEntry 17	–	No	No	No	No	–	The interface status at the remote end of the pseudowire. This object can have the following values: ■ unknown(0) ■ outOf - Range(1) ■ down(2) ■ up(3)
jnxVpnPwTimeUp	jnxVpnPwEntry 18	–	Yes	Yes	Yes	No	–	The time, in hundredths of a second, that a pseudowire has been operational.

Table 98: Supported jnxVpnEntry Objects, VPNs, and Connection Circuit Services *(continued)*

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnPwTransitions	jnxVpnPwEntry 19	–	Yes	Yes	Yes	No	–	The number of state transitions (up to down and down to up) that a tunnel has undergone.
jnxVpnPwLastTransition	jnxVpnPwEntry 20	–	Yes	Yes	Yes	No	–	The time, in hundredths of a second, since the last transition occurred in a tunnel.
jnxVpnPwPacketsSent	jnxVpnPwEntry 21	–	No	No	No	No	–	The number of packets sent over a pseudowire.
jnxVpnPwOctetsSent	jnxVpnPwEntry 22	–	No	No	No	No	–	The number of octets sent over a pseudowire.
jnxVpnPwPacketsReceived	jnxVpnPwEntry 23	No	No		No	No	–	The number of packets received over a pseudowire.
jnxVpnPwOctetsReceived	jnxVpnPwEntry 24	No	No		No	No	–	The number of octets received over a pseudowire.
jnxVpnPwLRPacketsSent	jnxVpnPwEntry 25	No	No		No	No	–	The number of packets sent over a pseudowire.
jnxVpnPwLROctetsSent	jnxVpnPwEntry 26	No	No		No	No	–	The number of octets sent over a pseudowire.
jnxVpnPwLRPacketsReceived	jnxVpnPwEntry 27	No	No		No	No	–	The number of packets received over a pseudowire.
jnxVpnPwLROctetsReceived	jnxVpnPwEntry 28	No	No		No	No	–	The number of octets received over a pseudowire.

jnxVpnRTTable

The jnxVpnRTTable, whose object identifier is jnxVpnMibObjects 4, contains route targets for a VPN.

- jnxVpnRTEntry on page 461

jnxVpnRTEntry

jnxVpnRTEntry lists route targets for a given VPN, and has the objects listed in Table 99 on page 461. The first three objects (jnxVpnRTVpnType, jnxVpnRTVpnName, and jnxVpnRTIndex) are indexes and are not listed in this table.

Table 99: Supported jnxVpnRTEntry Objects, VPNs, and Circuit Connection Services

Object	ObjectIdentifier	Layer 3 VPN	Layer 2 VPN	VPLS	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnRTRowStatus	jnxVpnRTEntry 4	–	–	–	–	–	–	Creates, modifies, or deletes a row in this table.
jnxVpnRTStorageType	jnxVpnRTEntry 5	–	–	–	–	–	–	Identifies the storage type for an object.
jnxVpnRTType	jnxVpnRTEntry 6	Yes	Yes	Yes	–	No	–	The type of the following route target. The type can be routeTarget[012] or none.
jnxVpnRT	jnxVpnRTEntry 7	Yes	Yes	Yes	–	No	–	The VPN route target. If jnxVpnRTType is none, the value must be all zeros.
jnxVpnRTFunction	jnxVpnRTEntry 8	Yes	Yes	Yes	–	No	–	The route target export distribution type.

VPN Traps

The enterprise-specific VPN MIB provides traps for monitoring VPNs.
Table 100 on page 462 lists supported VPN traps, VPNs, and circuit connection services.

Table 100: Supported VPN Traps, VPNs, and Circuit Connection Services

Object	Object Identifier	Layer 3 VPN	Layer 2 VPN	VPLS VPN	L2 Circuit	Circuit Cross-Connect	Optical VPN	Description
jnxVpnIfUp	jnxVpnMIBnotificatios 1	Yes	Yes	–	Yes	No	–	Indicates that the interface with the index jnxVpnIfIndex belonging to the jnxVpnIfVpnName of type jnxVpnIfVpnType went up.
jnxVpnIfDown	jnxVpnMIBnotificatios 2	Yes	Yes	–	Yes	No	–	Indicates that the interface with index jnxVpnIfIndex belonging to jnxVpnIfVpnName of type jnxVpnIfVpnType went down.
jnxVpnPwUp	jnxVpnMIBnotificatios 3	No	Yes	Yes	Yes	No	–	Indicates that the pseudowire with the index jnxVpnPwIndex belonging to jnxVpnPwVpnName of type jnxVpnPwVpnType went up.
jnxVpnPwDown	jnxVpnMIBnotificatios 4	No	Yes	Yes	Yes	No	–	Indicates that the pseudowire with index jnxVpnPwIndex belonging to jnxVpnPwVpnName of type jnxVpnPwVpnType went down.

Chapter 37

Interpreting the Enterprise-Specific Flow Collection Services MIB

The enterprise-specific Flow Collection Services MIB, whose object identifier is {jnxMibs 28}, provides statistics on files, records, memory, FTP, and error states of flow collection services on a Monitoring Services Physical Interface Card (PIC). It also provides Simple Network Management (SNMP) traps for unavailable destinations, unsuccessful file transfers, flow overloading, and memory overloading. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-coll.txt.

For information about how to configure the flow collection services interface, see the *JUNOS Services Interfaces Configuration Guide* and the *JUNOS Feature Guide*.

This chapter discusses the following topics:

jnxCollGlobalStats

jnxCollGlobalStats provides statistics on all the router's Monitoring Services PICs and has the objects listed in Table 101 on page 463.

Table 101: jnxCollGlobalStats

Object	Object Identifier	Description
jnxCollGlobalCreatedFiles	jnxCollGlobalStats 1	The number of files created by all the Monitoring Services PICs on the router since the last time the router was reset.
jnxCollGlobalOpenFiles	jnxCollGlobalStats 2	The number of open flow collection services files currently on the router.

jnxCollPicIfTable

jnxCollPicIfTable contains statistics about each Monitoring Services PIC.

■ jnxCollPicEntry on page 464

jnxCollPicEntry

JnxCollPicEntry contains information about a Monitoring Services PIC. Each Monitoring Services PIC contains one interface and is identified by IfIndex. It has objects listed in Table 102 on page 464.

Table 102: jnxCollPicEntry

Object	Object Identifier	Description
File Statistics		
jnxCollPicIfCreatedFiles	jnxCollPicIfEntry 1	The number of files created by a Monitoring Services PIC since the last time the PIC was reset.
jnxCollPicIfCreatedFileRate	jnxCollPicIfEntry 2	The number of files created per second during the current 10-second interval.
jnxCollPicIfPeakCreatedFileRate	jnxCollPicIfEntry 3	The peak number of files created per second.
jnxCollPicIfExportedFiles	jnxCollPicIfEntry 4s	The number of files exported by a Monitoring Services PIC.
jnxCollPicIfExportedFileRate	jnxCollPicIfEntry 5	The number of files exported per second during the current 10-second interval.
jnxCollPicIfPeakExportedFileRate	jnxCollPicIfEntry 6	The peak number of files exported per second.
jnxCollPicIfDestroyedFiles	jnxCollPicIfEntry 7	The number of files successfully exported and files dropped by the Monitoring Services PIC. Files are destroyed after they are transferred to the FTP server or when there is not enough memory.
jnxCollPicIfDestroyedFileRate	jnxCollPicIfEntry 8	The number of files dropped per second during the current 10-second interval. Files are dropped after they are transferred to the FTP server or when there is not enough memory.
jnxCollPicIfPeakDestroyedFileRate	jnxCollPicIfEntry 9	The peak number of files dropped, per second. Files are dropped after they are transfered to the FTP server or when there is not enough memory.
Record Statistics		
jnxCollPicIfProcRecords	jnxCollPicIfEntry 10	The number of flow records processed by a Monitoring Services PIC.
jnxCollPicIfProcRecordsRate	jnxCollPicIfEntry 11	The number of flow records processed per second during the current 10-second interval.
jnxCollPicIfPeakProcRecordsRate	jnxCollPicIfEntry 12	The peak number of flow records processed.
Memory Statistics		
jnxCollPicIfMemoryUsed	jnxCollPicIfEntry 13	The amount of memory used, in bytes, by a Monitoring Services PIC.

Table 102: jnxCollPicEntry *(continued)*

Object	Object Identifier	Description
File Statistics		
jnxCollPicIfMemoryFree	jnxCollPicIfEntry 14	The amount of free memory, in bytes, on a Monitoring Services PIC.
FTP Statistics		
jnxCollPicIfFtpBytes	jnxCollPicIfEntry 15	The number of bytes transferred using FTP by a Monitoring Services PIC.
jnxCollPicIfFtpByteRate	jnxCollPicIfEntry 16	The number of bytes per second transferred using FTP, measured during the current 10-second interval.
jnxCollPicIfPeakFtpByteRate	jnxCollPicIfEntry 17	The peak number of bytes per second transferred using FTP.
jnxCollPicIfFtpFiles	jnxCollPicIfEntry 18	The number of files transferred by a Monitoring Services PIC using FTP.
jnxCollPicIfFtpFileRate	jnxCollPicIfEntry 19	The number of files per second transferred using FTP.
jnxCollPicIfPeakFtpFileRate	jnxCollPicIfEntry 20	The peak number of files per second transferred using FTP.
jnxCollPicIfFtpFailures	jnxCollPicIfEntry 21	The number of FTP transfer failures transferred by a Monitoring Services PIC.
Error State Statistics		
jnxCollPicIfCurrentState	jnxCollPicIfEntry 22	The current state of various error conditions on a Monitoring Services PIC.
jnxCollPicIfLastStateChange	jnxCollPicIfEntry 23	The error condition of the last changed state.
jnxCollPicIfStateChangeTime	jnxCollPicIfEntry 24	The value of sysUpTime when the management subsystem last learned of a change to the jnxCollPicIfCurrentState for a Monitoring Services PIC.
jnxCollPicIfStateChangeDate	jnxCollPicIfEntry 25	The system date and time when the management subsystem last learned of a change to the jnxCollPicIfCurrentState on a Monitoring Services PIC.
jnxCollPicIfStateChangeType	jnxCollPicIfEntry 26	Indicates whether the last state change set a new error condition or cleared an existing one. This object contains the following values: ■ none(1) ■ set(2) ■ cleared(3)

jnxCollFileTable

jnxCollFileTable contains information about each flow collection services file on the router.

■ jnxCollFileEntry on page 466

jnxCollFileEntry

jnxCollFileEntry contains information about a single file open on a Monitoring Services PIC, and has the objects listed in Table 103 on page 466.

Table 103: jnxCollFileTable

Object	Object Identifier	Description
jnxCollFileName	jnxCollFileEntry 1	The name of a flow collection services file on a Monitoring Services PIC.
jnxCollFileFname	jnxCollFileEntry 2	The name of a flow collection services file on this Monitoring Services PIC. This object is included for those Network Management (NM) applications that can't parse the filename from the instance portion of the OIDs and provides the value of jnxCollFileName.
jnxCollFileRecords	jnxCollFileEntry 3	The number of flow records in this file.
jnxCollFileRecordRate	jnxCollFileEntry 4	The number of flow records per second added to this file, measured during the current 10-second interval.
jnxCollFilePeakRecordRate	jnxCollFileEntry 5	The peak number of flow records per second added to this file.
jnxCollFileUncompBytes	jnxCollFileEntry 6	The number of uncompressed bytes in this file.
jnxCollFileUncompByteRate	jnxCollFileEntry 7	The number of uncompressed bytes per second added to this file.
jnxCollFilePeakUncompByteRate	jnxCollFileEntry 8	The peak number of uncompressed bytes per second added to this file.
jnxCollFileCompBytes	jnxCollFileEntry 9	The number of compressed bytes in this file.
jnxCollFileCompByteRate	jnxCollFileEntry 10	The number of compressed bytes per second added to this file during the current 10-second interval.
jnxCollFilePeakCompByteRate	jnxCollFileEntry 11	The peak number of compressed bytes per second added to this file.
jnxCollFileBlocks	jnxCollFileEntry 12	The number of blocks in this file.
jnxCollFileCompBlocks	jnxCollFileEntry 14	The number of compressed blocks in this file.
jnxCollFileTransferAttempts	jnxCollFileEntry 15	The number of FTP transfer attempts in this file.
jnxCollFileState	jnxCollFileEntry 16	The current state of this file. This object contains the following values: ■ unknown(1) ■ active(2)—The file is actively receiving flow records. ■ wait(3)—The file is waiting for export. ■ export1(4)—The file is being exported to the primary server. ■ export2(5)—The file is being exported to the secondary server.

Chapter 38

Interpreting the Enterprise-Specific Services PIC MIB

The Adaptive Services (AS) Physical Interface Card (PIC) allows you to provide multiple services on a single PIC by configuring a set of services and applications. The AS PIC offers a special range of services you configure in one or more service sets: stateful firewalls, Network Address Translation (NAT), and intrusion detection services (IDS).

The enterprise-specific Services PIC MIB, whose object identifier is {jnxMibs 32}, sends the current operational status for each Adaptive Services PIC. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-sp.txt.

NOTE: The Services PIC MIB is not supported on J-series Services Routers unless the appropriate services license is enabled.

This chapter discusses the following topics:

jnxSpSvcSetTable

The jnxSpSvcSetTable, whose object identifier is {jnxSPSvcSet 1}, provides information about each service set on each Adaptive Services PIC on the router.

jnxSpSvcSetEntry

The jnxSpSvcSetEntry, whose object identifier is {jnxSpSvcSetTable 1}, has 11objects, which are listed in Table 104 on page 468. Each entry provides information about a single service set. The service set is identified by the name of the service set. The Adaptive Services PIC on which the service set is configured is identified by JnxSpSvcSetIFName.

Table 104: jnxSpSvcSetTable

Object	Object Identifier	Description
jnxSpSvcSetName	jnxSpSvcSetEntry 1	A text name for the service set.
jnxSpSvcSetSvcType	jnxSpSvcSetEntry 2	The name of the service type associated with the service set.
jnxSpSvcSetTypeIndex	jnxSpSvcSetEntry 3	An integer used to identify the service type for the service set.
jnxSpSvcSetIfName	jnxSpSvcSetEntry 4	The name of the interface identifying the Adaptive Services PIC. If more than one interface is associated with the Adaptive Services PIC, the name associated with the lower layer interface is used.
jnxSpSvcSetIfIndex	jnxSpSvcSetEntry 5	An index number associated with the interface name.
jnxSpSvcSetMemoryUsage	jnxSpSvcSetEntry 6	Amount of memory used by the service set, in bytes.
jnxSpSvcSetCpuUtil	jnxSpSvcSetEntry 7	Amount of CPU processing used by the service set, expressed as a percentage of total CPU usage. J-series Services Routers do not have a dedicated CPU for services. CPU usage on these routers appears as 0.
jnxSpSvcSetSvcStyle	jnxSpSvcSetEntry 8	Type of service for the service set. Service types include: ■ Unknown—The service type is not known. ■ Interface-service—The service is interface based. ■ Next-hop-service—The service is next-hop based.
jnxSpSvcSetMemLimitPktDrops	jnxSpSvcSetEntry 9	Number of packets dropped because the service set exceeded its memory limits (operating in the Red zone).
jnxSpSvcSetCpuLimitPktDrops	jnxSpSvcSetEntry 10	Number of packets dropped because the service set exceeded the average CPU limits (when total CPU usage exceeds 85 percent).
jnxSpSvcSetFlowLimitPktDrops	jnxSpSvcSetEntry 11	Number of packets dropped because the service set exceeded the flow limit.

jnxSpSvcSetSvcTypeTable

The jnxSpSvcSetSvcTypeTable, whose object identifier is {jnxSPSvcSet 2}, provides information about each service on each Adaptive Services PIC on the router. The stateful firewall, NAT, or IDS service sets are categorized as one SvcType (SFW/NAT/IDS).

■ jnxSpSvcSetSvcTypeEntry on page 469

jnxSpSvcSetSvcTypeEntry

The jnxSpSvcSetSvcTypeEntry, whose object identifier is {jnxSpSvcSetSvcTypeTable 1}, has seven objects, which are listed in Table 105 on page 469. Each entry provides information about a single service on each Adaptive Services PIC. Each Adaptive Services PIC is identified by its corresponding index number, while each service is identified by jnxSpSvcSetSvcTypeIndex. The service type associated with this index is provided by jnxSpSvcSetSvcTypeName.

Table 105: jnxSpSvcSetSvcTypeTable

Object	Object Identifier	Description
jnxSpSvcSetSvcTypeIndex	jnxSpSvcSetSvcTypeEntry 1	An integer used to identify the service type.
jnxSpSvcSetSvcTypeIfName	jnxSpSvcSetSvcTypeEntry 2	The name of the interface identifying the Adaptive Services PIC. If more than one interface is associated with the Adaptive Services PIC, the name associated with the lower layer interface is used.
jnxSpSvcSetSvcTypeName	jnxSpSvcSetSvcTypeEntry 3	The name of the service type.
jnxSpSvcSetSvcTypeSvcSets	jnxSpSvcSetSvcTypeEntry 4	Number of service sets configured on the Adaptive Services PIC that use this service type.
jnxSpSvcSetSvcTypeMemoryUsage	jnxSpSvcSetSvcTypeEntry 5	Amount of memory used by this service type, expressed in bytes.
jnxSpSvcSetSvcTypePctMemoryUsage	jnxSpSvcSetSvcTypeEntry 6	Amount of memory used by this service type, expressed as a percentage of total memory.
jnxSpSvcSetSvcTypeCpuUtil	jnxSpSvcSetSvcTypeEntry 7	Amount of CPU processing used by the service set, expressed as a percentage of total CPU usage. J-series Services Routers do not have a dedicated CPU for services. CPU usage on these routers appears as 0.

jnxSpSvcSetIfTable

The jnxSpSvcSetIfTable, whose object identifier is {jnxSPSvcSet 3}, provides service set information for each Adaptive Serices PIC on the router.

■ jnxSpSvcSetSvcIfEntry on page 470

jnxSpSvcSetSvcIfEntry

The jnxSpSvcSetIfEntry, whose object identifier is {jnxSpSvcSetIfTable 1}, has eight objects, which are listed in Table 106 on page 470. Each entry provides service set information about a single Adaptive Services PIC. Each Adaptive Services PIC is identified by its corresponding index number.

Table 106: jnxSpSvcSetIfTable

Object	Object Identifier	Description
jnxSpSvcSetIfTableName	jnxSpSvcSetIfEntry 1	The name of the interface used to identify the Adaptive Services PIC. If more than one interface is associated with the Adaptive Services PIC, the name associated with the lower layer interface is used.
jnxSpSvcSetIfsvcSets	jnxSpSvcSetIfEntry 2	The number of service sets configured on the Adaptive Services PIC.
jnxSpSvcSetIfMemoryUsage	jnxSpSvcSetIfEntry 3	Amount of memory used by the Adaptive Services PIC, expressed in bytes.
jnxSpSvcSetIfPctMemoryUsage	jnxSpSvcSetIfEntry 4	Amount of memory used by the Adaptive Services PIC, expressed as a percentage of total memory.
jnxSpSvcSetIfPolMemoryUsage	jnxSpSvcSetIfEntry 5	Amount of policy memory used by the Adaptive Services PIC, expressed in bytes.
jnxSpSvcSetIfPctPolMemoryUsage	jnxSpSvcSetIfEntry 6	Amount of policy memory used by the Adaptive Services PIC, expressed as a percentage of the total.
jnxSpSvcSetIfMemoryZone	jnxSpSvcSetIfEntry 7	The memory usage zone currently occupied by the Adaptive Services PIC. The definitions of each zone are: ■ Green—All new flows are allowed. ■ Yellow—Unused memory is reclaimed. All new flows are allowed. ■ Orange—New flows are allowed only for service sets that use less than their equal share of memory. ■ Red—No new flows are allowed.
jnxSpSvcSetIfCpuUtil	jnxSpSvcSetIfEntry 8	Amount of CPU processing used by the Adaptive Services PIC, expressed as a percentage of total CPU usage. J-series Services Routers do not have a dedicated CPU for services. CPU usage on these routers appears as 0.

Service Traps

The enterprise-specific Services PIC MIB provides traps for monitoring AS PICs. Table 107 on page 471 lists the supported traps.

Table 107: Supported Traps for Services PIC MIB

Object	Object Identifier	Description
jnxSpSvcSetZoneEntered	jnxSPNotificationPrefix 1	Indicates that an Adaptive Services PIC has entered a more severe memory usage zone from a less severe memory usage zone. The zone entered is identified by JnxSpSvcSetIfMemoryZone.
jnxSpSvcSetZoneExited	jnxSPNotificationPrefix 2	Indicates that an Adaptive Services PIC has exited a more severe memory usage zone to a less severe memory usage zone. The zone entered is identified by JnxSpSvcSetIfMemoryZone.
jnxSpSvcSetCpuExceeded	jnxSPNotificationPrefix 3	Indicates that an Adaptive Services PIC has over 85 % CPU usage. This trap is not supported on J-series Services Routers.
jnxSpSvcSetCpuOk	jnxSPNotificationPrefix 4	Indicates that an Adaptive Services PIC has returned to less than 85 % CPU usage. This trap is not supported on J-series Services Routers.

Redundant Interfaces

On M-series routers and T-series routing platforms, redundant adaptive services interfaces (rsp) appear in the jnxSpSvcSetIfTable just like any other adaptive services interface (sp). With the exception of the index, information presented for an rsp interface is similar to the underlying sp interface. In the jnxSpSvcSetTable, only the underlying sp interface is shown because the Adaptive Services PIC does not track the overlying rsp interface,

Chapter 39

Interpreting the Enterprise-Specific Dynamic Flow Capture MIB

The Dynamic Flow Capture (DFC) Physical Interface Card (PIC) forwards passively monitored packets matching a particular filter list to one or more destinations.

The DFC architecture consists of one or more control sources that send requests to a Juniper Networks routing platform to monitor incoming data and then forward any packets that match specific filter criteria to a set of one or more content destinations.

The enterprise-specific DFC MIB, whose object identifier is {jnxMibs 33}, sends the current operational status for each dynamic flow capture PIC. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-dfc.txt.

NOTE: The dynamic flow capture PIC is supported on M320 and T320 routers and the T640 Internet routing node.

This chapter discusses the following topics:

jnxDfcCSTable

The jnxDfcCSTable, whose object identifier is {jnxDfc 1}, provides information about the DFC control source on each dynamic flow capture PIC on the router.

jnxDfcCSEntry

The jnxDfcCSEntry, whose object identifier is {jnxDfcCSTable 1}, has 44 objects, which are listed in Table 108 on page 474.

Table 108: jnxDfcCSTable

Object	Object Identifier	Description
jnxDfcCSGrpName	jnxDfcCSEntry 1	The name assigned to a DFC group. A DFC group defines a profile of dynamic flow capture configuration information.
jnxDfcCSId	jnxDfcCSEntry 2	Control source identifier. The control source is a client that monitors electronic data or voice transfer over the network. The control source sends filter requests to the Juniper Networks routing platform using a control protocol. The control source has a unique identifier and an optional list of IP addresses.
jnxDfcCSControlProtocolAddRequests	jnxDfcCSEntry 3	The number of control protocol Add requests received. The Add request specifies new filter criteria to be included in the current filter configuration for a given control source and content destination.
jnxDfcCSCriteriaAdded	jnxDfcCSEntry 4	The number of filter criteria added successfully by the control source.
jnxDfcCSCriteriaAdditionFailed	jnxDfcCSEntry 5	The number of filter criteria Add requests that could not be processed successfully.
jnxDfcCSControlProtocolDeleteRequests	jnxDfcCSEntry 6	The number of control protocol Delete requests received. The Delete request specifies filter criteria to be removed from the current filter configuration for a given control source and content destination.
jnxDfcCSCriteriaDeleted	jnxDfcCSEntry 7	The number of filter criteria deleted successfully as requested by the control source.
jnxDfcCSCriteriaDeletionFailed	jnxDfcCSEntry 8	The number of filter criteria Delete requests that could not be processed successfully.
jnxDfcCSCriteriaDeletedTimeoutIdle	jnxDfcCSEntry 9	The number of criteria deleted by timeout idle.
jnxDfcCSCriteriaDeletedTimeoutTotal	jnxDfcCSEntry 10	The number of criteria deleted by timeout total.
jnxDfcCSCriteriaDeletedPackets	jnxDfcCSEntry 11	The number of criteria deleted by packets.
jnxDfcCSCriteriaDeletedBytes	jnxDfcCSEntry 12	The number of criteria deleted by bytes.
jnxDfcCSControlProtocolRefreshRequests	jnxDfcCSEntry 13	The number of control protocol Refresh requests received. The Refresh request updates the timeout for a particular filter criterion (or a set of filter criteria) for a given control source and content destination.
jnxDfcCSCriteriaRefreshed	jnxDfcCSEntry 14	The number of filter criteria Refresh requests processed successfully as requested by the control source.
jnxDfcCSCriteriaRefreshFailed	jnxDfcCSEntry 15	The number of filter criteria Refresh requests that could not be processed successfully.
jnxDfcCSControlProtocolListRequests	jnxDfcCSEntry 16	The number of control protocol List requests received. The List request returns a list of all criteria that a particular control source has added and are currently active.

Table 108: jnxDfcCSTable *(continued)*

Object	Object Identifier	Description
jnxDfcCSListSuccess	jnxDfcCSEntry 17	The number of List requests processed successfully as requested by the control source.
jnxDfcCSListFailed	jnxDfcCSEntry 18	The number of List requests that could not be processed successfully.
jnxDfcCSControlProtocolNoopRequests	jnxDfcCSEntry 19	The number of control protocol Noop requests received. This request is used to verify the end-to-end connectivity between the control source and the DFC PIC.
jnxDfcCSNoopSuccess	jnxDfcCSEntry 20	The number of Noop requests processed successfully as requested by the control source.
jnxDfcCSNoopFailed	jnxDfcCSEntry 21	The number of Noop requests that could not be processed successfully.
jnxDfcCSDynamicCrtieriaActive	jnxDfcCSEntry 22	The number of active dynamic filter criteria.
jnxDfcCSStaticCrtieriaActive	jnxDfcCSEntry 23	The number of active static filter criteria.
jnxDfcCSBadRequest	jnxDfcCSEntry 24	The number of Bad requests received.
jnxDfcCSResponseSuccessful	jnxDfcCSEntry 25	The number of successful responses corresponding to the Add, Delete, Refresh, List, and Noop requests sent to the control source.
jnxDfcCSResponseImproperCriteria	jnxDfcCSEntry 26	The number of responses generated because of improper filter criteria included in an Add request.
jnxDfcCSResponseUnknownContentDest	jnxDfcCSEntry 27	The number of responses generated because of an unknown content destination included in an Add, Delete, Refresh, or List request.
jnxDfcCSResponseUnknownControlSrc	jnxDfcCSEntry 28	The number of responses generated because of an unknown control source included in an Add, Delete, Refresh, or List request.
jnxDfcCSResponseUnknownCriteriaId	jnxDfcCSEntry 29	The number of responses generated because of an unknown criteria identifier included in an Add, Delete, Refresh, or List request.
jnxDfcCSResponseImproperTimeout	jnxDfcCSEntry 30	The number of responses generated because of an improper timeout specified in an Add or Refresh request.
jnxDfcCSResponseInvalidAuthentication	jnxDfcCSEntry 31	The number of responses generated because of invalid authentication information included in an Add, Delete, Refresh, List, or Noop request.
jnxDfcCSResponseInvalidSequenceNumber	jnxDfcCSEntry 32	The number of responses generated because of an invalid sequence number included in an Add, Delete, Refresh, List, or Noop request.
jnxDfcCSResponseInternalError	jnxDfcCSEntry 33	The number of responses generated because an internal error occurred on the DFC PIC processing the request.

Table 108: jnxDfcCSTable *(continued)*

Object	Object Identifier	Description
jnxDfcCSNotificationRestart	jnxDfcCSEntry 34	The number of Restart notifications sent to configured notification recipients. A notification is generated when a system failure occurs and all DFC filter criteria are lost.
jnxDfcCSNotificationRollover	jnxDfcCSEntry 35	The number of Rollover notifications sent to configured notification recipients. A notification is generated when a sequence number rollover occurs on the DFC PIC.
jnxDfcCSNotificationNoop	jnxDfcCSEntry 36	The number of Noop notifications sent to configured notification recipients. A notification is generated when the DFC PIC receives a Noop message that includes a SendAsync parameter.
jnxDfcCSNotificationTimeout	jnxDfcCSEntry 37	The number of Timeout notifications sent to configured notification recipients. This notification is generated when a DFC PIC times out a filter criterion (based on any one of its configured timeout parameters) and the criterion contains a SendTimeoutAsync parameter.
jnxDfcCSNotificationCongestion	jnxDfcCSEntry 38	A Congestion notification is generated when the total 10-second average packet forwarding rate (in bits per second) summed over all active filter criteria to a configured content destination exceeds the configured *soft* limit for the destination. The jnxDfcCSNotificationCongestion object contains the number of Congestion notifications sent to configured notification recipients.
jnxDfcCSNotificationCongestionDelete	jnxDfcCSEntry 39	A Congestion Delete notification is generated when the total 10-second average packet forwarding rate (in bits/second) summed over all active filter criteria to a configured content destination exceeds the configured *hard* limit for the destination. The jnxDfcCSNotificationCongestionDelete object contains the number of Congestion Delete notifications sent to configured notification recipients.
jnxDfcCSNotificationDuplicatesDropped	jnxDfcCSEntry 40	The number of Duplicated Dropped notifications sent to configured notification recipients. This notification is generated when the configurable Maximum Duplicates parameter has been exceeded and packets matching criteria added by the corresponding control source are dropped.
jnxDfcCSAddRequestRate	jnxDfcCSEntry 41	The request processing rate (in requests processed per second).
jnxDfcCSAddRequestPeakRate	jnxDfcCSEntry 42	The peak request processing rate (in requests processed per second.
jnxDfcCSAggrCriteriaBandwidth	jnxDfcCSEntry 43	Bandwidth (in bits per second).
jnxDfcCSSequenceNumber	jnxDfcCSEntry 44	Protocol sequence number.

jnxDfcCDTable

The jnxDfcCDTable, whose object identifier is {jnxDfc 2}, provides statistical information for content destinations.

■ jnxDfcCDEntry on page 477

jnxDfcCDEntry

The jnxDfcCDEntry, whose object identifier is {jnxDfcCDTable 1}, has seven objects, which are listed in Table 109 on page 477.

Table 109: jnxDfcCDTable

Object	Object Identifier	Description
jnxDfcCDGrpName	jnxDfcCDEntry 1	The name assigned to a DFC group. A DFC group defines a profile of dynamic flow capture configuration information.
jnxDfcCDId	jnxDfcCDEntry 2	Content destination identifier. The DFC router processes the requests from the control sources, creates the filters, monitors incoming data flows, and sends the matched packets to their respective content destinations. Content destinations receive the matched packets from the router.
jnxDfcCDCriteria	jnxDfcCDEntry 3	The number of filter criteria configured for the content destination.
jnxDfcCDByteRate	jnxDfcCDEntry 4	The average data rate (in bytes per second) summed over all active filter criteria configured for a given content destination.
jnxDfcCDMatchedPackets	jnxDfcCDEntry 5	The number of packets that match the filter criteria configured for a content destination.
jnxDfcCDMatchedBytes	jnxDfcCDEntry 6	The number of bytes that match the filter criteria configured for a content destination.
jnxDfcCDCongestionNotification	jnxDfcCDEntry 7	The number of Congestion notifications sent to a configured notification recipient.

DFC Notification Variables

The enterprise-specific DFC MIB provides notifications for monitoring dynamic flow capture. Table 110 on page 477 lists the supported notification variables.

Table 110: Supported Notification Variables for the DFC MIB

Object	Object Identifier	Description
jnxDfcInputPktRate	jnxDfcNotifyVars 1	Data packet rate (in packets per second).
jnxDfcPpsSoftOverloadLowWatermark	jnxDfcNotifyVars 2	Configured lowest value for the data packet rate (in packets per second).

Table 110: Supported Notification Variables for the DFC MIB *(continued)*

Object	Object Identifier	Description
jnxDfcPpsSoftOverloadHighWatermark	jnxDfcNotifyVars 3	Configured highest value for the data packet rate (in packets per second).
jnxDfcPpsHardOverloadLowWatermark	jnxDfcNotifyVars 4	Recommended lowest value for the data packet rate (in packets per second).
jnxDfcPpsHardOverloadHighWatermark	jnxDfcNotifyVars 5	Recommended highest value for the data packet rate (in packets per second).
jnxDfcFlowsUsage	jnxDfcNotifyVars 6	Percent (%) usage of the total number of flows.
jnxDfcCriteriaUsage	jnxDfcNotifyVars 7	Percent (%) usage of matching criteria for all filters.
jnxDfcMemSoftOverloadLowWatermark	jnxDfcNotifyVars 8	Configured lowest watermark percent for memory load.
jnxDfcMemSoftOverloadHighWatermark	jnxDfcNotifyVars 9	Configured highest watermark percent for memory load.
jnxDfcFlowLowWatermark	jnxDfcNotifyVars 10	Recommended lowest value for the number of flows allowed.
jnxDfcFlowHighWatermark	jnxDfcNotifyVars 11	Recommended highest value for the number of flows allowed.
jnxDfcCriteriaLowWatermark	jnxDfcNotifyVars 12	Recommended lowest value for the number of criteria allowed.
jnxDfcCriteriaHighWatermark	jnxDfcNotifyVars 13	Recommended highest value for the number of criteria allowed.

DFC Notification Definitions

Table 111 on page 478 lists the supported notification definitions.

Table 111: Supported Notification Definitions for the DFC MIB

Notification Type	Objects	Identifier	Description
jnxDfcSoftPpsThresholdExceeded	jnxDfcInputPktRate jnxDfcPpsSoftOverloadLowWatermark jnxDfcPpsSoftOverloadHighWatermark	jnxDfcNotificationPrefix 1	Notification that occurs when the input packet rate (in packets per second) exceeds the configured limit.
jnxDfcSoftPpsUnderThreshold	jnxDfcInputPktRate jnxDfcPpsSoftOverloadLowWatermark jnxDfcPpsSoftOverloadHighWatermark	jnxDfcNotificationPrefix 2	Notification that occurs when the input packet rate (in packets per second) returns to below the configured limit.

Table 111: Supported Notification Definitions for the DFC MIB *(continued)*

Notification Type	Objects	Identifier	Description
jnxDfcHardPpsThresholdExceeded	jnxDfcInputPktRate jnxDfcPpsHardOverloadLowWatermark jnxDfcPpsHardOverloadHighWatermark	jnxDfcNotificationPrefix 3	Notification that occurs when the input packet rate (in packets per second) exceeds the recommended limit.
jnxDfcHardPpsUnderThreshold	jnxDfcInputPktRate jnxDfcPpsHardOverloadLowWatermark jnxDfcPpsHardOverloadHighWatermark	jnxDfcNotificationPrefix 4	Notification that occurs when the input packet rate (in packets per second) returns to below the recommended limit.
jnxDfcSoftMemThresholdExceeded	jnxDfcFlowUsage jnxDfcCriteriaUsage jnxDfcMemSoftOverloadLowWatermark jnxDfcMemSoftOverloadHighWatermark	jnxDfcNotificationPrefix 5	Notification that occurs when memory usage exceeds the configured limit.
jnxDfcSoftMemUnderThreshold	jnxDfcFlowUsage jnxDfcCriteriaUsage jnxDfcMemSoftOverloadLowWatermark jnxDfcMemSoftOverloadHighWatermark	jnxDfcNotificationPrefix 6	Notification that occurs when memory usage returns to below the configured limit.
jnxDfcHardMemThresholdExceeded	jnxDfcFlowUsage jnxDfcFlowLowWatermark jnxDfcFlowHighWatermark jnxDfcCriteriaUsage jnxDfcCriteriaLowWatermark jnxDfcCriteriaHighWatermark	jnxDfcNotificationPrefix 7	Notification that occurs when memory usage exceeds the recommended limit.
jnxDfcHardMemUnderThreshold	jnxDfcFlowUsage jnxDfcFlowLowWatermark jnxDfcFlowHighWatermarkjnxDfcCriteriaUsage jnxDfcCriteriaLowWatermark jnxDfcCriteriaHighWatermark	jnxDfcNotificationPrefix 8	Notification that occurs when memory usage returns to below the recommended limit.

Chapter 40

Interpreting the Enterprise-Specific Chassis Forwarding MIB

The enterprise-specific Chassis Forwarding MIB, whose object identifier is {jnxMibs 34}, enables J-series Services Routers to fully support the JUNOS health monitor. This MIB extends the scope of health monitoring to include JUNOS forwarding process (fwdd) components on J-series Services Routers. The forwarding process is responsible for most of the packet transmission through a J-series Services Router. The overall performance of the router is largely determined by the effectiveness of the forwarding process.

The JUNOS health monitor uses objects in the Chassis Forwarding MIB to access information about the forwarding process such as microkernel CPU usage and real-time thread CPU usage.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-chassis-fwdd.txt.

This chapter contains the following topic:

jnxFwddProcess

The object identifier for jnxFwddProcess is {jnxFwdd 1}. This object shows health monitoring statistics for the forwarding process (fwdd) (Table 112 on page 481).

Table 112: jnxFwddProcess

Object	Object Identifier	Description
jnxFwddMicroKernelCPUUsage	jnxFwddProcess 1	Percentage of the CPU being used by the forwarding process microkernel. If this information is unavailable or is not applicable, the value is 0 (zero).
jnxFwddRtThreadsCPUUsage	jnxFwddProcess 2	Percentage of the CPU being used by the forwarding process real-time threads. If this information is unavailable or is not applicable, the value is 0 (zero).

Table 112: jnxFwddProcess *(continued)*

Object	Object Identifier	Description
jnxFwddHeapUsage	jnxFwddProcess 3	Percentage of heap space being used by the forwarding process. If this information is unavailable or is not applicable, the value is 0 (zero).
jnxFwddDmaMemUsage	jnxFwddProcess 4	Percentage of DMA memory used by the forwarding process. If this information is unavailable or is not applicable, the value is 0 (zero).
jnxFwddUpTime	jnxFwddProcess 5	Forwarding process uptime expressed in terms of system uptime. If this information is unavailable or is not applicable, the value is 0 (zero).

Chapter 41

Interpreting the Enterprise-Specific System Log MIB

Event policies can include an action that raises traps for events based on system log messages. This feature enables notification of an SNMP trap-based application when an important system log message occurs. You can convert any system log message (for which there are no corresponding traps) into a trap. This feature is valuable for customers who use network management system traps rather than system log messages to monitor their networks. For more information on converting system log messages into traps, see the *JUNOS Configuration and Diagnostic Automation Guide*.

The enterprise-specific System Log MIB, whose object identifier is {jnxMibs 35}, provides support for this feature.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-syslog.txt.

This chapter contains the following topics:

jnxSyslogTable

The jnxSyslogTable, whose object identifier is {jnxSyslog 1}, provides information about each system log message generated by the router.

jnxSyslogEntry

The jnxSyslogEntry, whose object identifier is {jnxSyslogTable 1}, has nine objects, which are listed in Table 113 on page 484. Each entry provides information about a single system log message.

Table 113: jnxSyslogTable

Object	Object Identifier	Description
jnxSyslogID	jnxSyslogEntry 1	System log message identifier. This identifier is a numerical value and may not be consecutive. This identifier is also used as the primary index in jnxSyslogAttrValTable.
jnxSyslogEventName	jnxSyslogEntry 2	An octet string that contains the system log event name.
jnxSyslogTimestamp	jnxSyslogEntry 3	Time the message was generated. This value is expressed as DateAndTime.
jnxSyslogSeverity	jnxSyslogEntry 4	Severity of the system log message. The severity value is equal to the value that the system log uses + 1. For example, an emergency message (severity 0 in the system log) has a severity of 1. Severity values include: ■ emergency (1) ■ alert (2) ■ critical (3) ■ error (4) ■ warning (5) ■ notice (6) ■ info (7) ■ debug (8)
jnxSyslogFacility	jnxSyslogEntry 5	Identifies the facility used to generate the log message. (Table 114 on page 484.)
jnxSyslogProcessID	jnxSyslogEntry 6	Process ID of the process that generated the system log message.
jnxSyslogProcessName	jnxSyslogEntry 7	Process that generated the system log message.
jnxSyslogHostName	jnxSyslogEntry 8	Hostname of the machine that generated the system log.
jnxSyslogMessage	jnxSyslogEntry 9	System log message that was generated.

Table 114 on page 484 lists the facilities that generate system log messages..

Table 114: Facilities That Generate System Log Messages

Index	Item	Description
1	kernel	Kernel messages
2	user	User level messages

Table 114: Facilities That Generate System Log Messages *(continued)*

Index	Item	Description
3	mail	Mail system
4	daemon	System processes
5	auth	Authorization messages
6	syslog	Messages generated by the system log process (syslogd)
7	lpr	Line printer subsystem
8	news	Network news subsystem
9	uucp	UUCP subsystem
10	cron	Clock process
11	authPriv	Authorization messages
12	ftp	FTP process
13	ntp	NTP subsystem
14	security	Security subsystems (for example, firewall)
15	console	/dev/console output
16	reserved	Reserved for system use
17	loca10	–
18	dfc	JUNOS names
19	loca12	–
20	firewall	JUNOS names
21	pfe	JUNOS names
22	conflict	JUNOS names
23	change	JUNOS names
24	interact	JUNOS names

jnxSyslogAvTable

The jnxSyslogAvTable, whose object identifier is {jnxSyslogNotifyVars 2}, provides information about each system log message generated by the router.

■ jnxSyslogEntry on page 486

jnxSyslogEntry

The jnxSyslogAvEntry, whose object identifier is {jnxSyslogAvTable 1}, has three objects, which are listed in Table 115 on page 486. Each entry provides information about attribute value pairs of system log messages generated by a device.

Table 115: jnxSyslogAvTable

Object	Object Identifier	Description
jnxSyslogAvIndex	jnxSyslogAvEntry 1	Index for the attribute value pair in the system log message.
jnxSyslogAvAttribute	jnxSyslogAvEntry 2	Attribute of the system log message (identified by jnxSyslogID).
jnxSyslogAvValue	jnxSyslogAvEntry 3	Value of the attribute (identified by jnxSyslogAvAttribute).

Chapter 42

Interpreting the Enterprise-Specific MPLS LDP MIB

The enterprise-specific MPLS LDF MIB, whose object identifier is {jnxMibs 36}, contains object definitions as described in RFC 3815, *Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)*.

This MIB was supported in earlier releases of JUNOS software as a proprietary LDP MIB (mib-ldpmib.txt). Because the branch used by the proprietary LDP MIB (mib-ldpmib.txt) conflicts with RFC 3812, the proprietary LDP MIB (mib-ldpmib.txt) has been deprecated and replaced by the enterprise-specific MPLS LDP MIB (mib-jnx-mpls-ldp.txt).

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-mpls-ldp.txt.

Chapter 43

Interpreting the Enterprise-Specific Packet Forwarding Engine MIB

The enterprise-specific Packet Forwarding Engine (PFE) MIB, whose object identifier is {jnxPfeMibRoot 1}, provides notification statistics for Packet Forwarding Engines. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-pfe.txt.

NOTE: Information provided by this MIB is modeled after information provided by the show pfe statistics notification CLI command.

This chapter discusses the following topics:

jnxPfeNotifyGlTable

jnxPfeNotifyGlTable contains global PFE notification statistics.

jnxPfeNotifyGlEntry

JnxPfeNotifyGlEntry contains notification statistics for each PFE slot. Each entry has objects listed in Table 116 on page 489.

Table 116: jnxPfeNotifyGlEntry

Object	Object Identifier	Description
jnxPfeNotifyGlSlot	jnxPfeNotifyGlEntry 1	The slot number for a set of PFE notification statistics.
jnxPfeNotifyGlParsed	jnxPfeNotifyGlEntry 2	The number of notifications reported by the Packet Forwarding Engine controller, which manages packet forwarding functions.
jnxPfeNotifyGlAged	jnxPfeNotifyGlEntry 3	The number of notifications dropped because they have expired.

Table 116: jnxPfeNotifyGlEntry *(continued)*

Object	Object Identifier	Description
jnxPfeNotifyGlCorrupt	jnxPfeNotifyGlEntry 4	The number of notifications dropped because the notification result format is invalid. This counter is valid for Internet Processor-I and Internet Processor-II only.
jnxPfeNotifyGlIllegal	jnxPfeNotifyGlEntry 5	The number of notifications dropped because the notification has an illegal notification type.
jnxPfeNotifyGlSample	jnxPfeNotifyGlEntry 6	The number of sample notifications reported by the Packet Forwarding Engine controller.
jnxPfeNotifyGlGiants	jnxPfeNotifyGlEntry 7	The number of notifications dropped because the notification is larger than the supported direct memory access (DMA) size.
jnxPfeNotifyGlTtlExceeded	jnxPfeNotifyGlEntry 8	The number of options/TTL-expired notifications sent to service interfaces as transit packets. This counter is valid for Internet Processor-I and Internet Processor-II only.
jnxPfeNotifyGlTtlExcErrors	jnxPfeNotifyGlEntry 9	The number of options/TTL-expired notifications that could not be sent to service interfaces as transit packets because the output interface could not be determined. This counter is valid for Internet Processor-I and Internet Processor-II only.
jnxPfeNotifyGlSvcOptAsp	jnxPfeNotifyGlEntry 10	The number of IP options packets sent to a Services PIC.
jnxPfeNotifyGlSvcOptRe	jnxPfeNotifyGlEntry 11	The number of IP options packets sent to the Routing Engine.
jnxPfeNotifyGlPostSvcOptOut	jnxPfeNotifyGlEntry 12	The number of notifications re-injected by a Services PIC after processing the associated packets. The PFE will forward these notifications to their actual destination. This counter is valid for Internet Processor-I and Internet Processor-II only.
jnxPfeNotifyGlOptTtlExp	jnxPfeNotifyGlEntry 13	The number of TTL-expired transit packets.
jnxPfeNotifyGlDiscSample	jnxPfeNotifyGlEntry 14	The number of sample notifications dropped because the notifications refer to discarded packets in the PFE.
jnxPfeNotifyGlRateLimited	jnxPfeNotifyGlEntry 15	The number of notification ignored because of PFE software throttling (delaying or refusing requests).
jnxPfeNotifyGlPktGetFails	jnxPfeNotifyGlEntry 16	The number of notifications ignored because DMA memory could not be allocated.
jnxPfeNotifyGlDmaFails	jnxPfeNotifyGlEntry 17	The number of notifications where the DMA of associated packets failed for miscellaneous reasons. This counter is valid for T-series routing platforms only.
jnxPfeNotifyGlDmaTotals	jnxPfeNotifyGlEntry 18	The number of notifications for which the packet DMA completed. This counter is valid for T-series routing platforms only.
jnxPfeNotifyGlUnknowns	jnxPfeNotifyGlEntry 19	The number of notifications that could not be resolved to a known, next hop destination. This counter is valid for T-series routing platforms only.

jnxPfeNotifyTypeTable

jnxPfeNotifyTypeTable contains information on type-specific PFE notifications for each PFE slot. PFE notification types are listed in Table 117 on page 491.

Table 117: PFE Notification Types

Index	Item	Description
1	Illegal	Packets with an invalid notification type
2	Unclassified	Packets that did not have a key lookup performed on them
3	Option	Packets that include L3 options
4	Next Hop	Packets that are destined to the host
5	Discard	Discarded packets sent to the route processor
6	Sample	Unused
7	Redirect	Packets sent back to the interfaces from which they arrived
8	Do Not Fragment	Packets that need to be fragmented, but have a don't fragment (DF) value set.
9	CFDF	Packets that have a DF value set and a maximum transmission unit (MTU) exceeded indicator is triggered.
10	Poison	Packets that have a poisoned next-hop index.

■ jnxPfeNotifyTypeEntry on page 491

jnxPfeNotifyTypeEntry

jnxPfeNotifyTypeEntry contains information about type-specific PFE notifications, and has the objects listed in Table 118 on page 491.

Table 118: jnxPfeNotifyTypeTable

Object	Object Identifier	Description
jnxPfeNotifyTypeId	jnxPfeNotifyTypeEntry 1	Identifies the PFE notification type. See Table 117 on page 491 for a list of notification types.
jnxPfeNotifyTypeDescr	jnxPfeNotifyTypeEntry 2	A description of the PFE notification type.
jnxPfeNotifyTypeParsed	jnxPfeNotifyTypeEntry 3	The number of notifications that are parsed successfully.
jnxPfeNotifyTypeInput	jnxPfeNotifyTypeEntry 4	The number of notifications whose associated packets are stored in router processor memory using direct memory access.
jnxPfeNotifyTypeFailed	jnxPfeNotifyTypeEntry 5	The number of notifications that are not parsed successfully.

Table 118: jnxPfeNotifyTypeTable *(continued)*

Object	Object Identifier	Description
jnxPfeNotifyTypeIgnored	jnxPfeNotifyTypeEntry 6	The number of notifications where the notification type in the message does not match any of the valid notification types.

Chapter 44

Interpreting the Enterprise-Specific Event MIB

The enterprise-specific Event MIB, whose object identifier is {jnxMibs 37}, defines a generic trap that can be generated using an op script or event policy. This MIB provides the ability to specify a system log string and raise a trap if that system log string is found.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-event.txt.

This chapter discusses the following topics:

jnxEventAvTable

The jnxEventAvTable, whose object identifier is {jnxEventNotifyVars 2}, provides information about traps generated by op scripts or event policies.

jnxEventAvEntry

jnxEventAvEntry, whose object identifier is {jnxEventAvTable 1}, has three objects, which are listed in Table 119 on page 493.

Table 119: jnxEventAvTable

Object	Object Identifier	Description
jnxEventAvIndex	jnxEventAvEntry 1	The sequence number of the attribute value pair in the trap generated by a op script or event policy
jnxEventAvAttribute	jnxEventAvEntry 2	The attribute name in the trap generated by an op script or event policy
jnxEventAvValue	jnxEventAvEntry 3	The value of the attribute identified by jnxEventAvAttribute

Notifications for the Event MIB

Table 120 on page 494 lists the supported notifications for the Event MIB.

Table 120: Supported Notifications for the Event MIB

Object	Object Identifier	Description
jnxEventTrapDescr	jnxEventNotificationPrefix 1	A notification generated by an op script or event policy. In addition to the jnxEventTrap objects, this notification can include one or more attribute value pairs (identified by jnxEventAvAttribute and jnxEventAvValue).

Chapter 45

Interpreting the Enterprise-Specific Bidirectional Forwarding Detection (BFD) MIB

The enterprise-specific Bidirectional Forwarding Detection (BFD) MIB, whose object identifier is {jnxBfdMibRoot 1}, sends the current operational status for the transmit interval and detection time of BFD sessions. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-bfd.txt.

This chapter discusses the following topics:

jnxBfdSessTable

The jnxBfdSessTable, whose object identifier is {jnxBfdObjects 1}, is an extension to the jnxSessTable. It provides information about threshold values for the transmit interval and detection time on BFD sessions.

jnxBfdSessEntry

The jnxBfdSessEntry, whose object identifier is {jnxBfdSessTable 1}, has four objects, which are listed in Table 121 on page 495.

Table 121: jnxBfdSessTable

Object	Object Identifier	Description
jnxBfdSessThresTxInterval	jnxBfdSessEntry 1	The threshold value (in microseconds) for the transmit interval. If the current transmit interval value (jnxBfdSessCurrTxInterval) adapts to a value greater than the threshold value, a trap is raised (jnxBfdSessTxIntervalHigh).
jnxBfdSessCurrTxInterval	jnxBfdSessEntry 2	The current transmit interval for the session (in microseconds).

Table 121: jnxBfdSessTable *(continued)*

Object	Object Identifier	Description
jnxBfdSessThreshDectTime	jnxBfdSessEntry 3	The threshold value (in microseconds) for the detection time. If the current detection time value (jnxBfdSessCurrDectTime) adapts to a value greater than the threshold value, a trap is raised (jnxBfdSessDetectionTimeHigh).
jnxBfdSessCurrDectTime	jnxBfdSessEntry 4	The current detection time for the session (in microseconds).

Notifications for the BFD MIB

Table 122 on page 496 lists the supported notifications for the BFD MIB.

Table 122: Supported Notifications for the BFD MIB

Object	Object Identifier	Description
jnxBfdSessTxIntervalHigh	jnxBfdNotification 1	A notification generated when the threshold value for the transmit interval is configured (jnxBfdSessThresTxInterval) and the BFD session transmit interval (jnxBfdSessCurrTxInterval) adapts to a value greater than the threshold value. This trap is sent only once, when the threshold is first exceeded. The transmit interval can continue to adapt beyond the threshold value.
jnxBfdSessDetectionTimeHigh	jnxBfdNotification 2	A notification generated when the threshold value for the detection time is configured (jnxBfdSessThresDectTime) and the BFD session detection time (jnxBfdSessCurrDectTime) adapts to a value greater than the threshold value. This trap is sent only once, when the threshold is first exceeded. The detection time can continue to adapt beyond the threshold value.

Chapter 46

Interpreting the Enterprise-Specific Layer 2 Transport Protocol (L2TP) MIB

The enterprise-specific Layer 2 Tunneling Protocol (L2TP) Management Information Base (MIB) enables you to monitor L2TP tunnels and sessions using SNMP. L2TP MIB, whose object identifier is {jnxMibs 49}, provides information related to L2TP tunnels and sessions

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-l2tp.txt.

This chapter discusses the following topics:

The L2TP Scalar Status and Statistics Group

Table 123 on page 497 lists the objects in L2TP scalar status and statistics group.

Table 123: The L2TP Scalar Status and Statistics Group

Object	Object Identifier	Description
jnxL2tpStatsTotalTunnels	jnxL2tpStats 1	Returns the total number of tunnels that are in established state at the time of querying.
jnxL2tpStatsTotalSessions	jnxL2tpStats 2	Returns the total number of sessions that are in established state at the time of querying.
jnxL2tpStatsControlRxOctets	jnxL2tpStats 3	Returns the number of control channel octets received by the tunnels in established state at the time of querying.
jnxL2tpStatsControlRxPkts	jnxL2tpStats 4	Returns the number of control packets received by the tunnels in established state at the time of querying.
jnxL2tpStatsControlTxOctets	jnxL2tpStats 5	Returns the number of control channel octets that were transmitted to tunnel end points that are in established state at the time of querying.

Table 123: The L2TP Scalar Status and Statistics Group *(continued)*

Object	Object Identifier	Description
jnxL2tpStatsControlTxPkts	jnxL2tpStats 6	Returns the number of control packets that were transmitted to the tunnel endpoints that are in established state at the time of querying.
jnxL2tpStatsPayloadRxOctets	jnxL2tpStats 7	Returns the number of payload channel octets that were received on the tunnels that are in established state at the time of querying.
jnxL2tpStatsPayloadRxPkts	jnxL2tpStats 8	Returns the number of payload packets that were received on the tunnels that are in established state at the time of querying.
jnxL2tpStatsPayloadTxOctets	jnxL2tpStats 9	Returns the number of payload channel octets that were transmitted to the tunnel peers that are in established state at the time of querying.
jnxL2tpStatsPayloadTxPkts	jnxL2tpStats 10	Returns the number of payload packets that were transmitted to existing tunnel peers that are in established state at the time of querying.
jnxL2tpStatsErrorTxPkts	jnxL2tpStats 11	Returns the number of packet transmission attempts with errors to the tunnel peers that are in established state at the time of querying.
jnxL2tpStatsErrorRxPkts	jnxL2tpStats 12	Returns the number of packets with errors that were received from the existing tunnel peers that are in established state at the time of querying.

jnxL2tpTunnelGroupStatsTable

The jnxL2tpTunnelGroupStatsTable, whose object ID is jnxL2tpObjects 2, contains objects that describe the current status and statistics of an L2TP tunnel group.

The jnxL2tpTunnelGroupStatsEntry objects are listed in Table 124 on page 498.

Table 124: jnxL2tpTunnelGroupStatsTable

Object	Object Identifier	Description
jnxL2tpTunnelGroupStatsTnlGrpName	jnxL2tpTunnelGroupStatsEntry 1	The name of the particular tunnel group.
jnxL2tpTunnelGroupStatsGatewayAddrType	jnxL2tpTunnelGroupStatsEntry 2	The type of local IP address for L2TP tunnels that are part of the group.
jnxL2tpTunnelGroupStatsGatewayAddr	jnxL2tpTunnelGroupStatsEntry 3	The local IP address for L2TP tunnels that are part of the group.
jnxL2tpTunnelGroupStatsSvcIntfName	jnxL2tpTunnelGroupStatsEntry 4	The name of the service interface that is hosting the tunnel group.
jnxL2tpTunnelGroupStatsTotalTunnels	jnxL2tpTunnelGroupStatsEntry 5	The total number of tunnels that are in the established state at the time of querying.
jnxL2tpTunnelGroupStatsTotalSessions	jnxL2tpTunnelGroupStatsEntry 6	The total number of established sessions in the tunnel group at the time of querying.

jnxL2tpTunnelStatsTable

The jnxL2tpTunnelStatsTable, whose object ID is jnxL2tpObjects 3, contains objects that describe the current status and statistics of an L2TP tunnel.

A jnxL2tpTunnelStatsEntry represents an L2TP tunnel interface statistics entry and has objects that are listed in Table 125 on page 499.

Table 125: jnxL2tpTunnelStatsTable

Object	Object Identifier	Description
jnxL2tpTunnelStatsLocalTID	jnxL2tpTunnelStatsEntry 1	The local tunnel Identifier.
jnxL2tpTunnelStatsServiceInterfac	jnxL2tpTunnelStatsEntry 2	The name of the service interface on which the tunnel is being hosted.
jnxL2tpTunnelStatsTunnelGroup	jnxL2tpTunnelStatsEntry 3	The name of the tunnel group to which the tunnel belongs.
jnxL2tpTunnelStatsRemoteTID	jnxL2tpTunnelStatsEntry 4	The remote tunnel identifier. See RFC 2661, Section 3.1.
jnxL2tpTunnelStatsRemoteIpAddrType	jnxL2tpTunnelStatsEntry 5	The type of the remote-end address of the tunnel.
jnxL2tpTunnelStatsRemoteIpAddress	jnxL2tpTunnelStatsEntry 6	The remote-end address of the tunnel.
jnxL2tpTunnelStatsRemoteUdpPort	jnxL2tpTunnelStatsEntry 7	The remote-end UDP port of the tunnel.
jnxL2tpTunnelStatsActiveSessions	jnxL2tpTunnelStatsEntry 8	The total number of sessions that are in established state for the tunnel.
jnxL2tpTunnelStatsStat	jnxL2tpTunnelStatsEntry 9	One of the following states for the control tunnel: ■ cc_responder_accept_new—shows that the tunnel has received and accepted the start control connection request (SCCRQ). ■ cc_responder_reject_new—shows that the tunnel has received and rejected the SCCRQ. ■ cc_responder_idle—shows that the tunnel has just been created. ■ cc_responder_wait_ctl_conn—shows that the tunnel has sent the start control connection response (SCCRP) and is waiting for the start control connection connected (SCCCN) message. ■ Cleanup—shows that the tunnel is being cleaned up. ■ Closed—shows that the tunnel is being closed. ■ Destroyed—shows that the tunnel is being destroyed. ■ Established—shows that the tunnel is operational. ■ Terminate—shows that the tunnel is being terminated. ■ Unknown—shows that the tunnel is not connected to the router.

Table 125: jnxL2tpTunnelStatsTable *(continued)*

Object	Object Identifier	Description
jnxL2tpTunnelStatsLocalIpAddrType	jnxL2tpTunnelStatsEntry 10	The type of local-end address of the tunnel.
jnxL2tpTunnelStatsLocalIpAddress	jnxL2tpTunnelStatsEntry 11	The local-end address of the tunnel.
jnxL2tpTunnelStatsLocalUdpPort	jnxL2tpTunnelStatsEntry 12	The local-end UDP port number of the tunnel.
jnxL2tpTunnelStatsLocalHostName	jnxL2tpTunnelStatsEntry 13	The local host name of the tunnel.
jnxL2tpTunnelStatsRemoteHostName	jnxL2tpTunnelStatsEntry 14	The host name of the L2TP peer, as discovered during the tunnel establishment phase (via the Host Name AVP). If the tunnel is idle, this object shows the value based on the data from the last time it was connected.
jnxL2tpTunnelMaxSessions	jnxL2tpTunnelStatsEntry 15	The maximum number of sessions configured on the tunnel. Value could be a positive number or zero (unlimited).
jnxL2tpTunnelStatsWindowSize	jnxL2tpTunnelStatsEntry 16	The send window size for the tunnel.
jnxL2tpTunnelStatsHelloInterval	jnxL2tpTunnelStatsEntry 17	The hello interval for the tunnel.
jnxL2tpTunnelStatsCreationTime	jnxL2tpTunnelStatsEntry 18	The time when the tunnel was creaed.
jnxL2tpTunnelStatsUpTime	jnxL2tpTunnelStatsEntry 19	The time elapsed since the tunnel was established.
jnxL2tpTunnelStatsIdleTime	jnxL2tpTunnelStatsEntry 20	The time elapsed since the last data activity, transmission or reception, on the tunnel.
jnxL2tpTunnelStatsCollectionStart	jnxL2tpTunnelStatsEntry 21	The time at which the statistics gathering started for the tunnel.
jnxL2tpTunnelStatsControlTxPkts	jnxL2tpTunnelStatsEntry 22	The number of control packets transmitted to the tunnel peer.
jnxL2tpTunnelStatsControlTxBytes	jnxL2tpTunnelStatsEntry 23	The number of control bytes transmitted to the tunnel peer.
jnxL2tpTunnelStatsControlRxPkts	jnxL2tpTunnelStatsEntry 24	The number of control packets received on the tunnel.
jnxL2tpTunnelStatsControlRxByte	jnxL2tpTunnelStatsEntry 25	The number of control bytes received from the tunnel peer.
jnxL2tpTunnelStatsDataTxPkts	jnxL2tpTunnelStatsEntry 26	The number of data packets transmitted to the tunnel.
jnxL2tpTunnelStatsDataTxBytes	jnxL2tpTunnelStatsEntry 27	The number of data bytes transmitted to the tunnel peer.
JnxL2tpTunnelStatsDataRxPkts	jnxL2tpTunnelStatsEntry 28	The number of data packets received from the tunnel.
jnxL2tpTunnelStatsDataRxBytes	jnxL2tpTunnelStatsEntry 29	The number of data bytes received from the tunnel peer.
jnxL2tpTunnelStatsErrorTxPkts	jnxL2tpTunnelStatsEntry 30	The number of error transmits packets on the tunnel.
jnxL2tpTunnelStatsErrorRxPkts	jnxL2tpTunnelStatsEntry 31	The number of error receive packets on the tunnel.

jnxL2tpSessionStatsTable

The jnxL2tpSessionStatsTable, whose object ID is jnxL2tpObjects 4, contains the objects that describe the current status and statistics of a single L2TP tunneled session.

A jnxL2tpSessionStatsEntry represents an L2TP session interface status and has the objects that are listed in Table 126 on page 501.

Table 126: jnxL2tpSessionStatsTable

Object	Object Identifier	Description
jnxL2tpSessionStatsLocalTID	jnxL2tpSessionStatsEntry 1	The local tunnel Identifier.
jnxL2tpSessionStatsLocalSID	jnxL2tpSessionStatsEntry 2	The local session Identifier.
jnxL2tpSessionStatsServiceInterface	jnxL2tpSessionStatsEntry 3	The name of the service interface on which this session is being hosted.
jnxL2tpSessionStatsTunnelGroup	jnxL2tpSessionStatsEntry 4	The name of the tunnel group to which this session belongs.
jnxL2tpSessionStatsRemoteSID	jnxL2tpSessionStatsEntry 5	The remote-end assigned session identifier for this session. This value remains zero from the time of starting the session until the time the remote end point responds.
jnxL2tpSessionStatsInterfaceUnit	jnxL2tpSessionStatsEntry 6	The interface unit number that corresponds to the logical service interface on which the session is being hosted.
jnxL2tpSessionStatsEncapType	jnxL2tpSessionStatsEntry 7	The tunnel encapsulation type.
jnxL2tpSessionStatsBundleID	jnxL2tpSessionStatsEntry 8	The ID of the bundle to which the session is linked. This field is valid only for tunnel encapsulation type multilink-ppp.
jnxL2tpSessionStatsStat	jnxL2tpSessionStatsEntry 9	One of the following status messages to show the state of the session at the time of querying: ■ Established— The session is operational. ■ Closed—The session has been closed. ■ Destroyed—The session has been destroyed. ■ Cleanup—The session has been cleaned up. ■ lns_ic_accept_new—TThe new session has been accepted. ■ lns_ic_idle—The session has been created but is in idle state. ■ lns_ic_reject_new—A new session has been rejected. ■ lns_ic_wait_connect—The session is waiting for the peer's incoming call connected (ICCN) message.

Table 126: jnxL2tpSessionStatsTable *(continued)*

Object	Object Identifier	Description
jnxL2tpSessionStatsUserName	jnxL2tpSessionStatsEntry 10	The peer session name on the interface. This is typically the login name of the remote user. This object contains a null string when the user name is unknown to the local tunnel peer.
jnxL2tpSessionStatsMode	jnxL2tpSessionStatsEntry 11	The configured mode value for this session.
jnxL2tpSessionStatsLocalAddrType	jnxL2tpSessionStatsEntry 12	The type of the local-end address of the tunnel that hosts the session.
jnxL2tpSessionStatsLocalAddress	jnxL2tpSessionStatsEntry 13	The local end address of the tunnel that hosts the session.
jnxL2tpSessionStatsLocalUdpPort	jnxL2tpSessionStatsEntry 14	The UDP port of the local end of the tunnel that hosts the session.
jnxL2tpSessionStatsRemoteAddrType	jnxL2tpSessionStatsEntry 15	The type of the remote end address of the tunnel that hosts the session.
jnxL2tpSessionStatsRemoteAddress	jnxL2tpSessionStatsEntry 16	The remote end address of the tunnel that hosts the session.
jnxL2tpSessionStatsRemoteUdpPort	jnxL2tpSessionStatsEntry 17	The UDP port of the remote-end of the tunnel that hosts the session.
jnxL2tpSessionStatsLocalHostName	jnxL2tpSessionStatsEntry 18	The local host name of the tunnel that hosts the session.
jnxL2tpSessionStatsRemoteHostName	jnxL2tpSessionStatsEntry 19	The host name as discovered during the tunnel establishment phase (via the Host Name AVP) of the L2TP peer.
jnxL2tpSessionAssignedIpAddrType	jnxL2tpSessionStatsEntry 20	The type of IP address of PPP client being tunneled as obtained from IPCP configuration while establishing the session.
jnxL2tpSessionAssignedIpAddress	jnxL2tpSessionStatsEntry 21	The IP address of the PPP client being tunneled as obtained from IPCP configuration while establishing the session.
jnxL2tpSessionLocalMRU	jnxL2tpSessionStatsEntry 22	The MRU for the local PPP Entity. This value is the MRU that the remote entity uses when sending packets to the session.
jnxL2tpSessionRemoteMRU	jnxL2tpSessionStatsEntry 23	The MRU for the remote PPP Entity. This value is the MRU that the local entity uses when sending packets to the remote PPP client.
jnxL2tpSessionStatsTxSpeed	jnxL2tpSessionStatsEntry 24	The last known transmit baud rate for the session.
jnxL2tpSessionStatsRxSpeed	jnxL2tpSessionStatsEntry 25	The last known receive baud rate for the session.

Table 126: jnxL2tpSessionStatsTable *(continued)*

Object	Object Identifier	Description
jnxL2tpSessionStatsCallBearerType	jnxL2tpSessionStatsEntry 26	The bearer type of this session.
jnxL2tpSessionStatsFramingType	jnxL2tpSessionStatsEntry 27	The framing type of the session.
jnxL2tpSessionStatsLCPRenegotiation	jnxL2tpSessionStatsEntry 28	The ON/OFF state of the LCP renegotiation for the session.
jnxL2tpSessionStatsAuthMethod	jnxL2tpSessionStatsEntry 29	The proxy authentication method employed by the LAC for the session.
nxL2tpSessionStatsNasIpAddrType	jnxL2tpSessionStatsEntry 30	The type of IP address of the RADIUS network address server to which the accounting records for this session are being sent.
jnxL2tpSessionStatsNasIpAddress	jnxL2tpSessionStatsEntry 31	The IP address of the RADIUS network address server to which the accounting records for the session are being sent.
jnxL2tpSessionStatsNasIpPort	jnxL2tpSessionStatsEntry 32	The port on which RADIUS network address server accounting messages are sent.
jnxL2tpSessionStatsFramedProtocol	jnxL2tpSessionStatsEntry 33	The frame protocol attribute obtained from RADIUS server for the session.
jnxL2tpSessionStatsFramedIpAddrType	jnxL2tpSessionStatsEntry 34	The address to be configured for the user, as provided by the RADIUS server in response to authentication request.
jnxL2tpSessionStatsFramedIpAddress	jnxL2tpSessionStatsEntry 35	The address to be configured for the user, as provided by the RADIUS server in response to the authentication request.
jnxL2tpSessionStatsCallingStationID	jnxL2tpSessionStatsEntry 36	The phone number from which call came in. The RADIUS NAS obtains the phone number that the call came from by using Automatic Number Identification (ANI) or similar technology. It is used only in Access-Request packets.
jnxL2tpSessionStatsCalledStationID	jnxL2tpSessionStatsEntry 37	The phone number to which the user called. The RADIUS NAS obtains the phone number that the user called by using Dialed Number Identification (DNIS) or similar technology. It is used only in Access-Request packets.
jnxL2tpSessionStatsAcctDelayTime	jnxL2tpSessionStatsEntry 38	Duration (in seconds) for which the RADIUS accounting client has been trying to send a record for. This value can be subtracted from the time of arrival on the server to find the approximate time of the event generating this Accounting-Request.
jnxL2tpSessionStatsAcctSessionID	jnxL2tpSessionStatsEntry 39	A unique Accounting ID to help match start and stop records in a log file.

Table 126: jnxL2tpSessionStatsTable *(continued)*

Object	Object Identifier	Description
jnxL2tpSessionStatsAcctMethod	jnxL2tpSessionStatsEntry 40	The accounting method employed for this session.
jnxL2tpSessionStatsAcctSessionTim	jnxL2tpSessionStatsEntry 41	Number of seconds for which the user has received service.
jnxL2tpSessionStatsAcctNasPortType	jnxL2tpSessionStatsEntry 42	The type of the physical port of the NAS that performs accounting for the user.
jnxL2tpSessionStatsAcctTnlClientEndPoint	jnxL2tpSessionStatsEntry 43	This object contains the remote tunnel Identifier of the tunnel that hosts the session.
jnxL2tpSessionStatsAcctTnlServerEndPoint	jnxL2tpSessionStatsEntry 44	The local tunnel Identifier of the tunnel that hosts the session.
jnxL2tpSessionStatsAcctTnlClientAuthID	jnxL2tpSessionStatsEntry 45	The host name of the tunnel that hosts the session as discovered during the tunnel establishment phase (via the Host Name AVP) of the L2TP peer.
jnxL2tpSessionStatsAcctTnlServerAuthID	jnxL2tpSessionStatsEntry 46	The local host name of the tunnel that hosts the session.
jnxL2tpSessionStatsUserProfileName	jnxL2tpSessionStatsEntry 47	The configured access profile name that is being used for the session.
jnxL2tpSessionStatsInterfaceID	jnxL2tpSessionStatsEntry 48	The interface identification (name) for the service interface that bears the session.
jnxL2tpSessionStatsCallSerialNumber	jnxL2tpSessionStatsEntry 49	The serial number assigned to the session.
jnxL2tpSessionStatsCreationTim	jnxL2tpSessionStatsEntry 50	Time when the session was created.
jnxL2tpSessionStatsUpTim	jnxL2tpSessionStatsEntry 51	The time elapsed since the session was established.
jnxL2tpSessionStatsIdleTime	jnxL2tpSessionStatsEntry 52	The time elapsed since the session had any data activity (transmission or reception).
jnxL2tpSessionStatsCollectionStart	jnxL2tpSessionStatsEntry 53	The time at which the statistics gathering started for the session.
jnxL2tpSessionStatsControlTxPkts	jnxL2tpSessionStatsEntry 54	The number of control packets transmitted to the session peer.
jnxL2tpSessionStatsControlTxBytes	jnxL2tpSessionStatsEntry 55	The number of control bytes that were transmitted to the session peer.
jnxL2tpSessionStatsControlRxPkts	jnxL2tpSessionStatsEntry 56	The number of control packets received on the session.
jnxL2tpSessionStatsControlRxBytes	jnxL2tpSessionStatsEntry 57	The number of control bytes received from the session peer.

Table 126: jnxL2tpSessionStatsTable *(continued)*

Object	Object Identifier	Description
jnxL2tpSessionStatsDataTxPkts	jnxL2tpSessionStatsEntry 58	The number of data packets transmitted to the remote session peer.
jnxL2tpSessionStatsDataTxBytes	jnxL2tpSessionStatsEntry 59	The number of data bytes that were transmitted to the session peer.
jnxL2tpSessionStatsDataRxPkts	jnxL2tpSessionStatsEntry 60	The number of data packets received on this session.
jnxL2tpSessionStatsDataRxBytes	jnxL2tpSessionStatsEntry 61	The number of data bytes that were received from the session peer.
jnxL2tpSessionStatsErrorTxPkt	jnxL2tpSessionStatsEntry 62	The number of error transmit packets on the session.
jnxL2tpSessionStatsErrorRxPkts	jnxL2tpSessionStatsEntry 63	The number of error receive packets on the session.

jnxL2tpMIpppBundleStatsTable

The jnxL2tpMIpppBundleStatsTable, whose object ID is jnxL2tpObjects 5, contains objects that describe the current status and statistics of a single L2TP tunneled multilink PPP bundle.

A jnxL2tpMIpppBundleStatsEntry represents the L2TP MLPPP bundle statistics and has the objects listed in Table 127 on page 505.

Table 127: jnxL2tpMIpppBundleStatsTable

Object	Object Identifier	Description
jnxL2tpMIpppBundleStatsBundleID	jnxL2tpMIpppBundleStatsEntry 1	Identifies the session's associated bundle.
jnxL2tpMIpppBundleStatsNumLinks	jnxL2tpMIpppBundleStatsEntry 2	Shows the current number of links that have joined the bundle.
jnxL2tpMIpppBundleStatsEndpoint	jnxL2tpMIpppBundleStatsEntry 3	Shows the username of the MLPPP bundle.
jnxL2tpMIpppBundleStatsInputMrru	jnxL2tpMIpppBundleStatsEntry 4	Shows the maximum packet size that the input interface can process.
jnxL2tpMIpppBundleStatsOutputMrru	jnxL2tpMIpppBundleStatsEntry 5	Shows the maximum packet size that the output interface can process.

Chapter 47

Interpreting the Enterprise-Specific Real-Time Performance Monitoring (RPM) MIB

The enterprise-specific Real-Time Performance Monitoring (RPM) Management Information Base (MIB), enables you to access real-time performance-related data over SNMP. Starting with JUNOS Release 8.4, you can access jitter measurements and calculations over SNMP.

The RPM MIB represents a restructuring of the standard Ping MIB and converts the flat structure of the Ping MIB into a hierarchical collection of data. For more information on Ping MIB, see Chapter 25, "Interpreting the Enterprise-Specific Ping MIB." Similar to the Ping MIB, the RPM MIB too has two groups of tables: the Results group and the History group. The RPM MIB, however, groups its data into separate collection types and measurement sets.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-rpm.txt.

This chapter discusses the following topics:

jnxRpmResultsSampleTable

The jnxRpmResultsSampleTable provides you measurements from the latest individual RPM probe samples. Each jnxRpmResultsSampleEntry has the objects listed in Table 128 on page 508.

NOTE: jnxRpmResultsSampleTable does not maintain entries for unsuccessful probes.

Table 128: jnxRpmResultsSampleTable

Object	Object Identifier	Description
jnxRpmResSampleType	jnxRpmResultsSampleEntry 1	The measurement type for the particular jnxRpmResultsSampleEntry.
jnxRpmResSampleValue	jnxRpmResultsSampleEntry 2	The measurement for the entry.
jnxRpmResSampleTsType	jnxRpmResultsSampleEntry 3	The type of timestamp used to obtain the measurement.
jnxRpmResSampleDate	jnxRpmResultsSampleEntry 4	Date and time at which the measurement was obtained.

■ JnxRpmMeasurementType on page 508

JnxRpmMeasurementType

Different types of measurements can be made for each probe. Table 129 on page 508 lists the measurement types used in jnxRpm.mib.

Table 129: JnxRpmMeasurementType

Measurement Type	Description
roundTripTime	The delay between the transmission of a probe and the arrival of its response.
rttJitter	The difference between the current round trip time measurement and the previous one.
rttInterarrivalJitter	An estimate of the statistical variance of a packet's inter-arrival time. Defined in RFC 1889 as: J=J+(|D(i-1,i)|-J)/16 where J is the inter-arrival jitter and D (i-1, i) is the egressJitter measurement.
egress	The delay between the transmission of a probe and its arrival at the destination.
egressJitter	The difference between the current egress delay and the previous measurement.
egressInterarrivalJitter	An estimate of the statistical variance of a packet's inter-arrival time. Defined in RFC 1889 as: J=J+(|D(i-1,i)|-J)/16 where J is the inter-arrival jitter and D (i-1, i) is the egressJitter measurement

Table 129: JnxRpmMeasurementType *(continued)*

Measurement Type	Description
ingress	The delay between the transmission of a probe response and its arrival at the destination.
ingressJitter	The difference between the current ingress delay and the previous measurement.
ingressInterarrivalJitter	An estimate of the statistical variance of a packet's interarrival time. Defined in RFC1889 as: J=J+(|D(i-1,i)|-J)/16 Where J is the interarrival jitter and D (i-1, i) is the current ingressjitter measurement.

Not all types of measurements are performed for every probe. For example, the jitter measurements are available only for those RPM entries that use hardware timestamps on both client and server. Similarly, the ingress and egress measurements are available only for those probe types that measure one-way delays or where hardware timestamps are used (for this, the one-way-hardware timestamp knob must be enabled). However, in the cases discussed above, if the one-way delay is greater than the round-trip time, the corresponding entries are not stored.

NOTE: To avoid possible variations in one-way jitter measurements and calculations due to clock synchronization issues, one-way jitter measurements are performed only on samples that are less than 10 seconds apart.

JnxRpmTimestampType

The following three types of timestamps are used to obtain measurements:

- software—Indicates that software-based timestamps are used on both client and server.
- clientHardware—Indicates that hardware-based timestamps are used on the client.
- clientAndServerHardware—Indicates that hardware-based timestamps are used on the RPM client and the server.

jnxRpmResultsSummaryTable

The jnxRpmResultsSummaryTable provides a summary of the results for each RPM entry (identified by pingCtlOwnerIndex/ pingCtlTestName in the Ping MIB) and for each data collection maintained by that entry. The RPM feature maintains several different collections of probe data, providing overall summaries as well as detailed calculations for each collection.

The jnxRpmResultsSummaryTable maintains the following collection types:

- currentTest—The test that is being executed currently.
- lastCompletedTest—The most recently completed test.
- movingAverage—A list of most recent probes. You can configure the number of probes for this list using jnxPingCtlMovAvgSize or the moving-average-size CLI command.
- allTests—All the probes that were sent. The value gets reset when the 64–bit value storing the square rolls over.

For each collection type, the table provides the following details:

- Number of probes sent
- Number of probes received
- Percentage of probes lost
- Timestamp for the latest sample in the collection

The jnxRpmResultsSummaryEntry has the objects listed in Table 130 on page 510.

Table 130: jnxRpmResultsSummaryTable

Object	Object Identifer	Description
jnxRpmResSumCollection	jnxRpmResultsSummaryEntry 1	The collection of probes to which the jnxRpmResultsSummaryEntry refers. **NOTE:** No entries are created for collection types that are not supported or not configured.
jnxRpmResSumSent	jnxRpmResultsSummaryEntry 2	The number of probes sent within the collection.
jnxRpmResSumReceived	jnxRpmResultsSummaryEntry 3	The number of probes received within the collection.
jnxRpmResSumPercentLost	jnxRpmResultsSummaryEntry 4	The percentage of probes that are lost within the collection.
jnxRpmResSumDate	jnxRpmResultsSummaryEntry 5	The timestamp for the most recent probe within the collection.

jnxRpmResultsCalculatedTable

The jnxRpmResultsCalculatedTable provides a set of calculated values for each RPM entry, for each collection of probes maintained within that entry, and for each supported measurement set within that collection of probes.

The jnxRpmResultsCalculatedEntry has the objects listed in Table 131 on page 511.

Table 131: jnxRpmResultsCalculatedTable

Object	Object Identifier	Description
jnxRpmResCalcSet	jnxRpmResultsCalculatedEntry 1	The measurement set for the particular jnxRpmResultsCalculatedEntry.
jnxRpmResCalcSamples	jnxRpmResultsCalculatedEntry 2	The number of samples used in the calculations.
jnxRpmResCalcMin	jnxRpmResultsCalculatedEntry 3	The minimum (in microseconds) of all the samples in the collection and the measurement set associated with the entry.
jnxRpmResCalcMax	jnxRpmResultsCalculatedEntry 4	The maximum (in microseconds) of all the samples in the collection and the measurement set.
jnxRpmResCalcAverage	jnxRpmResultsCalculatedEntry 5	The average (in microseconds) of all the samples in the collection and the measurement set associated with the entry.
jnxRpmResCalcPkToPk	jnxRpmResultsCalculatedEntry 6	The difference (in microseconds) between the minimum and maximum of all the samples in the collection and the measurement set associated with the entry.
jnxRpmResCalcStdDev	jnxRpmResultsCalculatedEntry 7	The standard deviation (in microseconds) calculated over all the samples in the collection and the measurement set associated with the entry.
jnxRpmResCalcSum	jnxRpmResultsCalculatedEntry 8	The sum (in microseconds) of all the samples in the collection and the measurement set associated with the entry.

jnxRpmHistorySampleTable

The jnxRpmHistorySampleTable provides measurements for each sample stored in the history table of RPM probe entries. In addition to the last completed probe, the table also provides data for a configurable number of most recent probes (all the history tables in this MIB provide the same number of entries as the pingProbeHistoryTable). However, the table does not maintain entries for:

- Unsuccessful probes
- Invalid measurement types

The jnxRpmHistorySampleEntry has the objects listed in Table 132 on page 511.

Table 132: jnxRpmHistorySampleTable

Object	Object Identifier	Description
jnxRpmHistSampleType	jnxRpmHistorySampleEntry 1	The measurement type associated with the entry.
jnxRpmHistSampleValue	jnxRpmHistorySampleEntry 2	The measurement for the entry.
jnxRpmHistSampleTsType	jnxRpmHistorySampleEntry 3	The type of timestamp used to obtain the measurement.

jnxRpmHistorySummaryTable

Similar to the jnxRpmResultsSummaryTable, the jnxRpmHistorySummaryTable provides you with summary data for each collection of probes within each RPM entry. In addition to summary data for the current probe, the table also provides summary information for a number of the most recent probes. You can configure the number of most recent probes that should be stored in the table.

The jnxRpmHistorySummaryEntry has the objects listed in Table 133 on page 512.

Table 133: jnxRpmHistorySummaryTable

Object	Object Identifier	Description
jnxRpmHistSumCollection	jnxRpmHistorySummaryEntry 1	The collection of probes associated with the entry. **NOTE:** Historical summaries are available only for the current test (currentTest).
jnxRpmHistSumSent	jnxRpmHistorySummaryEntry 2	The number of probes sent within the collection.
jnxRpmHistSumReceived	jnxRpmHistorySummaryEntry 3	The number of probes received within the collection.
jnxRpmHistSumPercentLost	jnxRpmHistorySummaryEntry 4	The percentage of probes lost within the collection.

jnxRpmHistoryCalculatedTable

As with the jnxRpmResultsCalculatedTable, the jnxRpmHistoryCalculatedTable provides a set of calculated values for each RPM entry, for each collection of probes maintained within that entry, and for each supported calculated type within that collection of probes

In addition to data from the current probe, this table also provides data from a configurable number of the most recent probes.

NOTE: The only collection type that is stored in jnxRpmHistoryCalculatedTable is the currentTest.

Each jnxRpmHistoryCalculatedEntryhas the objects listed in Table 134 on page 512.

Table 134: jnxRpmHistoryCalculatedTable

Object	Object Identifier	Description
jnxRpmHistCalcSet	jnxRpmHistoryCalculatedEntry	The measurement set for the jnxRpmHistoryCalculatedEntry.
jnxRpmHistCalcSamples	jnxRpmHistoryCalculatedEntry 2	The number of samples used in the calculations for this entry.
jnxRpmHistCalcMin	jnxRpmHistoryCalculatedEntry 3	The minimum (in microseconds) of all the samples in the collection and the measurement set associated with the entry.

Table 134: jnxRpmHistoryCalculatedTable *(continued)*

Object	Object Identifier	Description
jnxRpmHistCalcMax	jnxRpmHistoryCalculatedEntry 4	The maximum (in microseconds) of all the samples in the collection and the measurement set associated with the entry.
jnxRpmHistCalcAverage	jnxRpmHistoryCalculatedEntry 5	The average (in microseconds) of all the samples in the collection and the measurement set associated with the entry.
jnxRpmHistCalcPkToPk	jnxRpmHistoryCalculatedEntry 6	The difference (in microseconds) between the minimum and the maximum of all the samples in the collection and the measurement set associated with the row.
jnxRpmHistCalcStdDev	jnxRpmHistoryCalculatedEntry 7	The standard deviation (in microseconds) calculated over all the samples in the collection and the measurement set associated with the entry.
jnxRpmHistCalcSum	jnxRpmHistoryCalculatedEntry 8	The sum of all the samples in the collection and the measurement set associated with the entry.

Chapter 48

Interpreting the Enterprise-Specific Class-of-Service MIB

The enterprise-specific class-of-service (CoS) MIB provides support for monitoring interface output queue statistics per interface and per forwarding class.

The CoS MIB is an object of the jnxMibs branch of the enterprise-specific MIB and has an object identifier of {jnxMIB 15}. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-cos.txt.

This chapter contains the following topic:

jnxCosInvQstatTable

This table provides output queue statistics for each interface. Only those physical interfaces that support output queue statistics appear in this table. This table provides the same information as the jnxCosQstatTable, but the information is ordered by queue number and interface index, instead of by interface index and queue number.

The entries in the jnxCosInvQstatTable, whose object identifier is {jnxCos 6}, are represented by jnxCosInvQstatEntry, whose object identifier is {jnxCosIfqStatsTable 1}, and are listed in Table 135 on page 515.

Table 135: jnxCosInvQstatEntry

Object	Object Identifier	Description
jnxCosInvQstatQedPkts	jnxCosInvQstatEntry 1	The number of packets queued at the output queue.
jnxCosInvQstatQedPktRate	jnxCosInvQstatEntry 2	The rate (in packets per second) at which packets are queued at the output queue.
jnxCosInvQstatQedBytes	jnxCosInvQstatEntry 3	The number of bytes queued at the output queue.
jnxCosInvQstatQedByteRate	jnxCosInvQstatEntry 4	The rate (in bytes per second) at which bytes are queued at the output queue.
jnxCosInvQstatQedTxedPkts	jnxCosInvQstatEntry 5	The number of packets transmitted on the queue.

Table 135: jnxCosInvQstatEntry *(continued)*

Object	Object Identifier	Description
jnxCosInvQstatQedTxedPktRate	jnxCosInvQstatEntry 6	The packet transmission rate of the output queue (in packets per second).
jnxCosInvQstatQedTxedBytes	jnxCosInvQstatEntry 7	The number of bytes transmitted on the queue.
jnxCosInvQstatQedTxedByteRate	jnxCosInvQstatEntry 8	The byte transmission rate of the output queue (in bytes per second).
jnxCosInvQstatQedTailDropPkts	jnxCosInvQstatEntry 9	The number of packets tail dropped at the output queue.
jnxCosInvQstatQedTailDropPktRate	jnxCosInvQstatEntry 10	The tail drop packet rate (in packets per second) for the queue.
jnxCosInvQstatTotalRedDropPkts	jnxCosInvQstatEntry 11	The number of packets dropped on the interface due to random early detection (RED) at the output.
jnxCosInvQstatTotalRedDropPktRate	jnxCosInvQstatEntry 12	The most-recent estimate of the drop rate (in packets per second) for packets dropped on the interface due to RED at the output.
jnxCosInvQstatLpNonTcpRedDropPkts	jnxCosInvQstatEntry 13	The number of low PLP non-TCP packets dropped on the interface due to RED at the output.
jnxCosInvQstatLpNonTcpRedDropPktRate	jnxCosInvQstatEntry 14	The rate (in packets per second) at which low PLP non-TCP packets are dropped on the interface due to RED at the output.
jnxCosInvQstatLpTcpRedDropPkts	jnxCosInvQstatEntry 15	The number of low PLP TCP packets dropped on the interface due to RED at the output.
jnxCosInvQstatLpTcpRedDropPktRate	jnxCosInvQstatEntry 16	The rate (in packets per second) at which low PLP TCP packets are dropped on the interface due to RED at the output.
jnxCosInvQstatHpNonTcpRedDropPkts	jnxCosInvQstatEntry 17	The number of high PLP non-TCP packets dropped on the interface due to RED at the output.
jnxCosInvQstatHpNonTcpRedDropPktRate	jnxCosInvQstatEntry 18	The rate (in packets per second) at which high PLP non-TCP packets are dropped on the interface due to RED at the output.
jnxCosInvQstatHpTcpRedDropPkts	jnxCosInvQstatEntry 19	The number of high PLP TCP packets dropped on the interface due to RED at the output.
jnxCosInvQstatHpTcpRedDropPktRate	jnxCosInvQstatEntry 20	The rate (in packets per second) at which high PLP TCP packets are dropped on the interface due to RED at the output.
jnxCosInvQstatTotalRedDropBytes	jnxCosInvQstatEntry 21	The number of bytes dropped on the interface due to RED at the output.
jnxCosInvQstatTotalRedDropByteRate	jnxCosInvQstatEntry 22	The rate (in bytes per second) at which bytes are dropped on the interface due to RED at the output.

Table 135: jnxCosInvQstatEntry *(continued)*

Object	Object Identifier	Description
jnxCosInvQstatLpNonTcpRedDropBytes	jnxCosInvQstatEntry 23	The number of low PLP non-TCP bytes dropped on the interface due to RED at the output.
jnxCosInvQstatLpNonTcpRedDropByteRate	jnxCosInvQstatEntry 24	The rate (in bytes per second) at which low PLP non-TCP bytes are dropped on the interface due to RED at the output.
jnxCosInvQstatLpTcpRedDropBytes	jnxCosInvQstatEntry 25	The number of low PLP TCP bytes dropped on the interface due to RED at the output.
jnxCosInvQstatLpTcpRedDropByteRate	jnxCosInvQstatEntry 26	The rate (in bytes per second) at which low PLP TCP bytes are dropped on the interface due to RED at the output.
jnxCosInvQstatHpNonTcpRedDropBytes	jnxCosInvQstatEntry 27	The number of high PLP non-TCP bytes dropped on the interface due to RED at the output.
jnxCosInvQstatHpNonTcpRedDropByteRate	jnxCosInvQstatEntry 28	The rate (in bytes per second) at which high PLP non-TCP bytes are dropped on the interface due to RED at the output.
jnxCosInvQstatHpTcpRedDropBytes	jnxCosInvQstatEntry 29	The number of high PLP TCP bytes dropped on the interface due to RED at the output.
jnxCosInvQstatHpTcpRedDropByteRate	jnxCosInvQstatEntry 30	The rate (in bytes per second) at which high PLP TCP bytes are dropped on the interface due to RED at the output.
jnxCosInvQstatLpRedDropPkts	jnxCosInvQstatEntry 31	The number of low PLP packets dropped on the interface due to RED at the output.
jnxCosInvQstatLpRedDropPktRate	jnxCosInvQstatEntry 32	The rate (in packets per second) at which low PLP packets are dropped on the interface due to RED at the output.
jnxCosInvQstatMLpRedDropPkts	jnxCosInvQstatEntry 33	The number of medium-low PLP packets dropped on the interface due to RED at the output.
jnxCosInvQstatMLpRedDropPktRate	jnxCosInvQstatEntry 34	The rate (in packets per second) at which medium-low PLP packets are dropped on the interface due to RED at the output.
jnxCosInvQstatMHpRedDropPkts	jnxCosInvQstatEntry 35	The number of medium-high PLP packets dropped on the interface due to RED at the output.
jnxCosInvQstatMHpRedDropPktRate	jnxCosInvQstatEntry 36	The rate (in packets per second) at which medium-high PLP packets are dropped on the interface due to RED at the output.
jnxCosInvQstatHpRedDropPkts	jnxCosInvQstatEntry 37	The number of high PLP packets dropped on the interface due to RED at the output.
jnxCosInvQstatHpRedDropPktRate	jnxCosInvQstatEntry 38	The rate (in packets per second) at which high PLP packets are dropped on the interface due to RED at the output.
jnxCosInvQstatLpRedDropBytes	jnxCosInvQstatEntry 39	The number of low PLP bytes dropped on the interface due to RED at the output.

Table 135: jnxCosInvQstatEntry *(continued)*

Object	Object Identifier	Description
jnxCosInvQstatLpRedDropByteRate	jnxCosInvQstatEntry 40	The rate (in bytes per second) at which low PLP bytes are dropped on the interface due to RED at the output.
jnxCosInvQstatMLpRedDropBytes	jnxCosInvQstatEntry 41	The number of medium-low PLP bytes dropped on the interface due to RED at the output.
jnxCosInvQstatMLpRedDropByteRate	jnxCosInvQstatEntry 42	The rate (in bytes per second) at which medium-low PLP bytes are dropped on the interface due to RED at the output.
jnxCosInvQstatMHpRedDropBytes	jnxCosInvQstatEntry 43	The number of medium-high PLP bytes dropped on the interface due to RED at the output.
jnxCosInvQstatMHpRedDropByteRate	jnxCosInvQstatEntry 44	The rate (in bytes per second) at which medium-high PLP bytes are dropped on the interface due to RED at the output.
jnxCosInvQstatHpRedDropBytes	jnxCosInvQstatEntry 45	The number of high PLP bytes dropped on the interface due to RED at the output.
jnxCosInvQstatHpRedDropByteRate	jnxCosInvQstatEntry 46	The rate (in bytes per second) at which high PLP bytes are dropped on the interface due to RED at the output.

Chapter 49

Interpreting the Enterprise-Specific IP Forward MIB

The enterprise-specific IP Forward MIB, whose object identifier is {jnxMibs 38}, extends the ipCidrRouteTable in the IP Forwarding Table MIB (as defined in RFC 2096) to include a tunnel name when the next hop is through an RSVP-signaled LSP.

This MIB adds an jnxIpCidrRouteTunnelName attribute to the ipCidrRouteTable. The attribute exists for each entry in the ipCidrRouteTable. (One entry in the ipCidrRouteTable represents each route in inet.0). If the route's next hop is an RSVP-signaled MPLS LSP, the new attribute contains the LSP name. If the route's next hop is not an RSVP-signaled MPLS LSP, the new attribute is defined as null.

The attribute's name is jnxIpCidrRouteTunnelName. Its OID is .1.3.6.1.4.1.2636.3.38.1.1.1. As with any SNMP attribute, an index is appended to the OID to form the instance identifier. Because this attribute augments the ipCidrRouteTable, the index is identical to that used in the ipCidrRouteTable. The index is formed by concatenating destination address, subnet mask, tos byte, and next hop.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software /junos/junos94/swconfig-net-mgmt/mib-jnx-ipforward.txt.

This chapter contains the following topic:

jnxIpCidrRouteTable

The jnxIpCidrRouteTable, whose object identifier is {jnxIpForwardMIB 1}, extends the the ipCidrRouteTable with additional data.

jnxIpCidrRouteEntry

jnxIpCidrRouteEntry, whose object identifier is {jnxIpCidrRouteTable 1}, has one object, which is listed in Table 136 on page 520.

Table 136: jnxIpCidrRouteTable

Object	Object Identifier	Description
jnxIpCidrRouteTunnelName	nxIpCidrRouteEntry 1	The canonical name assigned to the tunnel. The router forwards traffic bound for the destination through this tunnel.

Chapter 50

Interpreting the Enterprise-Specific ATM Class-of-Service MIB

The enterprise-specific ATM Class-of-Service (CoS) Management Information Base (MIB) provides information on the ATM CoS infrastructure.

The Juniper Networks enterprise-specific ATM CoS MIB uses the following objects and definitions as per the RFCs and MIBs:

- ifIndex (*RFC 2233, IF MIB*)
- atmVclvpi and atmVclVci (*RFC 2515,ATM MIB*)
- jnxMibs (*Juniper Networks enterprise-specific SMI MIB*) and jnxCoSFcIf (*Juniper Networks enterprise-specific CoS MIB*)

For a downloadable version of the MIB, see
www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-atm-cos.txt

This chapter contains the following topics:

jnxCosAtmVcTable

The jnxCosAtmVcTable, whose object identifier is {jnxAtmCos 1}, contains information about virtual circuits (VC) that have CoS configured.

Each jnxCosAtmVcEntry (object identifier is jnxCosAtmVcTable 1) is indexed using ifIndex, atmVclVpi, and atmVclVci, and contains the jnxCosAtmVcCosMode object. The jnxCosAtmVcCosMode object represents the mode of CoS queue priority for the VC.

There are two modes, strict mode and alternate mode represented by integer values 0 and 1 respectively:

- Strict mode (represented by integer value 0): One of the four queues has high priority, and is always serviced before the other three queues. The remaining queues are serviced in a round robin fashion.

- Alternate mode (represented by integer value 1): Even though one of the four queues has high priority, the servicing of the queues alternates between the high priority queue and the other queues.

jnxCosAtmVcScTable

The jnxCosAtmVcScTable, whose object identifier is jnxAtmCos 2, contains ATM-scheduler configuration parameters for each forwarding class within a specified VC.

NOTE: The schedulers referred in this MIB are specific to an ATM interface, and are different from the typical schedulers specified by the Class of Service configuration CLI.

Each jnxCosAtmVcScEntry (object identifier is jnxCosAtmVcScTable 1) represents ATM-scheduler configuration parameters per forwarding class and per VC, and is indexed using ifIndex, atmVclVpi, and atmVclVci. Table 137 on page 522 lists the ATM scheduler parameters as represented by a jnxCosAtmVcScEntry.

Table 137: jnxCosAtmVcScTable

Object	Object ID	Description
jnxCosAtmVcScPriority	jnxCosAtmVcScEntry 1	Represents the ATM scheduler priority for the queue associated with the specified forwarding class within the VC.
jnxCosAtmVcScTxWeightType	jnxCosAtmVcScEntry 2	Represents the ATM scheduler transmit-weight-type for the queue associated with the specified forwarding class inside the VC. The transmit-weight-type is represented either as the number of cells or as a percentage of the queue size.
jnxCosAtmVcScTxWeight	jnxCosAtmVcScEntry 3	Represents the transmit weight of the ATM scheduler for the queue associated with the specified forwarding class and the VC. jnxCosAtmVcScTxWeight is expressed either as the number of cells or as a percentage of the total VC bandwidth. The value of jnxCosAtmVcScTxWeightType.determines the unit used.

Table 137: jnxCosAtmVcScTable *(continued)*

Object	Object ID	Description
jnxCosAtmVcScDpType	jnxCosAtmVcScEntry 4	Shows the type of RED drop profile configured for the specified forwarding class within the VC. A scheduler can specify either linear or constant drop profile. A constant type drop profile (also known as EPD) specifies that all the cells should be dropped when the number of queued cells exceeds a threshold. A linear type drop profile specifies that only a percentage of cells be dropped based on the number of queued cells at any time.
jnxCosAtmVcScLrdpQueueDepth	jnxCosAtmVcScEntry 5	Represents the maximum queue size in cells, as specified by the linear RED drop profile associated with the specified forwarding class within the VC. This object is valid only when the value of the object jnxCosAtmVcScDpType is linearRed(0).
jnxCosAtmVcScLrdpLowPlpThresh	jnxCosAtmVcScEntry 6	Represents the threshold percentage of fill-level beyond which the low Packet Loss Priority (PLP) packets belonging to the specified forwarding class within the VC are randomly dropped. This value is specified by the linear RED drop profile configuration. This object is valid only when the object jnxCosAtmVcScDpType is set to linearRed(0).
jnxCosAtmVcScLrdpHighPlpThresh	jnxCosAtmVcScEntry 7	Represents the threshold percentage of the fill level beyond which high PLP packets belonging to the specified forwarding class within the VC are randomly dropped. This value is specified by the linear RED drop profile configuration. This object is valid only when the object jnxCosAtmVcScDpType is set to linearRed(0).
jnxCosAtmVcEpdThreshold	jnxCosAtmVcScEntry 8	Shows the EPD drop threshold configured for the specified forwarding class within the VC. When the number of cells queued exceeds the value specified for this object, all the cells in the queue are dropped. This object is valid only when the jnxCosAtmVcScDpType object is set to epd(1).

jnxCosAtmVcQstatsTable

The jnxCosAtmVcQstatsTable (object identifier is jnxAtmCos 3) contains queue statistics for VCs and forwarding classes. Each jnxCosAtmVcQstatsEntry in the jnxCosAtmVcQstatsTable contains the queue status information for a particular forwarding class and VC. The jnxCosAtmVcQstatsEntry object uses ifIndex, atmVclVpi, atmVclVci, and jnxCosFcId for indexing.

Each jnxCosAtmVcQstatsEntry contains the objects listed in Table 138 on page 524.

Table 138: jnxCosAtmVcQstatsTable

Object	Object ID	Description
jnxCosAtmVcQstatsOutPackets	jnxCosAtmVcQstatsEntry 1	Represents the number of packets belonging to a particular forwarding class that is transmitted on a specific VC.
jnxCosAtmVcQstatsOutBytes	jnxCosAtmVcQstatsEntry 2	Represents the number of bytes of a particular forwarding class that are transmitted on a specific VC.
jnxCosAtmVcQstatsOutRedDropPkts	jnxCosAtmVcQstatsEntry 3	Represents the number of RED-dropped outgoing packets of a particular forwarding class that are transmitted on a specific VC.
jnxCosAtmVcQstatsOutNonRedDrops	jnxCosAtmVcQstatsEntry 4	Represents the number of outgoing packets, of a particular forwarding class and transmitted on a specific VC, that are dropped because of errors in packets.
jnxCosAtmVcQstatsOutLpBytes	jnxCosAtmVcQstatsEntry 5	Represents the number of low PLP (PLP0) bytes transmitted.
jnxCosAtmVcQstatsOutLpPkts	jnxCosAtmVcQstatsEntry 6	Represents the number of low PLP(PLP0) packets that are transmitted.
jnxCosAtmVcQstatsOutLpDropBytes	jnxCosAtmVcQstatsEntry 7	Represents the number of low PLP (PLP0) bytes dropped at the output queue.
jnxCosAtmVcQstatsOutHpDropBytes	jnxCosAtmVcQstatsEntry 8	Represents the number of high PLP (PLP1) bytes dropped at the output queue.
jnxCosAtmVcQstatsOutLpDropPkts	jnxCosAtmVcQstatsEntry 9	Represents the number of low PLP (PLP0) packets dropped at the output queue.
jnxCosAtmVcQstatsOutHpDropPkts	jnxCosAtmVcQstatsEntry 10	Represents the number of high PLP (PLP1) packets dropped at the output queue.

jnxCosAtmTrunkTable

The jnxCosAtmTrunkTable (object identifier is jnxAtmCos 4) contains statistics and configuration information related to ATM Trunk CoS interface.

The jnxCosAtmTrunkEntry (object identifier is jnxCosAtmTrunkTable 1) object uses ifIndex and jnxCosFcId, and contains the objects listed in Table 139 on page 525.

Table 139: jnxCosAtmTrunkTable

Object	Object ID	Description
jnxCosAtmTrunkMode	jnxCosAtmTrunkEntry 1	Represents the mode of CoS queue priority for the trunk: ■ Strict mode (represented by integer value 0): One of the four queues has high priority, and is always serviced before the other three queues. The remaining queues are serviced in a round-robin fashion. ■ Alternate mode (represented by integer value 1): Even though one of the four queues has high priority, the servicing of the queues alternates between the high priority queue and the other queues.
jnxCosAtmTrunkScPriority	jnxCosAtmTrunkEntry 2	Represents the ATM scheduler priority for the queue associated with a particular forwarding class within the trunk.
jnxCosAtmTrunkScTxWeightType	jnxCosAtmTrunkEntry 3	Represents the ATM scheduler transmit weight type for the queue associated with a particular forwarding class inside the trunk. The weight type can be expressed either as the number of cells or as a percentage of the queue size.
jnxCosAtmTrunkScTxWeight	jnxCosAtmTrunkEntry 4	Represents the transmit weight for the queue. The transmit weight can be expressed either as the number of cells or as a percentage of the total trunk bandwidth. The unit is determined by the value set for jnxCosAtmTrunkScTxWeightType.
jnxCosAtmTrunkQaType	jnxCosAtmTrunkEntry 5	Represents the ATM queue admission type used for the specified trunk. Available values for this object are: red(1), singleEpd(2), and dualEpd(3)
jnxCosAtmTrunkEpdThresholdPlp0	jnxCosAtmTrunkEntry 6	Represents the threshold value beyond which all PLP0 cells get dropped. This object has a valid value only when the value for jnxCosAtmTrunkQaType is set to singleEpd or dualEpd.
jnxCosAtmTrunkEpdThresholdPlp1	jnxCosAtmTrunkEntry 7	Represents the threshold value beyond which all PLP1 cells get dropped. This object has a valid value only when the jnxCosAtmTrunkQaType object is set to dualEpd.
jnxCosAtmTrunkQstatsOutPackets	jnxCosAtmTrunkEntry 8	Represents the number of packets that belong to a particular forwarding class, and are transmitted on the specific trunk.
jnxCosAtmTrunkQstatsOutBytes	jnxCosAtmTrunkEntry 9	Represents the number of bytes that belong to a particular forwarding class, and are transmitted on the specific trunk.
jnxCosAtmTrunkQstatsOutDrops	jnxCosAtmTrunkEntry 10	Represents the number of outgoing packets on the trunk that are dropped.
jnxCosAtmTrunkQstatsOutLpBytes	jnxCosAtmTrunkEntry 11	Represents the number of low PLP (PLP0) bytes that are transmitted on the trunk.
jnxCosAtmTrunkQstatsOutLpPkts	jnxCosAtmTrunkEntry 12	Represents the number of low PLP (PLP0) packets that are transmitted on the trunk.
jnxCosAtmTrunkQstatsOutLpDropBytes	jnxCosAtmTrunkEntry 13	Represents the number of low PLP (PLP0) bytes dropped at the output queue.

Table 139: jnxCosAtmTrunkTable *(continued)*

Object	Object ID	Description
jnxCosAtmTrunkQstatsOutHpDropBytes	jnxCosAtmTrunkEntry 14	Represents the number of high PLP (PLP1) bytes that are dropped at the output queue.
jnxCosAtmTrunkQstatsOutLpDropPkts	jnxCosAtmTrunkEntry 15	Represents the number of low PLP (PLP0) packets that are dropped at the output queue.
jnxCosAtmTrunkQstatsOutHpDropPkts	jnxCosAtmTrunkEntry 16	Represents the number of high PLP (PLP1) packets dropped at the output queue.
jnxCosAtmTrunkQstatsOutHpBytes	jnxCosAtmTrunkEntry 17	Represents the number of high PLP (PLP1) bytes that are transmitted on the trunk.
jnxCosAtmTrunkQstatsOutHpPkts	jnxCosAtmTrunkEntry 18	Represents the number of high PLP (PLP1) packets that are transmitted on the trunk.

Chapter 51

Interpreting the Enterprise-Specific Firewall MIB

The enterprise-specific Firewall MIB, whose object identifier is {jnxMibs 5}, contains information about firewall filters and policies.

Firewall MIB contains 2 tables, jnxFirewallsTable and jnxFirewallCounterTable.

The jnxFirewallsTable does not support the following conditions:

- Counter and filter names that have more than 24 characters.
- Duplicate counter names, even if the counter types are different.

Because of the preceding limitations, the jnxFirewallsTable has been deprecated and replaced with jnxFirewallCounterTable. However, for backward compatibility, the jnxFirewallsTable is retained in the Firewall MIB.

For a downloadable version of the MIB, see
www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-firewall.txt

This chapter contains the following topics:

jnxFirewallsTable

The deprecated jnxFirewallsTable contains jnxFirewallsEntry, whose object ID is {jnxFirewallsTable 1}. Each jnxFirewallsEntry contains the objects listed in Table 140 on page 527.

Table 140: jnxFirewallsEntry

Object	Object ID	Description
jnxFWFilter	jnxFirewallsEntry 1	The name of the firewall filter. This object does not support names that have more than 24 characters.
jnxFWCounter	jnxFirewallsEntry 2	The name of the counter or the policer. This name is specific within the firewall filter.

Table 140: jnxFirewallsEntry *(continued)*

Object	Object ID	Description
jnxFWType	jnxFirewallsEntry 3	The type of the jnxFWCounter object. The value of jnxFWType can be 1 (other), 2 (counter), or 3 (policer).
jnxFWPackets	jnxFirewallsEntry 4	The number of packets that are associated with the specified counter or policer.
jnxFWBytes	jnxFirewallsEntry 5	The number of bytes that are associated with the counter. For policers, the value of jnxFWBytes is always zero because the policers do not count the number of bytes.

jnxFirewallCounterTable

The jnxFirewallCounterTable, whose object identifier is jnxFirewalls 2, replaces the deprecated jnxFirewallsTable. Each JnxFirewallCounterEntry contains the objects listed in Table 141 on page 528.

Table 141: JnxFirewallCounterEntry

Object	Object ID	Description
jnxFWCounterFilterName	jnxFirewallCounterEntry 1	The name of the firewall filter. The name can have up to 127 characters.
jnxFWCounterName	jnxFirewallCounterEntry 2	The name of the counter or the policer. The name can have up to 127 characters.
jnxFWCounterType	jnxFirewallCounterEntry 3	The type of the jnxFWCounterName object. The value of jnxFWType can be 1 (other), 2 (counter), or 3 (policer).
jnxFWCounterPacketCount	jnxFirewallCounterEntry 4	The number of packets that are associated with the specified counter or policer.
jnxFWCounterByteCount	jnxFirewallCounterEntry 5	The number of bytes that are associated with the counter. For policers, the value of jnxFWCounterByteCount is always zero because the policers do not count the number of bytes.
jnxFWCounterDisplayFilterName	jnxFirewallCounterEntry 6	The name of the firewall filter. The name can have up to 127 characters.
jnxFWCounterDisplayName	jnxFirewallCounterEntry 7	The name of the counter or the policer.
jnxFWCounterDisplayType	jnxFirewallCounterEntry 8	The type of the jnxFWCounterName object. The value of jnxFWType can be 1 (other), 2 (counter), or 3 (policer).

Chapter 52

Interpreting the Enterprise-Specific ATM MIB

The enterprise-specific ATM MIB, whose object identifier is {jnxMibs 10}, extends the standard *ATM MIB, RFC 1695*, and contains information about ATM interfaces and VCs.

For a downloadable version of this MIB, see
www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-atm.txt

This chapter contains the following topics:

jnxAtmIfTable

The jnxAtmIfTable augments the atmInterfaceConfTable in the standard ATM MIB. The object identifier for jnxAtmIfTable is {jnxAtm 1}. Each jnxAtmIfEntry in the jnxAtmIfTable contains the configuration and statistic information for a particular ATM port. The jnxAtmIfEntry, whose object identifier is {jnxAtmIfTable 1}, is an extension of the atmInterfaceConfEntry in the standard ATM MIB.

Table 142 on page 530 lists the objects associated with the jnxAtmIfEntry.

Table 142: jnxAtmIfTable

Object	Object ID	Description
jnxAtmIfPortType	jnxAtmIfEntry 1	Represents the type of the physical port. This object uses the following integer values to denote the port type: ■ 1 (other) ■ 2 (oc3) ■ 3 (oc1) ■ 4 (t3) ■ 5 (e3) ■ 6 (oc48)
jnxAtmIfEncaps	jnxAtmIfEntry 2	Represents the type of ATM physical link layer encapsulation. This object uses the following integer values to denote the type of encapsulation: ■ 1 (other) ■ 2 (atmPvc) ■ 3 (atmCccCellRelay)
jnxAtmIfLpBackInfo	jnxAtmIfEntry 3	Represents the loopback configuration and type. This object uses the following integer values to denote the loopback configuration type: ■ 1 (noLoopBack) ■ 2 (localLoopBack) ■ 3 (remoteLoopBack)
jnxAtmIfScrambleEnable	jnxAtmIfEntry 4	Indicates whether scrambling is enabled (object value 1) or disabled (object value 2). Default value for this object is 2, disabled.
jnxAtmIfTxCellCount	jnxAtmIfEntry 5	Indicates the number of ATM cells, including the idle cells, transmitted by the interface.
jnxAtmIfRxCellCount	jnxAtmIfEntry 6	Indicates the number of ATM cells, excluding the idle cells, received by the interface.
jnxAtmIfTxIdleCellCount	jnxAtmIfEntry 7	Indicates the number of idle cells transmitted by the interface. When the interface does not have anything to send, it sends idle cells to fill the time slot.
jnxAtmIfUncorrHCSErrs	jnxAtmIfEntry 8	Indicates the number of uncorrectable cell Header Check Sequence (HCS) errors that occurred on the interface.
jnxAtmIfCorrHCSErrs	jnxAtmIfEntry 9	Indicates the number of correctable cell Header Check Sequence (HCS) errors.

Table 142: jnxAtmIfTable *(continued)*

Object	Object ID	Description
jnxAtmIfTxCellFIFOOverRuns	jnxAtmIfEntry 10	Indicates the number of overruns in the Transmit FIFO.
jnxAtmIfRxCellFIFOOverRuns	jnxAtmIfEntry 11	Indicates the number of overruns in the Receive FIFO.
jnxAtmIfRxCellFIFOUnderRuns	jnxAtmIfEntry 12	Indicates the number of underruns in the Receive FIFO.
jnxAtmIfInInvalidVCCells	jnxAtmIfEntry 13	Indicates the number of cells that are arrived for a non-existent VC.
jnxAtmIfInNoBufferOAMCells	jnxAtmIfEntry 14	Indicates the number of incoming OAM cells or raw cells that are dropped because of lack of buffer to handle them.
jnxAtmIfInNoBufDropPkts	jnxAtmIfEntry 15	Indicates the number of AAL5 packets that are dropped because of lack of buffer to handle them.
jnxAtmIfOutVCQueueDrops	jnxAtmIfEntry 16	Indicates the number of packets dropped because of queue limits on each VC.
jnxAtmIfInBadCrcs	jnxAtmIfEntry 17	Indicates the total number of incoming CRC errors.
jnxAtmIfInLenErrPkts	jnxAtmIfEntry 18	Indicates the number of AAL5 packets that were dropped because of incorrect length.
jnxAtmIfInTimeoutPkts	jnxAtmIfEntry 19	Indicates the number of AAL5 packets that were dropped because of reassembly timeout.
jnxAtmIfL2CircuitMode	jnxAtmIfEntry 20	Indicates the layer 2 circuit mode of the ATM interface (on an ATMII PIC). This object uses the following integer values to denote the circuit modes: ■ 1 (not applicable) ■ 2 (none) ■ 3 (aal5) ■ 4 (cell) ■ 5 (uniTrunk) ■ 6 (nniTrunk)

jnxAtmVCTable

The jnxAtmVCTable, whose object identifier is jnxAtm 2, extends the atmVclTable in the standard ATM MIB, and contains information on P2P, P2MP, and multicast virtual circuit entries.

Each jnxAtmVCEntry, whose object identifier is jnxAtmVCTable 1, in the jnxAtmVCTable contains the objects listed in Table 143 on page 532.

However, the jnxAtmVCEntry does not store any statistic for multicast VCs. A value of zero indicates this. Similarly, a value of 0.0.0.0 indicates that the multipoint destination IP address for a P2P VC is invalid. If atmCccCellRelay is set as the encapsulation type for the logical interface (to which the VC belongs), only the generic VC info is valid. And, if OAM is disabled (indicated by zero value for jnxAtmVCFlags), then all the OAM config and f5 statistics information is invalid.

Table 143: jnxAtmVCTable

Object	Object ID	Description
jnxAtmVCConnType	jnxAtmVCEntry 1	Indicates the type of connection. This object uses the following integer values to denote the connection types: ■ 1 (other; unknown connection type or a connection type that is not one of the other connection types explicitly represented) ■ 2 (p2p) ■ 3 (p2mp; point to multipoint) ■ 4 (multicast)
jnxAtmVCEncapsulation	jnxAtmVCEntry 2	Indicates the ATM encapsulation type associated with the VC. This object uses the following integer values to denote the encapsulation types: ■ 1 other ■ 2 atmCccCellRelay (ATM cell relay for CCC) ■ 3 atmCccVcMux (ATM VC for CCC) ■ 4 atmCiscoNlpid (Cisco-compatible ATM NLPID encapsulation) ■ 5 atmNlpid (ATM NLPID encapsulation) ■ 6 atmSnap (ATM LLC/SNAP encapsulation) ■ 7 atmVcMux (ATM VC multiplexing) ■ 8 atmTccVcmux (Translational Cross Connection (TCC) over ATM VC MUX encapsulation) ■ 9 atmTccSnap (TCC over ATM LLC/SNAP encapsulation)

Table 143: jnxAtmVCTable *(continued)*

Object	Object ID	Description
jnxAtmVCMpDestIPv4Addr	jnxAtmVCEntry 3	Represents the multipoint destination IPv4 address for a P2MP connection. This object returns an all zero address in the following cases: ■ When the connection type is not P2MP. ■ When the multipoint destination address type is IPv6.
jnxAtmVCMpDestIPv6Addr	jnxAtmVCEntry 4	Represents the multipoint destination IPv6 address for a P2MP connection. This object returns an all zero address in the following cases: ■ When the connection type is not P2MP. ■ When the multipoint destination address type is IPv4.
jnxAtmVCFlags	jnxAtmVCEntry 5	Contains the flags related to the VC.
jnxAtmVCTotalDownTime	jnxAtmVCEntry 6	Shows the total downtime for the VC after the last reboot of the system.
jnxAtmVCInBytes	jnxAtmVCEntry 7	Represents the number of bytes received on the VC.
jnxAtmVCOutBytes	jnxAtmVCEntry 8	Represents the number of bytes transmitted from the VC.
jnxAtmVCInPkts	jnxAtmVCEntry 9	Represents the number of packets received on the VC.
jnxAtmVCOutPkts	jnxAtmVCEntry 10	Represents the number of packets transmitted from the VC.
jnxAtmVCTailQueuePktDrops	jnxAtmVCEntry 11	Represents the number of packets that were dropped because of bandwidth constraints.
jnxAtmVCOAMPeriod	jnxAtmVCEntry 12	Shows the frequency at which the F5 cells are transmitted to check the status of the VC.
jnxAtmVCOAMUpCellCount	jnxAtmVCEntry 13	Shows the minimum number of loopback cells that are required to confirm that a VC is up.
jnxAtmVCOAMDownCellCount	jnxAtmVCEntry 14	Shows the minimum number of loopback cells that are required to confirm that a VC is down. **NOTE:** This object returns a zero value if OAM is not enabled.

Table 143: jnxAtmVCTable *(continued)*

Object	Object ID	Description
jnxAtmVCInOAMF5LoopCells	jnxAtmVCEntry 15	Shows the number of OAM F5 loopback cells received on a VC. **NOTE:** This object returns a zero value if OAM is not enabled.
jnxAtmVCOutOAMF5LoopCells	jnxAtmVCEntry 16	Shows the number of OAM F5 loopback cells transmitted from a VC. **NOTE:** This object returns a zero value if OAM is not enabled.
jnxAtmVCInOAMF5RDICells	jnxAtmVCEntry 17	Shows the number of OAM F5 cells that are received with RDI (Remote Defect Indication) bit set. **NOTE:** This object returns a zero value if OAM is not enabled.
jnxAtmVCOutOAMF5RDICells	jnxAtmVCEntry 18	Shows the number of OAM F5 cells that are transmitted with RDI (Remote Defect Indication) bit set. **NOTE:** This object returns a zero value if OAM is not enabled.
jnxAtmVCInOAMF5AISCells	jnxAtmVCEntry 19	Shows the number of OAM F5 cells that are received with AIS (Alarm Indication Signal) bit set. **NOTE:** This object returns a zero value if OAM is not enabled.
jnxAtmVCOutOAMF5AISCells	jnxAtmVCEntry 20	Shows the number of OAM F5 cells that are transmitted with AIS bit set. **NOTE:** This object returns a zero value if OAM is not enabled.

jnxAtmVpTable

The jnxAtmVpTable extends the atmVplTable defined in *RFC 2515, ATM MIB*, and contains additional information on ATM virtual paths (VP).

The jnxAtmVpTable, whose object identifier is jnxAtm 3, contains jnxAtmVpEntry. Each jnxAtmVpEntry, whose object ID is jnxAtmVpTable 1, contains the objects listed in Table 144 on page 535.

Table 144: jnxAtmVpTable

Object	Object ID	Description
jnxAtmVpEntry	jnxAtmVpTable 1	Represents configuration status and statistics information related to an ATM VP. However, traffic stats are available per VP tunnel only If shaping is configured on the VP. You can use the jnxAtmVpFlags to determine whether shaping is enabled. Similarly, the values for OAM config and OAM stat objects are invalid (default value: 0) if no OAM is configured. You can use the jnxAtmVpFlags to determine whether OAM is configured. **NOTE:** For an ATM-1 VP, the only valid object is jnxAtmVpFlags.
jnxAtmVpFlags	jnxAtmVpEntry 1	Represents the flags associated with the VP. This object uses the following values: ■ 0 active ■ 1 down ■ 2 oamEnabled ■ 3 shapingEnabled ■ 4 passiveOam
jnxAtmVpTotalDownTime	jnxAtmVpEntry 2	Represents the total downtime for the VP since the last reboot of the system.
jnxAtmVpOamPeriod	jnxAtmVpEntry 3	Indicates the frequency at which the OAM F4 cells are transmitted to find out the status of the VP. This object returns a value of zero if OAM is not enabled for the VP.
jnxAtmVpOamUpCellCount	jnxAtmVpEntry 4	Indicates the minimum number of consecutive loopback cells required to confirm that a VP is up.
jnxAtmVpOamDownCellCount	jnxAtmVpEntry 5	Indicates the minimum number of consecutive loopback cells required to confirm that a VP is down.
jnxAtmVpInBytes	jnxAtmVpEntry 6	Indicates the number of bytes received on the VP.
jnxAtmVpOutBytes	jnxAtmVpEntry 7	Indicates the number of bytes sent out of the VP.
jnxAtmVpInPkts	jnxAtmVpEntry 8	Indicates the number of packets received on the VP.
jnxAtmVpOutPkts	jnxAtmVpEntry 9	Indicates the number of packets sent out on the VP.
jnxAtmVpInOamF4Cells	jnxAtmVpEntry 10	Indicates the number of OAM F4 cells received on the VP.
jnxAtmVpOutOamF4Cells	jnxAtmVpEntry 11	Indicates the number of OAM F4 cells transmitted on the VP.
jnxAtmVpInOamF4LoopCells	jnxAtmVpEntry 12	Indicates the number of OAM F4 loopback cells received on the VP.
jnxAtmVpOutOamF4LoopCells	jnxAtmVpEntry 13	Indicates the number of OAM F4 cells transmitted on the VP.
jnxAtmVpInOamF4RdiCells	jnxAtmVpEntry 14	Indicates the number of OAM F4 RDI cells received on the VP.

Table 144: jnxAtmVpTable *(continued)*

Object	Object ID	Description
jnxAtmVpOutOamF4RdiCells	jnxAtmVpEntry 15	Indicates the number of OAM F4 RDI cells transmitted on the VP.
jnxAtmVpInOamF4AisCells	jnxAtmVpEntry 16	Indicates the number of OAM F4 AIS cells received on the VP.

jnxAtmTrunkTable

The jnxAtmTrunkTable, whose object identifier is jnxAtm 4, contains information related to ATM trunks. Each JnxAtmTrunkEntry in jnxAtmTrunkTable contains the objects listed in Table 145 on page 536.

NOTE: If the encapsulation type for the logical interface to which the trunk belongs is atmCccCellRelay, only the generic trunk information (jnxAtmTrunkConnType, jnxAtmTrunkEncapsulation, nxAtmTrunkFlags, and jnxAtmTrunkTotalDownTime) is valid.

Table 145: jnxAtmTrunkTable

Object	Object ID	Description
jnxAtmTrunkId	jnxAtmTrunkEntry 1	Represents the identifier of the ATM trunk.
jnxAtmTrunkConnType	jnxAtmTrunkEntry 2	Indicates the type of connection. This object uses the following integer values to denote the type of connection: ■ 1 other ■ 2 P2P
jnxAtmTrunkEncapsulation	jnxAtmTrunkEntry 3	Represents the ATM encapsulation type associated with the VC or trunk. This object uses the following integer values to denote the encapsulation type: ■ 1 other ■ 2 atmCccCellRelay
jnxAtmTrunkFlags	jnxAtmTrunkEntry 4	Represents the flags related to the trunk.
jnxAtmTrunkTotalDownTime	jnxAtmTrunkEntry 5	Indicates the total downtime (in seconds) for the trunk since the last reboot of the system.
jnxAtmTrunkInBytes	jnxAtmTrunkEntry 6	Indicates the number of bytes received on the trunk.
jnxAtmTrunkOutBytes	jnxAtmTrunkEntry 7	Indicates the number of bytes sent out on the trunk.
jnxAtmTrunkInPkts	jnxAtmTrunkEntry 8	Indicates the number of packets received on the trunk.
jnxAtmTrunkOutPkts	jnxAtmTrunkEntry 9	Indicates the number of packets sent out on the trunk.

Table 145: jnxAtmTrunkTable *(continued)*

Object	Object ID	Description
jnxAtmTrunkTailQueuePktDrops	jnxAtmTrunkEntry 10	Represents the number of packets that were dropped because of bandwidth constraints. This object indicates that the packets were queued to be transmitted at a rate faster than allowed.
jnxAtmTrunkInOAMF4AISCells	jnxAtmTrunkEntry 15	Indicates the number of OAM F4 cells that are received with AIS (Alarm Indication Signal) bit set.
jnxAtmTrunkOutOAMF4AISCells	jnxAtmTrunkEntry 16	Indicates the number of OAM F4 cells that are sent out with AIS bit set.

Chapter 53

Interpreting the Enterprise-Specific Configuration Management MIB

The enterprise-specific Configuration Management MIB, whose object identifier is {jnxMIbs 18}, defines the objects that are used for managing the configuration of Juniper Networks products.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-cfgmgmt.txt.

This chapter contains the following sections:

Text Conventions

Table 146 on page 539 contains information on the text conventions used in the enterprise-specific configuration management MIB.

Table 146: Text Conventions for Enterprise-Specific Configuration Management MIB

Object	Description	Syntax
JnxCmCfChgSource	Identifies the source of the configuration event.	This object uses the following integer values: ■ 1–Other ■ 2–CLI ■ 3—JUNOScript ■ 4—Synchronize ■ 5—SNMP ■ 6—Button ■ 7—Autoinstall ■ 8—Unknown

Table 146: Text Conventions for Enterprise-Specific Configuration Management MIB *(continued)*

Object	Description	Syntax
JnxCmRescueCfgState	Represents the state of the rescue configuration.	This object uses the following integer values: ■ 1—Nonexistent ■ 2—Updated

Configuration Change Management Objects and jnxCmCfgChgEventTable

The configuration change management objects listed in Table 147 on page 540 along with the objects in the jnxCmCfgChgEventTable provide you the configuration change history.

Each jnxCmCfgChg, whose object identifier is {jnxCfgMgmt 1}, contains the objects listed in Table 147 on page 540.

Table 147: Configuration Change Management Objects

Object	Object ID	Description
jnxCmCfgChgLatestIndex	jnxCmCfgChg 1	Contains the index used in jnxCmCfgChgEventTable to represent the latest configuration change event.
jnxCmCfgChgLatestTime	jnxCmCfgChg 2	Shows the value of sysUpTime at the time of the last configuration change. However, this object returns 0 if the management subsystem was reset after the last configuration change.
jnxCmCfgChgLatestDate	jnxCmCfgChg 3	Shows the date and time when the configuration was last modified.
jnxCmCfgChgLatestSource	jnxCmCfgChg 4	Shows the source from which the configuration event was triggered. This object uses JnxCmCfChgSource to represent the source of configuration event. For more information on JnxCmCfChgSource, see Table 146 on page 539.
jnxCmCfgChgLatestUser	jnxCmCfgChg 5	Shows the login name of the current user. This object returns a zero-length string if the user name is not available or not applicable.
jnxCmCfgChgMaxEventEntries	jnxCmCfgChg 6	Shows the maximum number of entries that jnxCmCfgChgEventTable can contain. Allowable range is 0 though 2147483647. When the number of entries in jnxCmCfgChgEventTable exceeds the maximum value set for jnxCmCfgChgMaxEventEntries, the latest entry displaces the oldest entry in the table.

■ jnxCmCfgChgEventTable on page 540

jnxCmCfgChgEventTable

The jnxCmCfgChgEventTable, whose object identifier is {jnxCmCfgChg 7}, contains jnxCmCfgChgEventEntry that maps to the most recent configuration change events on

the router. The jnxCmCfgChgMaxEventEntries object discussed in the preceding section (Table 147 on page 540) controls the number of entries stored in jnxCmCfgChgEventTable.

Each jnxCmCfgChgEventEntry, whose object identifier is {jnxCmCfgChgEventTable 1}, contains the objects listed in Table 148 on page 541.

Table 148: jnxCmCfgChgEventTable

Object	Object ID	Description
jnxCmCfgChgEventIndex	jnxCmCfgChgEventEntry 1	Uniquely identifies a configuration change event. The SNMP process assigns monotonically increasing values to each event as it occurs. However, when the SNMP process is reset, the index values too are reset,
jnxCmCfgChgEventTime	jnxCmCfgChgEventEntry 2	Contains the value of sysUpTime when the event occurred.
jnxCmCfgChgEventDate	jnxCmCfgChgEventEntry 3	Contains the system date and time when the event occurred.
jnxCmCfgChgEventSource	jnxCmCfgChgEventEntry 4	Shows the source from which the configuration event was triggered. This object uses JnxCmCfChgSource to represent the source of configuration event. For more information on JnxCmCfChgSource, see Table 146 on page 539.
jnxCmCfgChgEventUser	jnxCmCfgChgEventEntry 5	Contains the name of the user who was logged in at the time of the event. Returns a zero-length string if the user name is not applicable or not available.
jnxCmCfgChgEventLog	jnxCmCfgChgEventEntry 6	Contains the log of the configuration event. Returns a zero-length string if no log is available.

Rescue Configuration Change Management Objects

The jnxCmRescueChg, whose object identifier is {jnxCfgMgmt 2}, contains information about changes to rescue configuration.

Table 149 on page 541 lists the objects associated with jnxCmRescueChg.

Table 149: Rescue Configuration Change Management Objects

Object	Object ID	Description
jnxCmRescueChgTime	jnxCmRescueChg 1	Contains the value of sysUpTime when the rescue configuration was last changed. If the management subsystem has been reset since the last configuration change, this object returns 0.
jnxCmRescueChgDate	jnxCmRescueChg 2	Contains the date and time when the rescue configuration was last changed.
jnxCmRescueChgSource	jnxCmRescueChg 3	Shows the source from which the rescue configuration event was triggered. This object uses JnxCmCfChgSource to represent the source of configuration event. For more information on JnxCmCfChgSource, see Table 146 on page 539.

Table 149: Rescue Configuration Change Management Objects *(continued)*

Object	Object ID	Description
jnxCmRescueChgUser	jnxCmRescueChg 4	Contains the name of the user who was logged in at the time of the event. Returns a zero-length string if the user name is not applicable or not available.
jnxCmRescueChgState	jnxCmRescueChg 5	Shows the current state of the rescue configuration. For more information on the different states of rescue configuration, see Table 146 on page 539.

Configuration Management Notifications

The JUNOS software generates the following traps when a configuration or a rescue configuration event occurs:

- jnxCmCfgChange, whose object identifier is {jnxCmNotificationsPrefix 1}, contains jnxCmCfgChgEventTime, jnxCmCfgChgEventDate, jnxCmCfgChgEventSource, jnxCmCfgChgEventUser, and jnxCmCfgChgEventLog.

NOTE: Because configuration rollback is handled by the master management process that uses the root user ID, the jnxCmCfgChgEventUser object in the jnxCmCfgChange trap always returns root as the user name for configuration rollback events.

- jnxCmRescueChange, whose object identifier is {jnxCmNotificationsPrefix 2}, contains jnxCmRescueChgTime, jnxCmRescueChgDate, jnxCmRescueChgSource, jnxCmRescueChgUser, and jnxCmRescueChgState.

Chapter 54

Interpreting the Enterprise-Specific IPv4 MIB

The enterprise-specific IPv4 Management Information Base (MIB), whose object identifier is {jnxMibs12}, functions as an extension of the ifTable defined in *RFC 1573, IF MIB*, and defines the branches for IPV4 configuration.

For a downloadable version of this MIB, see
www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ipv4.txt

This chapter contains the following topic:

jnxIpv4AddrTable

The jnxIpv4AddrTable defines the jnxIpv4AddrEntry and its attributes. Each jnxIpv4AddrEntry contains the objects listed in Table 150 on page 543.

Table 150: jnxIpv4AddrTable

Object	Object ID	Description
jnxIpv4AdEntIfIndex	jnxIpv4AddrEntry 1	A unique index value that identifies the interface with which a particular entry is associated. An interface identified by a particular value of jnxIpv4AdEntIfIndex is the same as the interface that is identified by the same value of ifIndex as defined in *RFC 1573*.
jnxIpv4AdEntAddr	jnxIpv4AddrEntry 2	The IP address of the interface with which the address information stored in this entry is associated.
jnxIpv4AdEntNetMask	jnxIpv4AddrEntry 3	The subnet mask associated with the IP address of this entry. The value of the mask is an IP address with all the network bits set to 1 and all the host bits set to 0.
jnxIpv4AdEntBcastAddr	jnxIpv4AddrEntry 4	The least significant bit in the IP broadcast address used for sending datagrams on the logical interface associated with the IP address of this entry. For example, when the Internet standard all-ones broadcast address is used, the value will be 1. This value applies to both the subnet and network broadcast addresses used by the entry on the logical interface.
jnxIpv4AdEntReasmMaxSize	jnxIpv4AddrEntry 5	The size of the largest IP datagram that this entry can reassemble from the incoming fragmented IP datagrams received on the interface.

Chapter 55

Interpreting the Enterprise-Specific Alarm MIB

The enterprise-specific Alarm MIB, whose object identifier is {jnxMibs 4}, contains information about alarms from the router chassis.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-chassis-alarm.txt.

This chapter contains the following sections:

jnxAlarmRelayMode

The jnxAlarmRelayMode, whose object identifier is {jnxCraftAlarms 1}, denotes the alarm relay mode of the craft interface panel for the yellow and red alarms. This object uses the following integer values:

- 1–Other: Other or unknown state
- 2–passOn: Alarms are passed on. The alarm relay is activated to pass on the yellow or red alarms to audible sirens or visual flashing devices.
- 3–cutOff: Alarms are turned off. Both the yellow and red alarms are cut off from the alarm relays and do not get passed on to audible sirens or visual flashing devices.

NOTE: Both the yellow and red alarms can be cut off from the alarm relay using a Alarm Cutoff/Lamp Test button on the front panel of the router chassis.

jnxYellowAlarms

The jnxYellowAlarms, whose object identifier is {jnxCraftAlarms 2} contains the objects listed in Table 151 on page 546.

Table 151: jnxYellowAlarms

Object	Object ID	Description
jnxYellowAlarmState	jnxYellowAlarms 1	Denotes the yellow alarm state on the craft interface panel of the router chassis. This object contains one of the following integer values: ■ other–1: The alarm state is unknown. ■ off–2: The yellow alarms are off. You can turn off the yellow alarms using the Alarm Cutoff/Lamp Test button on the craft interface panel of the router chassis. ■ on–3: The yellow alarms are on.
jnxYellowAlarmCount	jnxYellowAlarms 2	Shows the number of currently active and non-silent yellow alarms. **NOTE:** The value of this object is independent of the state of the Alarm Cutoff/Lamp Test button.
jnxYellowAlarmLastChange	jnxYellowAlarms 3	Shows the value of the sysUp time when the state of the yellow alarm last changed from on to off or vice versa. This object returns 0 if the alarm state has not changed since the sysUp time was reset last time, or if the value is unknown.

jnxRedAlarms

The jnxRedAlarms, whose object identifier is {jnxCraftAlarms 3}, contains the objects listed in Table 152 on page 546.

Table 152: jnxRedAlarms

Object	Object ID	Description
jnxRedAlarmState	jnxRedAlarms 1	Denotes the state of red alarms on the craft interface panel of the router chassis. This object contains one of the following values: ■ 1–other: The red alarm state is unknown. ■ 2–off: The red alarm is turned off. ■ 3–on: The red alarm is on. Typically, the red alarm is on when there is a system failure, power failure, or hardware malfunction, or when a threshold value is exceeded.
jnxRedAlarmCount	jnxRedAlarms 2	Shows the number of currently active and non-silent red alarms. **NOTE:** The value of this object is independent of the state of the Alarm Cutoff/Lamp Test button.
jnxRedAlarmLastChange	jnxRedAlarms 3	Shows the value of the sysUp time when the red alarm last changed from on to off or vice versa. This object contains 0 value, if the alarm state has not changed since the sysUp time was reset last time, or if the value is unknown.

Chapter 56

Interpreting the Enterprise-Specific Resource Reservation Protocol (RSVP) MIB

The enterprise-specific Resource Reservation Protocol (RSVP) MIB, whose object identifier is {jnxMibs 30}, contains information about RSVP-traffic engineering (TE) sessions that correspond to MPLS LSPs on transit routing platforms in the service provider core network.

NOTE: To collect information about MPLS statistics on transit routers, use the enterprise-specific RSVP MIB (mib-jnx-rsvp.txt) instead of the enterprise-specific MPLS MIB (mib-jnx-mpls.txt).

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-rsvp.txt.

This chapter contains the following sections:

jnxRsvpSessionTable

The jnxRsvpSessionTable, whose object identifier is {jnxRsvpOperation 1}, contains information about RSVP sessions. Each jnxRsvpSessionEntry (object identifier {jnxRsvpSessionTable 1}) is identified using a combination of two indexes, jnxRsvpSessionName and jnxRsvpSessionIndex. The jnxRsvpSessionName maps to the LSP name in MPLS entry, and can be used to correlate the jnxRsvpSessionEntry with mplsLspEntry. Because there can be multiple entries with the same RSVP session name, a secondary index, jnxRsvpSessionIndex, is used to uniquely identify each session in combination with the jnxRsvpSessionName.

Each jnxRsvpSessionEntry contains the objects listed in Table 153 on page 548.

Table 153: jnxRsvpSessionTable

Object	Object ID	Description
jnxRsvpSessionName	jnxRsvpSessionEntry 1	Contains the name of the RSVP session. This is the same as the LSP name in the mplsLspEntry and can contain up to 64 characters.
jnxRsvpSessionIndex	jnxRsvpSessionEntry 2	Uniquely identifies an RSVP session entry in combination with the jnxRsvpSessionName.
jnxRsvpSessionState	jnxRsvpSessionEntry 3	Shows the operational state of the RSVP session. This object contains one of the following integer values: ■ 1–Up ■ 2–Down
jnxRsvpSessionFrom	jnxRsvpSessionEntry 4	Contains the source IP address of the RSVP session.
jnxRsvpSessionTo	jnxRsvpSessionEntry 5	Contains the destination IP address of the RSVP session.
jnxRsvpSessionLspId	jnxRsvpSessionEntry 6	Contains the LSP ID of the sender for the RSVP session.
jnxRsvpSessionTunnelId	jnxRsvpSessionEntry 7	Contains the tunnel ID for the RSVP session.
jnxRsvpSessionPathType	jnxRsvpSessionEntry 8	Denotes the type of the path for the RSVP session. This object uses the following integer values to denote the path type: ■ 1–Primary ■ 2–Secondary ■ 3–unknown
jnxRsvpSessionRole	jnxRsvpSessionEntry 9	Shows the role of an RSVP session with respect to the start and end points of the session. This object uses the following integer values to represent the role of the RSVP session: ■ 1–Ingress (source) ■ 2–Transit (intermediate nodes) ■ 3–Egress (destination)
jnxRsvpSessionDiscontinuityTime	jnxRsvpSessionEntry 10	Shows the value of sysUpTime when either jnxRsvpSessionMplsOctets or jnxRsvpSessionMplsPackets counters experienced discontinuity. This object contains a zero value if no discontinuity occurred since the last initialization of the local management subsystem.
jnxRsvpSessionMplsOctets	jnxRsvpSessionEntry 11	Contains the number of MPLS octets that have been forwarded over the RSVP session. Because the MPLS statistics collection occurs at predefined intervals (default of 5 minutes), the value of this object may not reflect real-time statistics. This object is not updated if MPLS statistics collection is not enabled.
jnxRsvpSessionMplsPackets	jnxRsvpSessionEntry 12	Shows the number of MPLS packets that have been forwarded over the RSVP session. Because the MPLS statistics collection occurs at predefined intervals (default of 5 minutes), the value of this object may not reflect real-time statistics. This object is not updated if MPLS statistics collection is not enabled.

Chapter 57

Interpreting the Enterprise-Specific MPLS MIB

The enterprise-specific Multiprotocol Label Switching MIB, whose object identifier is {jnxMibs 2}, provides information about MPLS paths and defines MPLS notifications.

The table mplsLspList and the sequence for mplsLspEntry have been deprecated and replaced by a new table mplsLspInfoList to extend support for LSP names longer than 32 characters.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-mpls.txt.

This chapter contains the following sections:

MPLS Info Table

The mplsInfo table, whose object identifier is {mpls 1}, contains the objects listed in Table 154 on page 549.

Table 154: mplsInfo

Object	Object ID	Description
mplsVersion	mplsInfo 1	Shows the MPLS version number.
mplsSignalingProto	mplsInfo 2	Indicates the MPLS signaling protocol. This object uses the following integer values to denote the MPLS signaling protocol: ■ 1–None ■ 2–Other ■ 3–RSVP ■ 4–LDP

Table 154: mplsInfo *(continued)*

Object	Object ID	Description
mplsConfiguredLsps	mplsInfo 3	Indicates the number of LSPs configured on the router.
mplsActiveLsps	mplsInfo 4	Indicates the number of active LSPs on the router.

MPLS Traffic Engineering (TE) Info Table

The mplsTEInfo table, whose object identifier is {mpls 2}, contains the objects listed in Table 155 on page 550.

Table 155: mplsTEInfo

Object	Object ID	Description
mplsTEDistProtocol	mplsTEInfo 1	Indicates the Interior Gateway Protocol (IGP) used to distribute Traffic Engineering information and topology to each Label Switch Router (LSR) for automatic path computation. This object uses the following integer values to denote the protocols: ■ 1–None ■ 2–IS-IS ■ 3–OSPF ■ 4–IS-IS – OSPF
mplsAdminGroupList	mplsTEInfo 2	Contains the list of administrative groups configured on the router. Administrative groups are used to label links in the Traffic Engineering topology for specifying constraints (include and exclude) on LSP paths.

mplsAdminGroup

The mplsAdminGroup, whose object identifier is {mplsAdminGroupList 1} contains mplsAdminGroupNumber and mplsAdminGroupName objects, and provides a mapping between the group number and name.

- mplsAdminGroupNumber–Whose object identifier is {mplsAdminGroup 1} contains an integer value from 0 through 31. This object indexes the mplsAdminGroup.
- mplsAdminGroupName–Whose object identifier is {mplsAdminGroup 2}, contains the name of the mplsAdminGroup. This object can contain a string of not more than 16 characters.

mplsLspInfoList

The mplsLspInfoList, whose object identifier is {mpls 5} contains a list of Label Switched Paths (LSP) configured on the router. Each MplsLspInfoEntry contains information about a particular LSP, and has the objects listed in Table 156 on page 551.

Table 156: MplsLspInfoEntry

Object	Object ID	Description
mplsLspInfoName	mplsLspInfoEntry 1	Contains the name of the LSP. This object can contain a string of not more than 64 characters.
mplsLspInfoState	mplsLspInfoEntry 2	Contains one of the following integer values to indicate the operational state of the LSP: ■ 1–Unknown ■ 2–Up ■ 3–Down
mplsLspInfoOctets	mplsLspInfoEntry 3	Indicates the number of octets that have been forwarded over the current LSP active path. Because the MPLS statistics are collected only at predefined intervals (default of 5 minutes), the value of this object may not reflect the real-time value. The value of the object is not updated if MPLS statistics collection is not enabled.
mplsLspInfoPackets	mplsLspInfoEntry 4	Indicates the number of packets that have been forwarded over the current LSP active path. Because the MPLS statistics are collected only at predefined intervals (default of 5 minutes), the value of this object may not reflect the real-time value. The value of the object is not updated if MPLS statistics collection is not enabled.
mplsLspInfoAge	mplsLspInfoEntry 5	Indicates the time duration (in 10-millisecond intervals) since the inception of the LSP.
mplsLspInfoTimeUp	mplsLspInfoEntry 6	Indicates the total time (in 10-millisecond intervals) that the LSP has been operational. The percentage of up time can be calculated using the following formula: mplsLspInfoTimeUp/mplsLspInfoAge x 100.
mplsLspInfoPrimaryTimeUp	mplsLspInfoEntry 7	Indicates the total time (in 10-millisecond intervals) when the primary path of the LSP has been operational.
mplsLspInfoTransitions	mplsLspInfoEntry 8	Indicates the number of state transitions, from up to down and down to up, that the LSP has undergone.
mplsLspInfoLastTransition	mplsLspInfoEntry 9	Shows the time (in 10-millisecond intervals) since the last state transition occurred on the LSP.
mplsLspInfoPathChanges	mplsLspInfoEntry 10	Shows the number of path changes that occurred on the LSP. Every path change (path down, path up, and path change) generates a syslog entry or trap or both if the corresponding configuration is enabled.
mplsLspInfoLastPathChange	mplsLspInfoEntry 11	Indicates the time (in 10-millisecond intervals) since the last path change occurred on the LSP.
mplsLspInfoConfiguredPaths	mplsLspInfoEntry 12	Indicates the number of paths configured for the LSP.
mplsLspInfoStandbyPaths	mplsLspInfoEntry 13	Indicates the number of standby paths configured on the LSP.
mplsLspInfoOperationalPaths	mplsLspInfoEntry 14	Indicates the number of operational paths for the LSP. The value of this object includes the currently active path as well as the operational standby paths.
mplsLspInfoFrom	mplsLspInfoEntry 15	Contains the source IP address of the LSP.

Table 156: MplsLspInfoEntry *(continued)*

Object	Object ID	Description
mplsLspInfoTo	mplsLspInfoEntry 16	Contains the destination IP address of the LSP.
mplsPathInfoName	mplsLspInfoEntry 17	Shows the name of the active path for the LSP. If the path does not have a name, the mplsLspInfoEntry objects listed in this table are invalid.
mplsPathInfoType	mplsLspInfoEntry 18	Contains one of the following integer values to denote the type of the active path: ■ 1–Other ■ 2–Primary ■ 3–Standby ■ 4–Secondary **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.
mplsPathInfoExplicitRoute	mplsLspInfoEntry 19	Contains the explicit route used to set up the LSP. The explicit router can be one configured by the user or a generated route that satisfies the constraints set by the user. The value of this object is stored in the following format: xxx.xxx.xxx.xxx S/L, where S/L stands for Strict/Loose route. Each explicit route appears in a new line. **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.
mplsPathInfoRecordRoute	mplsLspInfoEntry 20	Shows the route actually used for the LSP as recorded by the signaling protocol. **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.
mplsPathInfoBandwidth	mplsLspInfoEntry 21	Indicates the configured bandwidth (in kbps) for the LSP. **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.
mplsPathInfoCOS	mplsLspInfoEntry 22	Indicates the class of service (CoS) configured for the path. If the value of this object is from 0 through 7, it goes in the 3-bit CoS field in the label. If the value is 255, the value in the CoS field of the label depends on other factors. **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.
mplsPathInfoInclude	mplsLspInfoEntry 23	Contains a configured set of colors represented by bit vector. For each link this path goes through, the link must have colors associated with the path, and the intersection of the link's colors and the include set must be set to a value other than null. **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.
mplsPathInfoExclude	mplsLspInfoEntry 24	Contains a configured set of colors represented by bit vector. For each link the path goes through, the link must have colors associated with the path, and the intersection of the link's colors and the exclude set must be set to null. **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.

Table 156: MplsLspInfoEntry *(continued)*

Object	Object ID	Description
mplsPathInfoSetupPriority	mplsLspInfoEntry 25	Indicates the set up priority configured for the path. This object contains integer values from 0 through 7. **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.
mplsPathInfoHoldPriority	mplsLspInfoEntry 26	Indicates the hold priority configured for the path. This object contains integer values from 0 through 7. **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.
mplsPathInfoProperties	mplsLspInfoEntry 27	Denotes the properties configured for the path. This value is represented as a bit map. The possible values are: ■ 1–Record-Route ■ 2–Adaptive ■ 4–CSPF ■ 8–Mergeable ■ 16–Preemptable ■ 32–Preemptive ■ 64–Fast-Reroute **NOTE:** The value of this object is invalid if mplsPathInfoName is blank.

Enterprise-Specific MPLS Traps

Table 157 on page 553 lists the enterprise-specific MPLS traps based on mplsLspInfoName.

Table 157: MPLS Traps

Object	Object ID	Description
mplsLspInfoUp	mplsLspTraps 1	Indicates that the LSP (mplsLspInfoName) is up. The current active path is represented by mplsPathInfoName.
mplsLspInfoDown	mplsLspTraps 2	Indicates that the LSP (mplsLspInfoName) is down because the current active path (mplsPathInfoName) has gone down.
mplsLspInfoChange	mplsLspTraps 3	Indicates that the LSP (mplsLspInfoName) has switched traffic to a new active path (mplsPathInfoName) without changing the state (up) before or after the switch.
mplsLspInfoPathDown	mplsLspTraps 4	Indicates that the specified path (mplsPathInfoName) for the LSP (mplsLspInfoName) has gone down.
mplsLspInfoPathUp	mplsLspTraps 5	Indicates that the specified path (mplsPathInfoName) for the LSP (mplsLspInfoName) has come up.

Chapter 58

Interpreting the Enterprise-Specific Host Resources MIB

The enterprise-specific Host Resources MIB, whose object identifier is {jnxMibs 31}, extends the hrStorageTable defined in RFC 2790, the standard Host Resources MIB, to include the jnxHrStoragePercentUsed object.

For a downloadable version of this MIB, see
www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-hostresources.txt

This chapter contains the following section:

jnxHrStorageTable

The jnxHrStorageTable, whose object identifier is {jnxHrStorage 1}, contains jnxHrStorageEntry. Each jnxHrStorageEntry augments the hrStorageEntry to provide additional file system data, and contains the following object:

- jnxHrStoragePercentUsed—object identifier is {jnxHrStorageEntry 1}—Shows what percentage of the total storage space has been used.

Chapter 59

Interpreting the Enterprise-Specific Layer 2 Control Protocol (L2CP) MIB

The enterprise-specific Layer 2 Control Protocol (L2CP) MIB, whose object identifier is {jnxMibs 53}, provides information about LC2P-based features on MX-series Ethernet Services routers. Currently, the JUNOS software supports only the jnxDot1dStpPortRootProtectEnabled, jnxDot1dStpPortRootProtectState, and jnxPortRootProtectStateChangeTrap objects.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-l2cp-features.txt.

For more information about the L2CP MIB objects supported by the JUNOS software, see the following topic:

- L2CP MIB Objects Supported by JUNOS Software on page 557

L2CP MIB Objects Supported by JUNOS Software

Table 158 on page 557 lists the L2CP MIB objects supported by JUNOS software:

Table 158: L2CP MIB Objects Supported by JUNOS Software

Object	Object ID	Description
jnxDot1dStpPortRootProtectEnabled	{jnxDot1dStpPortProtectEntry 1}	Indicates whether the root protect functionality is enabled on the port. If set to true, the port cannot be selected as the root port even if it has the best spanning tree priority value. By default this object is set to false.
jnxDot1dStpPortRootProtectState	{jnxDot1dStpPortProtectEntry 2}	Returns one of the following integer values to indicate whether the port was ever prevented from being the root port or not: ■ 0 no-error—Indicates that the port was not prevented from being a root port. ■ 1 root-prevented—Indicates that the port was prevented from being a root port. This object always indicates a 0 no-error state if the jnxDot1dStpPortRootProtectEnabled is set to false.

Table 158: L2CP MIB Objects Supported by JUNOS Software *(continued)*

Object	Object ID	Description
jnxPortRootProtectStateChangeTrap	{jnxL2cpProtectTraps 1}	Generated when there is a change in the jnxDot1dStpPortRootProtectState for a port.

Chapter 60

Interpreting the Enterprise-Specific MIMSTP MIB

The JUNOS software provides SNMP support for spanning-tree protocols on MX-series Ethernet Services routers.

The following standard and Juniper Networks enterprise-specific MIBs have been added to extend SNMP support to spanning-tree protocols:

- RFC 4188, *Definitions of Managed Objects for Bridges*—Supports 802.1d STP (1998) only.
- RFC 4318, *Definitions of Managed Objects for Bridges with Rapid Spanning Tree Protocol*—Supports 802.1w and 802.1t extensions for RSTP.
- Juniper Networks Enterprise-Specific Multiple Instance Virtual Switch MIB (mib-jnx-mimstp.txt)—Supports 802.1s (2002) for MSTP.

The Juniper Networks enterprise-specific Multiple Instance Multiple Spanning Tree protocol (MIMSTP) management information base (MIB) (mib-jnx-mimstp.txt) provides information on multiple spanning-tree instances, that is routing instances of type Virtual Switch/Layer 2 control, also known as virtual contexts and associated VLANs.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-mimstp.txt.

This chapter discusses the following topics:

jnxMIDot1sJuniperMstTable

The jnxMIDot1sJuniperMstTable provides MSTP module parameters for a given virtual context. Table 159 on page 560 lists the objects in the jnxMIDot1sJuniperMstTable.

Table 159: jnxMIDot1sJuniperMstTable

Object	Object Identifier	Description
jnxMIDot1sJuniperMstContextId	jnxMIDot1sJuniperMstEntry 1	Identifies the virtual context.
jnxMIMstSystemControl	jnxMIDot1sJuniperMstEntry 2	Indicates the status of MST on the ports of the device. The value start (1) indicates that MIMST is active on all ports of the device; the value shutdown (2) indicates that MIMST is shut down on all ports of the device.
jnxMIMstModuleStatus	jnxMIDot1sJuniperMstEntry 3	Indicates whether MST is enabled or disabled on the ports. When set to value 1, enabled, MST is enabled on all ports of the device; when set to value 2, disabled, MIMST is disabled on all ports. **NOTE:** The object can be set to enabled(1) only when jnxMIMstSystemControl is set to start.
jnxMIMstMaxMstInstanceNumber	jnxMIDot1sJuniperMstEntry 4	Indicates the maximum number of spanning-tree instances allowed on the bridge.
jnxMIMstNoOfMstiSupported	jnxMIDot1sJuniperMstEntry 5	Indicates the maximum number of spanning-tree instances that can be supported on the bridge.
jnxMIMstMaxHopCount	jnxMIDot1sJuniperMstEntry 6	Returns the Maximum Hop Count value.
jnxMIMstBrgAddress	jnxMIDot1sJuniperMstEntry 7	Indicates the MAC address used by the bridge, which forms a unique bridge identifier when combined with jnxMIMstCistBridgePriority or jnxMIMstMstiBridgePriority.
jnxMIMstCistRoot	jnxMIDot1sJuniperMstEntry 8	Indicates the bridge identifier of the root of the common spanning tree as determined by the Spanning Tree Protocol. This value is used as the CIST Root Identifier parameter in all configuration bridge PDUs originating at this node.
jnxMIMstCistRegionalRoot	jnxMIDot1sJuniperMstEntry 9	Indicates the bridge identifier of the root of the multiple spanning-tree region as determined by the Spanning Tree Protocol. This value is used as the CIST Regional Root Identifier parameter in all configuration bridge PDUs originating at this node.
jnxMIMstCistRootCost	jnxMIDot1sJuniperMstEntry 10	Indicates the cost of the path to the CIST root from this bridge.

Table 159: jnxMIDot1sJuniperMstTable *(continued)*

Object	Object Identifier	Description
jnxMIMstCistRegionalRootCost	jnxMIDot1sJuniperMstEntry 11	Indicates the cost of the path to the CIST regional root from this bridge.
jnxMIMstCistRootPort	jnxMIDot1sJuniperMstEntry 12	Indicates the port number of the port that offers the lowest path cost from this bridge to the CIST Root Bridge.
jnxMIMstCistBridgePriority	jnxMIDot1sJuniperMstEntry 13	Indicates the value of the writable portion of the bridge identifier. The values set for Bridge Priority must be in multiples of 4096.
jnxMIMstCistBridgeMaxAge	jnxMIDot1sJuniperMstEntry 14s	Indicates the value that a bridge uses for MaxAge when the bridge is acting as the root.
jnxMIMstCistBridgeForwardDelay	jnxMIDot1sJuniperMstEntry 15	Indicates the value that the bridge uses for ForwardDelay when this bridge is acting as the root. Note that 802.1D specifies that the range for this parameter is related to the value of BridgeMaxAge.
jnxMIMstCistHoldTime	jnxMIDot1sJuniperMstEntry 16	Sets the interval between transmitting two configuration bridge PDUs.
jnxMIMstCistMaxAge	jnxMIDot1sJuniperMstEntry 17	Sets the maximum age of Spanning Tree Protocol (STP) information learned on the ports. The STP information is discarded when the age exceeds the set limit.
jnxMIMstCistForwardDelay	jnxMIDot1sJuniperMstEntry 18	Indicates the time period during which a port stays in a particular state before moving to the next state; for example, from spanning to forwarding state.
jnxMIMstMstpUpCount	jnxMIDot1sJuniperMstEntry 19	Shows the number of times the MSTP Module has been enabled on the bridge.
jnxMIMstMstpDownCount	jnxMIDot1sJuniperMstEntry 20	Shows the number of times the MSTP Module has been disabled on the bridge.
jnxMIMstPathCostDefaultType	jnxMIDot1sJuniperMstEntry 21	Shows the version of the spanning tree default path costs that are to be used by the bridge. ■ A value of 8021d1998(1) uses the 16-bit default path costs from IEEE Std. 802.1D-1998. ■ A value of stp8021t2001(2) uses the 32-bit default path costs from IEEE Std. 802.1t.

Table 159: jnxMIDot1sJuniperMstTable *(continued)*

Object	Object Identifier	Description
jnxMIMstDebug	jnxMIDot1sJuniperMstEntry 23	Enables debug statements in the MSTP module. A four-byte integer can be used to set the level of debugging. The bit position maps to the following levels of debugging: ■ 0: Init and shutdown debug statements ■ 1: Management debug statements ■ 2: Memory-related debug statements ■ 3: BPDU-related debug statements ■ 4: Event handling debug statements ■ 5: Time module debug statements ■ 6: Port information SEM debug statements ■ 7: Port receive SEM debug statements (valid in the case of MSTP alone) ■ 8: Role selection SEM debug statements ■ 9: Role transition SEM debug statements ■ 10: State transition SEM debug statements ■ 11: Protocol migration SEM debug statements ■ 12: Topology change SEM debug statements ■ 13: Port transmit SEM debug statements ■ 14: Bridge detection SEM debug statements ■ 15: All failure debug statements ■ 16: Redundancy code flow debug statements The rest of the bits remain unused. You can use a combination of debug levels to generate debug statements of multiple debug levels. **NOTE:** Debug options and trace options are mutually exclusive. When the debug option is set, the trace option is set to 0.

Table 159: jnxMIDot1sJuniperMstTable *(continued)*

Object	Object Identifier	Description
jnxMIMstForceProtocolVersion	jnxMIDot1sJuniperMstEntry 24	Indicates the version of the Spanning Tree Protocol that is running on the bridge. ■ stpCompatible(0): Represents Spanning Tree Protocol specified in IEEE 802.1D. ■ rstp(2): Represents the Rapid Spanning Tree protocol specified in IEEE 802.1w. ■ mstp(3): Represents the Multiple Spanning Tree protocol specified in IEEE 802.1s.
jnxMIMstTxHoldCount	jnxMIDot1sJuniperMstEntry 25	Indicates the value that the port transmit state machine uses to limit the maximum transmission rate.
jnxMIMstMstiConfigIdSel	jnxMIDot1sJuniperMstEntry 26	Indicates the Configuration Identifier Format Selector that the bridge uses.
jnxMIMstMstiRegionName	jnxMIDot1sJuniperMstEntry 27	Indicates the name of the region's configuration. By default, the region name and the MAC address of the bridge are the same.
jnxMIMstMstiRegionVersion	jnxMIDot1sJuniperMstEntry 28	Indicates the version of the multiple-spanning tree region.
jnxMIMstMstiConfigDigest	jnxMIDot1sJuniperMstEntry 29	Indicates the configuration digest value for the multiple-spanning tree region.
jnxMIMstBufferOverFlowCount	jnxMIDot1sJuniperMstEntry 30	Indicates the number of times buffer overflows or failures have occurred. This event generates a trap.
jnxMIMstMemAllocFailureCount	jnxMIDot1sJuniperMstEntry 31	Indicates the number of times memory allocation failures have occurred. This event generates a trap.
jnxMIMstRegionConfigChangeCount	jnxMIDot1sJuniperMstEntry 32	Indicates the number of times a Region Configuration Identifier Change was detected. This event generates a trap.
jnxMIMstCistBridgeRoleSelectionSemState	jnxMIDot1sJuniperMstEntry 33	Indicates the current state of the Port Role Selection State Machine of the bridge in a common spanning tree context
jnxMIMstCistTimeSinceTopologyChange	jnxMIDot1sJuniperMstEntry 34	Indicates the time since the TcWhile Timer for any port of the Bridge was non-zero for the common spanning-tree context.

Table 159: jnxMIDot1sJuniperMstTable *(continued)*

Object	Object Identifier	Description
jnxMIMstCistTopChanges	jnxMIDot1sJuniperMstEntry 35	Indicates the number of times when there was at least one non-zero TcWhile Timer on the bridge for the common spanning-tree context.
jnxMIMstCistNewRootBridgeCount	jnxMIDot1sJuniperMstEntry 36	Indicates how many times the bridge has detected a root bridge change for a common-spanning tree context. This event generates a trap.
jnxMIMstCistHelloTime	jnxMIDot1sJuniperMstEntry 37	Specifies the interval between the transmission of configuration BPDUs by this node on any port when it is either the root of the spanning tree or trying to become the root.
jnxMIMstCistBridgeHelloTime	jnxMIDot1sJuniperMstEntry 38	Specifies the interval between the transmission of configuration bridge PDUs by this node.
jnxMIMstCistDynamicPathcostCalculation	jnxMIDot1sJuniperMstEntry 39	Indicates whether the dynamic path cost calculation is allowed. If set to true, path cost is calculated dynamically from the port speed; otherwise the link speed at the time of port creation is used for calculating the path cost. In both cases, the user has configured a path cost for the port that will be used. By default, dynamic path cost calculation is set to false.

Juniper Networks MSTI Bridge Table

The jnxMIMstMstiBridgeTable provides information on a bridge that belongs to a given spanning-tree instance (MSTI). Each jnxMIMstMstiBridgeEntry points to a bridge in the spanning-tree instance and has the objects listed in Table 160 on page 564.

Table 160: jnxMIMstMstiBridgeTable

Object	Object Identifier	Description
jnxMIMstMstiInstanceIndex	jnxMIMstMstiBridgeEntry 1	Identifies the spanning-tree instance to which the information belongs.
jnxMIMstMstiBridgeRegionalRoot	jnxMIMstMstiBridgeEntry 2	Indicates the MSTI Regional Root Identifier value for the Instance. This value is used as the Regional Root Identifier parameter in all the configuration bridge PDUs originated by this node.

Table 160: jnxMIMstMstiBridgeTable *(continued)*

Object	Object Identifier	Description
jnxMIMstMstiBridgePriority	jnxMIMstMstiBridgeEntry 3	Indicates the writable portion of the MSTI Bridge Identifier that comprises the first two octets. The values that are set for Bridge Priority must be in multiples of 4096.
jnxMIMstMstiRootCost	jnxMIMstMstiBridgeEntry 4	Indicates the cost of the path to the MSTI Regional Root as calculated by the bridge.
jnxMIMstMstiRootPort	jnxMIMstMstiBridgeEntry 5	Indicates the port number of the port that offers the lowest path cost from the bridge to the MSTI Region Root Bridge.
jnxMIMstMstiTimeSinceTopologyChange	jnxMIMstMstiBridgeEntry 6	Indicates the time (in hundredths of a second) since the TcWhile Timer for any port on this bridge was non-zero for this spanning-tree instance.
jnxMIMstMstiTopChanges	jnxMIMstMstiBridgeEntry 7	Indicates the number of times when there was at least one non-zero TcWhile Timer on the bridge for the spanning-tree instance.
jnxMIMstMstiNewRootBridgeCount	jnxMIMstMstiBridgeEntry 8	Indicates the number of times the bridge has detected a root bridge change for the spanning-tree instance. This event generates a trap.
jnxMIMstMstiBridgeRoleSelectionSemState	jnxMIMstMstiBridgeEntry 9	Shows the current state of the Port Role Selection State Machine for the spanning-tree instance of this bridge.
jnxMIMstInstanceUpCount	jnxMIMstMstiBridgeEntry 10	Indicates the number of times a new spanning-tree instance has been created. This counter is incremented whenever a new spanning-tree instance is created and also whenever a VLAN is mapped to the instance. This event generates a trap.
jnxMIMstInstanceDownCount	jnxMIMstMstiBridgeEntry 11	Indicates the number of times a spanning-tree instance has been deleted. This counter is incremented whenever a spanning tree instance is deleted and also whenever a VLAN is unmapped from the instance. This event generates a trap.
jnxMIMstOldDesignatedRoot	jnxMIMstMstiBridgeEntry 12	Indicates the bridge identifier of the old root of the spanning-tree instance as determined by the Spanning Tree Protocol.

jnxMIMstVlanInstanceMappingTable

The jnxMIMstVlanInstanceMappingTable contains information on the mapping between each instance of MSTP and associated VLANs. Each jnxMIMstVlanInstanceMappingEntry indicates the status and properties of a specific MSTP instance-VLAN mapping and has the objects listed in Table 161 on page 566.

Table 161: jnxMIMstVlanInstanceMappingTable

Object	Object Identifier	Description
jnxMIMstInstanceIndex	jnxMIMstVlanInstanceMappingEntry 1	Identifies a multiple spanning-tree instance using an arbitrary integer from 1 through the value of Max Instance Number.
jnxMIMstMapVlanIndex	jnxMIMstVlanInstanceMappingEntry 2	Indicates that the VLAN ID is mapped to the multiple spanning-tree instance specified.
jnxMIMstUnMapVlanIndex	jnxMIMstVlanInstanceMappingEntry 3	Indicates that the VLAN ID is unmapped from the spanning-tree instance to which it was mapped.
jnxMIMstInstanceVlanMapped	jnxMIMstVlanInstanceMappingEntry 6	Represents a string of octets that contain one bit per VLAN. The first octet corresponds to VLANs with VLAN index values 1 through 8; the second octet to VLANs 9 through 16, and so on. The most significant bit of each octet corresponds to the lowest VlanIndex value in that octet. For each VLAN that is mapped to this MSTP instance, the bit corresponding to that VLAN is set to 1.
jnxMIMstInstanceVlanMapped2k	jnxMIMstVlanInstanceMappingEntry 7	Represents a string of octets that contain one bit per VLAN for VLANS with VlanIndex values from 1024 through 2047. The first octet corresponds to VLANs with VlanIndex values 1024 through 1031; the second octet to VLANs 1032 through 1039, and so on. The most significant bit of each octet corresponds to the lowest VlanIndex value in that octet. For each VLAN that is mapped to this MSTP instance, the bit corresponding to that VLAN is set to 1.

Table 161: jnxMIMstVlanInstanceMappingTable *(continued)*

Object	Object Identifier	Description
jnxMIMstInstanceVlanMapped3k	jnxMIMstVlanInstanceMappingEntry 8	Represents a string of octets that contain one bit per VLAN for VLANS with VlanIndex values from 2048 through 3071. The first octet corresponds to VLANs with VlanIndex values 2048 through 2055; the second octet to VLANs 2056 through 2063, and so on. The most significant bit of each octet corresponds to the lowest VlanIndex value in that octet. For each VLAN that is mapped to this MSTP instance, the bit corresponding to that VLAN is set to 1.
jnxMIMstInstanceVlanMapped4k	jnxMIMstVlanInstanceMappingEntry 9	Represents a string of octets that contain one bit per VLAN for VLANS with VlanIndex values from 3072 through 4095. The first octet corresponds to VLANs with VlanIndex values 3072 through 3079; the second octet to VLANs 3080 through 3087, and so on. The most significant bit of each octet corresponds to the lowest VlanIndex value in that octet. For each VLAN that is mapped to this MSTP instance, the bit corresponding to that VLAN is set to 1.

jnxMIMstCistPortTable

The jnxMIMstCistPortTable contains the information maintained by the ports of Common and Internal Spanning Tree Protocol. Table 162 on page 567 lists the parameters maintained by each jnxMIMstCistPortEntry.

Table 162: jnxMIMstCistPortTable

Object	Object Identifier	Description
jnxMIMstCistPort	jnxMIMstCistPortEntry 1	Specifies the port number of the port to which this entry is mapped.
nxMIMstCistPortPathCost	jnxMIMstCistPortEntry 2	Indicates the contribution of this port to the path cost of paths towards the CIST root that includes this port.
jnxMIMstCistPortPriority	jnxMIMstCistPortEntry 3	Contains the four most significant bits of the Port Identifier of the spanning-tree instance that can be modified by setting the CistPortPriority value. The values that are set for Port Priority must be in multiples of 16.
jnxMIMstCistPortDesignatedRoot	jnxMIMstCistPortEntry 4	Specifies the unique Bridge Identifier that is recorded as the CIST root in the configuration BPDUs.

Table 162: jnxMIMstCistPortTable *(continued)*

Object	Object Identifier	Description
jnxMIMstCistPortDesignatedBridge	jnxMIMstCistPortEntry 5	Specifies the unique Bridge Identifier of the bridge that is considered as the designated bridge for the port's segment.
jnxMIMstCistPortDesignatedPort	jnxMIMstCistPortEntry 6	Indicates the port identifier of the port on the designated bridge for this port's segment.
jnxMIMstCistPortAdminP2P	jnxMIMstCistPortEntry 7	Indicates the administrative point-to-point status of the LAN segment attached to this port. ■ A value of forceTrue(0) indicates that this port must be treated as if it were connected to a point-to-point link. ■ A value of forceFalse(1) indicates that this port should be treated as having a shared media connection. ■ A value of auto(2) indicates that this port is considered to have a point-to-point link if it is an aggregator and all of its members are aggregatable, or if the MAC entity is configured for full duplex operation, either through autonegotiation or by management.
jnxMIMstCistPortOperP2P	jnxMIMstCistPortEntry 8	Indicates the operational point-to-point status of the LAN segment that is attached to this port. It indicates whether a port is considered to have a point-to-point connection or not. The value is determined by management or by autodetection, as described in the jnxMIMstCistPortAdminP2P object.
jnxMIMstCistPortAdminEdgeStatus	jnxMIMstCistPortEntry 9	Specifies the administrative value of the EdgePort parameter. A value of TRUE(1) indicates that this port must be treated as an edge port, and a value of FALSE(2) indicates that this port should be treated as a non-edge port.
jnxMIMstCistPortOperEdgeStatus	jnxMIMstCistPortEntry 10	Specifies the operational value of the EdgePort parameter. The object is initialized to the value of jnxMIMstCistPortAdminEdgeStatus and is set FALSE on reception of a BPDU.
jnxMIMstCistPortState	jnxMIMstCistPortEntry 12	Shows the current state of the port as defined by the Common Spanning Tree Protocol.
jnxMIMstCistPortForwardTransitions	jnxMIMstCistPortEntry 14	Indicates the number of times this port has transitioned to the forwarding state.
jnxMIMstCistPortRxMstBpduCount	jnxMIMstCistPortEntry 15	Indicates the number of multiple spanning-tree BPDUs that are received on this port.
jnxMIMstCistPortRxRstBpduCount	jnxMIMstCistPortEntry 16	Indicates the number of rapid spanning-tree BPDUs that are received on this port.
jnxMIMstCistPortRxConfigBpduCount	jnxMIMstCistPortEntry 17	Indicates the number of configuration BPDUs that are received on the port.

Table 162: jnxMIMstCistPortTable *(continued)*

Object	Object Identifier	Description
jnxMIMstCistPortRxTcnBpduCount	jnxMIMstCistPortEntry 18	Indicates the number of topology change notification BPDUs that are received on the port.
jnxMIMstCistPortTxMstBpduCount	jnxMIMstCistPortEntry 19	Indicates the number of multiple spanning-tree BPDUs that are transmitted from the port.
jnxMIMstCistPortTxRstBpduCount	jnxMIMstCistPortEntry 20	Indicates the number of rapid spanning-tree BPDUs that are transmitted from the port.
jnxMIMstCistPortTxConfigBpduCount	jnxMIMstCistPortEntry 21	Indicates the number of configuration BPDUs that are transmitted from the port.
jnxMIMstCistPortTxTcnBpduCount	jnxMIMstCistPortEntry 22	Indicates the number of TCN BPDUs that are transmitted from the port.
jnxMIMstCistPortInvalidMstBpduRxCount	jnxMIMstCistPortEntry 23	Indicates the number of invalid MST BPDUs that are received on the port.
jnxMIMstCistPortInvalidRstBpduRxCount	jnxMIMstCistPortEntry 24	Indicates the number of invalid RST BPDUs that are received on the port.
jnxMIMstCistPortInvalidConfigBpduRxCount	jnxMIMstCistPortEntry 25	Indicates the number of invalid configuration BPDUs that are received on the port.
jnxMIMstCistPortInvalidTcnBpduRxCount	jnxMIMstCistPortEntry 26	Indicates the number of invalid TCN BPDUs that are received on the port.
jnxMIMstCistPortTransmitSemState	jnxMIMstCistPortEntry 27	Indicates the current state of the port transmit state machine.
jnxMIMstCistPortReceiveSemState	jnxMIMstCistPortEntry 28	Indicates the current state of the port receive state machine.
jnxMIMstCistPortProtMigrationSemState	jnxMIMstCistPortEntry 29	Indicates the current state of the port protocol migration state machine.
jnxMIMstCistProtocolMigrationCount	jnxMIMstCistPortEntry 30	Indicates the number of times the port has migrated from one Spanning Tree Protocol version to another. The relevant protocols are STP-COMPATIBLE and RSTP/MSTP. This event generates a trap.
jnxMIMstCistPortDesignatedCost	jnxMIMstCistPortEntry 31	Indicates the path cost of the designated port of the segment connected to this port.
jnxMIMstCistPortRegionalRoot	jnxMIMstCistPortEntry 32	Specifies the unique Bridge Identifier of the bridge recorded as the CIST Regional Root Identifier in the configuration BPDUs transmitted.
jnxMIMstCistPortRegionalPathCost	jnxMIMstCistPortEntry 33	Specifies the contribution of this port to the path cost of paths towards the CIST regional root that includes this port.
jnxMIMstCistSelectedPortRole	jnxMIMstCistPortEntry 34	Indicates the selected port role of the port for this spanning-tree instance.

Table 162: jnxMIMstCistPortTable *(continued)*

Object	Object Identifier	Description
jnxMIMstCistCurrentPortRole	jnxMIMstCistPortEntry 35	Specifies the current port role of the port for this spanning-tree instance.
jnxMIMstCistPortInfoSemState	jnxMIMstCistPortEntry 36	Indicates the current state of the port information state machine for this port in this spanning-tree context.
jnxMIMstCistPortRoleTransitionSemState	jnxMIMstCistPortEntry 37	Indicates the current state of the port role transition state machine for this port in this spanning tree context.
jnxMIMstCistPortStateTransitionSemState	jnxMIMstCistPortEntry 38	Indicates the current state of the port state transition state machine for this port in this spanning-tree context.
jnxMIMstCistPortTopologyChangeSemState	jnxMIMstCistPortEntry 39	Indicates the current state of the topology change state machine for this port in this spanning-tree context.
jnxMIMstCistPortHelloTime	jnxMIMstCistPortEntry 40	Indicates the interval between the transmission of configuration bridge PDUs on this port.
jnxMIMstCistPortOperVersion	jnxMIMstCistPortEntry 41	Indicates one of the following operational modes of the port: MSTP, RSTP, and STP-compatible.
jnxMIMstCistPortEffectivePortState	jnxMIMstCistPortEntry 42	Indicates the effective operational state of the port for CIST. This values is set to TRUE only when the port is operationally up in the Interface level and Protocol level for CIST. This value is set to FALSE for all other instances.
jnxMIMstCistPortAutoEdgeStatus	jnxMIMstCistPortEntry 43	Indicates one of the following states: ■ TRUE(1) when the detection of a port as edge post happens automatically ■ FALSE(2) when this feature is disabled.

jnxMIMstMstiPortTable

The jnxMIMstMstiPortTable contains information maintained by the non-CIST ports for each spanning treee instance. Each jnxMIMstMstiPortEntry contains the parameters listed in Table 163 on page 570.

Table 163: jnxMIMstMstiPortTable

Object	Object Identifier	Description
jnxMIMstMstiPort	jnxMIMstMstiPortEntry 1	Specifies the port number of the port to which this entry maps.
jnxMIMstMstiPortPathCost	jnxMIMstMstiPortEntry 2	Shows the contribution of this port to the path cost of paths towards the MSTI root that includes this port.

Table 163: jnxMIMstMstiPortTable *(continued)*

Object	Object Identifier	Description
jnxMIMstMstiPortPriority	jnxMIMstMstiPortEntry 3	Enables you to specify the four most significant bits of the Port Identifier for a given spanning-tree instance that can be modified independently for each spanning-tree instance supported by the bridge. The values that are set for Port Priority must be in multiples of 16.
jnxMIMstMstiPortDesignatedRoot	jnxMIMstMstiPortEntry 4	Indicates the unique Bridge Identifier of the bridge recorded as the MSTI regional root in the configuration BPDUs transmitted.
jnxMIMstMstiPortDesignatedBridge	jnxMIMstMstiPortEntry 5	Indicates the unique Bridge Identifier of the bridge which this port considers to be the designated bridge for the port's segment.
jnxMIMstMstiPortDesignatedPort	jnxMIMstMstiPortEntry 6	Indicates the port identifier of the port on the designated bridge for this port's segment.
jnxMIMstMstiPortState	jnxMIMstMstiPortEntry 7	Indicates the current state of the port as defined by the Multiple Spanning Tree protocol. A port which is in forwarding state in one instance can be in discarding (blocking) state in another instance.
jnxMIMstMstiPortForwardTransitions	jnxMIMstMstiPortEntry 9	Indicates the number of times this port has transitioned to the forwarding state for specific instance.
jnxMIMstMstiPortReceivedBPDUs	jnxMIMstMstiPortEntry 10	Indicates the number of BPDUs received by this port for this spanning-tree instance.
jnxMIMstMstiPortTransmittedBPDUs	jnxMIMstMstiPortEntry 11	Indicates the number of BPDUs transmitted on this port for this spanning tree instance.
jnxMIMstMstiPortInvalidBPDUsRcvd	jnxMIMstMstiPortEntry 12	Indicates the number of invalid BPDUs received on this port for this spanning-tree instance.
jnxMIMstMstiPortDesignatedCost	jnxMIMstMstiPortEntry 13	Indicates the path cost of the designated port of the segment connected to this port.
jnxMIMstMstiSelectedPortRole	jnxMIMstMstiPortEntry 14	Indicates the selected Port Role of the port for this spanning-tree instance.
jnxMIMstMstiCurrentPortRole	jnxMIMstMstiPortEntry 15	Indicates the current Port Role of the port for this spanning-tree instance.
jnxMIMstMstiPortInfoSemState	jnxMIMstMstiPortEntry 16	Shows the current state of the port information state machine for this port in this spanning-tree context.
jnxMIMstMstiPortRoleTransitionSemState	jnxMIMstMstiPortEntry 17	Shows the current state of the port role transition state machine for this port in this spanning-tree context.
jnxMIMstMstiPortStateTransitionSemState	nxMIMstMstiPortEntry 18	Shows the current state of the port state transition state machine for this port in this spanning-tree context.
jnxMIMstMstiPortTopologyChangeSemState	nxMIMstMstiPortEntry 19	Shows the current state of the topology change state machine for this port in this spanning tree context.

Table 163: jnxMIMstMstiPortTable *(continued)*

Object	Object Identifier	Description
jnxMIMstMstiPortEffectivePortState	jnxMIMstMstiPortEntry 20	Shows the effective operational state of the port for the specific instance. The value is set to TRUE only when the port is operationally up in the interface level and protocol level for the specific instance. This is set to be FALSE at all other times.

Juniper Networks Enterprise-Specific MIMSTP Traps

Table 164 on page 572 lists the Juniper Networks enterprise-specific MIMSTP traps.

Table 164: Juniper Networks Enterprise-Specific MIMSTP Traps

Object	Object Identifier	Description
jnxMIMstGenTrap	jnxMIMstTraps 1	Generated when any of the general events such as protocol up or protocol down occurs.
jnxMIMstErrTrap	jnxMIMstTraps 2	Generated when any of the error events such as memory failure, buffer failure, protocol migration, or new root or topology change occurs.
jnxMIMstNewRootTrap	jnxMIMstTraps 3	Generated when a new root bridge is selected in the topology. The jnxMIMstNewRootTrap indicates that the sending agent has become the new root of the spanning tree; the trap is sent by a bridge soon after its election as the new root
jnxMIMstTopologyChgTrap	jnxMIMstTraps 4	Generated when a topology change is detected.
jnxMIMstProtocolMigrationTrap	jnxMIMstTraps 5	Generated when a port protocol migration happens on the port.
jnxMIMstInvalidBpduRxdTrap	jnxMIMstTraps 6	Generated when an invalid packet is received for bpdu/stp/rstp/maximum age/forward delay/hello time.
jnxMIMstRegionConfigChangeTrap	jnxMIMstTraps 7	Generated when the multiple spanning-tree region's configuration identifier changes.

Chapter 61

Interpreting the Enterprise-Specific L2ALD MIB

The enterprise-specific Layer 2 Address Learning Daemon (L2ALD) Management Information Base (MIB), whose object identifier is {jnxl2aldMibRoot 1}, contains information about Layer 2 addresses and defines L2ALD traps.

The L2ALD MIB has the following two branches:

- jnxl2aldNotification, whose object identifier is {jnxl2aldMib 0}
- jnxl2aldObjects, whose object identifier is {jnxl2aldMib 1}

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-l2ald.txt.

This chapter contains the following sections:

jnxl2aldInterfaceTable

The jnxl2aldInterfaceTable, whose object identifier is {jnxl2aldObjects 1}, contains objects that control the MAC address limit on each interface. Each jnxl2aldEntry (object identifier: {jnxl2aldInterfaceTable 1}) in the jnxl2aldInterfaceTable contains the objects listed in Table 165 on page 573.

Table 165: jnxl2aldInterfaceTable

Object	Object ID	Description
jnxl2aldIntfLogicalRouter	jnxl2aldEntry 1	Identifies the logical system with which the jnxl2aldEntry is associated.
jnxl2aldIntfRoutingInst	jnxl2aldEntry 2	Identifies the routing instance with which the jnxl2aldEntry is associated.
jnxl2aldIntfBridgeDomain	jnxl2aldEntry 3	Identifies the bridge domain with which the jnxl2aldEntry is associated.

Table 165: jnxl2aldInterfaceTable *(continued)*

Object	Object ID	Description
jnxl2aldIntfMacLimit	jnxl2aldEntry 4	Defines the MAC address limit for physical interface associated with the jnxl2aldEntry.
Scalar Objects for Notifications		
jnxl2aldRoutingInst	jnxl2aldObjects 2	Specifies the routing instance for the jnxl2aldRoutingInstMacLimit trap.
jnxl2aldBridgeDomain	jnxl2aldObjects 3	Specifies the bridge domain for the jnxl2aldRoutingInstMacLimit trap.
jnxl2aldLogicalRouter	jnxl2aldObjects 4	Specifies the logical system for the jnxl2aldRoutingInstMacLimit trap.
jnxl2aldMacLimit	jnxl2aldObjects 5	Specifies the maximum number of MAC addresses that can be learned by the routing instance.
jnxl2aldGbMacLimit	jnxl2aldObjects 6	Specifies the maximum number of MAC addresses that can be learned by the router.

MAC Address Limit Traps

The enterprise-specific L2ALD MIB defines the following traps:

- jnxl2aldRoutingInstMacLimit, whose object identifier is {jnxl2aldNotification 1}, is generated when the number of MAC addresses for the given routing instance, jnxl2aldRoutingInst, exceeds the set limit. This trap contains the following objects: jnxl2aldLogicalRouter, jnxl2aldRoutingInst, jnxl2aldBridgeDomain, and jnxl2aldMacLimit.
- jnxl2aldInterfaceMacLimit, whose object identifier is {jnxl2aldNotification 2}, is generated when the number of MAC addresses for the given physical interface exceeds the set limit. This trap contains the following objects: jnxl2aldIntfLogicalRouter, jnxl2aldIntfRoutingInst, jnxl2aldIntfBridgeDomain,ifDescr, and jnxl2aldIntfMacLimit.
- jnxl2aldGlobalMacLimit, whose object identifier is {jnxl2aldNotification 3}, is generated when the MAC limit for the entire system exceeds the set limit.

Chapter 62

Interpreting the Enterprise-Specific Utility MIB

The enterprise-specific Utility MIB, whose object ID is {jnxUtilMibRoot 1} defines objects for counters, intergers, and strings. The Utility MIB contains one table for each of the following five data types:

- 32–bit counters
- 64–bit counters
- Signed integers
- Unsigned integers
- Octet strings

Each data has an arbitrary ASCII name, which is defined when the data is populated, and a timestamp that shows the last time when the data instance was modified. For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-util.txt.

This chapter contains the following topics:

jnxUtilCounter32Table

jnxUtilCounter32Table, whose object ID is {jnxUtilData 1},contains information on 32–bit counters.

Each jnxUtilCounter32Entry has the objects listed in Table 166 on page 576.

Table 166: jnxUtilCounter32Entry

Object	Object ID	Description
jnxUtilCounter32Name	jnxUtilCounter32Entry 1	Name assigned to the instance
jnxUtilCounter32Value	jnxUtilCounter32Entry 2	Value of the instance
jnxUtilCounter32Time	jnxUtilCounter32Entry 3	Time when the instance was last populated.

jnxUtilCounter64Table

jnxUtilCounter64Table, whose object ID is {jnxUtilData 2}, contains information about 64–bit counters.

Each jnxUtilCounter64Entry has the objects listed in Table 167 on page 576.

Table 167: jnxUtilCounter64Entry

Object	Object ID	Description
jnxUtilCounter64Name	jnxUtilCounter64Entry 1	Name assigned to the instance
jnxUtilCounter64Value	jnxUtilCounter64Entry 2	Value of the instance
jnxUtilCounter64Time	jnxUtilCounter64Entry 3	Time when the instance was last populated.

jnxUtilIntegerTable

jnxUtilIntegerTable, whose object ID is {jnxUtilData 3}, contains information about signed integer values.

Each jnxUtilIntegerEntry contains the objects listed in Table 168 on page 576.

Table 168: jnxUtilIntegerEntry

Object	Object ID	Description
jnxUtilIntegerName	jnxUtilIntegerEntry 1	Name assigned to the instance
jnxUtilIntegerValue	jnxUtilIntegerEntry 2	Value of the instance
jnxUtilIntegerTime	jnxUtilIntegerEntry 3	Time when the instance was last populated.

jnxUtilUintTable

jnxUtilUintTable, whose object ID is {jnxUtilData 4}, contains information about unsigned integer values.

Each jnxUtilUintEntry has the objects listed in Table 169 on page 577.

Table 169: jnxUtilUintEntry

Object	Object ID	Description
jnxUtilUintName	jnxUtilUintEntry 1	Name assigned to the instance
jnxUtilUintValue	jnxUtilUintEntry 2	Value of the instance
jnxUtilUintTime	jnxUtilUintEntry 3	Time when the instance was last populated.

jnxUtilStringTable

jnxUtilStringTable, whose object ID is {jnxUtilData 5}, contains information about octate strings.

Each jnxUtilStringEntry contains the objects listed in Table 170 on page 577.

Table 170: jnxUtilStringEntry

Object	Object ID	Description
jnxUtilStringName	jnxUtilStringEntry 1	Name assigned to the instance
jnxUtilStringValue	jnxUtilStringEntry 2	Value of the instance
jnxUtilStringTime	jnxUtilStringEntry 31	Time when the instance was last populated.

Chapter 63

Interpreting the Enterprise-Specific AAA Objects MIB

The enterprise-specific AAA Objects MIB, whose object ID is {jnxUserAAAMibRoot 1}, defines the objects pertaining to user authentication, authorization, and accounting.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-user-aaa.txt..

Object IDs for next branch nodes are as follows:

- jnxUserAAAGlobalStats—{jnxUserAAAObjects 1}
- jnxUserAAAAccessAuthStats—{jnxUserAAAObjects 2}
- jnxUserAAATrapVars—{jnxUserAAAObjects 3}

Object IDs for statistic counters related to access authentication are as follows:

- jnxTotalAuthenticationRequests—{jnxUserAAAGlobalStats 1}
- jnxTotalAuthenticationResponses—{jjnxUserAAAGlobalStats 2}

This chapter contains the following topics:

Text Conventions

JnxAuthenticateType—Defines the method to authenticate a user:

Table 171: JnxAuthenticateType

Method	Syntax Integer
radius—authentication via a radius server	(1)
local—local authenticaiton	(2)

Table 171: JnxAuthenticateType *(continued)*

Method	Syntax Integer
ldap—authentication via a LDAP server	(3)

jnxUserAAAStatTable

jnxUserAAAStatTable, whose object ID is {jnxUserAAAAccessAuthStats 1}, exposes the user authentication statistics listed in Table 172 on page 580.

Table 172: jnxUserAAAStatTable

Object	Object ID	Description
jnxUserAAAStatEntry	jnxUserAAAStatTable 1	Statistics entries collected for authentication. Sequence of parameters: ■ jnxUserAAAStatAuthType ■ jnxUserAAAStatRequestReceived ■ jnxUserAAAStatAccessAccepted ■ jnxUserAAAStatAccessRejected
jnxUserAAAStatAuthType	jnxUserAAAStatEntry 1	Indicates the authentication type. This entry uniquely identifies the statistics counters related to its authentication.
jnxUserAAAStatRequestReceived	jnxUserAAAStatEntry 2	The number of the request received.
jnxUserAAAStatAccessAccepted	jnxUserAAAStatEntry 3	The number of the access granted. This entry is an aggregated statistic for this type of authentication.
jnxUserAAAStatAccessRejected	jnxUserAAAStatEntry 4	This number of the access request rejected. This entry is an aggregated statistic for this type of authentication.

jnxUserAAAServerName

jnxUserAAAServerName, whose object ID is {jjnxUserAAAAccessAuthStats 1}, specifies the server name that identifies the authentication server.

Access Authentication-Related Traps

Table 173 on page 580 identifies access-authentication traps.

Table 173: Access Authentication-Related Traps

Object	Object ID	Description
jnxAccessAuthServiceUp	jnxUserAAANotifications 1	Access authentication trap to signify that the specified service has started

Table 173: Access Authentication-Related Traps *(continued)*

Object	Object ID	Description
jnxAccessAuthServiceDown	jnxUserAAANotifications 2	Access authentication trap to signify that the specified service has been stopped
jnxAccessAuthServerDisabled	jnxUserAAANotifications 3	Access authentication trap to signify that the external authentication server is not responding
jnxAccessAuthServerEnabled	jnxUserAAANotifications 4	Access authentication trap to signify that the external authentication server started responding again

Chapter 64

Interpreting the Enterprise-Specific Access Authentication Objects MIB

The enterprise-specific Access Authentication Objects MIB, whose object ID is {jnxJsAuth 1}, defines the objects that pertain to access authentication. Firewall and security features restrict the accessing of protected resources (ideally on different zones) behind a firewall based on their source IP and other credentials.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-auth.txt.

This chapter contains the following topics:

jnxJsFwAuthStats

jnxJsFwAuthStats, whose object ID is {jnxJsAuthObjects 1}, exposes the firewall authentication statistics listed in Table 174 on page 583.

Table 174: jnxJsFwAuthStats

Object	Object ID	Description
jnxJsFwAuthNumPendingUsers	jnxJsFwAuthStats 1	Number of users currently waiting to be authenticated by the firewall user authentication mechanism
jnxJsFwAuthNumSuccUsers	jnxJsFwAuthStats 2	Number of users currently allowed access by the firewall user authentication mechanism
jnxJsFwAuthNumFailedUsers	jnxJsFwAuthStats 3	Number of users currently failed to be authenticated by the firewall user authentication mechanism
jnxJsFwAuthTotalUsers	jnxJsFwAuthStats 4	Total number of users that are accessing or attempting to access resources managed by the firewall user authentication mechanism

jnxJsAuthTrapVars

jnxJsAuthTrapVars identifies access authentication traps variables listed in Table 175 on page 584.

Table 175: jnxJsAuthTrapVars

Object	Object ID	Description
jnxJsFwAuthUserName	jnxJsAuthTrapVars 1	Name of the user who is attempting to be authenticated or has been authenticated
jnxJsFwAuthServiceDesc	jnxJsAuthTrapVars 2	Service or application name that the enthentication is performed for: Telnet, FTP, HTTP
jnxJsFwAuthReason	jnxJsAuthTrapVars 3	Reason for the trap being generated: authentication failure due to: timeout, invalid password, invalid username, and so on
jnxJsFwAuthClientIpAddr	jnxJsAuthTrapVars 4	Authentication client's IP address

jnxJsAuthNotifications

jnxJsAuthNotifications, whose object ID is {jnxJsAuthMIB 0 }, identifies the user access authentication notifications listed in Table 176 on page 584 .

Table 176: jnxJsAuthNotifications

Object	Object ID	Description
jnxJsFwAuthFailure	jnxJsAuthNotifications 1	A firewall user authentication status trap to signify whether a user using the pass-through firewall authentication mechanism has been rejected due to reason specified in the trap. ■ jnxJsFwAuthUserName is the user. ■ jnxClientIPAddress is the IP address the user came from. ■ jnxJsFwAuthServiceDesc specifies the application by which the authentication was performed. ■ jnxJsFwAuthReason indicates the reason for failure.
jnxJsFwAuthServiceUp	jnxJsAuthNotifications 2	Firewall user authentication service has started.
jnxJsFwAuthServiceDown	jnxJsAuthNotifications 3	Firewall user authentication service has stopped.
jnxJsFwAuthCapacityExceeded	jnxJsAuthNotifications 4	Firewall user authentication maximum capacity has been exceeded. jnxJsFwAuthTotalUsers indicates the total number of users being authenticated, and it has exceeds the maximum allowable users.

Chapter 65

Interpreting the Enterprise-Specific DNS Objects MIB

The enterprise-specific DNS Objects MIB, jnxJsDns,whose object ID is {jnxJsDnsRoot 1}, provides collated statistics for the Domain Name System (DNS) proxy collected over all interfaces on which it is configured to serve.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-dns.txt. .

This chapter contains the following topic:

jnxJsDnsProxyDataObjects

jnxJsDnsProxyDataObjects, whose object ID is {jnxJsDns 1}, displays the DNS query-related statistics listed in Table 177 on page 585.

Table 177: jnxJsDnsProxyDataObjects

Object	Object ID	Description
jnxJsDNSProxyQueriesReceived	jnxJsDnsProxyDataObjects 1	Total number of DNS queries received by the DNS proxy.
jnxJsDnsProxyResponsesSent	jnxJsDnsProxyDataObjects 2	Number of DNS queries answered sent by the DNS proxy. This includes DNS cache hits and misses that were answered.
jnxJsDnsProxyQueriesForwarded	jnxJsDnsProxyDataObjects 3	Number of DNS queries forwarded to other DNS servers. This is the number of queries that have been proxied due to cache misses.
jnxJsDnsProxyNegativeResponses	jnxJsDnsProxyDataObjects 4	Number of negative DNS query responses. This is the count of DNS queries for which the proxy could not obtain answers.
jnxJsDnsProxyRetryRequests	jnxJsDnsProxyDataObjects 5	Number of DNS retry queries that this proxy received.
jnxJsDnsProxyPendingRequests	jnxJsDnsProxyDataObjects 6	Number of DNS requests yet to be answered.
jnxJsDnsProxyServerFailures	jnxJsDnsProxyDataObjects 7	Number of DNS proxy failures.

Chapter 66

Interpreting the Enterprise-Specific IPSec Generic Flow Monitoring Object MIB

The enterprise-specific IPSec Generic Flow Monitoring Object MIB, whose object ID is {jnxIpSecMibRoot 1}, defines the objects used to monitor the entries pertaining to IPSec objects and the management of the IPSec VPN functionalities. This generic MIB models the standard, dynamic aspects of IPSec, including the counters and objects that are of management interest in a standard IPSec implementation.

This MIB module is based on the jnxIpSecMonitorMib. Building on the existing Internet Key Exchange (IKE) infrastructure, the security IKE implementation integrates the value-added features for the security products.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ipsec-flow-mon.txt.

This chapter contains the following topics:

Branch Tree Objects

The following branch tree objects are associated with the IPSec Generic Flow Monitoring Object MIB:

- jnxIpSecFlowMonNotifications {jnxIpSecFlowMonMIB 0}
- jnxIpSecFlowMonPhaseOne {jnxIpSecFlowMonMIB 1}
- jnxIpSecFlowMonPhaseTwo {jnxIpSecFlowMonMIB 2}

Text Conventions

- JnxIkePeerType—The type of IPSec Phase 1 IKE peer identity. This identity is the local IKE identify to send in the exchange. The IKE peer may be identified by one of the ID types defined in IPSec DOI:

Table 178: IKE Identity Type Text Conventions

Type	Description	Syntax Integer
Unknown	Unknown type	(0)
idIpv4Addr	IPv4 address	(1)
idFqdn	Fully qualified domain name	(2)
idDn	Distinguished name	(3)
idUfqdn	User fully qualified domain name	(4)

- JnxIkeNegoMode—The IPSec Phase 1 IKE negotiation mode:

Table 179: IKE Negotiation Mode Text Conventions

Type	Description	Syntax Integer
Main mode	A six-message Phase 1 exchange that provides identity protection	(1)
Aggressive mode	A three-message Phase 1 exchange that does not provide identity protection	(2)

- JnxIkeHashAlgo—The hash algorithm used in IPSec Phase 1 IKE negotiations:

Table 180: IKE Negotiations Hash Alogorithms

Hash Alogorithm	Syntax Integer
md5	(1)
sha	(2)

- JnxIkeAuthMethod—The authentication method used in IPSec Phase 1 IKE negotiations:

Table 181: IKE Authentication Method

Method	Syntax Integer
preSharedKey	(1)
dssSignature	(2)
rsaSignature	(3)
rsaEncryption	(4)
revRsaEncryption	(5)
xauthPreSharedKey	(6)
xauthDssSignature	(7)
xauthRsaSignature	(8)
xauthRsaEncryption	(9)
xauthRevRsaEncryption	(10)

- JnxIkePeerRole—The role of the local endpoint in negotiating the IPSec Phase 1 IKE security association (SA). It can be either initiator or responder.

Table 182: Role of Local Endpoint in Negotiations

Role	Syntax Integer
Initiator	(1)
Responder	(2)

- JnxIkeTunStateType—State of the Phase 1 IKE negotiation:

Table 183: State of Phase 1 IKE Negotiation

State	Syntax Integer
Up	(1)
Down	(2)

- JnxDiffHellmanGrp—The Diffie-Hellman Group used in negotiations:

Table 184: Diffie-Hellman Group in Negotiations

Diffie Hellman Group	Description	Syntax Integer
Unknown	Unknown	(0)
modp768	768-bit MODP	(1)
modp1024	1024-bit MODP	(2)
modp1536	modp1536	(3)

- JnxKeyType—The type of key used by an IPSec Phase 2 Tunnel:

Table 185: Key Used by IPSec Phase 2 Tunnel

Key	Syntax Integer
Unknown	(0)
keyIke	(1)
keyManual	(2)

- JnxKeyType—The encryption algorithm used in negotiations:

Table 186: Encryption Algorithm in Negotiations

Algorithm	Syntax Integer
espDes	(1)
esp3des	(2)
espNull	(3)
espAes128	(4)
espAes192	(5)
espAes256	(6)

- JnxAuthAlgo—The authentication algorithm used by an SA of an IPSec Phase 2 Tunnel:

Table 187: Role of Local Endpoint in Negotiations

Algorithm	Syntax Integer
Unknown	(0)
hmacMd5	(1)
hmacSha	(2)

- JnxRemotePeerType—The type of the remote peer gateway (endpoint). It can be one of the following two types:.
  - Static (remote peer whose IP address is known beforehand)
  - Dynamic (remote peer whose IP address is not known beforehand)

Table 188: Type of Remote Peer Gateway

Gateway Type	Syntax Integer
Unknown	(0)
static	(1)
dynamic	(2)

- JnxSpiType—The type of the SPI associated with IPSec Phase 2 SAs. An unsigned 32–bit integer (256. . . 4294967295).
- JnxSAType—The SA type:

Table 189: Role of Local Endpoint in Negotiations

SA Type	Syntax Integer
Unknown	(0)
manual	(1)
dynamic	(2)

Number of IKE Tunnels Currently Active

NOTE: The jnxIkeNumOfTunnels object is not supported in this release.

Table 190 on page 592 reports the number of IKE Tunnels currently active.

Table 190: Number of IKE Tunnels Currently Active

Object	Object ID	Description
jnxIkeNumOfTunnels	jnxIpSecFlowMonPhaseOne 1	Number of IKE Tunnels (Phase 1) actively negotiating between peers. The SA can be in either the up or down state. This attribute details the number of IKE tunnels in jnxIkeTunnelMonTable.

IPSec Phase 1 IKE Tunnel Table

Table 191 on page 592 identifies objects listed in the IPSec Phase 1 IKE Tunnel Table.

Phase 1 is used to negotiate the parameter and key material required to establish an ISAKMP SA.

Phase 1 SA components include encryption algorithm, authentication, Diffie-Hellman group values, and anthentication method, such as preshared keys or certificates.

Table 191: IPSec Phase 1 IKE Tunnel Table

Object	Object ID	Description
jnxIkeTunnelMonTable	jnxIpSecFlowMonPhaseOne 2	The IPSec Phase 1 IKE Tunnel Table. There is one entry in this table for each active IPSec Phase 1 IKE tunnel.

Table 191: IPSec Phase 1 IKE Tunnel Table *(continued)*

Object	Object ID	Description
jnxIkeTunnelMonEntry	jnxIkeTunnelMonTable 1	Attributes associated with an active IPSec Phase 1 IKE tunnel. Sequence of attributes: ■ jnxIkeTunMonRemoteGwAddrType ■ jnxIkeTunMonRemoteGwAddr ■ jnxIkeTunMonIndex ■ jnxIkeTunMonLocalGwAddrType ■ jnxIkeTunMonLocalGwAddr ■ jnxIkeTunMonState ■ jnxIkeTunMonInitiatorCookie ■ jnxIkeTunMonResponderCookie ■ jnxIkeTunMonLocalRole ■ jnxIkeTunMonLocalIdType ■ jnxIkeTunMonLocalIdValue ■ jnxIkeTunMonLocalCertName ■ jnxIkeTunMonRemoteIdType ■ jnxIkeTunMonRemoteIdValue ■ jnxIkeTunMonNegoMode ■ jnxIkeTunMonDiffHellmanGrp (not supported in this release) ■ jnxIkeTunMonEncryptAlgo ■ jnxIkeTunMonHashAlgo ■ jnxIkeTunMonAuthMethod ■ jnxIkeTunMonLifeTime ■ jnxIkeTunMonActiveTime ■ jnxIkeTunMonInOctets ■ jnxIkeTunMonInPkts ■ jnxIkeTunMonOutOctets ■ jnxIkeTunMonOutPkts ■ jnxIkeTunMonXAuthUserId ■ jnxIkeTunMonDPDDownCount
jnxIkeTunMonRemoteGwAddrType	jnxIkeTunnelMonEntry 1	IP address type of remote gateway (endpoint) for the IPSec Phase 1 IKE tunnel
jnxJsFwAuthClientIpAddr	jnxJsAuthTrapVars 4	IP address of remote gateway (endpoint) for the IPSec Phase 1 IKE tunnel
jnxIkeTunMonIndex	jnxIkeTunnelMonEntry 3	Index number of IPSec Phase 1 IKE Tunnel Table. The index number begins at 1 and is incremented with each tunnel that is created. The value of this object will wrap at 2,147,483,647.
jnxIkeTunMonLocalGwAddr	jnxIkeTunnelMonEntry 4	IP address of local endpoint (gateway) for the IPSec Phase 1 IKE tunnel
jnxIkeTunMonLocalGwAddrType	jnxIkeTunnelMonEntry 5	IP address type of local endpoint (gateway) for the IPSec Phase 1 IKE tunnel

Table 191: IPSec Phase 1 IKE Tunnel Table *(continued)*

Object	Object ID	Description
jnxIkeTunMonState	jnxIkeTunnelMonEntry 6	State of IKE tunnel. It can be: ■ 1—up, negotiation completed ■ 2—down, being negotiated
jnxIkeTunMonInitiatorCookie	jnxIkeTunnelMonEntry 7	Cookie as generated by peer that initiated the IKE Phase 1 negotiation. This cookie is carried in the ISAKMP header.
jnxIkeTunMonResponderCookie	jnxIkeTunnelMonEntry 8	Cookie as generated by peer responding to the IKE Phase 1 negotiation initiated by the remote peer. This cookie is carried in the ISAKMP header.
jnxIkeTunMonLocalRole	jnxIkeTunnelMonEntry 9	Role of local peer identity. The role of the local peer can be: ■ Initiator ■ Responder
jnxIkeTunMonLocalIdType	jnxIkeTunnelMonEntry 10	Type of local peer identity. The local peer can be identified by: ■ IP address ■ Fully qualified domain name string ■ Distinguished name string
jnxIkeTunMonLocalIdValue	jnxIkeTunnelMonEntry 11	Value of local peer identity. If the local peer type is an IP address, then this is the IP address used to identify the local peer. If the local peer type is a fully qualified domain name string, then this is the fully qualified domain name string of the local peer. If the local peer type is a distinguished name string, then this is the distinguished name string of the local peer.
jnxIkeTunMonLocalCertName	jnxIkeTunnelMonEntry 12	Name of certificate used for authentication of the local tunnel endpoint. This object has some valid value only if the negotiated IKE authentication method is other than preshared key. If the IKE negotiation does not use a certificate-based authentication method, then the value of this object is a NULL string.
jnxIkeTunMonRemoteIdType	jnxIkeTunnelMonEntry 13	Type of remote peer identity. The remote peer can be identified by: ■ IP address ■ Fully qualified domain name string ■ Distinguished name string

Table 191: IPSec Phase 1 IKE Tunnel Table *(continued)*

Object	Object ID	Description
jnxIkeTunMonRemoteIdValue	jnxIkeTunnelMonEntry 14	Value of remote peer identity. If the remote peer type is an IP address, then this is the IP address used to identify the remote peer. If the remote peer type is a fully qualified domain name string, then this is the fully qualified domain name string of the remote peer. If the remote peer type is a distinguished name string, then this is the distinguished name string of the remote peer.
jnxIkeTunMonNegoMode	jnxIkeTunnelMonEntry 15	Negotiation mode of IPSec Phase 1 IKE tunnel
NOTE: The jnxIkeTunMonDiffHellmanGrp object is not supported in this release.		
jnxIkeTunMonDiffHellmanGrp	jnxIkeTunnelMonEntry 16	Diffie-Hellman Group used in IPSec Phase 1 IKE negotiations
jnxIkeTunMonEncryptAlgo	jnxIkeTunnelMonEntry 17	Encryption algorithm used in IPSec Phase 1 IKE negotiations
jnxIkeTunMonHashAlgo	jnxIkeTunnelMonEntry 18	Hash algorithm used in IPSec Phase 1 IKE negotiations
jnxIkeTunMonAuthMethod	jnxIkeTunnelMonEntry 19	Authentication method used in IPSec Phase 1 IKE negotiations
jnxIkeTunMonLifeTime	jnxIkeTunnelMonEntry 20	Negotiated lifetime of IPSec Phase 1 IKE tunnel in seconds
jnxIkeTunMonActiveTime	jnxIkeTunnelMonEntry 21	Length of time IPSec Phase 1 IKE tunnel has been active in hundredths of seconds
jnxIkeTunMonInOctets	jnxIkeTunnelMonEntry 22	Total number of octets received by this IPSec Phase 1 IKE SA
jnxIkeTunMonInPkts	jnxIkeTunnelMonEntry 23	Total number of packets received by this IPSec Phase 1 IKE SA
jnxIkeTunMonOutOctets	jnxIkeTunnelMonEntry 24	Total number of octets sent by this IPSec Phase 1 IKE SA
jnxIkeTunMonOutPkts	jnxIkeTunnelMonEntry 25	Total number of packets sent by this IPSec Phase 1 IKE SA
jnxIkeTunMonXAuthUserId	jnxIkeTunnelMonEntry 26	Extended Authentication (XAuth) User Identifier. Identifies the user associated with this IPSec Phase 1 negotiation
jnxIkeTunMonDPDDownCount	jnxIkeTunnelMonEntry 27	Number of times that the remote peer is detected in a dead (or down) state

IPSec Phase 2 IKE Tunnel Table

Table 192 on page 596 identifies objects listed in the IPSec Phase 2 IKE Tunnel Table.

During this phase, IKE negotiates IPSec SA parameters and setup, matching IPSec SA in the peers.

Phase 2 VPN includes tunnel peer connection, associated with a specific policy or a tunnel interface. Phase 2 SA components include encryption and authentication algorithms, proxy-IDs, and optional DH group values.

Table 192: IPSec Phase 2 IKE Tunnel Table

Object	Object ID	Description
NOTE: The jnxIpSecNumOfTunnels object is not supported in this release.		
jnxIpSecNumOfTunnels	jnxIpSecFlowMonPhaseTwo 1	Number of IPSec VPN tunnels. This attribute should report the number of IPSec VPN tunnels in jnxIpSecTunnelTable.
jnxIpSecTunnelMonTable	jnxIpSecFlowMonPhaseTwo 2	The IPSec Phase 2 Tunnel Table. There is one entry in this table for each active IPSec Phase 2 tunnel. If the tunnel is terminated, then the entry is no longer available after the table has been refreshed.
jnxIpSecTunnelMonEntry	jnxIpSecTunnelMonTable 1	Each entry contains the attributes associated with an active IPSec Phase 2 tunnel. Sequence of attributes: ■ jnxIpSecTunMonRemoteGwAddrType ■ jnxIpSecTunMonRemoteGwAddr ■ jnxIpSecTunMonIndex ■ jnxIpSecTunMonLocalGwAddrType ■ jnxIpSecTunMonLocalGwAddr ■ jnxIpSecTunMonLocalProxyId ■ jnxIpSecTunMonRemoteProxyId ■ jnxIpSecTunMonKeyType ■ jnxIpSecTunMonRemotePeerType ■ jnxIpSecTunMonOutEncryptedBytes ■ jnxIpSecTunMonOutEncryptedPkts ■ jnxIpSecTunMonInDecryptedBytes ■ jnxIpSecTunMonInDecryptedPkts ■ jnxIpSecTunMonAHInBytes ■ jnxIpSecTunMonAHInPkts ■ jnxIpSecTunMonAHOutBytes ■ jnxIpSecTunMonAHOutPkts ■ jnxIpSecTunMonReplayDropPkts ■ jnxIpSecTunMonAhAuthFails ■ jnxIpSecTunMonDecryptFails ■ jnxIpSecTunMonBadHeaders ■ jnxIpSecTunMonBadTrailers ■ jnxIkeTunMonOutOctets ■ jnxIpSecTunMonDroppedPkts (not supported in this release)
jnxIpSecTunMonRemoteGwAddrType	jnxIpSecTunnelMonEntry 1	IP address type of remote gateway (endpoint) for the IPSec Phase 2 tunnel

Table 192: IPSec Phase 2 IKE Tunnel Table *(continued)*

Object	Object ID	Description
jnxIpSecTunMonRemoteGwAddr	jnxIpSecTunnelMonEntry 2	IP address of remote gateway (endpoint) for the IPSec Phase 2 tunnel
jnxIpSecTunMonIndex	jnxIpSecTunnelMonEntry 3	Index number of IPSec Phase 2 Tunnel Table. The index number begins at 1 and is incremented with each tunnel that is created. The value of this object will wrap at 2,147,483,647.
jnxIpSecTunMonLocalGwAddrType	jnxIpSecTunnelMonEntry 4	IP address type of local gateway (endpoint) for the IPSec Phase 2 tunnel
jnxIpSecTunMonLocalGwAddr	jnxIpSecTunnelMonEntry 5	IP address of local gateway (endpoint) for the IPSec Phase 2 tunnel
jnxIpSecTunMonLocalProxyId	jnxIpSecTunnelMonEntry 6	Identifier for local end
jnxIpSecTunMonRemoteProxyId	jnxIpSecTunnelMonEntry 7	Identifier for remote end
jnxIpSecTunMonKeyType	jnxIpSecTunnelMonEntry 8	Type of key used by IPSec Phase 2 tunnel. It can be one of the following two types: ■ IKE-negotiated ■ Manually installed
jnxIpSecTunMonRemotePeerType	jnxIpSecTunnelMonEntry 9	Type of the remote peer gateway (endpoint). It can be one of the following two types: ■ Static (remote peer whose IP address is known beforehand) ■ Dynamic (remote peer whose IP address is not known beforehand)
jnxIpSecTunMonOutEncryptedBytes	jnxIpSecTunnelMonEntry 10	Number of bytes encrypted by this Phase 2 tunnel
jnxIpSecTunMonOutEncryptedPkts	jnxIpSecTunnelMonEntry 11	Number of packets encrypted by this Phase 2 tunnel
jnxIpSecTunMonInDecryptedBytes	jnxIpSecTunnelMonEntry 12	Number of bytes decrypted by this Phase 2 tunnel
jnxIpSecTunMonInDecryptedPkts	jnxIpSecTunnelMonEntry 13	Number of packets decrypted by this Phase 2 tunnel
jnxIpSecTunMonAHInBytes	jnxIpSecTunnelMonEntry 14	Number of incoming bytes authenticated using AH by this Phase 2 tunnel
jnxIpSecTunMonAHInPkts	jnxIpSecTunnelMonEntry 15	Number of incoming packets authenticated using AH by this Phase 2 tunnel
jnxIpSecTunMonAHOutBytes	jnxIpSecTunnelMonEntry 16	Number of outgoing bytes applied AH by this Phase 2 tunnel
jnxIpSecTunMonAHOutPkts	jnxIpSecTunnelMonEntry 17	Number of outgoing packets applied AH by this Phase 2 tunnel.
jnxIpSecTunMonReplayDropPkts	jnxIpSecTunnelMonEntry 18	Number of packets dropped by this Phase 2 tunnel due to antireplay check failure

Table 192: IPSec Phase 2 IKE Tunnel Table *(continued)*

Object	Object ID	Description
jnxIpSecTunMonAhAuthFails	jnxIpSecTunnelMonEntry 19	Number of packets received by this Phase 2 tunnel that failed AH authentication
jnxIpSecTunMonEspAuthFails	jnxIpSecTunnelMonEntry 20	Number of packets received by this Phase 2 tunnel that failed ESP authentication
jnxIpSecTunMonDecryptFails	jnxIpSecTunnelMonEntry 21	Number of packets received by this Phase 2 tunnel that failed decryption
jnxIpSecTunMonBadHeaders	jnxIpSecTunnelMonEntry 22	Number of packets received by this Phase 2 tunnel that failed due to bad headers
jnxIpSecTunMonBadTrailers	jnxIpSecTunnelMonEntry 23	Number of packets received by this Phase 2 tunnel that failed due to bad ESP trailers
NOTE: The jnxIpSecTunMonDroppedPkts object is not supported in this release.		
jnxIpSecTunMonDroppedPkts	jnxIpSecTunnelMonEntry 26	Total number of dropped packets for this Phase 2 tunnel

IPSec Phase 2 Security Association Table

jnxIpSecSaMonTable, whose object ID is {jjnxIpSecFlowMonPhaseTwo 3}, identifies the objects listed in Table 193 on page 599. The IPSec Phase 2 Security Association table identifies the structure (in terms of component SAs) of each active Phase 2 IPSec tunnel. This table contains an entry for each active and expiring SA and maps each entry in the active Phase 2 tunnel table (ipSecTunTable) into a number of entries in this table.

SA contains the information negotiated by IKE. The SA is like a contract laying out the rules of the VPN connection for the duration of the SA. An SA is assigned a 32-bit number that, when used in conjunction with the destination IP address, uniquely identifies the SA. This number is called the Security Parameters Index (SPI).

IPSec SAs are unidirectional and are unique in each security protocol. A set of SAs is needed for a protected data pipe, one per direction per protocol.

Table 193: IPSec Phase 2 Security Association Table

Object	Object ID	Description
jnxIpSecSaMonEntry	jnxIpSecSaMonTable 1	Each entry contains the attributes associated with active and expiring IPSec Phase 2 SAs. Sequence of parameters: ■ jnxIpSecSaMonIndex ■ jnxIpSecSaMonProtocol ■ jnxIpSecSaMonInSpi ■ jnxIpSecSaMonOutSpi ■ jnxIpSecSaMonType ■ jnxIpSecSaMonEncapMode ■ jnxIpSecSaMonLifeSize ■ jnxIpSecSaMonLifeTime ■ jnxIpSecSaMonActiveTime ■ jnxIpSecSaMonLifeSizeThreshold (not supported in this release) ■ jnxIpSecSaMonLifeTimeThreshold ■ jnxIpSecSaMonEncryptAlgo ■ jnxIpSecSaMonAuthAlgo ■ jnxIpSecSaMonState
jnxIpSecSaMonIndex	jnxIpSecSaMonEntry 1	Index number, in the context of the IPSec tunnel ipSecTunIndex, of the SA represented by this table entry. The index number begins at 1 and is incremented with each SPI associated with an IPSec Phase 2 tunnel. The value of this object will wrap at 65535.
jnxIpSecSaMonProtocol	jnxIpSecSaMonEntry 2	Index number that represents the security protocol (AH, ESP or IPComp) for which this SA was set up
jnxIpSecSaMonInSpi	jnxIpSecSaMonEntry 3	Value of the incoming SPI
jnxIpSecSaMonOutSpi	jnxIpSecSaMonEntry 4	Value of the outgoing SPI
jnxIpSecSaMonType	jnxIpSecSaMonEntry 5	Types of SAs that can be either manual or dynamic
jnxIpSecSaMonEncapMode	jnxIpSecSaMonEntry 6	Encapsulation mode used by an IPSec Phase 2 tunnel
jnxIpSecSaMonLifeSize	jnxIpSecSaMonEntry 7	Negotiated lifesize of the IPSec Phase 2 tunnel in kilobytes
jnxIpSecSaMonLifeTime	jnxIpSecSaMonEntry 8	Negotiated lifetime of the IPSec Phase 2 tunnel in seconds
jnxIpSecSaMonActiveTime	jnxIpSecSaMonEntry 9	Length of time the IPSec Phase 2 tunnel has been active in hundredths of seconds
NOTE: The jnxIpSecSaMonLifeSizeThreshold object is not supported in this release.		
jnxIpSecSaMonLifeSizeThreshold	jnxIpSecSaMonEntry 10	SA lifesize refresh threshold in kilobytes
jnxIpSecSaMonLifeTimeThreshold	jnxIpSecSaMonEntry 11	SA lifetime refresh threshold in seconds

Table 193: IPSec Phase 2 Security Association Table *(continued)*

Object	Object ID	Description
jnxIpSecSaMonEncryptAlgo	jnxIpSecSaMonEntry 12	Encryption algorithm used to encrypt the packets that can be either es-cbc or 3des-cbc
jnxIpSecSaMonAuthAlgo	jnxIpSecSaMonEntry 13	Algorithm used for authentication of packets that can be hmac-md5-96 or hmac-sha1-96
jnxIpSecSaMonState	jnxIpSecSaMonEntry 14	This column represents the status of the SA represented by this table entry. If the status of the SA is active, the SA is ready for active use. The status expiring represents any of the various states that the SA transitions through before being purged.

Chapter 67

Interpreting the Enterprise-Specific IPSec VPN Objects MIB

The enterprise-specific IPSec VPN Objects MIB, jnxJsIpSecVpnMib, whose object ID is {jnxJsIPSecVpn 1}, defines the object used to monitor the entries pertaining to IPSec objects and the management of the IPSec VPN functionalities for Juniper Networks security product lines. This MIB models IPSec attributes specific to the appropriate Juniper Networks implementation.

This MIB module extends the Juniper Networks common IPSec flow monitoring MIB. Building on the existing common infrastructure, the security implementation integrates the value-added features for the security products.

Related IPSec VPN Objects MIBs include:

- jnxJsIpSecVpnNotifications {jnxJsIpSecVpnMib 0}
- jnxJsIpSecVpnPhaseOne {jnxJsIpSecVpnMib 1}
- jnxJsIpSecVpnPhaseTwo{jnxJsIpSecVpnMib 2}

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-ipsec-vpn.txt.

This chapter contains the following topics:

Text Conventions

JnxJsIpSecVpnType—Type of the remote peer gateway (endpoint):

Table 194: JnxJsIpSecVpnType

Type	Description	Syntax Integer
policyBased	Tunnels require a policy with action tunnel to trigger IPSec VPN. The device receives traffic and matches it with policy that has action tunnel, then performs the encryption/decryption and authentication options negotiated for this VPN Phase 2 negotiation.	(1)

Table 194: JnxJsIpSecVpnType *(continued)*

Type	Description	Syntax Integer
routeBased	Requires a tunnel interface to a route directing traffic to protected networks to exit the system using that tunnel interface. The tunnel interface is bound to a Phase 2 VPN configuration that specifies all the tunnel parameters.	(2)

jnxJsIpSecTunnelTable

jnxJsIpSecTunnelTable, whose object ID is {jnxJsIpSecVpnPhaseTwo 1}, is the IPSec Phase 2 Tunnel Table, with objects listed in Table 195 on page 602. There is one entry for each active IPSec Phase 2 tunnel. If the tunnel is terminated, then the entry is no longer available after the table has been refreshed.

This table augments jnxIpSecTunnelMonTable in Table 192 on page 596.

Table 195: jnxJsIpSecTunnelTable

Object	Object ID	Description
jnxJsIpSecTunnelEntry	jnxJsIpSecTunnelTable 1	Each entry contains the attributes associated with an active IPSec Phase 2 tunnel. Sequence of parameters: ■ jnxJsIpSecTunPolicyName ■ jnxJsIpSecVpnTunType ■ jnxJsIpSecTunCfgMonState ■ jnxJsIpSecTunState
jnxJsIpSecTunPolicyName	jnxJsIpSecTunnelEntry 1	Policy name assoicated with this tunnel if the IPSec VPN is policy-based. If the IPSec VPN is not policy-based, this attribute is not applicable.
jnxJsIpSecVpnTunType	jnxJsIpSecTunnelEntry 2	Attribute to indicate whether the IPSec VPN tunnel is policy-based or route-based.
jnxJsIpSecTunCfgMonState	jnxJsIpSecTunnelEntry 3	According to userconfiguration, whether to monitor the IPSec tunnel to be alive or not: ■ disable—(1) ■ enable—(2)

Table 195: jnxJsIpSecTunnelTable *(continued)*

Object	Object ID	Description
jnxJsIpSecTunState	jnxJsIpSecTunnelEntry 4	Attribute to indicate whether the IPSec tunnel is up or down, determined by ICMP ping if jnxJsIpSecTunCfgMonState is enabled: ■ up— ■ down—(2): VPN monitor detects the tunnel is down. ■ vpnMonitoringDisabled—(3): User has disabled VPN tunnel monitoring.

Chapter 68

Interpreting the Enterprise-Specific Network Address Translation Objects MIB

The enterprise-specific Network Address Translation (NAT) Objects MIB, jnxJsNatMIB, whose object ID is {jnxJsNAT 1}, defines the objects that are used to monitor NAT attributes.

Related NAT Objects MIB include:

- jnxJsNatNotifications {jnxJsNatMIB 0}
- jnxJsNatObjects {jnxJsNatMIB 1}
- jnxJsNatTrapVars{jnxJsNatMIB 2}

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-nat.txt.

This chapter contains the following topics:

Source NAT Table

Table 196 on page 605 identifies objects in the Source NAT Table.

Table 196: Source NAT Table

Object	Object ID	Description
jnxJsSrcNatNumOfEntries	jnxJsNatObjects 1	Total number of dynamic addresses being translated.

Table 196: Source NAT Table *(continued)*

Object	Object ID	Description
jnxJsSrcNatTable	jnxJsNatObjects 2	Table that exposes the source NAT attributes of the translated addresses. When performing source IP address translation, the device translates the original source IP address or port number to a different one. The resource, address source pools, provide the security device with a supply of addresses from which to draw when performing source NAT. The security device has the following types of source pools: ■ Source pool with Port Address Translation (PAT) ■ Source pool without PAT ■ Static source pool This table contains information on source IP address translation only.
jnxJsSrcNatEntry	jnxJsSrcNatTable 1	Source NAT address entries. This object is indexed by the address pool table and the address allocated. Sequence of parameters: ■ jnxJsNatSrcIpPoolName ■ jnxJsNatSrcGlobalAddr ■ jnxJsNatSrcPortPoolType ■ jnxJsNatSrcNumOfPortInuse ■ jnxJsNatSrcNumOfSessions ■ jnxJsNatSrcAssocatedIf
jnxJsNatSrcIpPoolName	jnxJsSrcNatEntry 1	Address pool from which the translated address is allocated.
jnxJsNatSrcGlobalAddr	jnxJsSrcNatEntry 2	Name of dynamic source IP address allocated from the address pool used in the NAT translation.
jnxJsNatSrcPortPoolType	jnxJsSrcNatEntry 3	Source NAT can do address translation with or without PAT. The source port pool type indicates whether the address translation is done with PAT, without PAT, or as a static translation: ■ withPAT—The security device translates both source IP address and port number of the packets. ■ withoutPAT—The device performs source NAT for the IP address without performing PAT for the source port number. ■ static—One range of IP addresses is statically mapped one-to-one to a shifted range of IP addresses.
jnxJsNatSrcNumOfPortInuse	jnxJsSrcNatEntry 4	Number of ports in use for this NAT address entry. This attribute is applicable to only NAT translation with PAT.
jnxJsNatSrcNumOfSessions	jnxJsSrcNatEntry 5	Number of sessions in use for this NAT address entry. This attribute is applicable to only NAT translation without PAT.

Table 196: Source NAT Table *(continued)*

Object	Object ID	Description
jnxJsNatSrcAssocatedIf	jnxJsSrcNatEntry 6	Index of interfaces associated with this NAT address entry. For each interface, the value is a unique value, greater than zero.

jnxJsNatIfSrcPoolPortTable

jnxJsNatIfSrcPoolPortTable, whose object ID is jnxJsNatObjects 3, monitors the port usage of the NAT interface source IP address pool by displaying information about the objects listed in Table 197 on page 607.

The interface source pool is predefined. This source pool is referenced in a policy in which it is configured. The security device translates the source IP address to the address of the egress interface for the traffic, matching a policy that references the interface source pool. The security device always applies PAT for the interface source pool.

Table 197: jnxJsNatIfSrcPoolPortTable

Object	Object ID	Description
jnxJsNatIfSrcPoolPortEntry	jnxJsNatIfSrcPoolPortTable 1	Source NAT address entries. This object is indexed by the address pool table and the address. Sequence of parameters: ■ jnxJsNatIfSrcPoolIndex ■ jnxJsNatIfSrcPoolTotalSinglePorts ■ jnxJsNatIfSrcPoolAllocSinglePorts ■ jnxJsNatIfSrcPoolTotalTwinPorts ■ jnxJsNatIfSrcPoolAllocTwinPorts
jnxJsNatIfSrcPoolIndex	jnxJsNatIfSrcPoolPortEntry 1	Index number of the port pool of this address pool.
jnxJsNatIfSrcPoolTotalSinglePorts	jnxJsNatIfSrcPoolPortEntry 2	Total number of single ports in a port pool.
jnxJsNatIfSrcPoolAllocSinglePorts	jnxJsNatIfSrcPoolPortEntry 3	Number of single ports in a port pool allocated or in use.
jnxJsNatIfSrcPoolTotalTwinPorts	jnxJsNatIfSrcPoolPortEntry 4	Total number of twin ports in a port pool.
jnxJsNatIfSrcPoolAllocTwinPorts	jnxJsNatIfSrcPoolPortEntry 5	Number of twin ports in a port pool allocated or in use.

NAT Trap Definitions

Table 198 on page 608 lists NAT trap definition objects.

Table 198: NAT Trap Definitions

Object	Object ID	Description
jnxJsNatAddrPoolThresholdStatus	jnxJsNatNotifications 1	NAT address pool untilization threshold status trap to signify that the address pool utilization either exceeds a certain percentage or is clear of that percentage. jnxJsNatSrcIpPoolName is the name of the resource pool. jnxJsNatAddrPoolUtil is the percentage of utilization of the address pool.
jnxJsNatAddrPoolUtil	jnxJsNatTrapVars 1	Dynamic address pool utilization expressed as a percentage.

Chapter 69

Interpreting the Enterprise-Specific Policy Objects MIB

The enterprise-specific Policy Objects MIB, jnxJsSecPolicyMIB, whose object ID is {jnxJsPolicies 1}, defines the MIB for policy monitoring.

A security policy, which can be configured from the user interface, controls the traffic flow from one zone to another zone by defining one or more kinds of traffic permitted from specified IP sources to specified IP destinations at scheduled times.

The Juniper Networks security device enforces the security policies rules for the transit traffic in terms of which traffic can pass through the firewall and the actions taken on the traffic as it passes through the firewall.

Related MIB objects include the following:

- jnxJsPolicyNotifications—{jnxJsSecPolicyMIB 0}
- jnxJsPolicyObjects—{jnxJsSecPolicyMIB 1}
- jnxJsPolicyTrapVars—{jnxJsSecPolicyMIB 2}

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-policy.txt.

This chapter contains the following topics:

Security Policy Table

Table 199 on page 609 describes the objects in the Security Policy Table.

Table 199: Security Policy Table

Object	Object ID	Description
jnxJsPolicyNumber	jnxJsPolicyObjects 1	Number of policies (regardless of their current state) present on this system.

Table 199: Security Policy Table *(continued)*

Object	Object ID	Description
jnxJsPolicyTable	jnxJsPolicyObjects 2	Exposes the security policy entries. Security devices and routers provide a network boundary with a single point of entry and exit, which allows the screening and directing of traffic through the implementation of access policies. The access policies can permit, deny, encrypt, authenticate, prioirtize, schedule, and monitor the traffic flow through the firewall. This table lists entries of policy. The number of policies are given by jnxJsPolicyNumber.
jnxJsPolicyEntry	jnxJsPolicyTable 1	An entry contains a security policy. Indexes: ■ nxJsPolicyFromZone ■ jnxJsPolicyToZone ■ jnxJsPolicyName Security policies are configured under FromZone and ToZone directions. Under a specific zone direction, each security policy contains a name, match-criteria, action, and other options. Sequence of parameters: ■ jnxJsPolicyFromZone ■ jnxJsPolicyToZone ■ jnxJsPolicyName ■ jnxJsPolicySequenceNumber ■ jnxJsPolicyAction ■ jnxJsPolicyScheduler ■ jnxJsPolicyState ■ jnxJsPolicyStatsAvailability ■ jnxJsPolicyPerSecBytesThreshold ■ jnxJsPolicyPerMinKbytesThreshold
jnxJsPolicyFromZone	jnxJsPolicyEntry 1	FromZone name
jnxJsPolicyToZone	jnxJsPolicyEntry 2	ToZone name
jnxJsPolicyName	jnxJsPolicyEntry 3	Name of the policy defined. The name consists of up to 256 ASCII characters and uniquely identifies the policy entry.

Table 199: Security Policy Table *(continued)*

Object	Object ID	Description
jnxJsPolicySequenceNumber	jnxJsPolicyEntry 4	Indication of the policy sequence order of the policy within a specific FromZone and ToZone pair. Policies are matched in a sequence in which the ordering is specified by this number.
jnxJsPolicyAction	jnxJsPolicyEntry 5	Indication of the actions performed when the criteria are matched The actions permit, reject, and deny are user-configured policies.
jnxJsPolicyScheduler	jnxJsPolicyEntry 6	Name of the schedule attached to this policy. Certain schedules have a specified duration that may affect the status of the policy.
jnxJsPolicyState	jnxJsPolicyEntry 7	State of this policy: active, inactive, or unavailable. The state can be affected by the scheduler if the scheduler has a specified duration.
jnxJsPolicyStatsAvailability	jnxJsPolicyEntry 8	Indication of whether the statistics counters are available and are actively updated. If available, a matching jnxJsPolicyStatsEntry exists for the policy.
jnxJsPolicyPerSecBytesThreshold	jnxJsPolicyEntry 9	Indication of the threshold value of bytes per second
jnxJsPolicyPerMinKbytesThreshold	jnxJsPolicyEntry 10	Indication of the threshold value of kbyte per minute

jnxJsPolicyStatsTable

jnxJsPolicyStatsTable, whose object ID is {jnxJsPolicyObjects 3}, exposes the security policy statistics entries listed in Table 200 on page 612. These statistics can be enabled and disabled by configuration on a per policy basis.

Table 200: jnxJsPolicyStatsTable

Object	Object ID	Description
jnxJsPolicyStatsEntry	jnxJsPolicyStatsTable 1	Contains security policy statistics. Indexes: ■ jnxJsPolicyFromZone ■ jnxJsPolicyToZone ■ jnxJsPolicyName Security policies are configured under FromZone and ToZone direction. Under a specific zone direction, each security policy contains name, match-criteria, action, and other options. Sequence of parameters: ■ jnxJsPolicyStatsCreationTime ■ jnxJsPolicyStatsInputBytes ■ jnxJsPolicyStatsInputByteRate ■ jnxJsPolicyStatsOutputBytes ■ jnxJsPolicyStatsOutputByteRate ■ jnxJsPolicyStatsInputPackets ■ jnxJsPolicyStatsInputPacketRate ■ jnxJsPolicyStatsOutputPackets ■ jnxJsPolicyStatsOutputPacketRate ■ jnxJsPolicyStatsNumSessions ■ jnxJsPolicyStatsSessionRate ■ jnxJsPolicyStatsSessionDeleted ■ jnxJsPolicyStatsLookups ■ jnxJsPolicyStatsCountAlarm
jnxJsPolicyStatsCreationTime	jnxJsPolicyStatsEntry 1	Creation timestamp of the policy statistics entry. The timestamp is modified during the creation and deletion of the policy statistics entry. When the timestamp changes, the policy entry statistics entry is assumed to be a new statistics entry and not associated with a previous statistic entry of the same indices.
jnxJsPolicyStatsInputBytes	jnxJsPolicyStatsEntry 2	Number of input bytes that enter the firewall through this policy
jnxJsPolicyStatsInputByteRate	jnxJsPolicyStatsEntry 3	Number of input bytes per second or the rate that enters the firewall through this policy
jnxJsPolicyStatsOutputBytes	jnxJsPolicyStatsEntry 4	Number of output bytes associated with this policy

Table 200: jnxJsPolicyStatsTable *(continued)*

Object	Object ID	Description
jnxJsPolicyStatsOutputByteRate	jnxJsPolicyStatsEntry 5	Number of output bytes per second or the rate associated with this policy
jnxJsPolicyStatsInputPackets	jnxJsPolicyStatsEntry 6	Number of input packets that enter the firewall through this policy
jnxJsPolicyStatsInputPacketRate	jnxJsPolicyStatsEntry 7	Number of input packets per second or the input packet rate of the firewall through this policy
jnxJsPolicyStatsOutputPackets	jnxJsPolicyStatsEntry 8	Number of output packets associated with this policy
jnxJsPolicyStatsOutputPacketRate	jnxJsPolicyStatsEntry 9	Number of output packets per second or the rate associated with this policy
jnxJsPolicyStatsNumSessions	jnxJsPolicyStatsEntry 10	Number of sessions associated with this policy
jnxJsPolicyStatsSessionRate	jnxJsPolicyStatsEntry 11	Rate of the sessions associated with this policy
jnxJsPolicyStatsSessionDeleted	jnxJsPolicyStatsEntry 12	Number of sessions associated with this policy
jnxJsPolicyStatsLookups	jnxJsPolicyStatsEntry 13	Number of policy lookups performed
jnxJsPolicyStatsCountAlarm	jnxJsPolicyStatsEntry 14	Number of alarms counted when the traffic exceeds a certain threshold configuration

Chapter 70

Interpreting the Enterprise-Specific Security Interface Extension Objects MIB

The enterprise-specific Security Interface Extension Objects MIB, jnxJsIfMIB, whose object ID is {jnxJsIf 1}, defines the object that are used to monitor the entries in the interfaces that pertain to the security management of the interface.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-if-ext.txt.

This chapter contains the following topic:

jnxJsIfMonTable

jnxJsIfMonTable, whose object ID is {jnxJsIfExtension 1}, extends the interface entries on a particular interface to support the security related-objects listed in Table 201 on page 616. The table is indexed by ifIndex.

Table 201: jnxJsIfMonTable

Object	Object ID	Description
jnxJsIfMonEntry	jnxJsIfMonTable 1	Object related to interface monitoring Sequence of parameters: ■ jnxJsIfMonInIcmp ■ jnxJsIfMonInSelf ■ jnxJsIfMonInVpn ■ jnxJsIfMonInPolicyPermit ■ jnxJsIfMonOutPolicyPermit ■ jnxJsIfMonConn ■ jnxJsIfMonInMcast ■ jnxJsIfMonOutMcast ■ jnxJsIfMonPolicyDeny ■ jnxJsIfMonNoGateParent ■ jnxJsIfMonTcpProxyDrop ■ jnxJsIfMonNoDip ■ jnxJsIfMonNoNspTunnel ■ jnxJsIfMonNoNatCon ■ jnxJsIfMonInvalidZone ■ jnxJsIfMonIpCIsFail ■ jnxJsIfMonAuthDrop ■ jnxJsIfMonMultiUserAuthDrop ■ jnxJsIfMonLoopMultiDipDrop ■ jnxJsIfMonAddrSpoof ■ jnxJsIfMonLpDrop ■ jnxJsIfMonNullZone ■ jnxJsIfMonNoGate ■ jnxJsIfMonNoMinorSess ■ jnxJsIfMonNvecErr ■ jnxJsIfMonTcpSeq ■ jnxJsIfMonIllegalPak ■ jnxJsIfMonNoRoute ■ jnxJsIfMonAuthFail ■ jnxJsIfMonSaInactive ■ jnxJsIfMonNoSa ■ jnxJsIfMonSelfPktDrop
jnxJsIfMonInIcmp	jnxJsIfMonEntry 1	ICMP packets received
jnxJsIfMonInSelf	jnxJsIfMonEntry 2	Self packets received
jnxJsIfMonInVpn	jnxJsIfMonEntry 3	VPN packets received
jnxJsIfMonInPolicyPermit	jnxJsIfMonEntry 4	Incoming bytes permitted by policy
jnxJsIfMonOutPolicyPermit	jnxJsIfMonEntry 5	Outgoing bytes permitted by policy

Table 201: jnxJsIfMonTable *(continued)*

Object	Object ID	Description
jnxJsIfMonConn	jnxJsIfMonEntry 6	Incoming connections established
jnxJsIfMonInMcast	jnxJsIfMonEntry 7	Multicast packets received
jnxJsIfMonOutMcast	jnxJsIfMonEntry 8	Multicast packets sent
jnxJsIfMonPolicyDeny	jnxJsIfMonEntry 9	Packets dropped due to policy denial
jnxJsIfMonNoGateParent	jnxJsIfMonEntry 10	Packets dropped due to no parent for a gate
jnxJsIfMonTcpProxyDrop	jnxJsIfMonEntry 11	Packets dropped due to syn-attack protection
jnxJsIfMonNoDip	jnxJsIfMonEntry 12	Packets dropped due to DIP errors
jnxJsIfMonNoNspTunnel	jnxJsIfMonEntry 13	Packets dropped because no NSP tunnel found
jnxJsIfMonNoNatCon	jnxJsIfMonEntry 14	Packets dropped due to no more sessions
jnxJsIfMonInvalidZone	jnxJsIfMonEntry 15	Packets dropped because an invalid zone received the packet
jnxJsIfMonIpClsFail	jnxJsIfMonEntry 16	Packets dropped due to IP classification failure
jnxJsIfMonAuthDrop	jnxJsIfMonEntry 17	Packets dropped due to user authentication errors
jnxJsIfMonMultiUserAuthDrop	jnxJsIfMonEntry 18	Packets dropped due to multiple user authentications in loopback sessions
jnxJsIfMonLoopMultiDipDrop	jnxJsIfMonEntry 19	Packets dropped due to multiple DIP in loopback sessions
jnxJsIfMonAddrSpoof	jnxJsIfMonEntry 20	Packets dropped due to address spoofing
jnxJsIfMonLpDrop	jnxJsIfMonEntry 21	Packets dropped due to no loopback
jnxJsIfMonNullZone	jnxJsIfMonEntry 22	Packets dropped due to no zone or NULL zone binding
jnxJsIfMonNoGate	jnxJsIfMonEntry 23	Packets dropped due to no NAT gateway
jnxJsIfMonNoMinorSess	jnxJsIfMonEntry 24	Packets dropped due to no minor session
jnxJsIfMonNvecErr	jnxJsIfMonEntry 25	Packets dropped due to no session for gateway
jnxJsIfMonTcpSeq	jnxJsIfMonEntry 26	Packets dropped because TCP sequence number out of window

Table 201: jnxJsIfMonTable *(continued)*

Object	Object ID	Description
jnxJsIfMonIllegalPak	jnxJsIfMonEntry 27	Packets dropped because they did not make any sense
jnxJsIfMonNoRoute	jnxJsIfMonEntry 28	Packets dropped because no route was present
jnxJsIfMonAuthFail	jnxJsIfMonEntry 29	Packets dropped because authentication failed
jnxJsIfMonSaInactive	jnxJsIfMonEntry 30	Packets dropped because security association (SA) is not active
jnxJsIfMonNoSa	jnxJsIfMonEntry 31	Packets dropped because no SA found for incoming security parameter index (SPI)
jnxJsIfMonSelfPktDrop	jnxJsIfMonEntry 32	Packets dropped because no one interested in self packets

Chapter 71

Interpreting the VPN Certificate Objects MIB

The enterprise-specific VPN Certificate Objects MIB, jnxJsCertificateMIB, whose object ID is {jjnxJsCertificates 1}, defines the objects that are used to monitor reference and attributes to the certificates.

A related VPN Certificate Object MIB is jnxJsCertificateObjects {jnxJsCertificateMIB 1}.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-cert.txt.

This chapter contains the following topics:

jnxJsLoadedCaCertTable

The jnxJsLoadedCaCertTable, whose object ID is {jnxJsCertificateObjects 1}, exposes the loaded Certification Authority (CA)-issued certificate objects listed in Table 202 on page 619. Certificates are used when establishing a secure connection in the device.

Table 202: jnxJsLoadedCaCertTable

Object	Object ID	Description
jnxJsLoadedCaCertEntry	jnxJsLoadedCaCertTable 1	Loaded CA certificate entry. The loaded CA certificate entry is indexed by the CA certification name. Sequence of parameters: ■ jnxJsLoadedCaCertName ■ jnxJsLoadedCaCertSubject ■ jnxJsLoadedCaCertExpire ■ jnxJsLoadedCaCertIssuer
jnxJsLoadedCaCertName	jnxJsLoadedCaCertEntry 1	Loaded CA certificate name. This name is unique within the loaded CA certifcates.

Table 202: jnxJsLoadedCaCertTable *(continued)*

Object	Object ID	Description
jnxJsLoadedCaCertSubject	jnxJsLoadedCaCertEntry 2	CA certificate subject
jnxJsLoadedCaCertExpire	jnxJsLoadedCaCertEntry 3	Expiration time and date of CA certificate
jnxJsLoadedCaCertIssuer	jnxJsLoadedCaCertEntry 4	Issuer of CA certificate

jnxJsLoadedLocalCertTable

The jnxJsLoadedLocalCertTable, whose object ID is jnxJsCertificateObjects 2, exposes the loaded local certificate objects listed in Table 203 on page 620. Certificates are used when establishing a secure connection in the device.

Table 203: jnxJsLoadedLocalCertTable

Object	Object ID	Description
jnxJsLoadedLocalCertEntry	jnxJsLoadedLocalCertTable 1	Default certificate entry. This entry is indexed by the certification name. Sequence of parameters: ■ jnxJsLoadedLocalCertName ■ jnxJsLoadedLocalCertSubject ■ jnxJsLoadedLocalCertExpire ■ jnxJsLoadedLocalCertIssuer
jnxJsLoadedLocalCertName	jnxJsLoadedLocalCertEntry 1	Name of the local certificate. The certificate name is unique within the loaded local certificates.
jnxJsLoadedLocalCertSubject	jnxJsLoadedLocalCertEntry 2	Certificate subject.
jnxJsLoadedLocalCertExpire	jnxJsLoadedLocalCertEntry 3	Expiration time and date of the local certificate.
jnxJsLoadedLocalCertIssuer	jnxJsLoadedLocalCertEntry 4	Issuer of the local certificate.

Chapter 72

Interpreting the Enterprise-Specific Security Screening Objects MIB

The enterprise-specific Security Screening Objects MIB, jnxJsScreenMIB, whose object ID is {jnxJsScreening 1}, defines the MIB for the Juniper Networks Enterprise Firewall screen functionality. Juniper Networks documentation is recommended as the reference.

The Juniper Networks Security Firewall provides various detection methods and defense mechanisms to combat exploits at all stages of the path of execution, including:

- Screen option setting
- Firewall Denial-of-Service (DoS) attack
- Network DoS attack
- OS-specific DoS attack
- Fragment reassembly

Related Security Screening Objects MIBs include:

- jnxJsScreenNotifications {jnxJsScreenMIB 0}
- jnxJsScreenObjects {jnxJsScreenMIB 1}
- jnxJsScreenTrapVars{jnxJsScreenMIB 2}

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-screening.txt.

This chapter contains the following topics:

jnxJsScreenMonTable

The jnxJsScreenMonTable, whose object ID is {jjnxJsScreenObjects 1}, collects the screen attributes that monitor the various attacks to enable the Juniper Networks Security Firewall to provide deep inspection (DI) protection on each of the security device's physical interfaces. These attributes are listed in Table 202 on page 619.

The screen options can be enabled at a security zone bounded to an interface or interfaces. When these options apply to traffic reaching the security device through interfaces (via a zone), they offer protection against a malicious information gathering probe or an attack to compromise, disable, or harm a network or network resources.

Table 204: jnxJsScreenMonTable

Object	Object ID	Description
jnxJsScreenMonEntry	jnxJsScreenMonTable 1	The screen option monitoring statistics entry. Each entry is uniquely identified by the zone name. The data is collected on a per zone basis. There can be multiple interfaces bound to a particular zone. Hence, the statistics are aggregated across the interfaces on a per zone basis. Sequence of parameters: ■ jnxJsScreenZoneName ■ jnxJsScreenNumOfIf ■ jnxJsScreenMonSynAttk ■ jnxJsScreenMonTearDrop ■ jnxJsScreenMonSrcRoute ■ jnxJsScreenMonPingDeath ■ jnxJsScreenMonAddrSpoof ■ jnxJsScreenMonLand ■ jnxJsScreenMonIcmpFlood ■ jnxJsScreenMonUdpFlood ■ jnxJsScreenMonWinnuke ■ jnxJsScreenMonPortScan ■ jnxJsScreenMonIpSweep ■ jnxJsScreenMonSynFrag ■ jnxJsScreenMonTcpNoFlag ■ jnxJsScreenMonIpUnknownProt ■ jnxJsScreenMonIpOptBad ■ jnxJsScreenMonIpOptRecRt—Record route option ■ jnxJsScreenMonIpOptTimestamp—Timestamp option ■ jnxJsScreenMonIpOptSecurity ■ jnxJsScreenMonIpOptLSR—Loose source route ■ jnxJsScreenMonIpOptSSR—Strict source route ■ jnxJsScreenMonIpOptStream—Stream options ■ jnxJsScreenMonIcmpFrag ■ jnxJsScreenMonIcmpLarge ■ jnxJsScreenMonTcpSynFin ■ jnxJsScreenMonTcpFinNoAck ■ jnxJsScreenMonLimitSessSrc—Session limit (source IP-based)

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
		■ jnxJsScreenMonLimitSessDest—Session limit (destination IP-based) ■ jnxJsScreenMonSynAckAck ■ jnxJsScreenMonIpFrag ■ jnxJsScreenSynAttackThresh—Threshold data ■ jnxJsScreenSynAttackThresh—Threshold data ■ jnxJsScreenSynAttackTimeout—Threshold data ■ jnxJsScreenSynAttackAlmTh—Threshold data ■ jnxJsScreenSynAttackQueSize—Threshold data ■ jnxJsScreenSynAttackAgeTime—Threshold data (obsolete in this release) ■ jnxJsScreenIcmpFloodThresh—Threshold data ■ jnxJsScreenUdpFloodThresh—Threshold data ■ jnxJsScreenPortScanThresh—Threshold data ■ jnxJsScreenIpSweepThresh—Threshold data ■ jnxJsScreenSynAckAckThres—Threshold data
jnxJsScreenZoneName	jnxJsScreenMonEntry 1	Name of the security zone under which the statistics are collected
jnxJsScreenNumOfIf	jnxJsScreenMonEntry 2	Number of interfaces bound to this zone. Each counter contains the aggregated data of all the interfaces.
jnxJsScreenMonSynAttk	jnxJsScreenMonEntry 3	Number of SYN (TCP connection request) attacks. A SYN attack is a common denial of service (DoS) technique characterized by the following pattern: ■ Using a spoofed IP address not in use on the Internet, an attacker sends multiple SYN packets to the target machine. ■ For each SYN packet received, the target machine allocates resources and sends an acknowledgement (SYN-ACK) to the source IP address. This can cause the target machine to allocate resources for more than 3 minutes to respond to just one SYN attack, subsequently wasting resources.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonTearDrop	jnxJsScreenMonEntry 4	Number of teardrop attacks. Teardrop attacks exploit the reassembly of fragmented IP packets. In the IP header, one of the fields is the fragment offset field, which indicates the starting position of the data contained in a fragmented packet relative to the data of the original unfragmented packet. When the sum of the offset and size of one fragmented packet differ from that of the next fragmented packet, the packets overlap. The server attempting to reassemble the packet can crash, especially if it is running an older operating system that has this vulnerability. When this option is enabled, the security device detects this discrepancy in a fragmented packet and drops it, and counts the number of packet dropped.
jnxJsScreenMonSrcRoute	jnxJsScreenMonEntry 5	Number of either loose source route option packets or strict source route attack packets. IP source route options can be used to hide their true address and access restricted areas of a network by specifying a different path. The security device should be able to either block any packets with loose or strict source route options set or detect such packets and then record the event for the ingress interface.
jnxJsScreenMonPingDeath	jnxJsScreenMonEntry 6	Number of ping-of-death attack packets. The maximum allowable IP packet size is 65,535 bytes, including the packet header (typically 20 bytes long). An ICMP echo request is an IP packet with a pseudo header, which is 8 bytes long. Therefore, the maximum allowable size of the data area of an ICMP echo request is 65,507 bytes. Many ping implementations, however, allow the user to specify a packet size larger than 65,507 bytes. A grossly oversized ICMP packet can trigger a range of adverse system reactions, such as DoS, crashing, freezing, and rebooting. When the ping-of-death option is enabled, the security device detects and rejects such oversized and irregular packet sizes, even when the attacker hides the total packet size by purposefully fragmenting it.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonAddrSpoof	jnxJsScreenMonEntry 7	Number of address spoofing attack packets. One method to gain access to a restricted network is to insert a bogus source address in the packet header to make the packet appear to come from a trusted source. This technique is called IP spoofing. The mechanism to detect IP spoofing relies on route table entries. For example, if a packet with source IP address 10.1.1.6 arrives at port eth3, but the security device has a route to 10.1.1.0/24 through port eth1, IP spoofing checking notes that this address arrived at an invalid interface as defined in the route table. A valid packet from 10.1.1.6 can arrive only via eth1, not eth3. The security device concludes that the packet has a spoofed source IP address and discards it.
jnxJsScreenMonLand	jnxJsScreenMonEntry 8	Number of land attack packets. A SYN attack combined with an IP spoof is referred to as land attack. A land attack occurs when an attacker sends spoofed SYN packets containing the IP address of the victim as both the destination and source IP address. The receiving victim responds by sending the SYN-ACK packet to itself, creating an empty connection that lasts until the idle timeout value is reached. Flooding a system with such empty connections can overwhelm the victim, causing a DoS.
jnxJsScreenMonIcmpFlood	jnxJsScreenMonEntry 9	Number of ICMP flood attack packets. An ICMP flood typically occurs when ICMP echo requests overload a victim with so many requests that the victim expends all its resources responding to the ICMP echo requests until it can no longer process valid network traffic. With ICMP flood protection enabled and a threshold set, if the threshold is exceeded, the victim invokes the flood attack protection feature. The default threshold value is 1000 packets per second. If the threshold is exceeded, the security device ignores further ICMP echo requests for the remainder of that second plus the next second as well.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonUdpFlood	jnxJsScreenMonEntry 10	Number of UDP flood attack packets. UDP flooding occurs when an attacker sends IP packets containing UDP datagrams with the purpose of slowing down the victim to the point that it can no longer handle valid connections. With UDP flood protection enabled, a threshold can be set so that when the threshold is exceeded, the system invokes UDP flood attack protection. The default threshold value is 1000 packets per second. If the number of UDP datagrams from one or more sources to a single destination exceeds this threshold, the security device ignores further UDP datagrams to that destination for the remainder of that second plus the next second as well.
jnxJsScreenMonWinnuke	jnxJsScreenMonEntry 11	Number of NetBIOS attacks. WinNuke is a DoS attack targeting any computer on the Internet running Microsoft Windows. The attacker sends a TCP segment, usually to NetBIOS port 139 of a host with an established connection with segment's urgent (URG) flag set. This practice introduces a NetBIOS fragment overlap, which causes many machines running Microsoft Windows to crash.
jnxJsScreenMonPortScan	jnxJsScreenMonEntry 12	Number of port scan attempt attack packets. A port scan occurs when one source IP address sends IP packets containing TCP SYN segments to a defined number of different ports at the same destination IP address within a defined interval. The purpose of this attack is to scan the available services in the hope that at least one port will respond, thus identifying a service of the target. The security device should internally log the number of different ports scanned from one remote source.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonIpSweep	jnxJsScreenMonEntry 13	Number of address sweep attemp attack packets. An address sweep occurs when one source IP address sends a defined number of ICMP packets to different hosts within a defined interval. The purpose of this attack is to send ICMP packets, typically echo requests, to various hosts in the hope that at least one replies, thus uncovering an address of the target. The security device internally logs the number of ICMP packets to different addresses from one remote source.
jnxJsScreenMonSynFrag	jnxJsScreenMonEntry 14	Number of SYN fragments. IP encapsulates a TCP SYN segment in the IP packet that initiates a TCP connection. The purpose is to initiate a connection and to invoke a SYN/ACK segment response. The SYN segment typically does not contain any data since the IP packet is small and there is no legitimate reason for it to be fragmented. A fragmented SYN packet is anomalous and is suspicious. To be cautious, it might be helpful to block such fragments from entering the protected network. When the SYN fragmentation check is enabled, the security device detects and drops the packets when the IP header indicates that the packet has been fragmented while the SYN flag is set in the TCP header.
jnxJsScreenMonTcpNoFlag	jnxJsScreenMonEntry 15	Number of TCP packets with no flag set. A normal TCP segment header has at least one flag control set. A TCP segment with no control flags set is an anomalous event. Operating systems respond to such anomalies in different ways. The response, or even lack of response, from the targeted device can provide a clue as to the target's OS type. When this option is enabled, if the security device discovers such a header with a missing or malformed flags field, it drops the packet.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonIpUnknownProt	jnxJsScreenMonEntry 16	Number of of unknown protocol IP packets. According to RFC-1700, some protocol types in an IP header are reserved and unassigned at this time. Precisely because these protocols are undefined, there is no way to know in advance whether a particular unknown protocol is benign or malicious. Unless your network makes use of a nonstandard protocol with a reserved or unassigned protocol number, a cautious stance is to block such unknown elements from entering your protected network. When the Unknown Protocol Protection SCREEN option is enabled, the security device drops packets when the protocol field contains a protocol ID number of 137 or greater.
jnxJsScreenMonIpOptBad	jnxJsScreenMonEntry 17	Number of IP bad option packets. The IP protocol specifies a set of eight options that provide special routing controls, diagnostic tools, and security. These eight options can be used for malicious objectives. Either intentionally or accidentally, attackers sometimes configure IP options incorrectly, producing either incomplete or malformed fields. The incorrect formatting is anomalous and potentially harmful to the intended recipient. When the Bad IP Option Protection SCREEN option is enabled, the security device detects and blocks packets when any IP option in the IP packet header is incorrectly formatted.
jnxJsScreenMonIpOptRecRt	jnxJsScreenMonEntry 18	Number of IP record option packets. The IP standard RFC-791 specifies a set of options to provide special routing controls, diagnostic tools, and security. These options appear after the destination address in an IP packet header. When they do appear, they are frequently being put to some nefarious use. The record option is one of these options that an attacker can use for reconnaissance or for some unknown but suspicious purpose When a record IP option is received, the security device flags it as an network reconnaissance attack and records the event for the ingress interface.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonIpOptTimestamp	jnxJsScreenMonEntry 19	Number of IP timestamp option packets. The IP standard RFC-791 specifies a set of options to provide special routing controls, diagnostic tools, and security. These options appear after the destination address in an IP packet header. When they do appear, they are frequently being put to some nefarious use. Timestamp is one of these options that an attacker can use for reconnaissance or for some unknown but suspicious purpose. When a timestamp IP option is received, the security device flags this as an network reconnaissance attack and records the event for the ingress interface.
jnxJsScreenMonIpOptSecurity	jnxJsScreenMonEntry 20	Number of IP security option packets. The IP standard RFC-791 specifies a set of options to provide special routing controls, diagnostic tools, and security. These options appear after the destination address in an IP packet header. When they do appear, they are frequently being put to some nefarious use. Security is one of these options that an attacker can use for reconnaissance or for some unknown but suspicious purpose. When a security IP option is received, the security device flags this as an network reconnaissance attack and records the event for the ingress interface.
jnxJsScreenMonIpOptLSR	jnxJsScreenMonEntry 21	Number of strict source route packets. Attackers can use IP source route options to hide their true address and access restricted areas of a network by specifying a different path. The security device should be able to either block any packets with loose or strict source route options set or detect such packets and then record the event for the ingress interface.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonIpOptStream	jnxJsScreenMonEntry 23	Number of IP stream option packets. The IP standard RFC-791 specifies a set of options to provide special routing controls, diagnostic tools, and security. These options appear after the destination address in an IP packet header. When they do appear, they are frequently being put to some nefarious use. Stream is one of these options that an attacker can use for reconnaissance or for some unknown but suspicious purpose. When a security IP option is received, the security device flags it as an network reconnaissance attack and records the event for the ingress interface.
jnxJsScreenMonIcmpFrag	jnxJsScreenMonEntry 24	Number of ICMP fragment packets. ICMP provides error reporting and network probe capabilities. Because ICMP packets contain very short messages, there is no legitimate reason for ICMP packets to be fragmented. If an ICMP packet is so large that it must be fragmented, something is wrong. With the ICMP Fragment Protection SCREEN option enabled, the security device should be able to block any ICMP packet with the More Fragments flag set or with an offset value indicated in the offset field.
jnxJsScreenMonIcmpLarge	jnxJsScreenMonEntry 25	Number of large ICMP packets. Because ICMP packets contain very short messages, there is no legitimate reason for ICMP packets to be fragmented. If an ICMP packet is unusually large, something is wrong. For example, the Loki program uses ICMP as a channel for transmitting covert messages. The presence of large ICMP packets might expose a compromised machine acting as a Loki agent. It might also indicate some other kind of malicious activity. When the the Large Size ICMP Packet Protection SCREEN option is enabled, the security device drops ICMP packets with a length greater than 1024 bytes.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonTcpSynFin	jnxJsScreenMonEntry 26	Number of dropped TCP packets because SYN and FIN are both set. Both the SYN and FIN control flags are not normally set in the same TCP segment header. The SYN flag synchronizes sequence numbers to initiate a TCP connection. The FIN flag indicates the end of data transmission to finish a TCP connection. Their purposes are mutually exclusive. A TCP header with the SYN and FIN flags set is anomalous TCP behavior, causing various responses from the recipient, depending on the OS. When the blocking of TCP packets with both SYN and FIN is enabled, the security device drops the packet when it discovers such a header.
jnxJsScreenMonTcpFinNoAck	jnxJsScreenMonEntry 27	Number of TCP packets with FIN set, but without the ACK bit set. A FIN scan sends TCP segments with the FIN flag set in an attempt to provoke a response and thereby discover an active host or an active port on a host. The use of TCP segments with the FIN flag set might evade detection and thereby help attackers succeed in their reconnaissance efforts.
jnxJsScreenMonLimitSessSrc	jnxJsScreenMonEntry 28	Number of the session connections for a source IP address that exceeds the specified limit. Because all the virus-generated traffic originates from the same IP address (generally from an infected server), a source-based session limit ensures that the firewall can curb such excessive amounts of traffic. This amount is based on a threshold value of the number of concurrent sessions required to fill up the session table of the particular firewall. The default maximum for a source-based session limit is 128 concurrent sessions, which can be adjusted accordingly.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonLimitSessDest	jnxJsScreenMonEntry 29	Number of session connections for the destination source IP address that exceeds the specified limit. The user can limit the number of concurrent sessions to the same destination IP address. An attacker can launch a distributed denial-of-service (DDoS) attack using "zombie agents." Setting a destination-based session limit can ensure that the security device allows only an acceptable number of concurrent connection requests, no matter what the source, to reach any one host. The default maximum for the destination-based session limit is 128 concurrent sessions.
jnxJsScreenMonSynAckAck	jnxJsScreenMonEntry 30	Number of SYN ACK ACK attacks. When an authentication user initiates a Telnet or FTP connection, the user sends a SYN segment to the Telnet or FTP server. The security device intercepts the SYN segment, creates an entry in its session table, and proxies a SYN-ACK segment to the user. The user then replies with an ACK segment. At that point, the initial three-way handshake is complete. The security device sends a login prompt to the user. When a malicious user does not log in, but instead continues initiating SYN-ACK-ACK sessions, the firewall session table can fill up to the point at which the security device begins rejecting legitimate connection requests. When the SYN-ACK-ACK proxy protection option is enabled, after the number of connections from the same IP address reaches the SYN-ACK-ACK proxy threshold, the security device rejects further connection requests from that IP address. By default, the threshold is 512 connections from any single IP address.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenMonIpFrag	jnxJsScreenMonEntry 31	Number of block IP fragment packets. As a packets travels, it is sometimes necessary to break the packet into smaller fragments based upon the maximum transmission unit (MTU) of each network. IP fragments might contain an attacker's attempt to exploit the vulnerabilities in the packet reassembly code of specific IP stack implementations. When the victim receives these packets, the results can range from processing the packets incorrectly to crashing the entire system. When the block IP framentation flag is enabled, the security device blocks all IP packet fragments that it receives at interfaces bound to that zone.
Threshold Values		
jnxJsScreenSynAttackThresh	jnxJsScreenMonEntry 32	SYN attack threshold value. The number of SYN segments to the same destination address and port number per second required to activate the SYN proxying mechanism. In order to set the appropriate threshold value, it requires a through knowledge of the normal traffic patterns at the site. For example, if the security device normally gets 2000 SYN segments per second, the threshold value should be set at 3000 segments per second.
jnxJsScreenSynAttackTimeout	jnxJsScreenMonEntry 33	SYN attack timeout value. The maximum length of time before a half-completed connection is dropped from the queue. The default is 20 seconds.
jnxJsScreenSynAttackAlmTh	jnxJsScreenMonEntry 34	SYN attack alarm threshold value. The SYN attack alarm threshold causes an alarm to be generated when the number of proxied, half-completed TCP connection requests per second to the same destination address and port number exceeds its value.
jnxJsScreenSynAttackQueSize	jnxJsScreenMonEntry 35	SYN attack queue size. The number of proxied connection requests held in the proxied connection queue before the security device starts rejecting new connection requests.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
NOTE: The jnxJsScreenSynAttackAgeTime object is obsolete in this release.		
jnxJsScreenSynAttackAgeTime	jnxJsScreenMonEntry 36	SYN flood age time
jnxJsScreenIcmpFloodThresh	jnxJsScreenMonEntry 37	ICMP attack alarm threshold value. The security device can impose a limit on the number of SYN segments permitted to pass through the firewall per second. The default attack threshold value is 1000. The valid threshold range is 1 through 100000. When the threshold value is exceed, an alarm is triggered.
jnxJsScreenUdpFloodThresh	jnxJsScreenMonEntry 38	UDP attack alarm threshold value. UDP flooding occurs when an attacker sends IP packets containing UDP datagrams with the purpose of slowing down the victim to the point that it can no longer handle valid connections. The default threshold value is 1000 packets per second.
jnxJsScreenPortScanThresh	jnxJsScreenMonEntry 39	Port scan threshold value. The port scan threshold interval is in microseconds. The default threshold value is 5000. The valid threshold range is 1000 through 1000000. By using the default settings, if a remote host scans 10 ports in 0.005 seconds (5000 microseconds), the security device flags this occurrence as a port scan attack and rejects all further packets from the remote source for the remainder of the specified timeout period. The security device detects and drops the tenth packet that meets the port scan attack criterion.

Table 204: jnxJsScreenMonTable *(continued)*

Object	Object ID	Description
jnxJsScreenIpSweepThresh	jnxJsScreenMonEntry 40	IP sweep threshold interval. The IP sweep threshold interval is in microseconds. The default threshold value is 5000. The valid threshold range is 1000 through 1000000. By using the default settings, if a remote host sends ICMP traffic to 10 addresses in 0.005 seconds (5000 microseconds), the security device flags this occurrence as an address sweep attack and rejects all further ICMP echo requests from that host for the remainder of the specified threshold time period. The security device detects and drops the tenth packet that meets the address sweep attack criterion.
jnxJsScreenSynAckAckThres	jnxJsScreenMonEntry 41	SYN-ACK-ACK alarm threshold value

Chapter 73

Interpreting the Enterprise-Specific LDP MIB

The enterprise-specific Label Distribution Path (LDP) MIB, whose object identifier is {jnxMibs 14}, contains LDP statistics, and defines LDP notification objects and types.

The enterprise-specific LDP MIB uses the following objects and definitions from standard MIBs and enterprise-specific MIB definitions:

- IpAddress from SNMPv2–SMI MIB
- DisplayString from SNMPv2–TC MIB
- InterfaceIndex and InterfaceIndexOrzero from IF MIB
- jnxMibs and jnxLdpTraps from Juniper Enterprise-Specific SMI MIB
- jnxMplsLdpSesState from Juniper Enterprise-Specific MPLS LDP MIB
- MplsVpnName from the standard MPLS VPN MIB
- InetAddressType, InetAddress, and InetAddressPrefixLength from the standard Inet Address MIB

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ldp.txt.

This chapter contains the following sections:

LDP Notification Objects and Notification Types

The jnxLdpTrapVars table, whose object identifier is {jnxLdp 1}, defines the objects used in the enterprise-specific LDP traps.

NOTE: The enterprise-specific LDP MIB requires jnxLdpTrapPrefix with 0 subidentifier for seamless translation of SNMPv2 notifications to SNMPv1 format.

Table 205: LDP Notification Objects

Object	Object ID	Description
jnxLdpLspFec	jnxLdpTrapVars 1	Contains the LSP forwarding equivalence class (FEC) in IpAddress format.
jnxLdpRtrid	jnxLdpTrapVars 2	Contains the router ID of the sending router in IpAddress format.
jnxLdpLspDownReason	jnxLdpTrapVars 3	Returns one of the following integer values to denote what might have caused the LSP to go down: ■ 1–Change in topology ■ 2–Withdrawal of label by the neighbor ■ 3–Unavailability of the neighbor because the neighbor is down ■ 4–Change in filter ■ 5–Unknown reason
jnxLdpSesDownReason	jnxLdpTrapVars 4	Returns one of the following integer values to denote what might have caused the session transition into non-existent state: ■ 0–Unknown reason ■ 1–Hold time expired ■ 2–Connection time expired ■ 3–All adjacencies are down ■ 4–Received bad TLV (type, length, and value encoding scheme) ■ 5–Received bad PDU (protocol data unit) ■ 6–Connection error occurred ■ 7–The connection was reset ■ 8–Received notification from peer ■ 9–Received unexpected end-of-file message ■ 10–The authentication key was changed ■ 11–Error occurred during initialization ■ 12–Graceful restart was aborted ■ 13– CLI command was issued to end the session
jnxLdpSesDownIf	jnxLdpTrapVars 5	Contains the SNMP index of the interface associated with the session-down event. If no interface is associated with the session-down event, then this object returns the SNMP index of any interface associated with one of the neighbors.
jnxLdpLspFecLen	jnxLdpTrapVars 6	Represents the length of the LSP FEC prefix in bits. The allowable range is 0 through 32 bits.
jnxLdpSesUpIf	jnxLdpTrapVars 7	Contains the interface index of one of the neighbors associated with the session.
jnxLdpInstanceName	jnxLdpTrapVars 8	Contains the name of the VPN interface.

Table 206 on page 639 lists the enterprise-specific LDP notifications and the objects contained in each notification. The enterprise-specific LDP notifications use the objects listed in Table 205 on page 638.

Table 206: LDP Notification Types

Object	Object ID	Description
jnxLdpLspUp	jnxLdpTrapPrefix 1	Generated when an LSP comes back online. Typically, this trap is generated only when an LSP that has an active jnxLdpLspDown trap comes back online. ■ jnxLdpLspFec ■ jnxLdpRtrid ■ jnxLdpLspFecLen ■ jnxLdpInstanceName
jnxLdpLspDown	jnxLdpTrapPrefix 2	Generated when an LSP goes offline. This trap contains the following objects: ■ jnxLdpLspFec ■ jnxLdpRtrid ■ jnxLdpLspDownReason ■ jnxLdpLspFecLen ■ jnxLdpInstanceName **NOTE:** For every jnxLdpLspDown trap generated, JUNOS software ensures that a jnxLdpLspUp trap is generated when the LSP comes back online.
jnxLdpSesUp	jnxLdpTrapPrefix 3	Generated when the jnxMplsLdpSesState object moves into the operational (5) state. This trap contains the following objects: ■ jnxMplsLdpSesState ■ jnxLdpSesUpIf
jnxLdpSesDown	jnxLdpTrapPrefix 4	Generated when the jnxMplsLdpSesState object moves out of the operational (5) state. This trap contains the following objects: ■ jnxMplsLdpSesState ■ jnxLdpSesDownReason ■ jnxLdpSesDownIf The jnxLdpSesDownIf object contains the address of the interface associated with the last neighbor when the value of jnxLdpSesDownReason was allAdjacenciesDown (3).

LDP Statistics Table

The jnxLdpStatsTable, whose object identifier is {jnxLdp 2}, contains the statistics associated with a particular LDP FEC. Each jnxLdpStatsEntry in jnxLdpStatsTable contains the objects listed in Table 207 on page 640.

Table 207: jnxLdpStatsTable

Object	Object ID	Description
jnxLdpInstanceId	jnxLdpStatsEntry 1	Identifies the LDP instance
jnxLdpFecType	jnxLdpStatsEntry 2	Denotes the type of the LDP instance.
jnxLdpFec	jnxLdpStatsEntry 3	Contains the InetAddress of the LDP FEC.
jnxLdpFecLength	jnxLdpStatsEntry 4	Shows the LDP FEC length in bits. The allowable range is 0 through 32 bits.
jnxLdpFecStatisticsStatus	jnxLdpStatsEntry 5	Contains one of the following integer values to indicate the status of traffic statistics for the FEC: ■ 1–Enabled and available ■ 2–Disabled ■ 3–Unavailable The traffic statistics may be disabled for the penultimate hop FECs, and in such cases, the objects after jnxLdpFecStatisticsStatus in the jnxLdpStatsEntry return 0 value.
jnxLdpIngressOctets	jnxLdpStatsEntry 6	Shows the number of octets of traffic originated from the router, and forwarded over the current LDP FEC. Because the LDP statistics are collected at preconfigured intervals and not in real time, this object may return a value that is different from the current value. The default interval for LDP statistics collection is 5 minutes.
jnxLdpIngressPackets	jnxLdpStatsEntry 7	Shows the number of packets originated from the router, and forwarded over the current LDP FEC. Because the LDP statistics are collected at preconfigured intervals and not in real time, this object may return a value that is different from the current value. The default interval for LDP statistics collection is 5 minutes.
jnxLdpTransitOctets	jnxLdpStatsEntry 8	Shows the number of octets of traffic originated from a different router but destined for this FEC, and forwarded over the current LDP FEC. Because the LDP statistics are collected at preconfigured intervals and not in real time, this object may return a value that is different from the current value. The default interval for LDP statistics collection is 5 minutes.
jnxLdpTransitPackets	jnxLdpStatsEntry 9	Shows the number of packets of traffic originated from a different router but destined for this FEC, and forwarded over the current LDP FEC. Because the LDP statistics are collected at preconfigured intervals and not in real time, this object may return a value that is different from the current value. The default interval for LDP statistics collection is 5 minutes.

Chapter 74

Interpreting the Enterprise-Specific EX-Series SMI MIB

The enterprise-specific Structure of Management Information (SMI) management information base (MIB) for EX-series leverages the jnxExMibRoot object from the enterprise-specific SMI MIB (jnx-smi.mib), and defines a MIB branch for switching-related MIB definitions for the EX-series Ethernet switches. MIB objects that are specific to EX-series are identified with a jnxEx prefix.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-ex-smi.txt.

The jnxExMibRoot contains one branch, jnxExSwitching, whose object identifier is {jnxExMibRoot 1}.

The jnxExSwitching branch contains the objects listed in Table 208 on page 641.

Table 208: jnxExSwitching

Object	Object ID	Description
jnxExAnalyzer	jnxExSwitching 1	Defines the branch for the enterprise-specific Analyzer MIB. For more information on Analyzer MIB, see "Interpreting the Enterprise-Specific Analyzer MIB" on page 643.
jnxExSecureAccessPort	jnxExSwitching 2	Defines the branch for the enterprise-specific Secure Access Port MIB. For more information on Secure Access Port MIB, see "Interpreting the Enterprise-Specific Secure Access Port MIB" on page 659.
jnxExPaeExtention	jnxExSwitching 3	Defines the branch for the enterprise-specific PAE Extensions MIB. For more information on PAE Extensions MIB, see "Interpreting the Enterprise-Specific PAE Extension MIB" on page 655.
jnxExVirtualChassis	jnxExSwitching 4	Defines the branch for the enterprise-specific Virtual Chassis MIB. For more information on Virtual Chassis MIB, see "Interpreting the Enterprise-Specific Virtual Chassis MIB" on page 653.
jnxExVlan	jnxExSwitching 5	Defines the branch for the enterprise-specific VLAN MIB. For more information on VLAN MIB, see "Interpreting the Enterprise-Specific VLAN MIB" on page 647.

Chapter 75

Interpreting the Enterprise-Specific Analyzer MIB

The Juniper Networks enterprise-specific Analyzer MIB, whose object identifier is {jnxExAnalyzer 1}, contains analyzer and remote analyzer data related to port mirroring on the EX-series Ethernet switches. Port mirroring is a method used on enterprise switches to monitor and analyze traffic on the network.

When port mirroring is enabled, copies of all (or a sample set of) packets are forwarded from one port of the switch to another port on the same switch (analyzer) or on another switch (remote analyzer) where the packet can be analyzed and studied.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-analyzer.txt.

This chapter contains the following sections:

Analyzer Table

The jnxAnalyzerTable, whose object identifier is {jnxAnalyzerMIBObjects 1}, contains information on analyzer parameters. Each jnxAnalyzerEntry contains the objects listed in Table 209 on page 643.

Table 209: jnxAnalyzerTable

Object	Object ID	Description
jnxAnalyzerName	jnxAnalyzerEntry 1	Uniquely identifies an analyzer configured on the switch.
jnxAnalyzerStatus	jnxAnalyzerEntry 2	Shows whether mirroring is enabled or disabled on the analyzer.
jnxMirroringRatio	jnxAnalyzerEntry 3	Specifies the mirroring ratio. This object defines the sample size for mirroring. For example, 1 out of every x packets, where x is a number in the range of 1 through 2047.

Table 209: jnxAnalyzerTable *(continued)*

Object	Object ID	Description
jnxLossPriority	jnxAnalyzerEntry 4	Specifies the loss priority for a packet. When the number of packets at the analyzer port exceeds the bandwidth of the analyzer port, packets are dropped based on the loss priority value. when there is a bandwidth crunch, packets with high loss priority are dropped to clear the congestion. This object uses the following integer values to denote the loss priority: ■ 0–Low loss priority ■ 1–High loss priority

Analyzer Input Table

The jnxAnalyzerInputTable, whose object identifier is {jnxAnalyzerMIBObjects 2}, contains information about analyzer sessions. In a typical analyzer session, several source ports can be associated with a single destination port, and a range or series of ports can be mirrored.

Each jnxAnalyzerInputEntry provides information about input source ports, and contains the objects listed in Table 210 on page 644.

Table 210: jnxAnalyzerInputTable

Object	Object ID	Description
jnxAnalyzerInputValue	jnxAnalyzerInputEntry 1	Identifies an analyzer input source port. This object can contain a display string of not more than 255 characters. ■ If the value of jnxAnalyzerInputType is 1, then the value of jnxAnalyzerInputValue denotes the interface name of the input source. ■ If the value of jnxAnalyzerInputType is 2, then the value of jnxAnalyzerInputValue denotes the VLAN name of the input source.
jnxAnalyzerInputOption	jnxAnalyzerInputEntry 2	Denotes the type of traffic to be mirrored from the source port; that is, whether it is ingress traffic or egress traffic. This object uses the following integer values: ■ 1–Ingress traffic, where the analyzer monitors packets received by the source port. ■ 2–Egress traffic, where the analyzer monitors packets transmitted by the source port. In both the cases, the number of packets mirrored to the destination port depends on the jnxMirroringRatio.
jnxAnalyzerInputType	jnxAnalyzerInputEntry 3	Denotes whether the mirroring source is an interface or a VLAN. This object uses integer values 1 (for interface) and 2 (for VLAN). For interfaces, you can configure either ingress or egress mirroring, whereas, for VLANS, you can configure only ingress mirroring.

Analyzer Output Table

The jnxAnalyzerOutputTable, whose object identifier is {jnxAnalyzerMIBObjects 3}, contains information about destination port to which the packets are mirrored. Each jnxAnalyzerOutputEntry contains the objects listed in Table 211 on page 645, and provides information about destination port or destination VLAN.

Table 211: jnxAnalyzerOutputTable

Object	Object ID	Description
jnxAnalyzerOutputValue	jnxAnalyzerOutputEntry 1	Uniquely identifies a destination port or VLAN. This object can contain a string of not more than 255 characters. If the value of jnxAnalyzerOutputType is 1, then jnxAnalyzerOutputValue contains an interface name. If the value of jnxAnalyzerOutputType is 1, then jnxAnalyzerOutputValue contains a VLAN name.
jnxAnalyzerOutputType	jnxAnalyzerOutputEntry 2	Denotes the type of the output destination port. This object uses integer values 1 (for destination port that is on the same switch) and 2 (for remote analyzer, that is a dedicated VLAN on a different switch).

Chapter 76

Interpreting the Enterprise-Specific VLAN MIB

The enterprise-specific VLAN MIB for EX-series Ethernet switches, whose object identifier is {jnxExSwitching 5}, contains information about prestandard IEEE 802.10 VLANS and their association with LAN Emulation Clients (LAC). Devices with prestandard implementation maintain port groupings and associated filters that are used to form a virtual bridge.

The enterprise-specific VLAN MIB leverages the following objects and data types from standard MIBs, RFCs, and Juniper Networks enterprise-specific MIBs:

- Integer 32 and IpAddress–From SNMPv2–SMI
- MacAddress, DisplayString, and TruthValue–From SNMPv2–TC
- InterfaceIndex–From IF MIB
- InetAddress and InetAddressType–From Inet Address MIB
- jnxExVlan–From Juniper Networks enterprise-specific SMI MIB

For a downloadable version of this MIB, see
www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-vlan.txt

This section contains the following topcs:

NOTE: jnxVlanTable, jnxVlanInterfaceTable, and jnxVlanPortGroupTable have been deprecated and are replaced by jnxExVlanTable, jnxExVlanInterfaceTable, and jnxExVlanPortGroupTable. However, the JUNOS software will continue to support the deprecated tables until the JUNOS Software, Release 9.5.

VLAN Configuration Table

NOTE: jnxVlanTable has been deprecated and is replaced by jnxExVlanTable. However, the JUNOS software will continue to support jnxExVlanTable until Release 9.5.

The jnxVlanTable, whose object identifier is {jnxVlanMIbObjects 1}, contains VLAN names and properties. Each jnxVlanEntry contains the entries listed in Table 212 on page 648.

Table 212: jnxVlanTable

Object	Object ID	Description
jnxVlanName	jnxVlanEntry 1	Contains the name of the VLAN, VLAN name can be a string of not more than 255 characters.
jnxVlanID	jnxVlanEntry 2	Contains the identifier used internally by the device to reference the VLAN. This object can be an integer value in the range 1 through 4094.
jnxVlanType	jnxVlanEntry 3	Denotes the type of the VLAN. This object uses the following integer values: ■ 1–Static ■ 2–Dynamic The default value for this object is 1, static.
jnxVlanPortGroupInstance	jnxVlanEntry 4	Contains the index that identifies the subtree in the jnxVlanPortGroupTable.
jnxVlanMacListInstance	jnxVlanEntry 5	Contains an index that identifies the subtree to retrieve the list of MAC addresses to the jnxVlanMacListTable subtree to retrieve in

jnxExVlanTable

jnxExVlanTable, whose object identifier is {jnxVlanMIBObjects 5}, replaces the deprecated jnxVlanTable and contains the objects listed in Table 213 on page 648.

Table 213: jnxExVlanTable

Object	Object ID	Description
jnxExVlanID	jnxExVlanEntry 1	Contains the identifier used internally by the device to reference the VLAN. This object can be an integer value in the range 1 through 4094.
jnxExVlanName	jnxExVlanEntry 2	Contains the name of the VLAN, VLAN name can be a string of not more than 255 characters.

Table 213: jnxExVlanTable *(continued)*

Object	Object ID	Description
jnxExVlanType	jnxExVlanEntry 3	Denotes the type of the VLAN. This object uses the following integer values: ■ 1–Static ■ 2–Dynamic The default value for this object is 1, static.
jnxExVlanPortGroupInstance	jnxExVlanEntry 4	Contains the index that identifies the subtree in the jnxVlanPortGroupTable.

VLAN Interfaces Table

NOTE: jnxVlanInterfaceTable has been deprecated and is replaced by jnxExVlanInterfaceTable. However, the JUNOS software will continue to support jnxVlanInterfaceTable until Release 9.5.

The jnxVlanInterfaceTable, whose object identifier is {jnxVlanMIBObjects 2 }, contains information about the Layer 3 properties of VLANs. Each jnxVlanInterfaceEntry, indexed with jnxVlanName, contains the objects listed in Table 214 on page 649.

Table 214: jnxVlanInterfaceTable

Object	Object ID	Description
jnxVlanInterfaceIpAddress	jnxVlanInterfaceEntry 1	Contains the IP address of the interface.
jnxVlanInterfaceProtocol	jnxVlanInterfaceEntry 2	Specifies the protocol used.
jnxVlanInterfaceSubNetMask	jnxVlanInterfaceEntry 3	Specifies the subnet mask of the VLAN,
jnxVlanInterfaceBroadcastAddress	jnxVlanInterfaceEntry 4	Specifies the broadband address of the VLAN.
jnxVlanInterfaceDescription	jnxVlanInterfaceEntry 5	Contains a description for the VLAN. This object can contain a string of not more than 255 characters.
jnxVlanInterfaceAdminStatus	jnxVlanInterfaceEntry 6	Denotes the administration status of the VLAN.
jnxVlanInterfaceOperStatus	jnxVlanInterfaceEntry 7	Denotes the operational status of the VLAN.
jnxVlanSnmpIfIndex	jnxVlanInterfaceEntry 8	Specifies the SNMP IF Index for the interface.

jnxExVlanInterfaceTable

jnxExVlanInterfaceTable, whose object identifier is {jnxVlanMIBObjects 6}, replaces the deprecated jnxVlanInterfaceTable and contains the objects listed in Table 215 on page 650.

Table 215: jnxExVlanInterfaceTable

Object	Object ID	Description
jnxExVlanInterfaceProtocol	jnxExVlanInterfaceEntry 1	Specifies the protocol used.
jnxExVlanInterfaceIpAddress	jnxExVlanInterfaceEntry 2	Contains the IP address of the interface.
jnxExVlanInterfacePrefixLength	jnxExVlanInterfaceEntry 3	Specifies the subnet mask of the VLAN,
jnxExVlanInterfaceBroadcastAddress	jnxExVlanInterfaceEntry 4	Specifies the broadband address of the VLAN.
jnxExVlanInterfaceDescription	jnxExVlanInterfaceEntry 5	Contains a description for the VLAN. This object can contain a string of not more than 255 characters.
jnxExVlanInterfaceAdminStatus	jnxExVlanInterfaceEntry 6	Denotes the administration status of the VLAN.
jnxExVlanInterfaceOperStatus	jnxExVlanInterfaceEntry 7	Denotes the operational status of the VLAN.
jnxExVlanSnmpIfIndex	jnxExVlanInterfaceEntry 8	Specifies the SNMP IF Index for the interface.

Port Group Table

NOTE: jnxVlanPortGroupTable has been deprecated and is replaced by jnxExVlanPortGroupTable. However, the JUNOS software will continue to support jnxVlanPortGroupTable until Release 9.5.

The jnxVlanPortGroupTable contains information about port groupings. Each jnxVlanPortGroupEntry contains the objects listed in Table 216 on page 650.

Table 216: jnxVlanPortGroupTable

Object	Object ID	Description
jnxVlanPortGroupIndex	jnxVlanPortGroupEntry 1	Uniquely identifies a port group.
jnxVlanPort	jnxVlanPortGroupEntry 2	Specifies the port on the VLAN with which this port group is associated.

Table 216: jnxVlanPortGroupTable *(continued)*

Object	Object ID	Description
jnxVlanPortStatus	jnxVlanPortGroupEntry 3	Shows the status of association between the port and the VLAN. This object uses the following integer values: ■ 1–autoActive: The port is part of the VLAN because the switch has automatically added the port. ■ 2–allowed: The port has been configured to be part of the VLAN, and will be allowed to be part of the VLAN, if the port meets all other requirements. ■ 3–allowedActive: The port has been configured to be part of the VLAN, and will be allowed to be part of the VLAN, if the port meets all other requirements. However, unlike in the case of allowed ports, this port has a device that is participating in the VLAN associated with the port. ■ 4–allowedNotAvail: The port is active on some other VLAN, and is not available currently. This value applies to devices that do not allow a port to be part of more than one VLANs at the same time. ■ 5–notAssociated: The port is part of a port group that is not associated with the VLAN.

jnxExVlanPortGroupTable

jnxExVlanPortGroupTable replaces the deprecated jnxVlanPortGroupTable and contains the objects listed in Table 217 on page 651.

Table 217: jnxExVlanPortGroupTable

Object	Object ID	Description
jnxExVlanPortGroupIndex	jnxExVlanPortGroupEntry 1	Uniquely identifies a port group.
jnxExVlanPort	jnxExVlanPortGroupEntry 2	Specifies the port on the VLAN with which this port group is associated.

Table 217: jnxExVlanPortGroupTable *(continued)*

Object	Object ID	Description
jnxExVlanPortStatus	jnxExVlanPortGroupEntry 3	Shows the status of association between the port and the VLAN. This object uses the following integer values: ■ 1–autoActive: The port is part of the VLAN because the switch has automatically added the port. ■ 2–allowed: The port has been configured to be part of the VLAN, and will be allowed to be part of the VLAN, if the port meets all other requirements. ■ 3–allowedActive: The port has been configured to be part of the VLAN, and will be allowed to be part of the VLAN, if the port meets all other requirements. However, unlike in the case of allowed ports, this port has a device that is participating in the VLAN associated with the port. ■ 4–allowedNotAvail: The port is active on some other VLAN, and is not available currently. This value applies to devices that do not allow a port to be part of more than one VLANs at the same time. ■ 5–notAssociated: The port is part of a port group that is not associated with the VLAN. Default value for this object is allowed.

MAC List Table

The jnxVlanMacListTable, whose object identifier is {jnxVlanMIBObjects 4}, contains information about MAC address lists. Each jnxVlanMacListEntry contains the objects listed in Table 218 on page 652.

Table 218: jnxVlanMacListTable

Object	Object ID	Description
jnxVlanMacListIndex	jnxVlanMacListEntry 1	Uniquely identifies a MAC address list.
jnxVlanMacAddress	jnxVlanMacListEntry 2	Specifies a MAC address that belongs to the group.

Chapter 77

Interpreting the Enterprise-Specific Virtual Chassis MIB

The enterprise-specific Virtual Chassis MIB, whose object identifier is {jnxExSwitching 4} contains information about virtual chassis on EX-series Ethernet switches. EX 4200 switches allow you to connect two or more switches (maximum ten) together to form a virtual chassis that can be managed as a single network element. The switches can be connected through dedicated 64 Gbps virtual chassis ports (VCPs) or through 10 Gbps fiber uplink ports.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-virtualchassis.txt.

This chapter contains the following section:

Virtual Chassis Member Table

The jnxVirtualChassisMemberTable, whose object identifier is {jnxVirtualChassisMemberMIB 1}, contains information about the devices that form the virtual chassis. Each jnxVirtualChassisMemberEntry contains the objects listed in Table 219 on page 653.

Table 219: jnxVirtualChassisMemberTable

Object	Object ID	Description
jnxVirtualChassisMemberId	jnxVirtualChassisMemberEntry 1	Uniquely identifies a virtual chassis member. This object contains integer values in the range 0 through 9.
jnxVirtualChassisMemberSerialnumber	jnxVirtualChassisMemberEntry 2	Contains the serial number of the virtual chassis member.
jnxVirtualChassisMemberRole	jnxVirtualChassisMemberEntry 3	Specifies the type of virtual chassis member. This object uses the following integer values: ■ 1–Master ■ 2–Backup ■ 3–Linecard

Table 219: jnxVirtualChassisMemberTable *(continued)*

Object	Object ID	Description
jnxVirtualChassisMemberMacAddBase	jnxVirtualChassisMemberEntry 4	Specifies the media access control (MAC) address base for the virtual-chassis member.
jnxVirtualChassisMemberSWVersion	jnxVirtualChassisMemberEntry 5	Identifies the JUNOS Base operating system software suite that is installed on the virtual chassis member.
jnxVirtualChassisMemberPriority	jnxVirtualChassisMemberEntry 6	Specifies the priority of the virtual-chassis member. This object contains integer values in the range 1 through 255.
jnxVirtualChassisMemberUptime	jnxVirtualChassisMemberEntry 7	Specifies the virtual chassis member uptime.

Chapter 78

Interpreting the Enterprise-Specific PAE Extension MIB

The enterprise-specific Port Access Entity (PAE) Extension MIB, whose object identifier is {jnxExSwitching 3}, is an extension of the standard IEEE802.1x PAE Extension MIB, and contains information for Static MAC Authentication. The enterprise-specific PAE Extension MIB has two branches, jnxPaeExtensionMIBNotification and jnxPaeExtensionMIBObjects.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-pae-extension.txt.

This chapter contains the following sections:

jnxAuthProfileName

The jnxAuthProfileName object, whose object identifier is {jnxPaeExtensionMIBObjects 1}, contains the authentication profile name. The authentication profile contains the RADIUS server IP address, port number, and the secret key.

Authentication Configuration Extension Table

The jnxPaeAuthConfigTable, whose object identifier is {jnxPaeExtensionMIBObjects 2}, contains the configuration objects for the Authenticator PAE associated with each port. Each jnxPaeAuthConfigEntry, indexed with dot1xPaePortNumber from the standard IEEE802.1x PAE Extension MIB, contains the objects listed in Table 220 on page 655.

Table 220: jnxPaeAuthConfigTable

Object	Object ID	Description
jnxPaeAuthConfigMacAuthStatus	jnxPaeAuthConfigEntry 1	Shows whether MAC authentication is enabled on the specified PAE port.

Table 220: jnxPaeAuthConfigTable *(continued)*

Object	Object ID	Description
jnxPaeAuthConfigGuestVlan	jnxPaeAuthConfigEntry 2	Specifies the VLAN to which an unauthenticated client moves. This object can contain a string of not more than 255 characters.
jnxPaeAuthConfigNumberRetries	jnxPaeAuthConfigEntry 3	Specifies the maximum number of failed authentication retries allowed on an interface before the interface transitions into quiet period. No authentication happens on the interface during the quiet period.

Static MAC List Authentication Bypass Table

The jnxStaticMacAuthBypassTable, whose object identifier is {jnxPaeExtensionMIBObjects 3}, contains a static list of MAC addresses specified by a user. The static MAC address list contains the MAC addresses of clients associated with a port. The clients whose MAC addresses are in the MAC address list are allowed to connect to the port without authentication. 802.1X or MAC authentication process is initiated for a connection request only when a matching entry is not available for the client in the jnxStaticMacAuthBypassTable.

The jnxStaticMacAuthBypassTable allows devices like printers that do not support 802.1X to connect to 802.1X–enabled ports.

Each jnxStaticMacAuthBypassEntry, whose object identifier is {jnxStaticMacAuthBypassTable 1}, contains the objects listed in Table 221 on page 656.

Table 221: jnxStaticMacAuthBypassTable

Object	Object ID	Description
jnxStaticMacAddress	jnxStaticMacAuthBypassEntry 1	Specifies the MAC address of the client connected to the PAE port.
jnxStaticMacVlanName	jnxStaticMacAuthBypassEntry 2	Specifies the VLAN to which the client is assigned.

jnxStaticMacAuthBypassIfTable

The jnxStaticMacAuthBypassIfTable, whose object identifier is {jnxPaeExtensionMIBObjects 4}, contains a list of interfaces associated with the MAC addresses in the jnxStaticMacAuthBypassTable.

Each jnxStaticMacAuthBypassIfEntry, whose object identifier is {jnxStaticMacAuthBypassIfTable 1}, is indexed with jnxStaticMacAddress (from jnxStaticMacAuthBypassTable) and jnxStaticMacIfIndex. The jnxStaticMacIfIndex contains

a list of interfaces from which a MAC address is allowed. If the interface associated with a MAC address does not match with the one stored in this entry, the authentication bypass does not happen.

Chapter 79

Interpreting the Enterprise-Specific Secure Access Port MIB

The enterprise-specific Secure Access Port MIB for EX-series Ethernet switches, whose object identifier is {jnxExSwitching }, contains information about secure access port configuration. The EX-series Ethernet switches use DHCP snooping and dynamic ARP inspection mechanisms to extend security capabilities on the interfaces.

The enterprise-specific Secure Access Port MIB also supports features like MAC address limiting, IP Source Guard, MAC Source Guard, and Storm Control.

For a downloadable version of this MIB, see www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-secure-access-port.txt.

This chapter contains the following sections:

Port Security Table for VLAN

The jnxSecAccessPortVlanTable, whose object identifier is {jnxSecAccessPortMIBObjects 1}, contains information related to DHCP Snooping and dynamic ARP inspection configuration for VLANs. When a VLAN gets added to a device that supports jnxSecAccessPortVlanTable, a corresponding jnxSecAccessPortVlanEntry gets added to the table. Each jnxSecAccessPortVlanEntry indicates whether DHCP Snooping and dynamic ARP inspection are enabled or disabled for a VLAN, and contains the objects listed in Table 222 on page 660.

Table 222: jnxSecAccessPortVlanTable

Object	Object ID	Description
jnxSecAccessVlanName	jnxSecAccessPortVlanEntry 1	Contains the name of the VLAN to which the jnxSecAccessPortVlanEntry maps. This object can contain a string of not more than 255 characters.
jnxSecAccessVlanDhcpSnoopStatus	jnxSecAccessPortVlanEntry 2	Shows whether DHCP snooping is enabled (true) or disabled (false) on the VLAN
jnxSecAccessVlanDAIStatus	jnxSecAccessPortVlanEntry 3	Shows whether dynamic ARP inspection is enabled (true) or disabled (false) on the VLAN.

Port Security Table for Interface

The jnxSecAccessPortIfTable, whose object identifier is {jnxSecAccessPortMIBObjects 2}, contains the following information:

- Trust state and rate limit of each interface for DHCP snooping
- Maximum number of MAC addresses that the interface can learn
- IP source guard and MAC source guard status for each interface

Each jnxSecAccessPortIfEntry contains the objects listed in Table 223 on page 660.

Table 223: jnxSecAccessPortIfTable

Object	Object ID	Description
jnxSecAccessdsIfTrustState	jnxSecAccessPortIfEntry 1	Contains one of the following values to indicate whether the interface is trusted for DHCP snooping: ■ true–the interface is trusted; that is, the packets coming to the interfaces are forwarded without checking. ■ false–the interface is not trusted; that is, the packets coming to the interface are subjected to DHCP checks.
jnxSecAccessdsIfRateLimit	jnxSecAccessPortIfEntry 2	Indicates the rate limit value for DHCP snooping. The rate limit is specified in packets per second unit. A value of 0 indicates that no rate limit is applied for DHCP traffic on the interface.
jnxSecAccessIfMacLimit	jnxSecAccessPortIfEntry 3	Specifies the maximum number of MAC address entries allowed on the interface. The default value is 5. A value of 0 indicates that no threshold limit is set for the interface. When the value for this object is 0, the value of the corresponding jnxSecAccessIfMacLimitExceed does not have any effect.

Table 223: jnxSecAccessPortIfTable *(continued)*

Object	Object ID	Description
jnxSecAccessIfMacLimitExceed	jnxSecAccessPortIfEntry 4	Specifies the action to be taken when the number of MAC addresses exceeds the value set for jnxSecAccessIfMacLimit. This object returns one of the following JnxMacLimitExceededAction values: ■ 1–none: Indicates that no MAC address limit is set for the interface, and that no action is required. ■ 2–drop: Disables the MAC address learning on the interface because the number of MAC addresses has exceeded the maximum limit. Generates a notification to indicate that the number of MAC addresses has exceeded the maximum number. MAC address learning restarts only after the number of MAC addresses returns to a value within the maximum allowed number. ■ 3–alarm: Generates a notification to indicate that the number of MAC addresses has exceeded the maximum limit. ■ 4–shutdown: Blocks the traffic on the interface because the number of MAC addresses has exceeded the maximum limit. Generates a notification to indicate the status. **NOTE:** The value for this object is invalid if jnxIfMacLimit is set to 0.
jnxSecAccessIfIpSrcGuardStatus	jnxSecAccessPortIfEntry 5	Indicates whether IP source guard is enabled (true) or disabled (false) on the interface
jnxSecAccessIfMacSrcGuardStatus	jnxSecAccessPortIfEntry 6	Indicates whether MAC source guard is enabled (true) or disabled (false) on the interface.

Storm Control Table

The jnxStormCtlTable, whose object identifier is {jnxSecAccessPortMIBObjects 3} contains information about different traffic types, the storm control parameters such as rising threshold and falling threshold associated with each type, and the action to be taken when the traffic exceeds the rising threshold level.

EachjnxStormCtlEntry, indexed with ifIndex and jnxStormCtlIfTrafficType, contains the objects listed in Table 224 on page 661.

Table 224: jnxStormCtlTable

Object	Object ID	Description
jnxStormCtlIfTrafficType	jnxStormCtlEntry 1	Indicates the type of traffic. This object uses the following integer values: ■ 1–Broadcast ■ 2–Multicast ■ 3–Unicast

Table 224: jnxStormCtlTable *(continued)*

Object	Object ID	Description
jnxStormCtlRisingThreshold	jnxStormCtlEntry 2	Specifies the rising threshold value in packets per second unit. Storm control action begins when the traffic exceeds this value.
jnxStormCtlFallingThreshold	jnxStormCtlEntry 3	Specifies the falling threshold value in packets per second unit. Storm control action stops when the traffic drops to this value.
jnxStormCtlAction	jnxStormCtlEntry 4	Specifies the action to be taken when the traffic exceeds the rising threshold. This object returns one of the following integer values: ■ 1–shutdown: shuts down the port. ■ 2–filter: applies a policy filter for the corresponding traffic type on the interface. The default value is 1, shutdown.

DHCP Snooping Notification

The jnxSecAccessdsRateLimitCrossed notification, whose object identifier is {jnxSecAccessPortMIBNotifications 1}, is generated when the number of DHCP packets from a source that is not trusted exceeds the jnxSecAccessdsIfRateLimit.

MAC Limit Exceeded Notification

The jnxSecAccessIfMacLimitExceeded notification, whose object identifier is {jnxSecAccessPortMIBNotifications 2}, is generated when the number of MAC addresses learned by the interface exceeds the maximum number of MAC addresses (jnxSecAccessIfMacLimit) allowed on the interface, and shows the value for jnxSecAccessIfMacLimitExceed.

Storm Event Notification

The jnxStormEventNotification notification, whose object identifier is {jnxSecAccessPortMIBNotifications 3}, is generated when the traffic on the interface exceeds the jnxStormCtlRisingThreshold value.

Chapter 80

Interpreting the Enterprise-Specific SPU Monitoring MIB

The enterprise-specific Services Processing Units (SPU) Monitoring Objects MIB, jnxJsSecPolicyMIB, whose object ID is {jnxJsSPUMonitoringMIB 1}, defines the MIB for SPU monitoring for SRX 5600 and SRX 5800 services gateways.

Related MIB objects include the following:

- jnxJsSPUMonitoringObjectsTable, whose object identifier is {jnxJsSPUMonitoringMIB 1}, provides statistics on the utilization of SPUs.
- jnxJsSPUMonitoringCurrentTotalSession, whose object identifier is {jnxJsSPUMonitoringMIB 2}, provides information about the total number of sessions in use at the system level.
- jnxJsSPUMonitoringMaxTotalSession, whose object identifier is {jnxJsSPUMonitoringMIB 3}, provides information about the maximum level of sessions possible at the system level.

For a downloadable version of this MIB, see
www.juniper.net/techpubs/software/junos/junos94/swconfig-net-mgmt/mib-jnx-js-spu-monitoring.txt

This chapter contains the following topic:

SPU Monitoring Objects Table

The object identifier for the jnxJsMonitoringObjectsTable is {jnxJsSPUMonitoringMIB 1}. SPU monitoring objects provide statistical information related to utilization of SPUs. Table 225 on page 663 describes the SPU monitoring objects.

Table 225: SPU Monitoring Objects Table

Object	Object ID	Description
jnxJsSPUMonitoringObjects	jnxJsSPUMonitoringObjectsTable 1	Each entry collects information about the memory utilization for an SPU.

Table 225: SPU Monitoring Objects Table *(continued)*

Object	Object ID	Description
JnxJsSPUMonitoringObjectsEntry		Indexes: ■ jnxJsSPUMonitoringIndex ■ jnxJsSPUMonitoringFPCIndex ■ jnxJsSPUMonitoringSPUIndex Sequence of parameters: ■ jnxJsSPUMonitoringCPUUsage ■ jnxJsSPUMonitoringMemoryUsage ■ jnxJsSPUMonitoringCurrentFlowSession ■ jnxJsSPUMonitoringMaxFlowSession ■ jnxJsSPUMonitoringCurrentCPSession ■ jnxJsSPUMonitoringMaxCPSession
jnxJsSPUMonitoringIndex	jnxJsSPUMonitoringObjects 1	Indicates an SPU's overall index in the system.
jnxJsSPUMonitoringFPCIndex	jnxJsSPUMonitoringObjects 2	Indicates the FPC on which the SPU is.
jnxJsSPUMonitoringSPUIndex	jnxJsSPUMonitoringObjects 3	Indicates the index of an SPU inside the FPC.
jnxJsSPUMonitoringCPUUsage	jnxJsSPUMonitoringObjects 4	Indicates the current utilization percentage of an SPU.
jnxJsSPUMonitoringMemoryUsage	jnxJsSPUMonitoringObjects 5	Indicates the current percentage of memory usage of an SPU(CPU).
jnxJsSPUMonitoringCurrentFlowSession	jnxJsSPUMonitoringObjects 6	Indicates the current flow sessions of an SPU.
jnxJsSPUMonitoringMaxFlowSession	jnxJsSPUMonitoringObjects 7	Indicates the maximum flow sessions of an SPU.
jnxJsSPUMonitoringCurrentCPSession	jnxJsSPUMonitoringObjects 8	Indicates the current number of central point (CP) sessions on an SPU.
jnxJsSPUMonitoringMaxCPSession	jnxJsSPUMonitoringObjects 9	Indicates the maximum number of CP sessions on an SPU.

Part 8
Accounting Options

Chapter 81

Accounting Options Overview

This chapter contains the following topic:

Accounting Options Overview

An accounting profile represents common characteristics of collected accounting data, including the following:

- Collection interval
- File to contain accounting data
- Specific fields and counter names on which to collect statistics

You can configure multiple accounting profiles, as described in Table 226 on page 667.

Table 226: Types of Accounting Profiles

Type of Profile	Description
Interface profile	Collects the specified error and statistic information.
Filter profile	Collects the byte and packet counts for the counter names specified in the filter profile.
MIB profile	Collects selected MIB statistics and logs them to a specified file.
Routing Engine profile	Collects selected Routing Engine statistics and logs them to a specified file.
Class usage profile	Collects class usage statistics and logs them to a specified file.

Chapter 82

Configuring Accounting Options

This chapter contains the following topics:

Accounting Options Configuration

This topic contains the following sections:

Accounting Options—Full Configuration

To configure accounting options, include the following statements at the [edit accounting-options] hierarchy level:

```
accounting-options {
   class-usage-profile profile-name {
      file filename;
      interval minutes;
      destination-classes {
         destination-class-name;
      }
      source-classes {
```

```
            source-class-name;
        }
        file filename {
            archive-sites {
                site-name;
            }
            files number;
            nonpersistent;
            size bytes;
            source-classes time
            transfer-interval minutes;
        }
        filter-profile profile-name {
            counters {
                counter-name;
            }
            file filename;
            interval minutes;
        }
    }
    interface-profile profile-name {
        fields {
            field-name;
        }
        file filename;
        interval minutes;
    }
    mib-profile profile-name {
        file filename;
        interval seconds;
        objects-names {
            mib-object-name;
        }
        operation operation-name;
    }
    routing-engine-profile profile-name {
        fields {
            field-name;
        }
        file filename;
        interval minutes;
    }
}
```

By default, accounting options are disabled.

Minimum Accounting Options Configuration

To enable accounting options on the router, you must perform at least the following tasks:

- Configure accounting options by including a file statement and one or more source-class-usage, destination-class-profile, filter-profile, interface-profile, mib-profile or routing-engine-profile statements at the [edit accounting-options] hierarchy level:

```
[edit]
accounting-options {
   class-usage-profile profile-name {
      file filename;
      interval minutes;
      source-classes {
         source-class-name;
         destination-classes {
            destination-class-name;
         }
      }
      file filename {
         archive-sites {
            site-name;
         }
         files number;
         size bytes;
         transfer-interval minutes;
      }
      filter-profile profile-name {
         counters {
            counter-name;
         }
         file filename;
         interval minutes;
      }
      interface-profile profile-name {
         fields {
            field-name;
         }
         file filename;
         interval minutes;
      }
      mib-profile profile-name {
         file filename;
         interval minutes;
         objects-names {
            mib-object-name;
         }
         operation operation-name;
      }
      routing-engine-profile profile-name{
         fields {
            field-name;
         }
         file filename;
         interval minutes;
      }
   }
}
```

- Apply the profiles to the chosen interfaces or filters.

  Apply an interface profile to a physical or logical interface by including the accounting-profile statement at either the [edit interfaces *interface-name*] or the

[edit interfaces *interface-name* unit *number*] hierarchy level. For more information on interface profiles, see the *JUNOS Network Interfaces Configuration Guide*.

```
[edit interfaces]
interface-name {
    accounting-profile profile-name;
    unit number {
        accounting-profile profile-name;
    }
}
```

NOTE: You do not apply destination class profiles to interfaces. Although the interface needs to have the destination-class-usage statement configured, the destination class profile automatically finds all interfaces with the destination class configured.

Apply a filter profile to a firewall filter by including the accounting-profile statement at the [edit firewall filter *filter-name*] hierarchy level:

```
[edit firewall]
filter filter-name {
    accounting-profile profile-name;
}
```

You do not need to apply the Routing Engine profile to an interface because the statistics are collected on the Routing Engine itself.

Configuring Files

An accounting profile specifies what statistics should be collected and written to a log file. To configure an accounting-data log file, include the file statement at the [edit accounting-options] hierarchy level:

```
[edit accounting-options]
file filename {
    archive-sites {
        site-name;
    }
    files number;
    nonpersistent;
    size bytes;
    start-time time;
    transfer-interval minutes;
}
```

filename is name of file in which to write accounting data.

If the filename contains spaces, enclose it in quotation marks (" "). The filename cannot contain a forward slash (;/;). The file is created in the /var/log directory and can contain data from multiple profiles.

All accounting-data log files include header and trailer sections that start with a # in the first column. The header contains the file creation time, the hostname, and the columns that appear in the file. The trailer contains the time that the file was closed.

Whenever any configured value changes that affects the columns in a file, the file creates a new profile layout record that contains a new list of columns.

You must configure the file size; all other properties are optional.

Configuring the Storage Location of the File

On J-series Services Routers, the files are stored by default on the compact flash drive. To configure the storage location of the files in the mfs/var/log directory (on DRAM) instead of the cf/var/log directory (on the compact flash drive), include the nonpersistent statement at the [edit accounting-options file *filename*] hierarchy level:

```
[edit accounting-options file filename]
nonpersistent;
```

This feature is useful for minimizing read/write traffic on the router's compact flash drive.

NOTE: If log files for accounting data are stored on DRAM, these files are lost when you reboot the router. Therefore, you should backup these files periodically.

Configuring the Maximum Size of the File

To configure the maximum size of the files, include the size statement at the [edit accounting-options file *filename*] hierarchy level:

```
[edit accounting-options file filename]
size bytes;
```

The size statement is the maximum size of the log file, in bytes, kilobytes (KB), megabytes (MB), or gigabytes (GB). The minimum value for *bytes* is 256 KB. You must configure *bytes*; the remaining attributes are optional.

Configuring the Maximum Number of Files

To configure the maximum number of files, include the files statement at the [edit accounting-options file *filename*] hierarchy level:

```
[edit accounting-options file filename]
files number;
```

The files statement specifies the maximum number of files. When a log file (for example, profilelog) reaches its maximum size, it is renamed profilelog.0, then profilelog.1, and so on, until the maximum number of log files is reached. Then the oldest log file is overwritten. The minimum value for *filenumber* is 3 and the default value is 10.

Configuring the Start Time for File Transfer

To configure the start time for transferring files, include the start-time statement at the [edit accounting-options file *filename*] hierarchy level:

```
[edit accounting-options file filename]
start-time time;
```

The start-time statement specifies a start time for file transfer (YYYY-MM-DD.HH:MM). For example, 10:00 a.m. on January 30, 2007 would be configured as 2007-01-30.10:00.

Configuring the Transfer Interval of the File

To configure the transfer interval of the files, include the transfer-interval statement at the [edit accounting-options file *filename*] hierarchy level:

```
[edit accounting-options file filename]
transfer-interval minutes;
```

The range for transfer-interval is 5 through 2880 minutes. The default is 30 minutes.

Configuring Archive Sites

After a file reaches its maximum size or the transfer-interval time is exceeded, the file is closed, renamed, and, if you configured an archive site, transferred to a remote host. To configure archive sites, include the archive-sites statement at the [edit accounting-options file *filename*] hierarchy level:

```
[edit accounting-options file filename]
archive-sites {
    site-name;
}
```

site-name is any valid FTP URL. For more information on how to specify valid FTP URLs, see the *JUNOS System Basics Configuration Guide*. You can specify more than one URL, in any order. When a file is archived, the router attempts to transfer the file to the first URL in the list, trying the next site in the list only if the transfer does not succeed. The log file is stored at the archive site with a filename of the format *router-name_log-filename_timestamp*.

Configuring the Interface Profile

An interface profile specifies the information collected and written to a log file. You can configure a profile to collect error and statistic information for input and output packets on a particular physical or logical interface.

To configure an interface profile, include the interface-profile statement at the [edit accounting-options] hierarchy level:

```
[edit accounting-options]
interface-profile profile-name {
    fields {
        field-name;
    }
    file filename;
    interval minutes;
}
```

Each accounting profile must have a unique *profile-name*. To apply a profile to a physical or logical interface, include the accounting-profile statement at either the [edit interfaces *interface-name*] or the [edit interfaces *interface-name* unit *number*] hierarchy level. You can also apply a accounting profile at the [edit firewall family *family-type* filter *filter-name*] hierarchy level. For more information, see the *JUNOS Policy Framework Configuration Guide*.

To configure an interface profile, you perform the tasks described in the following sections:

- Configuring Fields on page 675
- Configuring the File Information on page 675
- Configuring the Interval on page 676
- Example: Configuring the Interface Profile on page 676

Configuring Fields

An interface profile must specify what statistics are collected. To configure which statistics should be collected for an interface, include the fields statement at the [edit accounting options interface-profile *profile-name*] hierarchy level:

```
[edit accounting-options interface-profile profile-name]
fields {
    field-name;
}
```

Configuring the File Information

Each accounting profile logs its statistics to a file in the /var/log directory.

To configure which file to use, include the file statement at the [edit accounting options interface-profile *profile-name*] hierarchy level:

```
[edit accounting-options interface-profile profile-name]
```

```
file filename;
```

You must specify a file statement for the interface profile that has already been configured at the [edit accounting-options] hierarchy level.

Configuring the Interval

Each interface with an accounting profile enabled has statistics collected once per interval time specified for the accounting profile. Statistics collection time is scheduled evenly over the configured interval. To configure the interval, include the interval statement at the [edit accounting-options interface-profile *profile-name*] hierarchy level:

```
[edit accounting-options interface-profile profile-name]
interval minutes;
```

NOTE: The minimum interval allowed is 1 minute. Configuring a low interval in an accounting profile for a large number of interfaces might cause serious performance degradation.

The range for the interval statement is 1 through 2880 minutes. The default is 30 minutes.

Example: Configuring the Interface Profile

Configure the interface profile:

```
[edit]
accounting-options {
    file if_stats {
        size 40 files 5;
    }
    interface-profile if_profile1 {
        file if_stats;
        interval 30;
        fields {
            input-bytes;
            output-bytes;
            input-packets;
            output-packets;
            input-multicast;
            output-multicast;
        }
    }
    interface-profile if_profile2 {
        file if_stats;
        interval 30;
        fields {
            input-bytes;
            output-bytes;
            input-packets;
            output-packets;
            input-multicast;
```

```
            output-multicast;
        }
    }
    interfaces {
        xe-1/0/0 {
            accounting-profile if_profile1;
            unit 0 {
                accounting-profile if_profile2;
                ...
            }
        }
    }
}
```

The two interface profiles, if-profile1 and if-profile2, write data to the same file, if-stats. The if-stats file might look like the following:

```
#FILE CREATED 976823478 2000-12-14-19:51:18
#hostname host
#profile-layout
if_profile2,epoch-timestamp,interface-name,snmp-index,input-bytes,output-bytes,
input-packets,output-packets,input-multicast,output-multicast
#profile-layout
if_profile1,epoch-timestamp,interface-name,snmp-index,input-bytes,output-bytes,
input-packets
if_profile2,976823538,xe-1/0/0.0,8,134696815,3681534,501088,40723,0,0
if_profile1,976823538,xe-1/0/0,7,134696815,3681534,501088
...
#FILE CLOSED 976824378 2000-12-14-20:06:18
```

Configuring the Filter Profile

A filter profile specifies error and statistics information collected and written to a file. A filter profile must specify counter names for which statistics are collected.

To configure a filter profile, include the filter-profile statement at the [edit accounting-options] hierarchy level:

```
[edit accounting-options]
filter-profile profile-name {
    counters {
        counter-name;
    }
    file filename;
    interval minutes;
}
```

To apply the filter profile, include the accounting-profile statement at the [edit firewall filter *filter-name*] hierarchy level. For more information on firewall filters, see the *JUNOS Network Interfaces Configuration Guide*.

To configure a filter profile, perform the tasks described in the following sections:

- Configuring the Counters on page 678
- Configuring the File Information on page 678
- Configuring the Interval on page 678

Configuring the Counters

Statistics are collected for all counters specified in the filter profile. To configure the counters, include the counters statement at the [edit accounting-options filter-profile *profile-name*] hierarchy level:

```
[edit accounting-options filter-profile profile-name]
counters {
}
```

Configuring the File Information

Each accounting profile logs its statistics to a file in the /var/log directory.

To configure which file to use, include the file statement at the [edit accounting-options filter-profile *profile-name*] hierarchy level:

```
[edit accounting-options filter-profile profile-name]
file filename;
```

You must specify a filename for the filter profile that has already been configured at the [edit accounting options] hierarchy level.

NOTE: If the configured file size or transfer interval is exceeded, the JUNOS software closes the file and starts a new one. By default, the transfer interval value is 30 minutes. If the transfer interval is not configured, the JUNOS software closes the file and starts a new one when the file size exceeds its configured value or the default transfer interval value exceeds 30 minutes. To avoid transferring files every 30 minutes, specify a different value for the transfer interval.

Configuring the Interval

Each filter with an accounting profile enabled has statistics collected once per interval time specified for the accounting profile. Statistics collection time is scheduled evenly over the configured interval. To configure the interval, include the interval statement at the [edit accounting-options filter-profile *profile-name*] hierarchy level:

```
[edit accounting-options filter-profile profile-name]
interval;
```

NOTE: The minimum interval allowed is 1 minute. Configuring a low interval in an accounting profile for a large number of filters might cause serious performance degradation.

The range for the interval statement is 1 through 2880 minutes. The default is 30 minutes.

Example: Configuring a Filter Profile

Configure a filter profile:

```
[edit]
accounting-options {
   file fw_accounting {
      size 500k files 4;
   }
   filter-profile fw_profile1 {
      file fw_accounting;
      interval 60;
      counters {
         counter1;
         counter2;
         counter3;
      }
   }
}
firewall {
   filter myfilter {
      accounting-profile fw_profile1;
      ...
      term accept-all {
         then {
            count counter1;
            accept;
         }
      }
   }
}
```

The filter profile, fw-profile1, writes data to the file fw_accounting. The file might look like the following:

```
#FILE CREATED 976825278 2000-12-14-20:21:18
#hostname host
#profile-layout
fw_profile1,epoch-timestamp,filter-name,counter-name,packet-count,byte-count
fw_profile1,976826058,myfilter,counter1,163,10764
...
#FILE CLOSED 976826178 2000-12-14-20:36:18
```

Example: Configuring Interface-Specific Firewall Counters and Filter Profiles

To collect and log count statistics collected by firewall filters on a per-interface basis, you must configure a filter profile and include the interface-specific statement at the [edit firewall filter *filter-name*] hierarchy level.

Configure the firewall filter accounting profile:

```
[edit accounting-options]
file cust1_accounting {
    size 500k;
}
filter-profile cust1_profile {
    file cust1_accounting;
    interval 1;
    counters {
        r1;
    }
}
```

Configure the interface-specific firewall counter:

```
[edit firewall]
filter f3 {
    accounting-profile cust1_profile;
    interface-specific;
    term f3-term {
        then {
            count r1;
            accept;
        }
    }
}
```

Apply the firewall filter to an interface:

```
[edit interfaces]
xe-1/0/0 {
    unit 0 {
        family inet {
            filter {
                input f3;
                output f3;
            }
            address 20.20.20.30/24;
        }
    }
}
```

The following example shows the contents of the cust1_accounting file in the /var/log folder that might result from the preceding configuration:

```
#FILE CREATED 995495212 2001-07-18-22:26:52
#hostname host
#profile-layout cust1_profile,epoch-timestamp,interfaces,filter-name,
```

```
counter-name,packet-count,byte-count
cust1_profile,995495572,xe-1/0/0.0,f3-xe-1/0/0.0-i,r1-xe-1/0/0.0-i,5953,1008257
cust1_profile,995495602,xe-1/0/0.0,f3-xe-1/0/0.0-o,r1-xe-1/0/0.0-o,5929,1006481
...
```

If the interface-specific statement is not included in the configuration, the following output might result:

```
#FILE CREATED 995495212 2001-07-18-22:26:52
#hostname host
#profile-layout cust1_profile,epoch-timestamp,interfaces,filter-name,
counter-name,packet-count,byte-count
cust1_profile,995495572,xe-1/0/0.0,f3,r1,5953,1008257
cust1_profile,995495632,xe-1/0/0.0,f3,r1,5929,1006481
```

Source Class Usage Options Overview

You can maintain packet counts based on the entry and exit points for traffic passing through your network. Entry and exit points are identified by source and destination prefixes grouped into disjoint sets defined as source classes and *destination classes*. You can define classes based on a variety of parameters, such as routing neighbors, autonomous systems, and route filters.

Source class usage (SCU) counts packets sent to customers by performing lookup on the IP source address and the IP destination address. SCU makes it possible to track traffic originating from specific prefixes on the provider core and destined for specific prefixes on the customer edge. You must enable SCU accounting on both the inbound and outbound physical interfaces.

Destination class usage (DCU) counts packets from customers by performing lookup of the IP destination address. DCU makes it possible to track traffic originating from the customer edge and destined for specific prefixes on the provider core router.

On T-series and M320 routing platforms, the source class and destination classes are not carried across the platform fabric. The implications of this are as follows:

- On T-series and M320 platforms, SCU and DCU accounting is performed before the packet enters the fabric.
- On T-series and M320 routing platforms, DCU is performed before output filters are evaluated. On M-series platforms, DCU is performed after output filters are evaluated.
- If an output filter drops traffic on M-series platforms, the dropped packets are excluded from DCU statistics. If an output filter drops traffic on T-series and M320 routing platforms, the dropped packets are included in DCU statistics.

Class-based filter match conditions are not supported on J-series Services Routers.

For more information about source class usage, see the *JUNOS Policy Framework Configuration Guide*, the *JUNOS Network Interfaces Configuration Guide*, and the *JUNOS Feature Guide*.

Configuring SCU or DCU

To configure SCU or DCU, perform the following tasks described in this section:

NOTE: We recommend that you stop the network traffic on an interface before you modify the DCU or SCU configuration for that interface. Modifying the DCU or SCU configuration without stopping the traffic might corrupt the DCU or SCU statistics. Before you restart the traffic after modifying the configuration, enter the clear interfaces statistics command.

Creating Prefix Route Filters in a Policy Statement

Define prefix router filters:

```
[edit policy-options]
policy-statement scu-1 {
   term term1;
   from {
      route-filter 192.168.1.0/24 orlonger;
   }
   then source-class gold;
}
```

Applying the Policy to the Forwarding Table

Apply the policy to the forwarding table:

```
[edit]
routing-options {
   forwarding-table {
      export scu-1;
   }
}
```

Enabling Accounting on Inbound and Outbound Interfaces

You can enable accounting on inbound and outbound interfaces:

```
[edit]
interfaces {
   so-6/1/0 {
      unit 0 {
         family inet;
         accounting {
            destination-class-usage;
            source-class-usage {
```

```
            output;
        }
      }
    }
  }
}
[edit]
interfaces {
  xe-0/1/0 {
    unit 0 {
      family inet6 {
        accounting {
          source-class-usage {
            input;
          }
        }
      }
    }
  }
}
```

Optionally, you can include the input and output statements on a single interface:

```
[edit]
interfaces {
  xe-0/1/2 {
    unit 0 {
      family inet6 {
        accounting {
          source-class-usage {
            input;
            output;
          }
        }
      }
    }
  }
}
```

For more information on configuring route filters and source classes in a routing policy, see the *JUNOS Policy Framework Configuration Guide* and the *JUNOS Network Interfaces Configuration Guide*.

Configuring SCU on a Virtual Loopback Tunnel Interface

To configure source class usage on the virtual loopback tunnel interface, perform the tasks described in the following sections:

- Example: Configuring a Virtual Loopback Tunnel Interface on a Provider Edge Router Equipped with a Tunnel PIC on page 684
- Example: Mapping the VRF Instance Type to the Virtual Loopback Tunnel Interface on page 684
- Example: Sending Traffic Received from the Virtual Loopback Interface Out the Source Class Output Interface on page 684

Example: Configuring a Virtual Loopback Tunnel Interface on a Provider Edge Router Equipped with a Tunnel PIC

Define a virtual loop interface on a provider edge router with a Tunnel PIC:

```
[edit interfaces]
vt-0/3/0 {
   unit 0 {
      family inet {
         accounting {
            source-class-usage {
               input;
            }
         }
      }
   }
}
```

Example: Mapping the VRF Instance Type to the Virtual Loopback Tunnel Interface

Map the VRF instance type to the virtual loopback tunnel interface:

```
[edit]
routing-instances {
   VPN-A {
      instance-type vrf;
      interface at-2/1/1.0;
      interface vt-0/3/0.0;
      route-distinguisher 10.255.14.225:100;
      vrf-import import-policy-name;
      vrf-export export-policy-name;
      protocols {
         bgp {
            group to-r4 {
               local-address 10.27.253.1;
               peer-as 400;
               neighbor 10.27.253.2;
            }
         }
      }
   }
}
```

NOTE: For SCU and DCU to work, do not include the vrf-table-label statement at the [edit routing-instances *instance-name*] hierarchy level.

Example: Sending Traffic Received from the Virtual Loopback Interface Out the Source Class Output Interface

Send traffic received from the virtual loopback tunnel interface out of the source class output interface:

```
[edit interfaces]
at-1/1/0 {
   unit 0 {
      family inet {
         accounting {
            source-class-usage {
               output;
            }
         }
      }
   }
}
```

For more information about configuring source class usage on the virtual loopback tunnel interface, see the *JUNOS Network Interfaces Configuration Guide*.

Configuring Class Usage Profiles

To collect class usage statistics, perform the tasks described in these sections:

- Configuring a Class Usage Profile on page 685
- Configuring the File Information on page 686
- Configuring the Interval on page 686
- Creating a Class Usage Profile to Collect Source Class Usage Statistics on page 686
- Creating a Class Usage Profile to Collect Destination Class Usage Statistics on page 687

Configuring a Class Usage Profile

You can configure the class usage profile to collect statistics for particular source and destination classes.

To configure the class usage profile to filter by source classes, include the source-classes statement at the [edit accounting options class-usage-profile *profile-name*] hierarchy level:

```
[edit accounting-options class-usage-profile profile-name]
source-classes {
   source-class-name;
}
```

To configure the class usage profile to filter by destination classes, include the destination-classes statement at the [edit accounting options class-usage-profile *profile-name*] hierarchy level:

```
[edit accounting-options class-usage-profile profile-name]
destination-classes {
   destination-class-name;
}
```

Configuring the File Information

Each accounting profile logs its statistics to a file in the /var/log directory.

To configure which file to use, include the file statement at the [edit accounting-options class-usage-profile *profile-name*] hierarchy level:

```
[edit accounting-options class-usage-profile profile-name]
file filename;
```

You must specify a filename for the source class usage profile that has already been configured at the [edit accounting options] hierarchy level. You can also specify a filename for the destination class usage profile configured at the [edit accounting options] hierarchy level.

Configuring the Interval

Each interface with a class usage profile enabled has statistics collected once per interval specified for the accounting profile. Statistics collection time is scheduled evenly over the configured interval. To configure the interval, include the interval statement at the [edit accounting-options class-usage-profile *profile-name*] hierarchy level:

```
[edit accounting-options class-usage-profile profile-name]
interval;
```

Creating a Class Usage Profile to Collect Source Class Usage Statistics

To create a class usage profile to collect source class usage statistics:

```
[edit]
accounting-options {
   class-usage-profile scu-profile1;
   file usage-stats;
   interval 15;
   source-classes {
      gold;
      silver;
      bronze;
   }
}
```

The class usage profile, scu-profile1, writes data to the file usage_stats. The file might look like the following:

```
#FILE CREATED 976825278 2000-12-14-20:21:18
#profile-layout, scu_profile,epoch-timestamp,interface-name,source-class,
packet-count,byte-count
scu_profile,980313078,xe-1/0/0.0,gold,82,6888
scu_profile,980313078,xe-1/0/0.0,silver,164,13776
scu_profile,980313078,xe-1/0/0.0,bronze,0,0
scu_profile,980313678,xe-1/0/0.0,gold,82,6888
scu_profile,980313678,xe-1/0/0.0,silver,246,20664
scu_profile,980313678,xe-1/0/0.0,bronze,0,0
```

Creating a Class Usage Profile to Collect Destination Class Usage Statistics

To create a class usage profile to collect destination class usage statistics:

```
[edit]
accounting-options {
    class-usage-profile dcu-profile1;
    file usage-stats
    interval 15;
    destination-classes {
        gold;
        silver;
        bronze;
    }
}
```

The class usage profile, dcu-profile1, writes data to the file usage-stats. The file might look like the following:

```
#FILE CREATED 976825278 2000-12-14-20:21:18
#profile-layout, dcu_profile,epoch-timestamp,interface-name,destination-class,
packet-count,byte-count
dcu_profile,980313078,xe-1/0/0.0,gold,82,6888
dcu_profile,980313078,xe-1/0/0.0,silver,164,13776
dcu_profile,980313078,xe-1/0/0.0,bronze,0,0
dcu_profile,980313678,xe-1/0/0.0,gold,82,6888
dcu_profile,980313678,xe-1/0/0.0,silver,246,20664
dcu_profile,980313678,xe-1/0/0.0,bronze,0,0
...

#FILE CLOSED 976826178 2000-12-14-20:36:18
```

Configuring the MIB Profile

The MIB profile collects MIB statistics and logs them to a file. The MIB profile specifies the SNMP operation and MIB object names for which statistics are collected.

To configure a MIB profile, include the mib-profile statement at the [edit accounting-options] hierarchy level:

```
[edit accounting-options]
mib-profile profile-name {
    file filename;
    interval minutes;
    objects-names {
        mib-object-name;
    }
    operation operation-name;
}
```

To configure a MIB profile, perform the tasks described in the following sections:

Configuring the File Information

Each accounting profile logs its statistics to a file in the /var/log directory.

To configure which file to use, include the file statement at the [edit accounting options mib-profile *profile-name*] hierarchy level:

```
[edit accounting-options mib-profile profile-name]
file filename;
```

You must specify a *filename* for the MIB profile that has already been configured at the [edit accounting-options] hierarchy level.

Configuring the Interval

A MIB profile has statistics collected once per interval time specified for the profile. Statistics collection time is scheduled evenly over the configured interval. To configure the interval, include the interval statement at the [edit accounting-options mib-profile *profile-name*] hierarchy level:

```
[edit accounting-options mib-profile profile-name]
interval;
```

The range for the interval statement is 1 through 2880 minutes. The default is 30 minutes.

Configuring the MIB Operation

A MIB profile must specify the operation that is used to collect MIB statistics. To configure which operation is used to collect MIB statistics, include the operation statement at the [edit accounting options mib-profile *profile-name*] hierarchy level:

```
[edit accounting-options mib-profile profile-name]
operation operation-name;
```

You can configure a get, get-next, or walk operation. The default operation is walk.

Configuring MIB Object Names

A MIB profile must specify the MIB objects for which statistics are to be collected. To configure the MIB objects for which statistics are collected, include the objects-names statement at the [edit accounting options mib-profile *profile-name*] hierarchy level:

```
[edit accounting-options mib-profile profile-name]
objects-names {
    mib-object-name;
}
```

You can include multiple MIB object names in the configuration.

Example: Configuring a MIB Profile

Configure a MIB profile:

```
[edit accounting-options]
mib-profile mstatistics {
    file stats;
    interval 60;
    operation walk;
    objects-names {
        ipCidrRouteStatus;
        ifOutOctets;
    }
}
```

Configuring the Routing Engine Profile

The Routing Engine profile collects Routing Engine statistics and logs them to a file. The Routing Engine profile specifies the fields for which statistics are collected.

To configure a Routing Engine profile, include the routing-engine-profile statement at the [edit accounting-options] hierarchy level:

```
[edit accounting-options]
routing-engine-profile profile-name {
    fields {
        field-name;
    }
    file filename;
    interval minutes;
}
```

To configure a Routing Engine profile, perform the tasks described in the following sections:

- Configuring Fields on page 690
- Configuring the File Information on page 690
- Configuring Fields on page 690
- Configuring the File Information on page 690
- Configuring the Interval on page 690
- Example: Configuring a Routing Engine Profile on page 691

Configuring Fields

A Routing Engine profile must specify what statistics are collected. To configure which statistics should be collected for the Routing Engine, include the fields statement at the [edit accounting options routing-engine-profile *profile-name*] hierarchy level:

```
[edit accounting-options routing-engine-profile profile-name]
fields {
   field-name;
}
```

Configuring the File Information

Each accounting profile logs its statistics to a file in the /var/log directory.

To configure which file to use, include the file statement at the [edit accounting options routing-engine-profile *profile-name*] hierarchy level:

```
[edit accounting-options routing-engine-profile profile-name]
file filename;
```

You must specify a *filename* for the Routing Engine profile that has already been configured at the [edit accounting-options] hierarchy level.

Configuring Fields

A Routing Engine profile must specify what statistics are collected. To configure which statistics should be collected for the Routing Engine, include the fields statement at the [edit accounting options routing-engine-profile *profile-name*] hierarchy level:

```
[edit accounting-options routing-engine-profile profile-name]
fields {
   field-name;
}
```

Configuring the File Information

Each accounting profile logs its statistics to a file in the /var/log directory.

To configure which file to use, include the file statement at the [edit accounting options routing-engine-profile *profile-name*] hierarchy level:

```
[edit accounting-options routing-engine-profile profile-name]
file filename;
```

You must specify a *filename* for the Routing Engine profile that has already been configured at the [edit accounting-options] hierarchy level.

Configuring the Interval

A Routing Engine profile has statistics collected once per interval time specified for the profile. Statistics collection time is scheduled evenly over the configured interval.

To configure the interval, include the interval statement at the [edit accounting-options routing-engine-profile *profile-name*] hierarchy level:

```
[edit accounting-options routing-engine-profile profile-name]
interval;
```

The range for interval is 1 through 2880 minutes. The default is 30 minutes.

Example: Configuring a Routing Engine Profile

Configure a Routing Engine profile:

```
[edit accounting-options]
file my-file {
    size 300k;
}
routing-engine-profile profile-1 {
    file my-file;
    fields {
        host-name;
        date;
        time-of-day;
        uptime;
        cpu-load-1;
        cpu-load-5;
        cpu-load-15;
    }
}
```

Chapter 83

Summary of Accounting Options Configuration Statements

The following sections explain each of the accounting options configuration statements. The statements are organized alphabetically.

accounting-options

Syntax accounting-options {...}
}

Hierarchy Level [edit]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure options for accounting statistics collection.

Usage Guidelines See "Configuring Accounting Options" on page 669.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

archive-sites

Syntax
```
archive-sites {
    site-name;
}
```

Hierarchy Level [edit accounting-options file *filename*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure an archive site. If more than one site name is configured, an ordered list of archive sites for the accounting-data log files is created. When a file is archived, the router attempts to transfer the file to the first URL in the list, moving to the next site only if the transfer does not succeed. The log file is stored at the archive site with a filename of the format *router-name_log-filename_timestamp*.

Options *site-name*—Any valid FTP URL to a destination. For information on how to specify valid FTP URLs, see the *JUNOS System Basics Configuration Guide*.

Usage Guidelines See "Configuring Archive Sites" on page 674.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

class-usage-profile

Syntax

```
class-usage-profile profile-name {
    file filename;
    interval minutes;
    source-classes {
        source-class-name;
    }
    destination-classes {
        destination-class-name;
    }
}
```

Hierarchy Level [edit accounting-options]

Release Information Statement introduced before JUNOS Release 7.4.

Description Create a class usage profile, which is used to log class usage statistics to a file in the /var/log directory. The class usage profile logs class usage statistics for the configured source classes on every interface that has destination-class-usage configured.

For information on configuring source classes, see the *JUNOS Routing Protocols Configuration Guide*. For information on configuring source class usage, see the *JUNOS Network Interfaces Configuration Guide*.

Options *profile-name*—Name of the destination class profile.

The remaining statements are explained separately.

Usage Guidelines See "Configuring Class Usage Profiles" on page 685.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

counters

Syntax
```
counters {
    counter-name;
}
```

Hierarchy Level [edit accounting-options filter-profile *profile-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Names of counters for which filter profile statistics are collected. The packet and byte counts for the counters are logged to a file in the /var/log directory.

Options *counter-name*—Name of the counter.

Usage Guidelines See "Configuring the Counters" on page 678.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

destination-classes

Syntax
```
destination-classes {
    destination-class-name;
}
```

Hierarchy Level [edit accounting-options class-usage-profile *profile-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify the destination classes for which statistics are collected.

Options *destination-class-name*—Name of the destination class to include in the source class usage profile.

Usage Guidelines See "Configuring a Class Usage Profile" on page 685.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

fields

See the following sections:

fields (for Interface Profiles)

Syntax

```
fields {
    field-name;
}
```

Hierarchy Level [edit accounting-options interface-profile *profile-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Statistics to collect in an accounting-data log file for an interface.

Options *field-name*—Name of the field:

- input-bytes—Input bytes
- input-errors—Generic input error packets
- input-multicast—Input packets arriving by multicast
- input-packets—Input packets
- input-unicast—Input unicast packets
- output-bytes—Output bytes
- output-errors—Generic output error packets
- output-multicast—Output packets sent by multicast
- output-packets—Output packets
- output-unicast—Output unicast packets

Usage Guidelines See "Configuring the Interface Profile" on page 675.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

fields (for Routing Engine Profiles)

Syntax
```
fields {
    field-name;
}
```

Hierarchy Level [edit accounting-options routing-engine-profile *profile-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Statistics to collect in an accounting-data log file for a Routing Engine.

Options *field-name*—Name of the field:

- cpu-load-1—Average system load over the last 1 minute
- cpu-load-5—Average system load over the last 5 minutes
- cpu-load-15—Average system load over the last 15 minutes
- date—Date, in YYYYMMDD format
- host-name—Hostname for the router
- time-of-day—Time of day, in HHMMSS format
- uptime—Time since last reboot, in seconds

Usage Guidelines See “Configuring the Routing Engine Profile” on page 689.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

file

See the following sections:

file (Associating with a Profile)

Syntax file *filename*;

Hierarchy Level [edit accounting-options class-usage-profile *profile-name*],
[edit accounting-options filter-profile *profile-name*],
[edit accounting-options interface-profile *profile-name*],
[edit accounting-options mib-profile *profile-name*],
[edit accounting-options routing-engine-profile *profile-name*]

Release Information Statement introduced before JUNOS Release 7.4.
The [edit accounting-options mib-profile *profile-name*] hierarchy added in JUNOS Release 8.2.

Description The accounting log file to use.

Options *filename*—Name of the log file. You must specify a *filename* already configured in the file statement at the [edit accounting-options] hierarchy level.

Usage Guidelines See "Configuring the Interface Profile" on page 675, "Configuring the Filter Profile" on page 677, "Configuring the MIB Profile" on page 687, and "Configuring the Routing Engine Profile" on page 689.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

file (Configuring a Log File)

Syntax
```
file filename {
    archive-sites {
        site-name;
    }
    files number;
    nonpersistent;
    size bytes;
    source-classes time;
    transfer-interval minutes;
}
```

Hierarchy Level [edit accounting-options]

Release Information Statement introduced before JUNOS Release 7.4.

Description Information on a log file used for accounting data.

Options *filename*—Name of the file in which to write the accounting data.

The remaining statements are explained separately.

Usage Guidelines See "Configuring Files" on page 672.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

files

Syntax files *number*;

Hierarchy Level [edit accounting-options file *filename*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Information on log files used for accounting data.

Options *number*—The maximum number of files. When a log file (for example, profilelog) reaches its maximum size, it is renamed profilelog.0, then profilelog.1, and so on, until the maximum number of log files is reached. Then the oldest log file is overwritten. The minimum value for *number* is 3 and the default value is 10.

Usage Guidelines See "Configuring Files" on page 672.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

filter-profile

Syntax

```
filter-profile profile-name {
    counters {
        counter-name;
    }
    file filename;
    interval minutes;
}
```

Hierarchy Level [edit accounting-options]

Release Information Statement introduced before JUNOS Release 7.4.

Description Create a profile to filter and collect packet and byte count statistics and write them to a file in the /var/log directory. To apply the profile to a firewall filter, you include the accounting-profile statement at the [edit firewall filter *filter-name*] hierarchy level. For more information on firewall filters, see the *JUNOS Network Interfaces Configuration Guide*.

Options *profile-name*—Name of the filter profile.

The remaining statements are explained separately.

Usage Guidelines See "Configuring the Filter Profile" on page 677.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

interface-profile

Syntax

```
interface-profile profile-name {
    fields {
        field-name;
    }
    file filename;
    interval minutes;
}
```

Hierarchy Level [edit accounting-options]

Release Information Statement introduced before JUNOS Release 7.4.

Description Create a profile to filter and collect error and packet statistics and write them to a file in the /var/log directory. You can specify an interface profile for either a physical or a logical interface.

Options *profile-name*—Name of the interface profile.

The remaining statements are explained separately.

Usage Guidelines See "Configuring the Interface Profile" on page 675.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

interval

Syntax interval *minutes*;

Hierarchy Level [edit accounting-options class-usage-profile *profile-name*],
[edit accounting-options filter-profile *profile-name*],
[edit accounting-options interface-profile *profile-name*],
[edit accounting-options mib-profile *profile-name*],
[edit accounting-options routing-engine-profile *profile-name*]

Release Information Statement introduced before JUNOS Release 7.4.
The [edit accounting-options mib-profile *profile-name*] hierarchy level added in JUNOS Release 8.2.

Description How often statistics are collected for the accounting profile.

Options *minutes*—Amount of time between each collection of statistics.
Range: 1 through 2880 minutes
Default: 30 minutes

Usage Guidelines See "Configuring the Interface Profile" on page 675, "Configuring the Filter Profile" on page 677, "Configuring the MIB Profile" on page 687, and "Configuring the Routing Engine Profile" on page 689.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

mib-profile

Syntax

```
mib-profile profile-name {
    file filename;
    interval minutes;
    objects-names {
        mib-object-name;
    }
    operation operation-name;
}
```

Hierarchy Level [edit accounting-options]

Release Information Statement introduced in JUNOS Release 8.2.

Description Create a MIB profile to collect selected MIB statistics and write them to a file in the /var/log directory.

Options *profile-name*—Name of the MIB statistics profile.

The remaining statements are explained separately.

Usage Guidelines See "Configuring the MIB Profile" on page 687.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

nonpersistent

Syntax nonpersistent;

Hierarchy Level [edit accounting-options file *filename*]

Release Information Statement introduced in JUNOS Release 8.3.

Description For J-series Services Routers only. Stores log files used for accounting data in the mfs/var/log directory (located on DRAM) instead of the cf/var/log directory (located on the compact flash drive). This feature is useful for minimizing read/write traffic on the router's compact flash drive.

NOTE: If log files for accounting data are stored on DRAM, these files are lost when you reboot the router. Therefore, you should backup these files periodically.

Usage Guidelines See "Configuring the Storage Location of the File" on page 673.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

objects-names

Syntax
```
objects-names {
    mib-object-name;
}
```

Hierarchy Level [edit accounting-options mib-profile *profile-name*]

Release Information Statement introduced in JUNOS Release 8.2.

Description Name of the MIB objects for which MIB statistics are collected for an accounting-data log file.

Options *mib-object-name*—Name of a MIB object. You can specify more than one MIB object name.

Usage Guidelines See "Configuring the MIB Profile" on page 687.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

operation

Syntax operation *operation-name*;

Hierarchy Level [edit accounting-options mib-profile *profile-name*]

Release Information Statement introduced in JUNOS Release 8.2.

Description Name of the operation used to collect MIB statistics for an accounting-data log file.

Options *operation-name*—Name of the operation to use. You can specify a get, get-next, or walk operation.
Default: walk

Usage Guidelines See "Configuring the MIB Profile" on page 687.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

routing-engine-profile

Syntax
```
routing-engine-profile profile-name {
    fields {
        field-name;
    }
    file filename;
    interval minutes;
}
```

Hierarchy Level [edit accounting-options]

Release Information Statement introduced before JUNOS Release 7.4.

Description Create a Routing Engine profile to collect selected Routing Engine statistics and write them to a file in the /var/log directory.

Options *profile-name*—Name of the Routing Engine statistics profile.

The remaining statements are explained separately.

Usage Guidelines See "Configuring the Routing Engine Profile" on page 689.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

size

Syntax size *bytes*;

Hierarchy Level [edit accounting-options file *filename*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Attributes of an accounting-data log file.

Options *bytes*—Maximum size of each log file, in bytes, kilobytes (KB), megabytes (MB), or gigabytes (GB). When a log file (for example, profilelog) reaches its maximum size, it is renamed profilelog.0, then profilelog.1, and so on, until the maximum number of log files is reached. Then the oldest log file is overwritten. If you do not specify a size, the file is closed, archived, and renamed when the time specified for the transfer interval is exceeded.
Syntax: *x* to specify bytes, *x*k to specify KB, *x*m to specify MB, *x*g to specify GB
Range: 256 KB through 1 GB

Usage Guidelines See "Configuring the Maximum Size of the File" on page 673.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

source-classes

Syntax
```
source-classes {
    source-class-name;
}
```

Hierarchy Level [edit accounting-options class-usage-profile *profile-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify the source classes for which statistics are collected.

Options *source-class-name*—Name of the source class to include in the class usage profile.

Usage Guidelines See "Configuring a Class Usage Profile" on page 685.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

start-time

Syntax start-time *time*;

Hierarchy Level [edit accounting-options file *filename*]

Release Information Statement introduced in JUNOS Release 8.2.

Description Start time for transfer of an accounting-data log file.

Options *time*—Start time for file transfer.
Syntax: YYYY-MM-DD.HH:MM

Usage Guidelines See "Configuring the Start Time for File Transfer" on page 674.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

transfer-interval

Syntax transfer-interval *minutes*;

Hierarchy Level [edit accounting-options file *filename*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Time the file remains open and receives new statistics before it is closed and transferred to an archive site.

Options *minutes*—Time the file remains open and receives new statistics before it is closed and transferred to an archive site.
Range: 5 through 2880 minutes
Default: 30 minutes

Usage Guidelines See "Configuring the Transfer Interval of the File" on page 674.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

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